Drying oven VWR DRY-Line with Natural Convection

DL 53, DL 115

European Catalogue Numbers:			
	Euro Plug:	DL 53: 466-3510	DL 115: 466-3513
	UK Plug:	DL 53: 466-3511	DL 115: 466-3514
	Swiss Plug:	DL 53: 466-3512	DL 115: 466-3515

User Manual

Issue 05-08_en
valid from device serial number 08-35000

VWR® Supplier Partnerships for Customer Solutions CE

Declaration of conformity

We: VWR International BVBA
Geldenaaksebaan 464
B-3001 Leuven
Belgium
Tel.: +32 (0) 16 385 011
Fax: +32 (0) 16 385385
E-mail: info@be.vwr.com

hereby declare under our sole responsibility that the products listed in schedule 1 to which this declaration relates, are in conformity with the following Council directives of the EU Member states:

Council directive on harmonization of the laws of the Member states:
Low-Voltage directive 2006/95/EC EMC directive 2004/108/EEC

and meet the essential requirements of the mentioned directives.
This equipment has been tested according to following standards:

Titles of the applied standards	Standard reference number
Safety requirements for electrical equipment for measurement, control and laboratory use- Part 1: General requirements	IEC/ EN 61010-1:2001
Safety requirements for electrical equipment for measurement, control and laboratory use. Part 2-010: Particular requirements for laboratory equipment for the heating of materials	IEC/EN 61010-2-010:2003
Electrical equipment for measurement, control and laboratory use- EMC requirements. Part 1: General requirements.	IEC/EN 61326-1:2005
Electrical equipment for measurement, control and laboratory use- EMC requirements. Part 2-2: Particular Requirements – Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage Distribution systems.	IEC/EN 61326-2-2:2005

The technical documentation required to demonstrate that the products meet the requirements of theses directives has been compiled and can be made available for inspection by the relevant enforcement authorities.

Date of original issue: Leuven, 29/01/2008

Raoul Biskupek
Managing Director

VWR® Supplier Partnerships for Customer Solutions CE

Declaration of conformity

SCHEDULE 1

VWR ARTICLE NBR	VWRI ARTICLE DESCRIPTION	TYPE
466-3510	DRYING OVEN DL 53, with natural convection, 53 L interior Volume	EU plug
466-3511	DRYING OVEN DL 53, with natural convection, 53 L interior Volume	UK plug
466-3512	DRYING OVEN DL 53, with natural convection, 53 L interior Volume	CH Plug
466-3513	DRYING OVEN DL115, with natural convection, 115 L interior Volume	EU plug
466-3514	DRYING OVEN DL115, with natural convection, 115 L interior Volume	UK plug
466-3515	DRYING OVEN DL115, with natural convection, 115 L interior Volume	CH plug

KBC 432-0017011-82
Fortis 230-0049581-34
ING 330-0007044-17
Post 000-0007762-02

tel/tél +32(0)16 385 011
fax +32(0)16 385 385
info@be.vwr.com
www.vwr.com

Haasrode Researchpark Zone 3
Geldenaaksebaan 464 B-3001 Leuven
RPR/RPM Leuven
VAT BE 0403.593.343

Content

1 Introduction

1.1 General guidelines

These operating instructions describe how to set up, operate, clean and adjust the DRY-Line drying ovens. They apply to these models:

- DRY-Line drying oven DL 53
- DRY-Line drying oven DL 115

These operating instructions are intended for staff using the equipment in the laboratory.

Other service and maintenance activities should be carried out exclusively by your distributor's customer service agents, and are therefore not explained in this manual.

1.2 Syntax

Syntax	Meaning
`Mono spaced`	Display
italics	Parameters
<button>	Button to be pressed
"text"	Text to be entered

1.3 Safety instructions structure

These operating instructions employ the terms and symbols below to describe dangerous situations, in line with the harmonization of ISO 3864-2 and ANSI Z535.4.

1.3.1 Safety instructions hierarchy

WARNING LEVELS	
Warning symbols and/or Prohibitory symbols and/or Imperative symbols	**Type of danger.** **Possible consequences.** ⃠ Instruction how to avoid the hazard: prohibition ➢ Instruction how to avoid the hazard: mandatory action

1.3.2 Warning levels

Dangers are indicated, according to the severity and likelihood of their consequences, by a word to attract attention, with the associated warning color and, if appropriate, with the safety alert symbol.

⚠ DANGER
Indicates an imminently hazardous situation that, if not avoided, will result in death or serious (irreversible) injury.

⚠ WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious (irreversible) injury.

⚠ CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor (reversible) injury.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in damage of the product and/or its functions or of a property in its ambiance.

1.3.3 Safety alert symbol

	Danger of injury. Follow all the directions indicated by the safety alert symbol in order to avoid injury or death.

1.3.4 Warning symbols used in this manual

	Danger of electric shock.
	Danger of explosion.
	Danger of fire.
	Danger of poisoning.
	Danger of hot surface.
	Danger of damage to health by harmful substance
	Danger of injury through an object tipping up.

	Danger of injury through lifting heavy objects.
	Danger of environmental damages.

1.3.5 Prohibitory symbols used in this manual

	Do not spray with water.

1.3.6 Imperative symbols used in this manual

	Pull the power plug.
	Observe environmental protection.

1.3.7 Information symbol used in this manual

	Important information

2 General safety instructions

2.1 Intended use

The DRY-Line drying ovens are designed for all standard drying and tempering tasks as well as sterilizing glassware.

They are intended for use in biological, chemical, medical, pharmaceutical and physical laboratories.

Any other use is not intended, and can cause damage and be harmful to health.

The DRY-Line drying ovens should not, in particular, be used to prepare foods intended for consumption or to sterilize or decontaminate medical products or medical equipment as defined by the Medical Device Directive 93/42/EWG (MDD).

2.2 Dangers

When the DRY-Line drying oven is installed, operated, cleaned, adjusted or set up incorrectly, there is a risk of malfunction which could cause harm to human beings and material damage to the equipment and samples.

Therefore the DRY-Line drying oven should only be installed, operated, cleaned, adjusted and set up by qualified persons.

- Persons qualified to install, operate, clean, and adjust the DRY-Line drying oven include everyone who has carefully read the user manual.
- Persons qualified to repair the DRY-Line drying oven only include service engineers authorized by the equipment supplier who have undergone appropriate electrical training and who have carefully read the DRY-Line drying oven service and user manual.

DANGER	
	**Danger of explosion.** **Danger to life.** ➢ Only install the device where there is no danger of explosion. ⃠ Do not keep explosive powders or solvent/air mixtures in the vicinity. ⃠ Never insert materials into the device that are explosive or inflammable at the interior temperature selected. ⃠ Never insert materials into the device that contain explosive or inflammable solvents. ⃠ Never insert materials into the device that sublimate or pyrolyze to form flammable materials at the interior temperature selected.

DANGER

Danger of electric shock.

Danger to life.

- ⃠ Do not allow the device to get wet while operating or maintaining.
- ⃠ Do not connect any device with a dented or damaged rear panel to the power supply.
- ➢ Remove the plug from the power supply before opening the rear panel.
- ➢ If a device has a damaged power cable or rear panel, withdraw it from use immediately, remove the power plug and contact your dealer to get it repaired.
- ➢ All work on the device's electrical components should be carried out by qualified electricians only.

DANGER

Danger of poison.

Danger to life.

- ⃠ Never insert materials into the device that disintegrate to form poisonous gases at the interior temperature selected.

WARNING

Danger of fire.

- ⃠ DRY-Line drying ovens must not be used if the test of the temperature safety device class 3.1 fails.
- ➢ In case of temperature safety device test failure withdraw the DRY-Line drying oven from use immediately, remove the power plug and contact your dealer to get it repaired.
- ➢ Only rest the device on a base that is heat-resistant to 100°C.
- ⃠ Do not push anything beneath the device, e.g. paper, plastic film
- ➢ Only use the device connected to a power source fused to at least 10 Amp (adequate). Follow the regulations of your local electricity supply company.

CAUTION

Danger of burnings.

- ➢ The vent cover at the back of the housing is hot and must not be touched while the unit is operating.

⚠ CAUTION	
	**Danger of breakages.** **Danger of injury.** ➢ Only place the device on surfaces that can support its weight.

⚠ CAUTION	
	**Danger of toppling.** **Danger of injury.** ⃠ Never stack more than two DRY-Line drying ovens on top of each other. ➢ Always secure the two stacked devices with the flat assembly bars supplied (see chapter 7.3, page 22).

⚠ CAUTION	
	**Danger of injury.** **Through the device slipping or tipping over.** **Damage to the device.** ➢ The device should be lifted by 2 people. ➢ The device should only be transported in its original packaging. ➢ The device should be secured with straps when being transported. ➢ The device should only be lifted along with the supporting pallet from below using mechanical tools (e.g. fork-lift truck). ⃠ The device should not be lifted directly from below using mechanical tools (e.g. fork-lift truck). ⃠ The device should not be lifted or moved by pulling the door.

3 Specification of services

The DRY-Line drying ovens are designed for all standard drying and tempering tasks as well as sterilizing glassware.

The DRY-Line drying ovens are available for a 230 V power supply

The DRY-Line drying oven consists of an outer casing made from powder-coated steel paneling and an inner, stainless steel chamber.

The interior is tempered by a direct heating system with natural convection that provides rapid heating up and a precise internal temperature. The DRY-Line drying oven can be operated stably within an interior temperature range from 5°C above ambient temperature up to 220°C at ambient temperatures of 18°C to 32°C.

The tempering of the interior of the DRY-Line drying oven is measured by a Pt100 temperature sensor and adjusted by a controller which monitors and regulates the temperature inside the chamber. The controller is also equipped with a timer function. The timer can be set from 0 to 999 minutes or 0.0 to 99.9 hours alternatively.

The DRY-Line drying oven is equipped with three safety devices to protect the drying oven, its environment and the samples inside from forbidden temperature excesses:

- Electrically controlled temperature limitation

  The software of the controller switches off the heating in the DRY-Line drying oven and triggers audible and visual alarms if an adjustable maximum temperature is exceeded. This maximum temperature is specified as an offset to the temperature set point (*Alarm offset*).

  Alarm offset specifies a temperature difference by which the temperature set point may not be exceeded, e.g. set point: 105°C, *Alarm offset*: 10°C. In the example, the alarm is triggered after an interior temperature of 115°C is exceeded.

- Temperature safety device class 3.1 (as per DIN 12880)

  The temperature safety device serves to protect the drying oven, its environment and the samples from unintended temperature excesses. The device is functionally and electrically independent of the temperature control system.

  If an error occurs at the controller the safety device assumes the regulatory function.

- Temperature fuse class 1 (as per DIN 12880)

  The temperature fuse is triggered off irreversibly if the maximum temperature of 229°C inside the DRY-Line drying oven is exceeded.

4 Scope of delivery

- DRY-Line Drying oven DL
- 2 trays (additional trays can be ordered)
- Flat assembly bar for stacking (it is vital to keep them, as two flat assembly bars are required to stack two devices, and each device comes supplied with one)

5 Description of the device

5.1 Views of the device

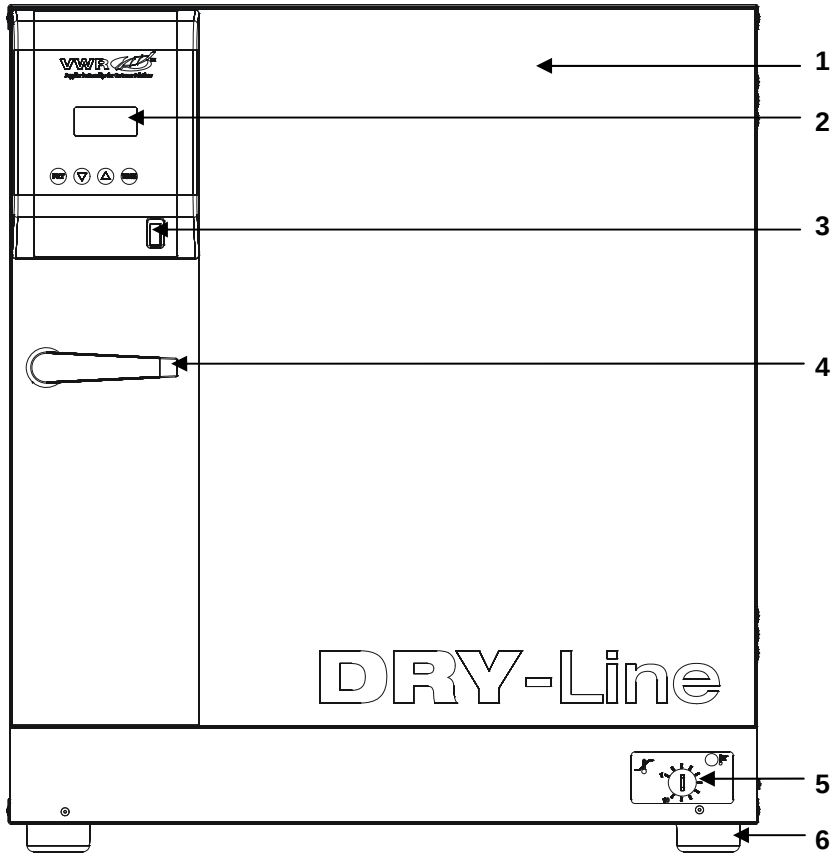


Figure 1: DRY-Line drying oven front view

1	Unit door
2	Controller
3	On/off switch
4	Door handle
5	Thermostat of temperature safety device class 3.1
6	Supporting foot

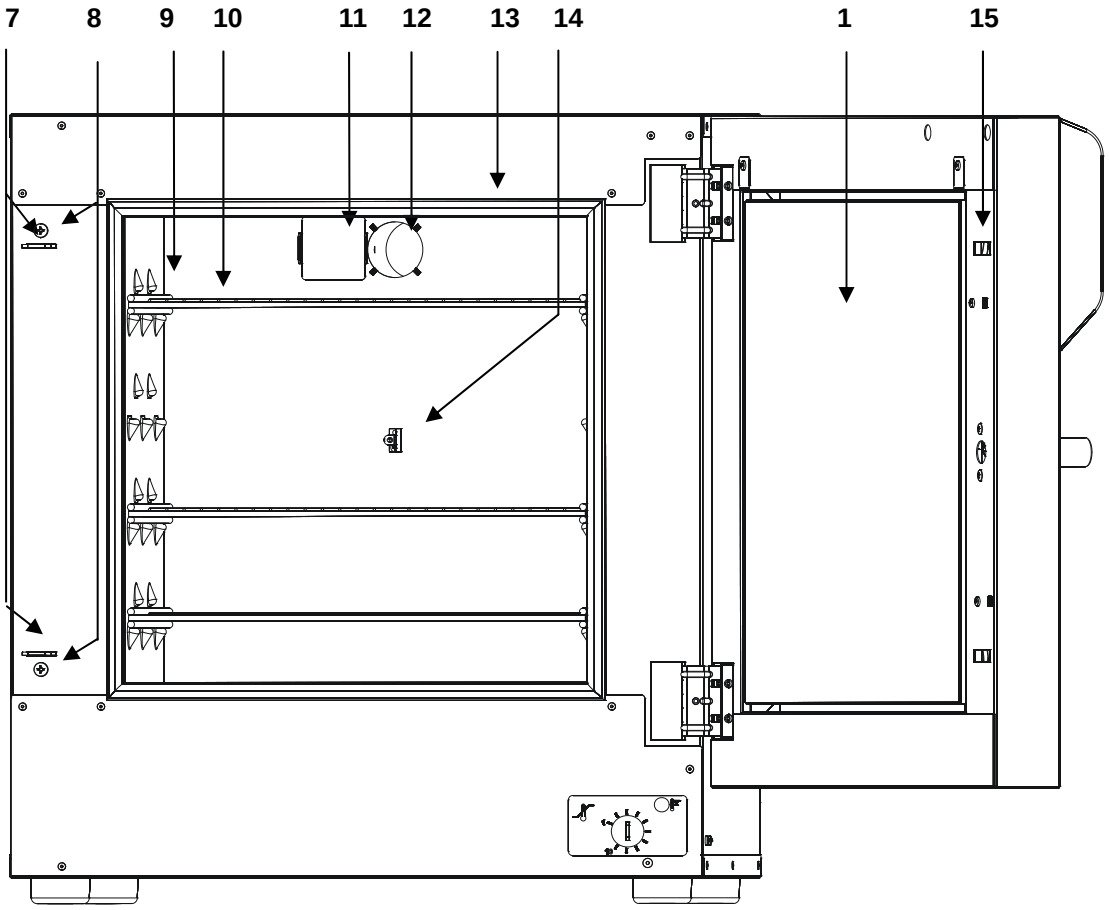


Figure 2: DRY-Line drying oven front view with open door

1	Door
7	Locking bracket for cabinet bolt
8	Adjusting screw of locking bracket
9	Guide bar
10	Tray
11	Ventilation flap
12	Vent
13	Door gasket
14	Pt100 temperature sensor
15	Cabinet bolt in door frame

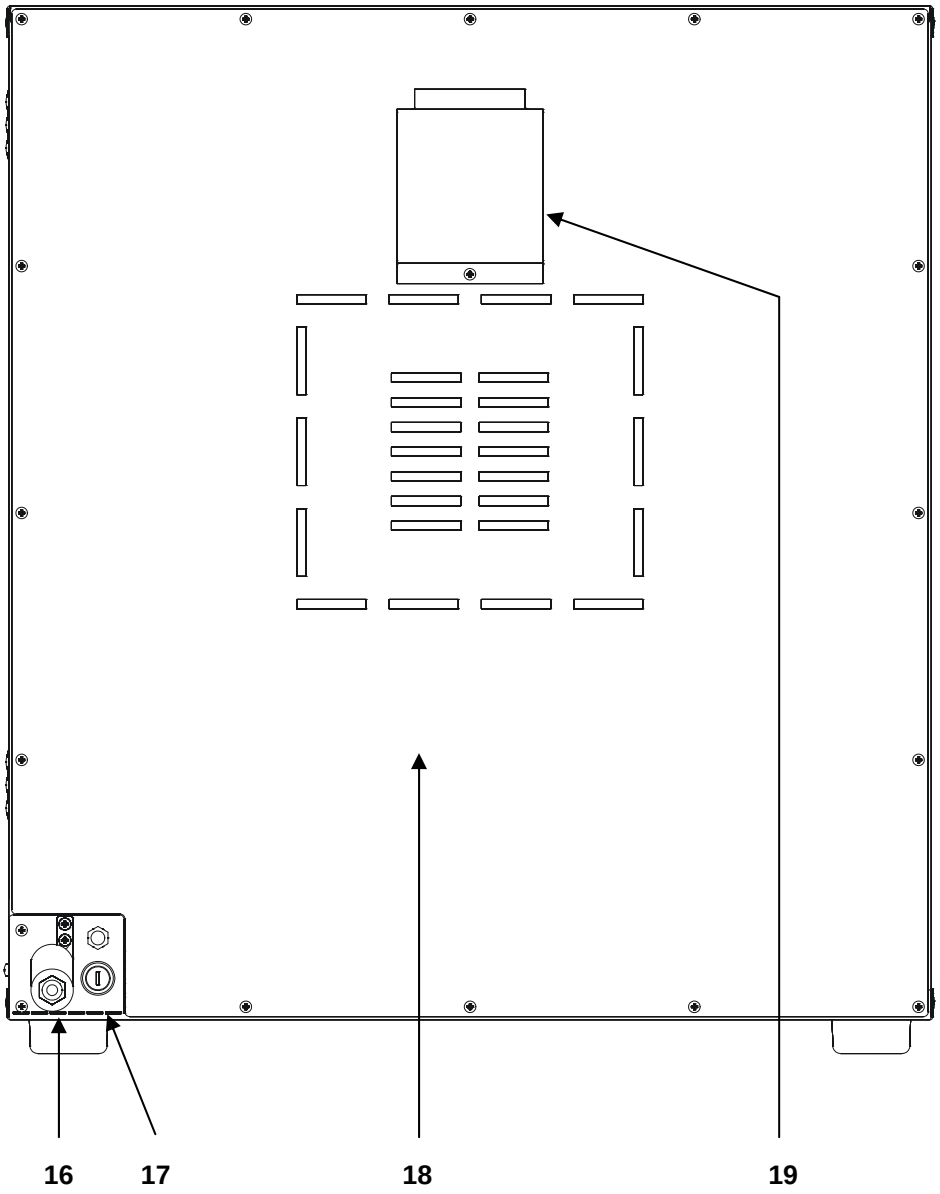


Figure 3: DRY-Line drying oven rear view

16	Power cable
17	Fuse
18	Rear panel
19	Vent cover

5.2 Controller components

Figure 4: Controller components and display

Table 1: Display symbols

Symbol	Meaning
-8.8.8.	Value
	Not assigned
	Heating active
°C	Interior temperature displayed as °C
°F	Interior temperature displayed as °F
s	Not assigned
h	Time displayed as h (hours)
min	Time displayed as min (minutes)

Table 2: Controller user interface

Button	Function
FKT	• Enter operation modes • Confirm entry and page forward through the controller's parameter list • Confirm alarm and switch off alarm sound
▼	Reduce the parameter value
▲	Increase the parameter value
TIME	• Start timer • Terminate timer count down

5.3 Technical data

	DRY-Line drying oven DL 53	DRY-Line drying oven DL 115
Outer casing		
Material	Powder-coated steel	
Width	620 mm	820 mm
Height	680 mm	760 mm
Depth	600 mm	710 mm
Minimum rear clearance	100 mm	100 mm
Minimum lateral clearance to adjacent devices and walls	150 mm	150 mm
Outer door swing radius	125°	125°
Interior		
Material	Stainless steel	
Width	401 mm	600 mm
Height	401 mm	480 mm
Depth	330 mm	400 mm
Interior volume	53 l	115 l
Interior fittings	• supplied: 2 chrome-plated trays • maximum: 4 chrome-plated trays	
Maximum load capacity of trays	• 10 kg per tray • 35 kg in sum of all trays	• 15 kg per tray • 45 kg in sum of all trays
Weight		
Weight incl. 2 trays	41 kg	62 kg
Heating system		
Heating system	Direct heating system	
Air convection	natural	
Temperature data (interior)		
Settable temperature range	5°C above ambient temperature up to 220°C	
Temperature deviation as a function of time at 150 °C set temperature*	±0.4°C	±0.3°C
Overtemperature protection devices		
Electrically controlled temperature limitation	*Alarm offset* 0°C to 99.9°C (see Table 4, page 29)	
Temperature safety device class 3.1 (as per DIN 12880)	50°C to 250°C	50°C to 250°C

	DRY-Line drying oven DL 53	DRY-Line drying oven DL 115
Electrical data		
IP protection type as per EN 60529	20	20
Nominal voltage (±10%)	230 V 50/60 Hz	
Power supply type	1/N/PE	1/N/PE
Protection system	Class 1	Class 1
Nominal power	0.8 kW	1.0 kW
Installation category as per IEC 1010-1	II	II
Pollution degree as per IEC 1010-1	2	2
Fusing	5 x 20 mm, 230 V / middle time-lag M, 10 Amp	
Ambient climate		
Operating temperature	18°C to 32°C	
Storage temperature	-10°C to +60°C	
Operating air humidity	Up to 70 % r.H. - non-condensing	
Storage air humidity	Up to 85 % r.H. - non-condensing	
Altitude of installation location	max. 2000 m above sea level	

6 Transport and storage

6.1 Guidelines for safe transport

⚠ CAUTION	
 	**Danger of injury.** **Through the device slipping or tipping over.** **Damage to the device.** ➢ The device should be lifted by 2 people. ➢ The device should only be transported in its original packaging. ➢ The device should be secured with straps when being transported. ➢ The device should only be raised along with the supporting pallet from beneath using mechanical tools (e.g. fork-lift truck). ⃠ The device should not be lifted directly from below using mechanical tools (e.g. fork-lift truck). ⃠ The device should not be lifted or moved by pulling the door.

6.1.1 Transporting a used DRY-Line drying oven

1. Switch off the DRY-Line drying oven using the power switch.
2. Pull out the power plug.
3. Remove the trays.
4. Clean the DRY-Line drying oven and its trays (see chapter 9 on page 32).
5. Dry the interior of the DRY-Line drying oven and the trays.
6. Wrap up the trays in bubble wrap.
7. Pack the trays in the original box and put them inside the DRY-Line drying oven.
8. Pack the DRY-Line drying oven in its original packaging.

	• Take care that the DRY-Line drying oven does not become wet while being transported. • During transport, maintain the permitted ambient temperature of -10°C to +60°C.

6.2 Storage

	• Only store the DRY-Line drying oven in enclosed, dry areas. • The permitted storage temperature is -10°C to +60°C, while the maximum permitted storage air humidity is 85 % r.H. non-condensing.

6.2.1 Storing a used DRY-Line drying oven

1. Switch off the DRY-Line drying oven using the power switch.
2. Pull out the power plug.
3. Clean the DRY-Line drying oven and its trays (see chapter 9 on page 32).
4. Dry the interior of the DRY-Line drying oven.
5. Store the DRY-Line drying oven in a suitable place.

7 Installing the DRY-Line drying oven

The DRY-Line drying oven drying oven is designed to be used in laboratories in enclosed spaces.

The minimum requirements for the location where the DRY-Line drying oven is to be installed are given below.

	When installing the DRY-Line drying oven in a laboratory or in a room similar to a laboratory, please comply with the national safety regulations that apply.

7.1 Installation location and ambient conditions

	Place the DRY-Line drying oven up in such a way that the On/Off switch is always accessible and that the device can be switched off immediately in case of danger.

7.1.1 Avoiding explosions

 **DANGER**	
	**Danger of explosion.** **Danger to life.** ➢ Only install the device where there is no danger of explosion. ➢ Do not keep explosive powders or solvent/air mixtures in the vicinity.

The DRY-Line drying oven provides no protection against explosions.

Never install or operate the DRY-Line drying oven in a location where explosive gases, powder or solvent-air mixtures could penetrate.

7.1.2 Avoiding wetting

DANGER	
	**Danger of electric shock.** **Danger to life.** ➢ Do not allow the device to get wet while operating or maintaining.

The DRY-Line drying oven is not waterproof. Do not install the DRY-Line drying oven in locations where water could be sprayed about, e.g. in the vicinity of sinks or safety showers.

7.1.3 Ventilation

CAUTION
Danger of overheating. **Damage to the device.** ➢ Ensure that there is sufficient ventilation to disperse the heat. ➢ Maintain a clearance of 150 mm to adjacent devices and walls. ⃠ Do not install the device in unventilated alcoves.

While operating the DRY-Line drying oven produces substantial amounts of heat.

The DRY-Line drying oven should only be installed in well-ventilated locations where the heat produced will be well dispersed. However, it should be shielded from strong gusts of air.

7.1.4 Supporting surface

WARNING	
	**Danger of fire.** ➢ Only rest the device on a base that is heat-resistant to 100°C. ⃠ Do not push anything beneath the device, e.g. paper, plastic film

⚠ CAUTION	
	**Danger of breakages.** **Danger of injury.** ➢ Only place the device on surfaces that can support its weight.

- The surface used to support a DRY-Line drying oven DL 53 must be capable of bearing at least 80 kg.
- The surface used to support a DRY-Line drying oven DL 115 must be capable of bearing at least 110 kg.
- A maximum of two DRY-Line drying ovens may be stacked on top of one another, and they should be secured together using two flat assembly bars.
- The surface used to support two stacked DRY-Line drying ovens DL 53 must be capable of bearing at least 160 kg.
- The surface used to support two stacked DRY-Line drying ovens DL 115 must be capable of bearing at least 220 kg.
- The supporting surface should be flat and level so that the DRY-Line drying oven can be set up in a way that is stable.
- There must be a clearance of at least 150 mm to the walls and other equipment.

7.1.5 Ambient climate for operating the DRY-Line drying oven

- Ambient temperature: 18°C to 32°C

  The ideal ambient temperature for the DRY-Line drying oven should be at least by 5°C below the intended interior operating temperature, e. g. interior operating temperature 35°C: ambient temperature +18°C to +30°C.
- Keep the device out of direct sunlight.
- Keep the device away from strong gusts of air (e.g. heating and ventilation systems).
- Ambient air humidity: max. 70 % r.H., non-condensing
- Altitude of installation location: max. 2000 m above sea level

7.2 Positioning the DRY-Line drying oven

⚠ CAUTION	
 	**Danger of injury.** **Through the device slipping or tipping over.** **Damage to the device.** ➢ The device should be lifted by 2 people at the device's 4 supporting feet. ➢ The device should only be raised along with the supporting pallet from beneath using mechanical tools (e.g. fork-lift truck). ⦸ The device should not be lifted directly from below using mechanical tools (e.g. fork-lift truck). ⦸ The device should not be lifted or moved by pulling the door.

The minimum requirements for the location of the DRY-Line drying oven are described in chapter 7.1 on page 19.

1. Place the DRY-Line drying oven on the intended supporting surface. Ensure there is sufficient clearance of at least 150 mm between the device and walls and other equipment.
2. Place the trays onto the guide bars in the interior space.

7.3 Placing two DRY-Line drying ovens on top of one another

⚠ CAUTION	
	**Danger of toppling.** **Danger of damage to health.** ⃠ Never stack more than two DRY-Line drying ovens on top of one another. ➢ Always secure stacked devices to one another using both flat assembly bars supplied.

The DRY-Line drying oven is designed so that two devices can be stacked on top of one another. To ensure that they are safely positioned, the two devices should be attached to one another using both flat assembly bars supplied. One flat assembly bar is supplied with each DRY-Line drying oven.

1. Place the lower DRY-Line drying oven at the intended location. Leave enough space between the rear panel of the device and the wall behind the device so that you can turn screws into the rear panel of the lower DRY-Line drying oven using a TX20 screwdriver.
2. Unscrew two of the screws which fix the upper edge of the rear panel of the lower DRY-Line drying oven.
3. Fasten two flat assembly bars with these screws at the upper edge of the rear panel (see Figure 5).
4. Place the second DRY-Line drying oven on top of the first.
5. Unscrew two of the screws which fix the lower edge of the rear panel of the upper DRY-Line drying oven.
6. Place the upper DRY-Line drying oven with the empty drilling holes overlapping the holes in the lower DRY-Line drying oven's flat assembly bars.
7. Screw the two assembly bars to the rear panel of the upper DRY-Line drying oven using the screws of step 5.

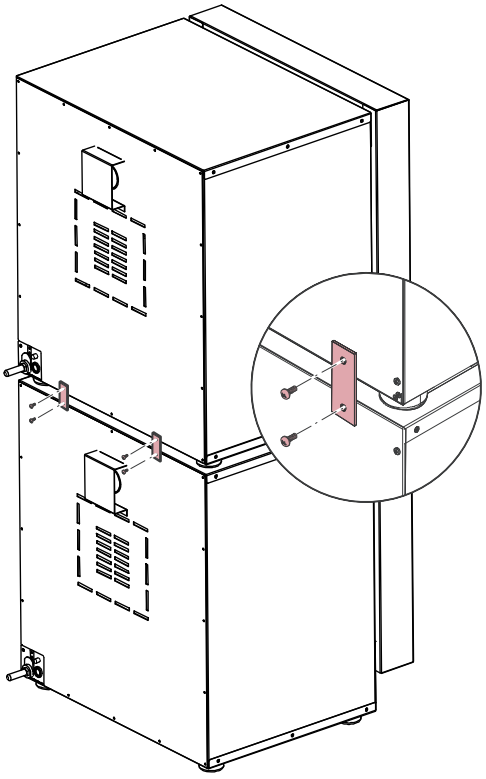


Figure 5: Placing two DRY-Line drying ovens on top of one another

7.4 Connecting the electrical supply

DANGER

Danger of electric shock.

Danger to life.

⃠ Do not connect any device with a dented or damaged rear panel to the power supply.

➢ Where a device has a damaged power cable or rear panel, withdraw it from use immediately, remove the power plug and contact your dealer to get it repaired.

WARNING

Danger of fire.

➢ Only use the device connected to a power source fused to at least 10 Amp (adequate).

➢ Observe the regulations of your local electricity supply company.

CAUTION

Danger of damage to the device.

➢ The device should only be operated at the supply voltage shown on the rating plate. Using a different supply voltage will damage the device.

The DRY-Line drying oven is available for a power supply of 230 V, 50/60 Hz AC 1/N/PE

1. Before connecting the DRY-Line drying oven to your power supply, verify that the supply voltage is the same as the supply voltage shown on the rating plate. If it is not the same, you must not connect this DRY-Line drying oven to your power supply.
2. Using the power plug, connect the DRY-Line drying oven to an adequately fused power source.

8 Operating the DRY-Line drying oven

8.1 Opening and closing the DRY-Line drying oven

The door of the DRY-Line drying oven must be closed while the device is operating normally in order to ensure that there is stable temperature in the interior.

1. To open the door, turn the locking knob clockwise and pull the door open.
2. Close the door in reverse order.

8.2 Adjusting the air exchange of the DRY-Line drying oven

CAUTION	
	**Danger of burnings.** ➢ The vent cover at the back of the housing is hot and must not be touched while the unit is operating.

	If the ventilation flap is completely open, the temperature accuracy can be negatively influenced

1. Shift the ventilation flap so that no condensation inside the DRY-Line drying oven takes place (see Figure 6).

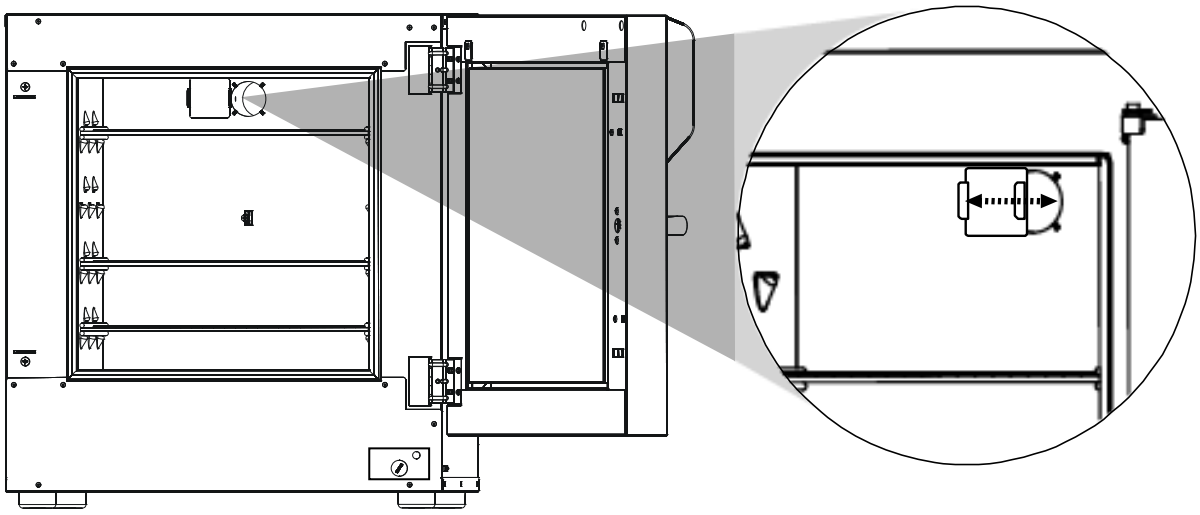


Figure 6: Adjusting the air exchange

8.3 Switching on the DRY-Line drying oven

CAUTION

Danger of samples being destroyed.

⦸ During the equilibration phase after the device is switched on, undefined climatic conditions are produced within the device. During this phase, do not place any sample materials in the device.

1. Check that the interior of the DRY-Line drying oven is empty, except the trays.
2. If you do not know what the DRY-Line drying oven was last used for, you should clean the interior (see chapter 9 on page 32).
3. Using the on/off switch on the bottom of the controller, switch on the DRY-Line drying oven.

   There is a subsequent brief startup phase with the controller display flashing.

   After a few seconds, the display shows the current interior temperature of the DRY-Line drying oven (see example in Figure 7).
4. On the controller, set the desired interior temperature that is to be used to operate the DRY-Line drying oven (see chapter 8.6 on page 28).

   The display symbol shows that the heating is active.

   Only insert samples into the DRY-Line drying oven when it has reached its stable operating state (see chapter 8.8 on page 30).

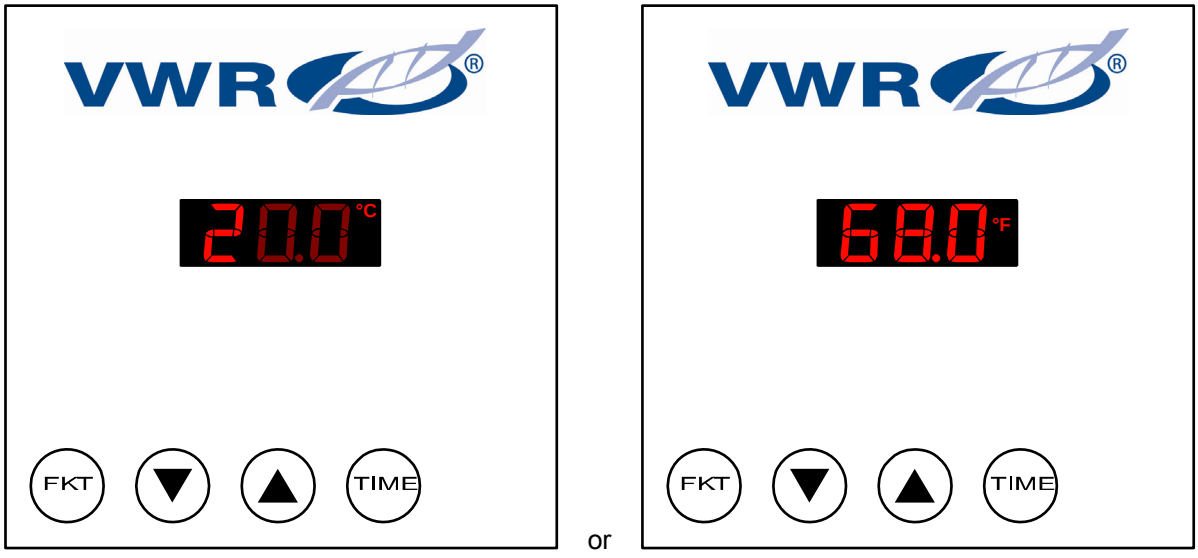


Figure 7: Basic mode: display is showing the current interior temperature (in °C or °F) (example)

8.4 Setting the temperature safety device class 3.1

	The temperature safety device must be checked at every change of the interior temperature set point and readjusted if necessary. The temperature being set at the temperature safety device must be higher than the temperature set point of the controller. Otherwise the temperature safety device switches off the DRY-Line drying oven before the temperature set at the controller is reached.

The temperature safety device class 3.1 (as per DIN 12880) serves to protect the unit, its environment and the samples from unintended temperature excesses. The device is functionally and electrically independent of the temperature control system. If an error occurs at the controller the safety device assumes the regulatory function.

The temperature safety device has an operating range from 50°C to 250°C.

- If the control knob is turned to its end-stop (maximum temperature), the temperature safety device class 3.1 functions as a safety device for the DRY-Line drying oven and switches off the heating if the interior temperature reaches 250°C.
- If the temperature safety device is set to a temperature somewhat higher than that selected on the controller, it switches off the heating if the controller fails and the interior temperature reaches these value.

If the selected temperature of the safety device is reached in case of controller failure the red alarm lamp lights up (see chap. 12.1 on page 34).

When the interior temperature decreases below the temperature set at the safety device, the red alarm lamp extinguishes and the heating resets automatically.

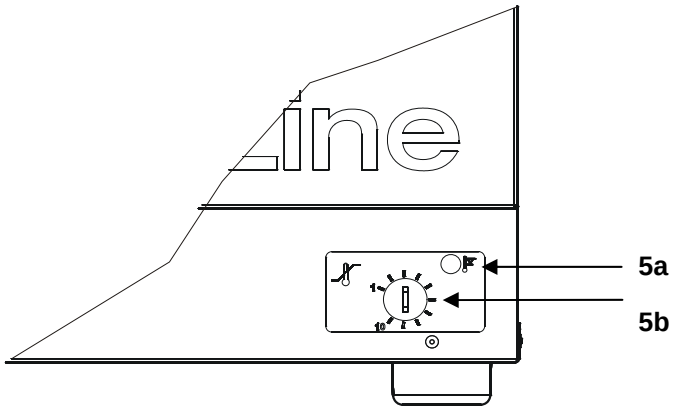


Figure 8: Temperature safety device

5a	Alarm lamp
5b	Control knob

8.4.1 Setting the temperature safety device

1. For using the temperature safety device to protect the DRY-Line drying oven turn the control knob clockwise to maximum.
2. For using the temperature safety device to protect the samples inside the DRY-Line drying oven use the following method for the setting of the temperature safety device:
   - Turn the control knob clockwise to maximum.
   - On the controller of the DRY-Line drying oven, set the desired temperature (see chapter 8.6 on page 28)
   - Wait until the interior temperature reaches the temperature set point.
   - Turn the control knob stepwise anti-clockwise until the red alarm lamp lights up.
   - Turn the control knob slightly clockwise from the value at which the red alarm lamp extinguishes.

8.4.2 Testing the temperature safety device

1. Switch on the DRY-Line drying oven.
2. Turn the control knob clockwise to maximum.
3. When the interior temperature reaches a temperature greater than 50°C, turn the control knob anti-clockwise.
4. When the setting of the temperature safety device remains below the interior temperature, the red alarm lamp (4a) must light up.

⚠ WARNING

Danger of fire.

⃠ Do not use the DRY-Line drying oven if the test of the temperature safety device fails.

➢ In case of temperature safety device test failure withdraw the DRY-Line drying oven from use immediately, remove the power plug and contact your dealer to get it repaired.

8.5 General instructions for setting the operating parameters at the controller

The controller has two operation modes 1 and 2, for setting different parameters and altering their values.

- Press the <FKT> button to enter into the operation mode menu. The controller's display shows alternately the selected parameter (e.g. `SP`) and its value (e.g. `105`) (see Figure 9).

  After 60 seconds without pressing any button the controller will automatically return to its basic mode displaying the current interior temperature (see Figure 7) with accepting every changed value.

- Move to the next parameter by pressing the <FKT> button.

  Pressing the <FKT> button will confirm the change made to the value of the current parameter and the DRY-Line drying oven will control towards the new set point.

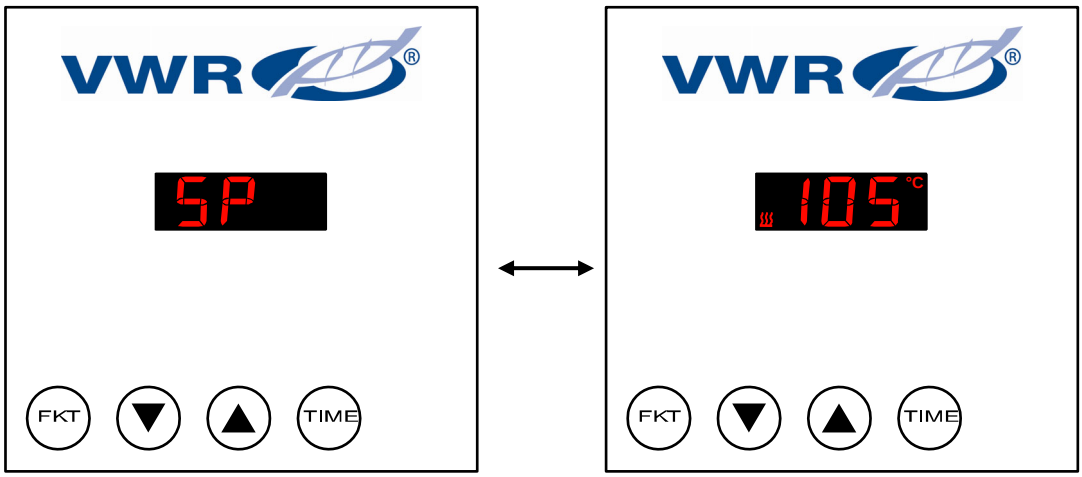


Figure 9: Displaying the parameter for the temperature set point (example)

- Press the <▲> and <▼> buttons to change the values of the parameters.

  For certain parameters pressing the buttons <▲> and <▼> enables selection between fixed values.

  There are parameter values which can only be read, but not changed, e.g. the *Firmware revision* `di.l` (see Table 4 on page 29).

	2 seconds after you have made a change to the value of a parameter the new value is accepted automatically and cannot be set back by any function.

- To go back to the basic controller display showing the current interior temperature (see Figure 7), press the <FKT> button repeatedly, or press the <FKT>+<▼> buttons simultaneously, or wait for 60 seconds without pressing any button.

8.6 Setting of temperature and timer

1. From the basic controller display, press the <FKT> button to go to the operation mode 1.
2. Use the <FKT>, <▲> and <▼> buttons to successively set the values for the following parameters: (see Table 3)

Table 3: Operating parameters that can be set in operation mode 1

Parameter	Code	Default Value	Value Range	Note
Temperature set point	`SP`	*110°C*	*0°C to 220°C*	The *Temperature set point* must be by at least 5°C above the ambient temperature in order to ensure a stable temperature inside the DRY-Line drying oven.
Timer unit	`t.Un`	*min*	• *min* • *hr*	• minutes • hours If *Timer unit* will be changed *Timer initial value* is set to 0. When the timer counts down the *Timer initial value* cannot be changed.
Timer initial value	`t.st`	*0*	• *0 min to 999 min* • *0 to 99.9 hr*	Initial value from which the timer counts down after being started by pressing the <TIME> button. • `t.st`=0: no timer operation

8.7 Setting of advanced operating parameters

1. From the basic controller display, press the <FKT> button for 5 seconds to go to the operation mode 2.
2. Use the <FKT>, <▲> and <▼> buttons successively set values for the following parameters: (see Table 4).

Table 4: Operating parameters that can be set in operation mode 2

Parameter	Code	Default Value	Value Range	Note
Alarm function	AL.F	*oFF*	• *oFF* • *on*	Switching on/off the offset alarm function (see chapter 12.2.1 on page 35).
Alarm offset	AL.o	*10.0°C*	*0°C to 99.9°C*	Temperature difference by which the temperature set point may not be exceeded. e.g. *Temperature set point*: 105°C, *Alarm offset*: 10°C. In the example, the offset alarm is triggered after an interior temperature of 115°C is exceeded (see chapter 12.2.1 on page 35).
Alarm hysteresis	AL.H	*1.0°C*	*0°C to 99.9°C*	Temperature difference by which the sum of *Temperature set point* and *Alarm offset* has to drop before the offset alarm reacts and unit heating assumes normal control. e.g. *Temperature set point*: 105°C, *Alarm offset*: 10°C, *Alarm hysteresis*: 1.0°C. The offset alarm will be switched off when the interior temperature drops to 114°C.
Temperature Unit	Uni	*°C*	*°C* *°F*	Display of temperature as °C or °F Temperature values are always stored in °C and will be converted into °F if Uni=*°F* is selected
Offset Temperature	oF.t	*Last value set*	*-25.0*°C *to* *+25.0*°C	This parameter is used to adjust the temperature sensor (see chapter 10 on page 33).
Firmware revision	di.1			Parameters for service maintenance only
Firmware revision	di.2			
Data set date (year)	di.3			These values are part of the data for creating the controller's data set. Parameters for service maintenance only
Data set date (month)	di.4			
Data set date (day)	di.5			
Data set version number	di.6			Parameters for service maintenance only

8.8 Inserting sample materials into the DRY-Line drying oven

The DRY-Line drying oven is designed for all standard drying and tempering tasks as well as sterilizing glassware.

DANGER

Danger of explosion.

Danger to life.

- ⃠ Never insert materials into the device that are explosive or flammable at the interior temperature selected.
- ⃠ Never insert materials into the device that contain explosive or inflammable solvents.
- ⃠ Never insert materials into the device that sublimate or pyrolyze to form flammable materials at the interior temperature selected.

DANGER

Danger of poison.

Danger to life.

- ⃠ Never insert materials into the device that disintegrate to form poisonous gases at the interior temperature selected.
- ⃠ Never insert materials into the device that react with moisture to form poisonous gases.

CAUTION

Danger of mechanical damage.

- ➢ DRY-Line drying oven DL 53: The trays inside the unit may be loaded to a maximum of 10 kg of sample material including containers respective 35 kg in total on all trays.
- ➢ DRY-Line drying oven DL 115: The trays inside the unit may be loaded to a maximum of 15 kg of sample material including containers respective 45 kg in total on all trays.

CAUTION

Danger of samples being disturbed.

- ⃠ During the equilibration phase after the device is switched on, undefined climatic conditions are produced within the device. During this phase, do not place any sample materials in the device.

1. If it is important for your purpose, you should determine whether the operating temperature that was set has stabilized before you insert sample material into the DRY-Line drying oven.

   To do this, you should check the controller's temperature display every 10 to 15 minutes after you have switched the DRY-Line drying oven on, or set a new temperature point.

2. Wait for 30 minutes after the temperature has reached its set point so that the interior temperature of the DRY-Line drying oven can become stable.

3. Open the door of the DRY-Line drying oven and place the samples into the device's usable area.

	The usable area as per DIN 12880 is that part of the interior where the temperature fluctuations listed in the technical data are maintained. • The usable area of the DRY-Line drying oven DL 53 starts 33 mm from the front and rear panels of the interior and 40 mm from the side panels, top and bottom of the interior. • The usable area of the DRY-Line drying oven DL 115 starts 40 mm from the front and rear panels of the interior, 60 mm from the side panels of the interior and 60 mm from the top and bottom of the interior.

CAUTION

Danger of samples being disturbed.

⦸ Do not remove the trays from the device in order to load them.

⦸ Never load the trays when they are pulled out. The trays and samples could tip over and fall on the floor.

⦸ Do not place samples on the interior base.

⦸ Do not place samples outside the usable area.

4. Close the door. The DRY-Line drying oven will automatically re-set the interior temperature to the set point defined.
5. After completing the experiment, remove the samples from the DRY-Line drying oven.
6. Clean the DRY-Line drying oven (see chapter 9 on page 32).

	At temperatures above 150°C the surface of the inner, stainless steel chamber may become oxidized by atmospheric oxygen and changes color to yellowish, brownish and bluish. This coloration has no impact in the performance and quality of the unit.

8.9 Using the timer function

You can use the timer function to switch off the drying oven heating after a defined time. The timer can be set from 0 to 999 minutes or 0.0 to 99.9 hours, alternatively.

1. Set the timer parameters to the required values (see chapter 8.6 on page 28).
2. Press the <TIME> button to start the timer.

   While the timer counts down the remaining time and the interior temperature are displayed alternately.
3. You can terminate the count down by pressing the <TIME> button.

   `t.oF` and the interior temperature are displayed alternately and the drying oven heating is switched off. The count down cannot be continued.
4. When the time has elapsed the controller will give an acoustic signal of 5 beeps. `t.oF` and the interior temperature will be displayed alternately while the drying oven remains switched off.

9 Cleaning

DANGER



Danger of electric shock.

Danger to life.

- Pull the power plug before cleaning.
- Do not pour water or cleaning agents excessively onto the inner or outer surfaces.
- Dry the device completely before starting to operate it again.

CAUTION

Danger of damage.

The interior of the unit is made from stainless steel.

- ⃠ Do not use any corrosive, oxidizing, acid or halide-containing cleaning agents for cleaning purposes.
- Only use cleaning agents that can be removed from the chamber using water and/or ventilation.
- Any residual cleaning agents left in the device may attack the stainless steel.

CAUTION

Danger of samples being disturbed.

- Only use cleaning agents that can be removed from the device using water and/or ventilation.
- Any residual cleaning agents left in the device may pollute the samples.

1. Remove the power plug before beginning to clean the device.
2. Clean thoroughly the interior, the inside of the door, and the gaskets with a neutral cleaning agent suited for use in laboratories or one containing ethanol or propanol.
3. Clean the outer casing of the DRY-Line drying oven with a slightly damp cloth to which you can, if you require, add a small amount of a neutral cleaning agent or one containing ethanol or propanol.
4. Thoroughly remove all residues of cleaning agents from the interior with deionized water.
5. If necessary, ventilate the interior thoroughly.

10 Taking the DRY-Line drying oven out of service

1. Switch off the DRY-Line drying oven using the power switch.
2. Pull out the power plug.
3. Clean the DRY-Line drying oven and its trays (see chapter 9 on page 32).
4. Dry the interior of the DRY-Line drying oven fully.
5. Where necessary, store the DRY-Line drying oven (see chapter 6.2 on page 18).

11 Adjusting the temperature control

The temperature display and control must be checked for accuracy every year and, if necessary, readjusted.

To adjust the temperature control, you need an electronic measuring and display instrument that has a valid calibration certificate and which has been approved by a recognized standards or calibration authority or regulatory body.

Measuring range: ≥ 20°C to 250°C

The sensor should be connected to the display instrument via a slim cable that can be placed over the door gasket without this causing a leak.

1. Attach the reference measuring instrument's temperature sensor to a tray in the center of the DRY-Line drying oven’s usable area (see chapter 5.3 on page 16).
2. Place the sensor cable out over the door gasket in such a way that the door can be closed and sealed.
3. Close the unit door.
4. Switch on the DRY-Line drying oven and set the temperature at which you usually operate the device.
5. Before making adjustments, you should determine whether the operating parameters that were set have stabilized.

   To do this, look at the controller's temperature display every 10 or 15 minutes.
6. Wait for 60 minutes after the interior temperature has first reached the set point so that the temperature can stabilize.
7. Compare the temperature displayed at the controller to the reading of the reference measuring instrument.

   The temperature control needs to be adjusted if the temperature displayed on the controller deviates by more than ±1 K from the temperature shown by the reference measuring instrument including the measurement uncertainty.

   e.g.:

Reference measuring instrument measurement uncertainty:	±0.5 K
Permitted deviation of controller display from reference temperature:	±1.5 K
Controller display:	105°C
Temperature measured with reference measuring instrument:	104°C
⇒ Temperature control does not need to be adjusted.	
Controller display:	105°C
Temperature measured with reference measuring instrument:	103°C
⇒ Temperature control needs to be adjusted.	

8. Calculate the temperature difference:

   (Measured reference temperature) minus (Controller displayed temperature)
   e. g. 103°C – 105°C = *-2°C*

9. To adjust the temperature control, access the oF.t *Offset temperature* parameter in the operation mode 2 (see chapter 8.7 on page 29).

10. Press the <▲> and <▼> buttons to enter the temperature difference calculated (see step 8.).

11. Confirm the temperature entry by pressing <FKT> + <▼> simultaneously.

    The DRY-Line drying oven's temperature control has now been readjusted.

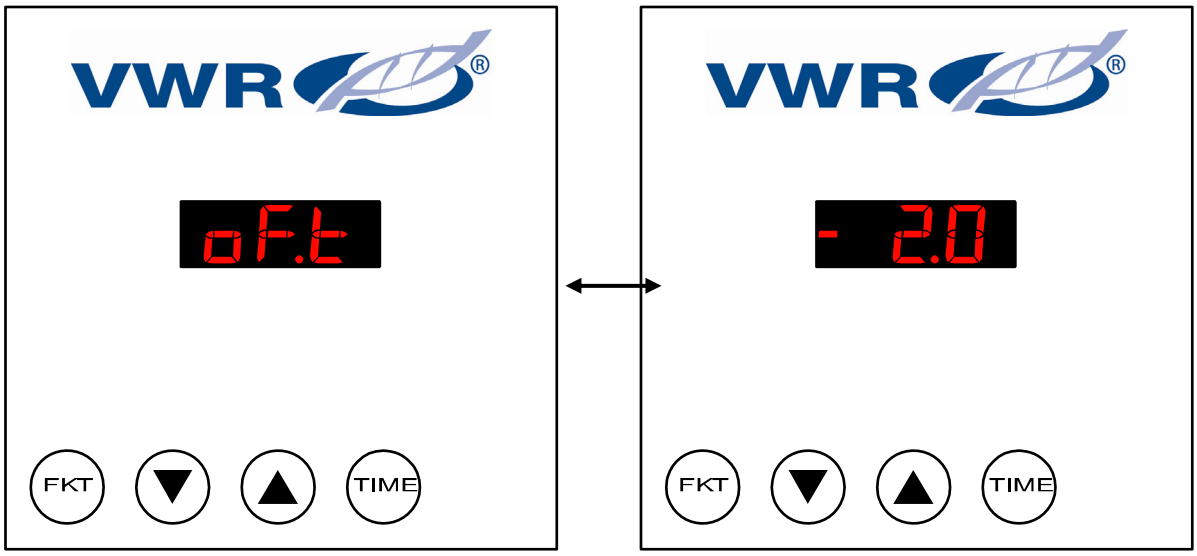


Figure 10: Setting of adjusting parameter (example)

12 Trouble shooting

12.1 Temperature safety device class 3.1 alarm

When the interior temperature exceeds the temperature set at the temperature safety device the red alarm lamp lights up.

- The alarm signal is emitted immediately when the fault occurs.
- Visual display: red alarm lamp of the temperature safety device is lighting
- Audible alarm: no audible alarm

Actions:

1. Check the temperature setting of the temperature safety device (see chap. 8.4 on page 26).

   The temperature being set at the temperature safety device must be higher than the temperature set point SP of the controller (see chapter 8.6 on page 28). If necessary, change the temperature setting of the temperature safety device.

2. If you can exclude point 1. as the source of the alarm, it may be that the device is faulty.

   Disconnect the unit from the mains and contact your dealer.

12.2 Controller alarm signals

When operational faults occur in the DRY-Line drying oven during normal operations, the controller indicates visual and audible alarm signals.

Table 5: Alarms

Alarm Code	Alarm	Description
	Offset alarm	see chapter 12.2.1
	Break of temperature sensor, exceeding of measuring range	see chapter 12.2.2
	Short circuit of temperature sensor, underflow of measuring range	see chapter 12.2.3

You may use the <FKT> button to confirm and thus switch off the audible alarm signal.

The visual alarm display may not be switched off but will resume when the reason for the fault has been remedied or the temperature returns to within its tolerance limits (see Table 4 on page 29).

12.2.1 Offset alarm

The *alarm offset* temperature has been exceeded (see Table 3 on page 28).

- The alarm signal is emitted immediately when the fault occurs.
- Visual display:  alternately actual temperature, e. g. 
- Audible alarm: buzzer (intermittent sound)

Actions:

1. Check the setting of the parameter `AL.o` *Alarm offset* (see Table 3 on page 28).

   The Alarm offset should be ≥ `10°C`.

   If necessary, change this parameter dependent on the other operating parameters.

2. Check whether samples were inserted into the DRY-Line drying oven that produce heat under the climate conditions in the device.

3. Check the ambient climate.

   The ambient temperature must be at least by 5°C below the temperature set point of the DRY-Line drying oven.

   The DRY-Line drying oven must be protected from direct sunlight.

   The DRY-Line drying oven's installation location must be sufficiently ventilated to prevent any buildup of heat in the device.

4. If you can exclude points 1. to 3. as the source of the fault, it may be that the device is faulty.

   Please contact your dealer.

12.2.2 Break of temperature sensor, exceeding of measuring range

- The alarm signal is emitted immediately when the fault occurs.
- Visual display:  (flashing)
- Audible alarm: buzzer (intermittent sound)

Actions:

1. Switch off the DRY-Line drying oven.
2. If necessary, clean the DRY-Line drying oven (see chapter 9 on page 32).
3. Please contact your dealer.

12.2.3 Short circuit of temperature sensor, underflow of measuring range

- The alarm signal is emitted immediately when the fault occurs.
- Visual display:  (flashing)
- Audible alarm: buzzer (intermittent sound)

Actions:

1. Switch off the DRY-Line drying oven.
2. If necessary, clean the DRY-Line drying oven (see chapter 9 on page 32).
3. Please contact your dealer.

13 Regular checks and maintenance

Table 6: Maintenance plan

Interval	Action
Weekly	Dust the outer casing
	Check the power cable for damage
After each experiment	Clean the device (see chapter 9 on page 32).
	Check the device for mechanical damage and corrosion
Annually	Check the temperature control and, if necessary, adjust it

DANGER	
	**Danger of electric shock.** **Danger to life.** ➢ If a device has a damaged power cable or rear panel, withdraw it from use immediately, remove the power plug and contact your dealer to get it repaired.

14 Technical service

Web Resources

Visit the VWR's website at **www.vwr.com** for:

- Complete technical service contact information
- Access to VWR's Online Catalogue, and information about accessories and related products
- Additional product information and special offers

Contact us

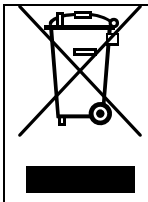
For information or technical assistance contact your local VWR representative or visit www.vwr.com.

15 Waste disposal

15.1 Disposal of the unit in the member states of the EC

WARNING	
	**Contamination of the device with toxic or radioactive substances.** **Danger of poisoning.** ⃠ Never lead a unit with sticking toxic substances to recycling according to directive 2002/96/EC. ➢ Prior to disposal, clean the unit of sticking toxic substances. ➢ Dispose of a unit which you cannot safely free from all toxic substances as special waste according to national law.

According to directive 2002/96/EC of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), the DRY-Line drying oven is classified as "monitoring and control instrument" (category 9) only intended for professional use.

	The DRY-Line drying oven bears the label for electrical and electronic equipment manufactured / distributed on the market in the EC after 13 August 2005 and to be disposed of according to the directive 2002/96/EC on waste electrical and electronic equipment (WEEE). WEEE label: crossed-out wheelie bin with solid bar below.

CAUTION	
	**Violation of existing law.** ⃠ The DRY-Line drying oven must not be disposed of at public collecting points. ➢ The DRY-Line drying oven should be disposed of professionally at a recycling company which is certified according to implementation of the directive 2002/96/EC into national law.

Certified companies disassemble used VWR equipment into recyclable components according to directive 2002/96/EC. In order to exclude any health hazard for the employees of the recycling companies, the devices must be free from toxic, infectious or radioactive substances.

	It is the user's responsibility that the unit is free from toxic or radioactive substances prior to handing it over to a recycling company. • Prior to disposal clean the unit from all introduced or sticking toxic substances. • If you cannot safely clean the unit from toxic substances, dispose of it as special waste according to national law.

15.2 Disposal of the unit in non-member states of the EC

CAUTION	
	**Danger of environmental damages.** ➢ Refer to national legislation when disposing of used equipment.

15.3 Disposing of packaging

Packaging components	Material	Type of disposal
Pallet	Non-wood (compressed wood shavings)	Wood recycling
Inner and outer packaging	Cardboard	Paper recycling
L-section	PE foam	Plastics recycling
Bubble wrap	PE foil	Plastics recycling
Padded parts on pallet	PE foam	Plastics recycling
User manual bag	PE foil	Plastics recycling
Straps for fixing to pallet	Plastic	Plastics recycling

Where recycling is impossible, all the packaging parts can also be disposed of along with household waste collection.

Manufacturer:

VWR International bvba

Haasrode Research Park Zone 3
Geldenaaksebaan 464

B-3001 Leuven

Belgium

Tel. +32 16 38 50 11

Internet: www.be.vwr.com

Equipment made in Germany

Local VWR offices in Europe

Austria

VWR International GmbH
Graumanngasse 7
1150 Wien
Tel.: 01 97 002 0
Fax: 01 97 002 600
E-mail: info@at.vwr.com

Belgium

VWR International bvba/sprl
Haasrode Researchpark Zone 3
Geldenaaksebaan 464
3001 Leuven
Tel.: 016 385 011
Fax: 016 385 385
E-mail:
customerservice@be.vwr.com

Denmark

VWR - Bie & Berntsen
Transformervej 8
2730 Herlev
Tel.: 43 86 87 88
Fax: 43 86 87 90
E-mail: info@dk.vwr.com

Finland

VWR International Oy
Pihatörmä 1 C 1
FI - 02240 Espoo
Tel.: +358 9 80 45 51
Fax: +358 9 80 45 52 00
E-mail: info@fi.vwr.com

France

VWR International S.A.S.
Le Périgares – Bâtiment B
201, rue Carnot
94126 Fontenay-sous-Bois cedex
Tel.: 0 825 02 30 30 (0,15 EUR TTC/min)
Fax: 0 825 02 30 35 (0,15 EUR TTC/min)
E-mail: info@fr.vwr.com

Germany

VWR International GmbH
Hilpertstrasse 20a
D - 64295 Darmstadt
Tel.: 0180 570 20 00*
Fax: 0180 570 22 22*
E-mail: info@de.vwr.com

*14 Cent/Minute aus d. dt. Festnetz

Ireland

AGB Scientific Ltd - A VWR International Company
Orion Business Campus
Northwest Business Park
Ballycoolin
Dublin 15
Tel.: 01 88 22 222
Fax: 01 88 22 333
e-mail info@agb.ie

Northern Ireland

AGB Scientific Apparatus Ltd
A VWR International Company
A10 Harbour Court, 7 Heron Rd
Sydenham Business Park
Belfast BT3 9HB
Tel.: 028 9058 5800
Fax: 028 9080 7812
Email: info@agbscientific.co.uk

Italy

VWR International s.r.l.
Via Stephenson 94
20157 Milano (MI)
Tel.: 02 332 03 11
Fax: 800 152 999
E-mail: info@it.vwr.com

The Netherlands

VWR International B.V.
Postbus 8198
1005 AD Amsterdam
Tel.: 020 4808 400
Fax: 020 4808 480
E-mail: info@nl.vwr.com

Norway

VWR International AS
Kakkelovnskroken 1
P.B. 45, Kalbakken
0901 Oslo
Tel.: 02290
Fax: 815 00 940
E-mail: info@no.vwr.com

Portugal

VWR International - Material de Laboratório, Lda
Edifício Neopark
Rua Tomás Ribeiro, 43- 3 D
2790-221 Carnaxide
Tel.: 21 3600 770
Fax: 21 3600 798/9
E-mail: info@pt.vwr.com

Spain

VWR International Eurolab S.L.
Ronda Can Fatjó, nº 11
Edifici Tecnopark, 3
Parc Tecnològic del Vallés
08290 Cerdanyola del Vallés
(Barcelona)
Tel.: 902 222 897
Fax: 902 430 657
E-mail: info@es.vwr.com

Sweden

VWR International AB
Fagerstagatan 18a
163 94 Stockholm
Tel.: 08 621 34 00
Fax: 08 621 34 66
E-mail: info@se.vwr.com

Switzerland

VWR International AG
Lerzenstrasse 16/18
8953 Dietikon
Tel.: 044 745 13 13
Fax: 044 745 13 10
E-mail: info@ch.vwr.com

UK

VWR International Ltd
Customer Service Centre
Hunter Boulevard
Magna Park
Lutterworth
Leicestershire
LE17 4XN
Tel.: 0800 22 33 44
Fax: 01455 55 85 86
E-mail: uksales@uk.vwr.com