

HERAguard ECO

Clean Benches

with Horizontal Airflow

Operating instructions

50138900 A

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1**General notes**

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1**General notes****1.1 Data of the Heraguard ECO and the documentation****Device identification**

Device Name: Clean Workbench
Model: Heraguard ECO

Certification and Quality Audit:

Conformity: CE conformity marking

1.2 Instruction of the operating personnel

These operating instructions describe the clean workbench Heraguard ECO and apply to the models 0.9, 1.2, 1.5, 1.8, 1.8/95.

The clean workbench has been manufactured in keeping with the latest technological developments and has been tested before delivery for its correct function. It may, however, present potential hazards if it is not used according to the intended purpose or outside of operating parameters. Therefore, the following procedures must always be observed to prevent accidents:

- The Clean Bench must be operated only by trained and authorized personnel.
- For any operation of this device, the operator must prepare clear and concise written instructions in the language of the operating and cleaning personnel based on these operating instructions, applicable safety data sheets, plant hygiene guidelines, and technical regulations, in particular:
 - which decontamination measures are to be applied for the cabinet and accessories,
 - which protective measures apply while specific agents are used,
 - which measures are to be taken in the case of an accident.
- Repairs to the device must be carried out only by trained and authorized expert personnel.

1.3 Applicability of the instructions

- The contents of the operating instructions are subject to change without further notice.
- Concerning translations into foreign languages, the German version of these operating instructions is binding.
- Keep these operating instructions close to the device so that safety instructions and important information are always accessible.
- Should you encounter problems that are not detailed adequately in these operating instructions, please contact Thermo Fisher Scientific immediately for your own safety.

1.4 Warranty

Thermo Fisher Scientific warrants the operational safety and functions of the clean workbench only under the condition that:

- the device is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions,

1**General notes**

- the device is not modified,
 - only original spare parts and accessories that have been approved by Thermo Fisher Scientific are used,
 - inspections and maintenance are performed at the specified intervals,
 - an installation test is performed prior to the initial operation of the device and that a repeat test is performed on the occasion of all inspections and repairs.
- The warranty is valid from the date of delivery of the device to the operator.

1.5 Standards and safety regulations

The device complies with the safety requirements of the following standards and directives:

- IEC 61010-1 3rd Ed
- IEC 61326-1 2nd Ed
- Low Voltage Directive 2006/95 EC
- EMC Directive 2004/108 EC

For the setting-up and installation of the clean workbench the respective national regulations must be observed.

It may be necessary to perform suitable disinfection/cleaning work before beginning maintenance.

Disconnect the unit from the electrical and other supply networks before beginning maintenance/repair work, and pull the unit's power plug out of the wall socket or remove or turn off the fuse or circuit breaker. Lock the unit out to prevent the power from being accidentally turned on to it. Shut off and lock the gas connection, and secure it.

To prevent static electricity buildup and the hazards associated with it, it may be necessary to connect any supply lines (e.g., gas, water...) to your building's ground circuit.

If flammable materials/solvents are used or released during work in the test chamber, remember that, after a point that is specific to the material involved, these materials form a flammable, and in some cases explosive, vapour/air mixture.

This mixture can result in fires or explosions.

If such work cannot be avoided, make sure that the release of such materials only occurs if there is adequate ventilation. Releases are to be controlled in such a way that they stay well below the limits with respect to the volume flow of the unit and the laboratory ventilation system, as set forth in the regulations concerning primary explosion protection.

In order to ensure the stability of the unit, only laboratory benches with an appropriate degree of stability and adequate capacity, or the bases and stands available as accessory parts may be employed.

If in doubt and were the unit is subject to rough treatment, additional anchors should be installed.

1

General notes

1.6 Explanation of symbols

1.6.1 Symbols used in the operating instructions

**WARNING!**

is used if non-observance may cause serious or even lethal injuries.

**CAUTION!**

is used if non-observance may cause medium to minor injuries or damage.

**NOTE!**

is used for hints and useful information.

**RECYCLING!**

Valuable raw materials can be reused.



Warning against electric shock.



UV-C radiation

1.6.2 Symbols on the device



Observe operating instructions



CE mark for EU conformity declaration



Mark of conformity USA/Canada



WEEE mark for Recycling and disposal



Grounding mark

1**General notes****1.7 Use of the device****1.7.1 Correct use**

The clean workbench is a laboratory device for installation and operation in microbiological and biotechnical laboratories of safety levels 1, 2, and 3.

The unit may only be employed for its intended purpose, that is, for work with non-hazardous substances or vapors with the highest requirements for production safety. The use of the bench for any other purpose may present unknown risks and hazards, and is not permitted.

The clean workbench with horizontal airflow is a laboratory-quality unit, that protects the material being processed against hazardous influences from the test area. Clean workbenches are suitable for setup and operation in the following areas:

- In laboratories performing microbiological and biotechnology work;
- In pharmacy laboratories;
- In medical/microbiological laboratories in accord. with DIN 58956;
- In laboratories in the central areas of clinics and hospitals;
- In optical industry laboratories;
- In electronics industry laboratories.

Follow all applicable federal, state, and local ordinances with respect to setup. Clean workbenches provide no protection against hazardous gases or vapors.

1.7.2 Incorrect use

The clean workbench may not be used to process hazardous substances or vapors.

The filters installed in the device are not capable of separating gaseous substances. Therefore, never store or process gases or gas-releasing substances in the device:

- which in quantity or concentration are toxic,
- if a reaction with other substances may result in hazardous toxic concentrations or formation of toxic gases,
- that may form combustible or explosive mixtures in combination with air.

Excess of the maximum load of 1100 Watts for 230V and 600 Watts for 120 V units that can be connected to the secondary outlets.

2**Delivery****2.1 Scope of delivery**

Delivery for the clean workbench cabinet includes the following:

- Clean workbench (without stand)
- device documentation:
 - operating instructions
 - factory test report

Optional components and accessories are listed as separate items in the delivery document.

2.2 Acceptance inspection

After the device has been delivered, immediately check the device:

- for completeness,
- for possible damage.

If the delivery is incomplete or if you detect any transport damage to the device, contact the forwarding agency and Thermo Fisher Scientific immediately.

2.3 Device packaging

The packaging is intended to protect the unit against damage during shipping. Aside from suitability for performing this protective function, packaging material selection is primarily based on environmental and disposal aspects to ensure that the material can be recycled.

To remove the protective packagings, please refer to the enclosed installation instructions and to section 5.2 of these instructions.

3
Installation
3.1 Ambient conditions

The operational safety and correct function of the device depends on the location where it is to be operated. The clean workbench must be operated only at locations that meet the ambient conditions listed below.

Location requirements:

- The electrical system of the device has been designed for an operating height of up to 2000 m (6560 ft) above sea level.
- The mains power supply outlet should be out of casual reach to prevent accidental shut-off. Ideally, the outlet should be installed above the safety cabinet.
The outlet must be accessible to authorized personnel only. It constitutes, together with the power cable plug, the disconnection device for all poles.
- The flooring of the location must be adequately strong and not flammable.
- The stand must ensure a sufficient load-bearing capacity (twice the device weight).
- The room in which the device is installed must be of adequate height. For devices that are not connected to an exhaust system, the distance between the exhaust air opening at the device ceiling and the room ceiling must be at least 200 mm (8 in).
- The location must be equipped with an appropriate ventilation system (see section 3.2).
- For the valves may be installed a lateral distance of at least 300 mm (11,8 in) is required to ensure accessibility for the installation.
- The temperature within the room must be between 5 °C and 40 °C (41 °F and 104 °F).
- The relative humidity in the vicinity of the device must not exceed 80 % r.h. at 31 °C (88 °F) und 50 % r.F at 40 °C (104 °F).


NOTE - Ambient conditions!

If ambient conditions vary from those described above, please contact Thermo Fisher Scientific for assistance in installing the device.


NOTE - Temporary storage!

If the device is stored only temporarily (up to four weeks), the ambient temperature may be between -20 °C and +60 °C (-4 °F and +140 °F) at a relative air humidity of up to 90 %. For longer storage periods, the location requirements apply.

3

Installation

3.2 Room ventilation

The room ventilation should preferably be a ventilation system that complies with the national requirements for the application.

- The inlet air and exhaust air openings of the room ventilation must be located so that draughts are prevented from impairing the function of the Clean Workbench air system.

3.3 Correct location



Guideliness

Follow all applicable federal, state, and local guidelines pertaining to the setup and installation of the clean benches.

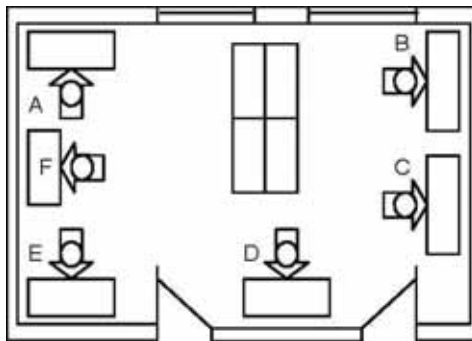


Fig. 1
Location

Correct, „draught-free“ setup of the unit in the laboratory is an essential requirement for safe operation. Locations A, E, and F are well selected. Here, neither draughts nor traffic can be expected to affect the unit. Location B is significantly influenced by draughts. Location C is influenced by both draughts and traffic. Location D is also influenced by both draughts and traffic.

3

Installation

3.4 Transport

To prevent tilting, always transport the device using a suitable carrier, even for a transport within a building, and separate it from the stand (see section 5.2).



CAUTION – Tilting danger!

If the unit is tilted too much during lifting, risk of tipping exists. Lift the clean workbench only vertically!

For transportation (including inside buildings) use an appropriate lifting device, which ensures that the unit:

- is on a stable stand and
- is secured against lateral tilting.

Do not transport the clean bench on a base with rollers.



CAUTION CAUTION – Lift points!

For transport, lift the device only at the lift points shown in figure 2.

Do not allow the weight of the cabinet to rest on the working surface.



Fig. 2
Lift points

4**Description of the device****4.1 Overall view**

- Mains connection [1], must be clearly visible by the user und easily accessable.
- Plenum assembly [3] with plenum for blower [19] is installed immediately to the pertaining plenum.
The plenum assembly is concealed with the rear wall [18].
- Switchbox [4] with RS 232 connection [23] for a PC and two fuse holders [22].
- Light dome [4] for the sample chamber illumination unit, equipped with two fluorescent tubes.
The optional, device-integral UV lamp is installed at the front section of the sample chamber.
- Operating panel [5] with function keys and indicators.
- Bushings [8] and [9] in the side panels (2 on each side). The bushings [9] can be used to install media valves [11], the bushings [8] of type SmartPort are provided for laying cables or hoses into the utility chamber.
- Stand [10] (optional).
- Working area [13]
- Diffusor plate [14]
- Internal outlets [15] for the power supply of accessories.
- Anti-tilt anchor [20]

4

Description of the device

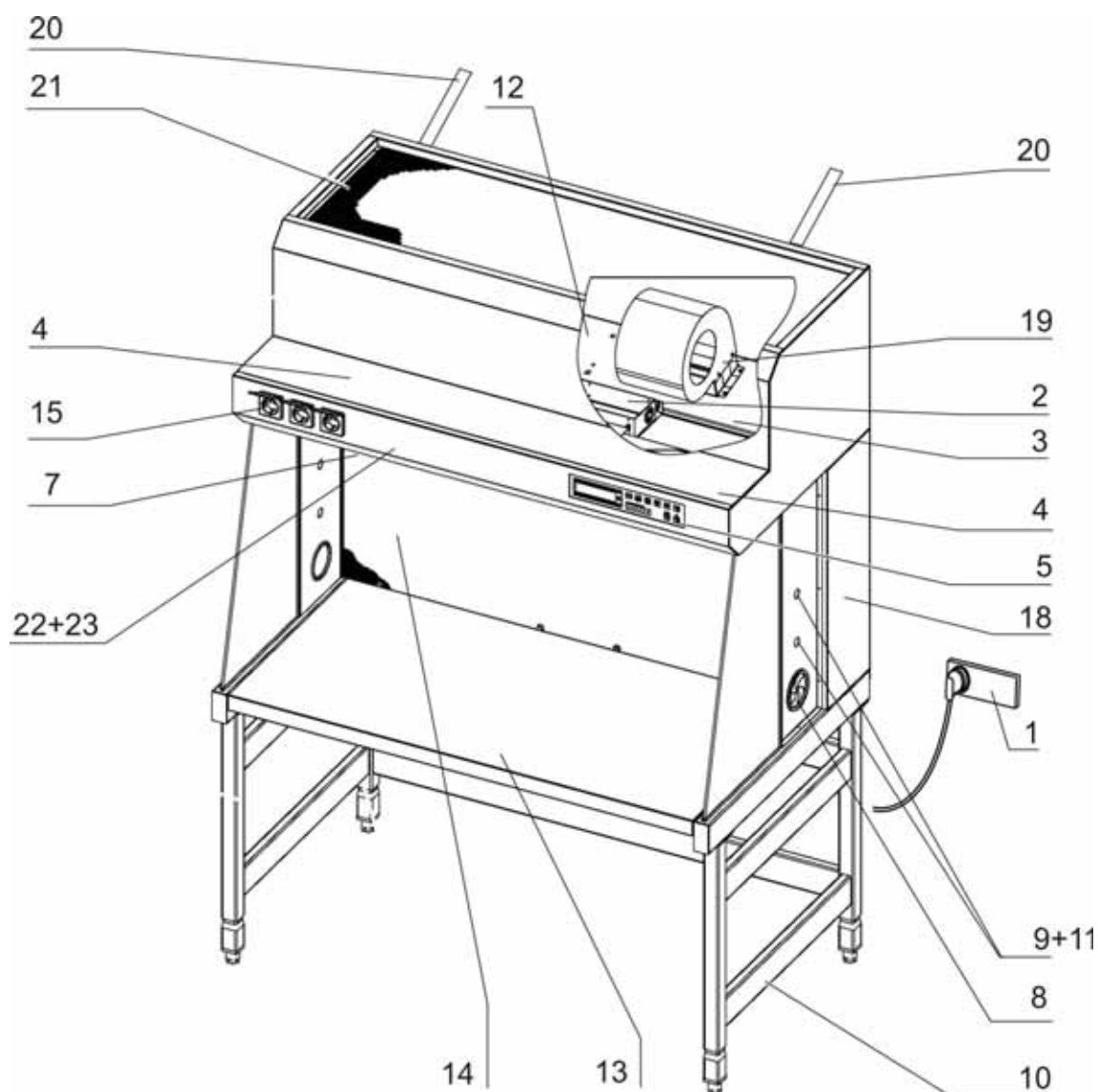


Fig. 3
Overall view

4

Description of the device

4.2 Safety system

The safety system comprises a combination of protective and alarm systems that ensure maximum material protection.

Warning system:

- **Airflow monitoring**

Airflow monitoring determines the velocity of the airflow in the sample chamber. As soon as airflow velocities move above or below a specified safety value, a signal is transmitted to the alarm system.

- **Visual alarm system**

The warning system constantly monitors the safety-relevant device functions:

- Flow velocity of the air

The alarm system displays a visual alarm signal.

4.3 Filter system

The filter system consists of a pre-filter [2] and a HEPA filter [5] for the device downflow and exhaust air.

Room air [1] is drawn into the sample chamber through a blower. The pre-filtered air [5] is drawn through an HEPA-filter [3] and fed into the working area as clean air.

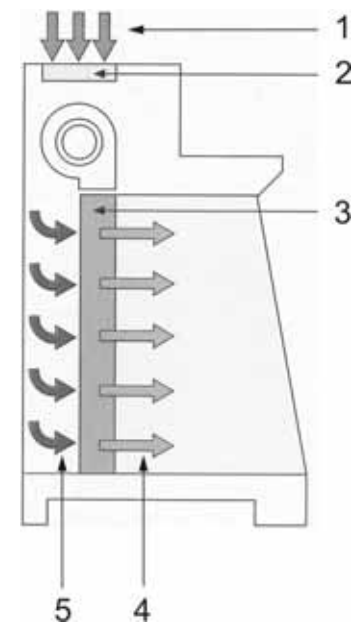


Fig. 4
Filter system with air filter

4
Description of the device
4.4 Operating and display elements

The clean workbench is operated using an operating panel consisting of keys, function indicators and a display.

[1] The display with its 5-digit indicator panel shows the following information, regardless of the activated operating function:

- normal operation: operating hours of the device,
- in safe work mode: additional the air velocity,
- device-controlled UV disinfection (optional): remaining disinfection time.

Values are output as integers.

[2] Keys for switching operational functions on or off,

[3] Status indicators show the operational status of:

- airflow,
- reduced blower speed,
- SmartFlow Indicator

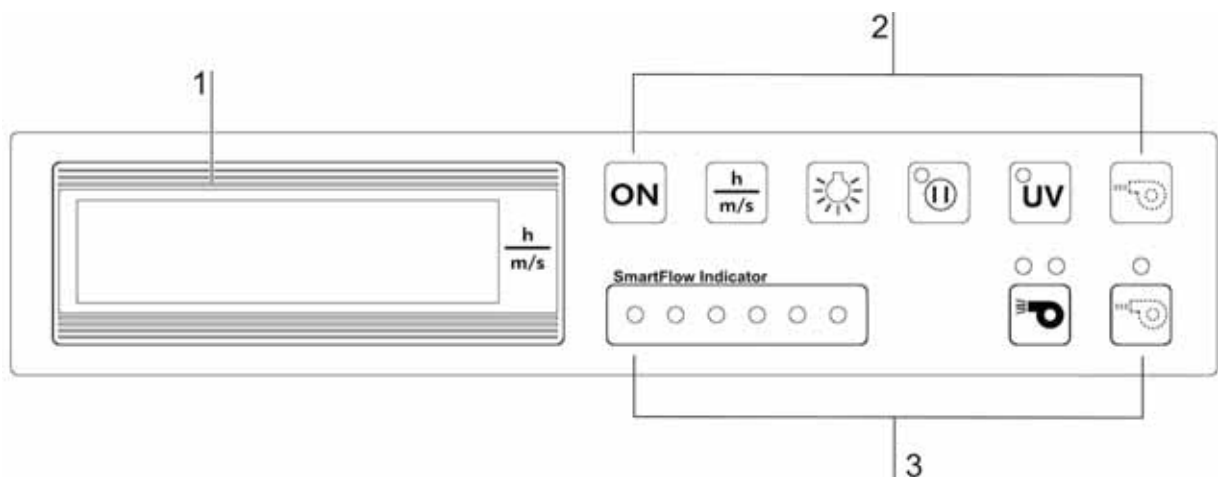


Fig. 5
Operating and display
elements

For 120 V units $\frac{h}{m/s}$ is replaced by $\frac{h}{feet/min}$.

4

Description of the device

4.5 Device interfaces

The standard equipment includes:

- outlets for internal/external power supply,
- bushings on both sides for cables, media valves, and hoses,
- a communication port,
- a connection to external alarm systems.

Power supply connection: The connection to the power supply system is established via a mains cable [4].

Device-integral power supply: The lighthoode contains 3 outlets [1] for the power supply (overall maximal current: 5 A) of internal accessories.

Two fuse holders for 5 A miniature fuses at the top of the front cover protect the device-integral power supply: for (L) and (N).

**NOTE**

The T5A 250V H fuse are to be changed only by skilled service personnel.

Communication port: Inside the device is a RS232 connection [2].

Bushings: The standard fittings are 3 bushings per side panel.

SmartPort [6] is provided to lead through cables or hoses for accessories required in the utility chamber. To this end, the rubber grommet [5] is punched out in the exact opening size to avoid possible contamination.

Media valves [8] are installed solely in the bushings [7].

Media valves suitable for installing in bushings can be supplied as an option.

Upon delivery of the device, the bushings are sealed.

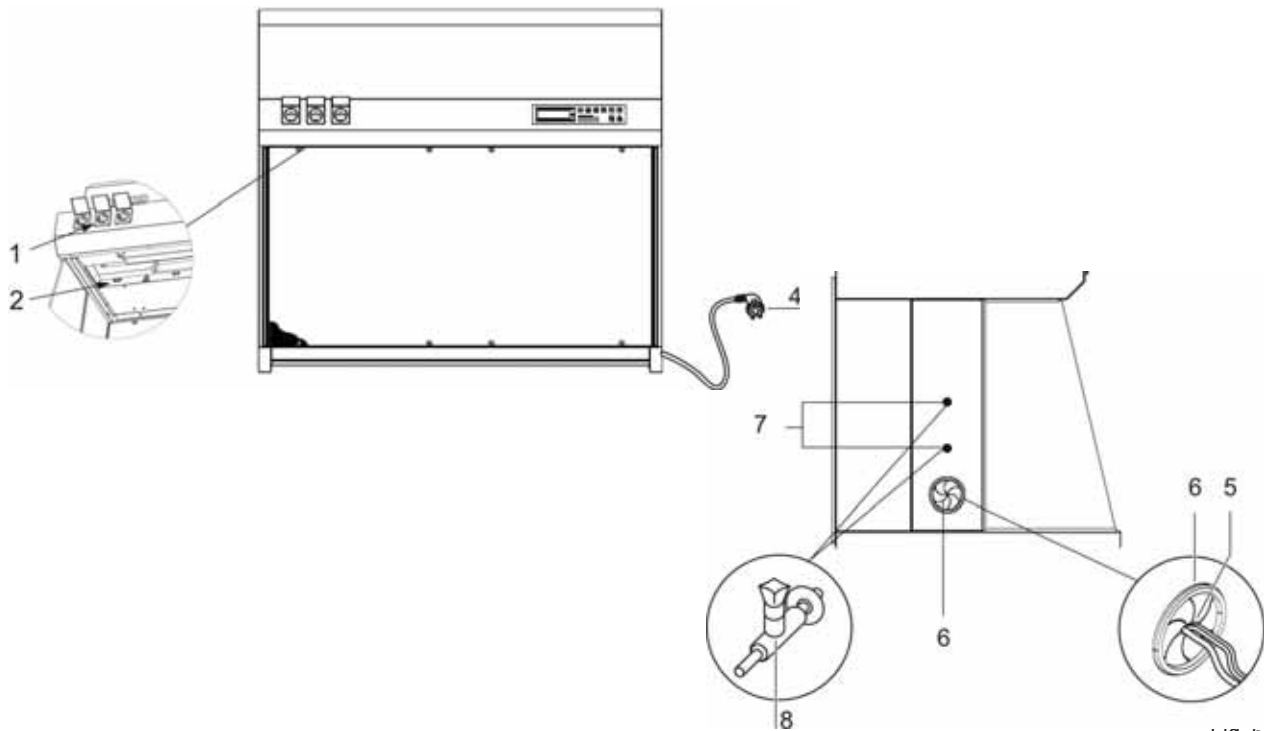


Fig. 6
Supply interfaces

4

Description of the device



CAUTION – Combustible gas!

If a gas burner is to be operated in the sample chamber, an appropriate shut-off device for the gas supply system (shut-off valve, solenoid valve) must be installed.

To ensure a safe distance to the recirculation filter the laboratory safety burner are to be placed at the working surface and not at an elevated position.

Use only laboratory safety burners in the sample chamber.

Potential equalization: To avoid static charges and the associated risks, if necessary, intended supply connections and the device itself should be integrated in the on-site potential equalization.

For this purpose, the potential equalization connection on the stand can be used. The installation of utility connections to the built-in fittings must be made with consideration to the current national technical rules.

External alarm systems: This alarm contact can be used for two different external alarm systems:

- Potential-free contact (valve) for driving external exhaust air systems (technical ventilation),
- Potential-free contact (monitor alarm) for the connection to an external alarm system (failure reporting system) or gas supply solenoids.
- Only EN, CSA and UL certified isolated cable-end sleeves of 6 mm should be used.

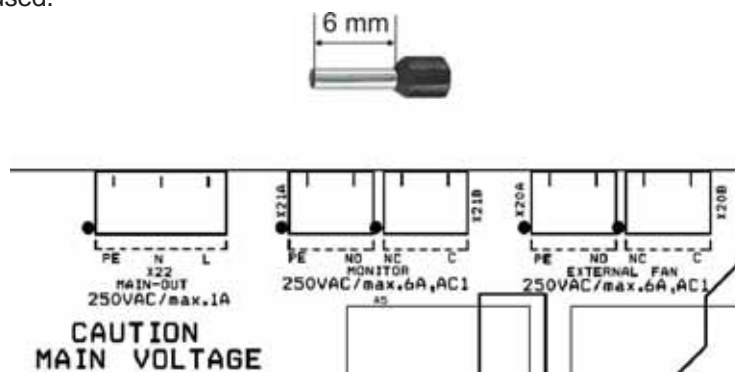


Abb. 7
External alarm system



CAUTION – High voltage!

The contact with live parts may result to a lethal electrical shock. During work on electrical equipment shut of the device and all poles disconnected.

Repairs to the device must be carried out only by trained and authorized expert personnel.

4

Description of the device

4.6 Sample chamber illumination

The sample chamber illumination unit [2] comprises of two fluorescent tubes installed behind the light dome [3].

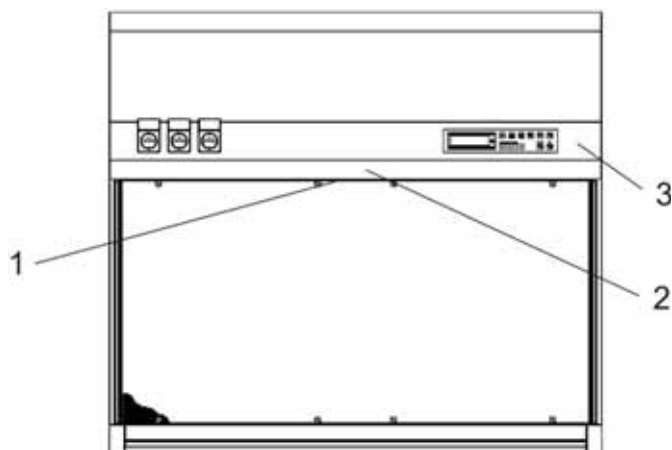


Fig.8-1
Position of the illumination unit
and the UV lamp unit

4.7 UV lamp unit

The optional, device-integral UV lamp [1] is installed to the ceiling at the front section of the sample chamber.

The operating time of the UV lamp is preset and can be changed. The UV disinfection routine can be started by depressing a key on the operating panel, during switched off mode of the clean workbench..

**NOTE – Protection from UV radiation!**

To protect from UV radiation, the UV lamp can be activated only when the UV-C protection cover is completely arrested.

The UV lamp unit is equipped with a lamp protection.

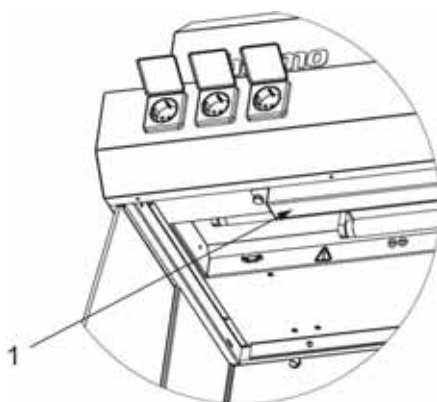


Fig.8-2
Position of UV lamp unit

During UV irradiation the protection should be removed and afterwards reinstalled.

4
Description of the device
4.8 UV protection cover

The UV protection cover is used during UV-C irradiation (wave length 253,8 nm). Only original Thermo UV protection covers should be used.


UV Lamp protection

Before using the clean workbench after an UV-C irradiation the UV lamp protection must be reinstalled.


UV protection cover

After arresting the protection cover it should be checked for damages. It is forbidden to use a damaged or repaired protection cover!

Retaining fixture

The retaining fixture of the protection cover must be checked for correct installation, because otherwise UV light can escape out of the workbench.

Operating life

The operating life of the UV protection cover is limited. It should be used maximum 1500 operating hours. Record the device log accordingly.

Operation

As long as the UV-LED is illuminated the UV protection cover must not be removed.

Storage

The UV protection cover should be stored in the storage bag.


Wind screen

The wind screen has no UV-C protection function.


UV-routine

Before initiating the UV-routine the windows, the SmartPort and the feed-throughs of the side walls should be checked for correct installation prior to arresting the UV protection cover.

4**Description of the device**

Installation of the UV-C protection cover

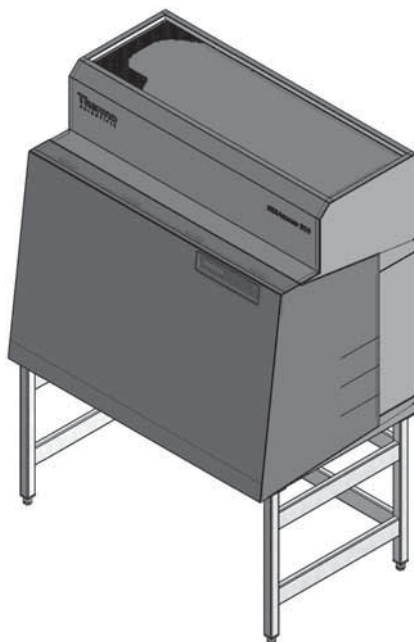


Abb. 9-1
UV protection cover

At both sides pull the protection cover with the pockets over the feed-throughs.

Arrest the protection cover with the hooks [2] at the upper and lower position at both sides of the rear wall.

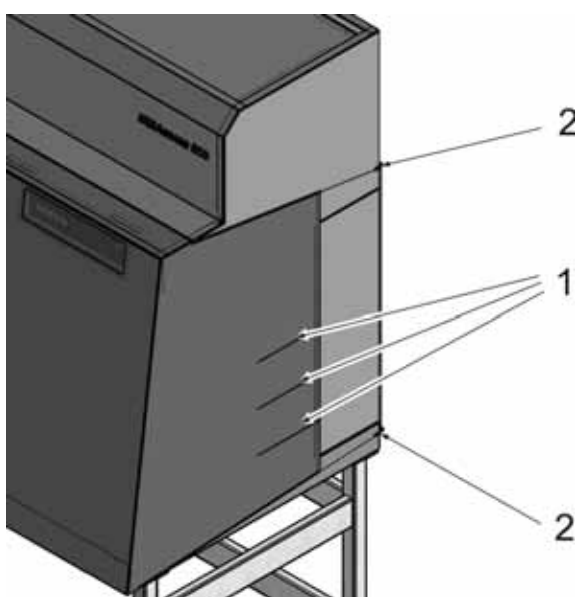


Abb. 9-2
UV protection cover

5

Start-up

5.1 Initial operation

Prior to the initial operation, the clean workbench must be subjected to an installation test. Correct assembly and installation performed by the operator are essential for good start-up.

5.2 Installing the device and accessories

Device without stand:

- Place the device without stand onto a sufficiently stable substructure so that the weight of the device frame does not rest upon the working surface.
- Remove the protective foil from the working surface (stainless steel only).

Device with stand:

Assemble the stand (accessory) and install the device frame onto the stand:

1. Slide the two crossmembers [2] onto the retaining angles [3] of the side panels [1], then secure the crossmembers to the side panels using the screws with wedge lock washers [4].
2. To install the device frame [5] to the stand [7], insert four Allen screws with wedge lock washers [6] loosely into the threaded holes at the bottom of the device.
3. Place the clean workbench onto the stand so that the Allen screws with wedge lock washers [6] are routed through the holes [8] of the retaining tabs [10].
4. Slide the device frame [5] into the retaining tab grooves [9] all the way to the stop.
5. Tighten the four Allen screws with wedge lock washers [6].



Note – Castors

If castors are applied, the lower position of the stand must be used only!

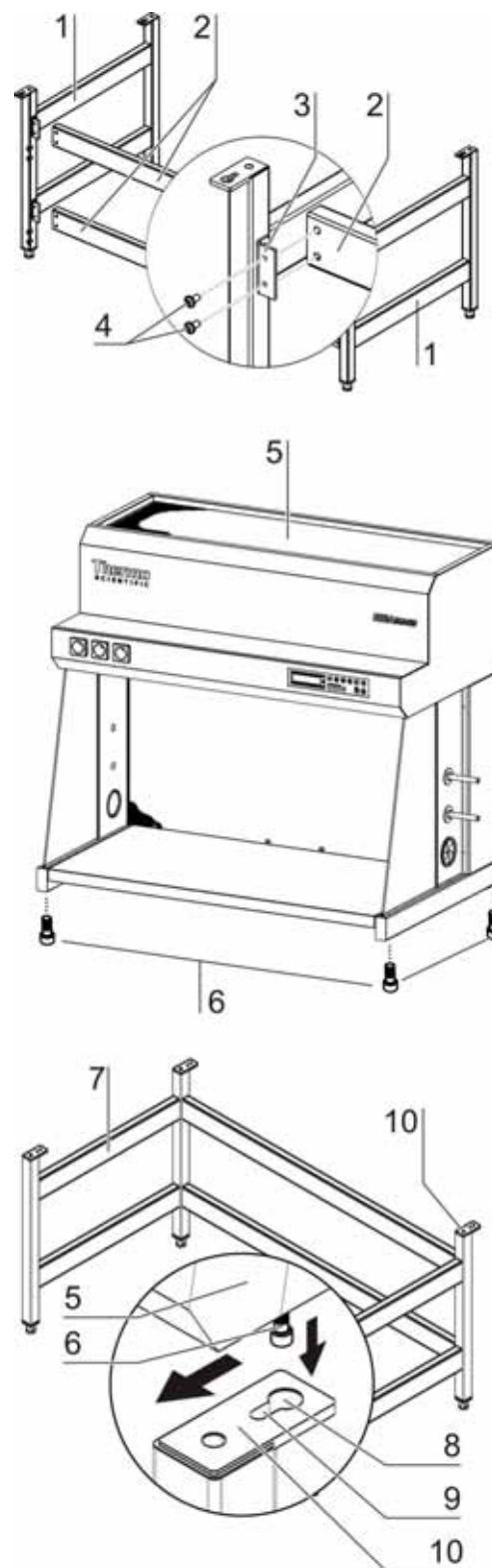


Fig. 10
Stand installation

5

Start-up

5.3 Levelling the cabinet

The clean workbench should be levelled only after it has been positioned.

1. Remove transport protection (vinyl) from the working area.
2. **Devices without stand:** Place a bubble level onto the working area align the stand until the level indicates an absolutely horizontal position in all directions.
3. **Devices with optional stand:** Place a bubble level onto the working area and adjust the four stands until the level indicates an absolutely horizontal position in all directions. Proceed the elevating adjustment from right to left and from rear to front.

5.4 Installing the Anti-tilt anchor



NOTE – Installation points

The clean workbench must always be attached to the wall using two (2) retaining brackets on the outer left and right side on the back of the unit.

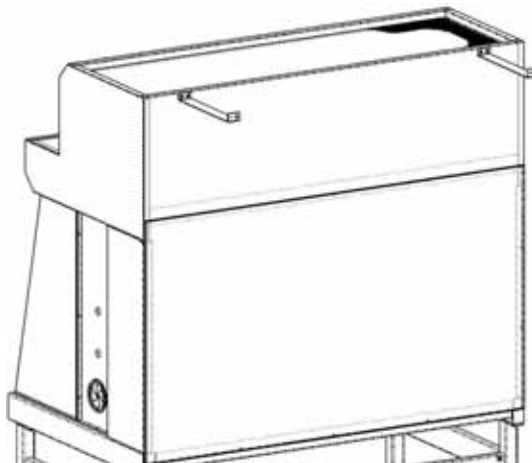


Fig. 11
Position anti-tilt anchor

- Bend anti-tilt anchor 90° upwards.
- Bend the hanger of the anti-tilt anchor 90° upwards.
- Align the device to the solid part of the building.
- Affix the anti-tilt anchor to the solid part of the building.



ATTENTION – Unsafe part of the building!

Install the anti-tilt anchor to a solid part of the building, which is able for shoring loads.

The installation has to be carried out by qualified personnel only.

The connection to the building must be carried out with appropriate screws and dowels according to the consistence of the building part.

5**Start-up****5.5 Power supply connection**

WARNING – High voltage!



Contact with current-carrying components may cause a lethal electric shock.

Before connecting the device to the power supply system, check plug and power supply cable for possible damage.

Do not use damaged components to connect the device to the power supply system!

Establishing the power supply connection:

1. Before connecting the device to the power supply system, check to see if the voltage of the outlet corresponds with the specifications on the nameplate of the device. If the ratings given for voltage (V) and maximum current (A) do not match, the device must not be connected to the power supply system.
2. Connect the grounding plug of the device to a properly grounded and fused outlet.
3. Make sure that the power supply line is not subjected to tensile or compressive force.

Installation of the power supply connection:

Mains connection must be clearly visible for the user and easily accessible.

The power supply cable plug is the interruption device in all poles.

Connecting the equipotential bonding:

If the device sample chamber is supplied with media (gas, water, etc.), the on-site equipotential bonding must be connected to the main ground of the device.

Initialization routine:

Upon connection to the power supply system, the device control passes through an initialization routine and switches the device to OFF mode (the right indicator segment of the display shows a dot to indicate that voltage is present).

The clean workbench is now ready for operation and can be operated using the keys.

6

Handling and control

6.1 Operating panel

The operating panel is the major display and operating element and has been divided into three functional units:

- Display [1], keys [2] - [7], status indicators [8] - [18]

6.1.1 Functional units

Display:

[1] Display for numbers and text:

- normal operation: operating hours of the device,
- in safe work mode: shows additional air velocity,
- device-controlled UV disinfection (optional): remaining disinfection time.

Keys:

The keys are used for enabling / disabling device functions:

[2] Key for switching the device on / off.

[3] Operating data key with dual function:

- Indicating operating data:
Press the key to switch between the data: Operating hours and air velocity in the safe work mode.

[4] Key for switching the sample chamber illumination on and off.

[5] Key for switching the power supply of device-integral outlets on and off (the LED indicates that voltage is present).

[6] Key for switching UV disinfection on and off (the yellow LED indicates that the UV disinfection routine has been activated; if the optional UV lamp is not installed, this key has no function). Turning on is possible only in switched off condition. The time can be set in mode "Safe working" and "Reduced".

[7] Reduced mode.

Status indicators:

[8] The air system is operated at reduced capacity (the yellow LED is illuminated),

[9] Airflow **is not** steady (the red LED is illuminated),

[10] Airflow **is** steady (the green LED is illuminated),

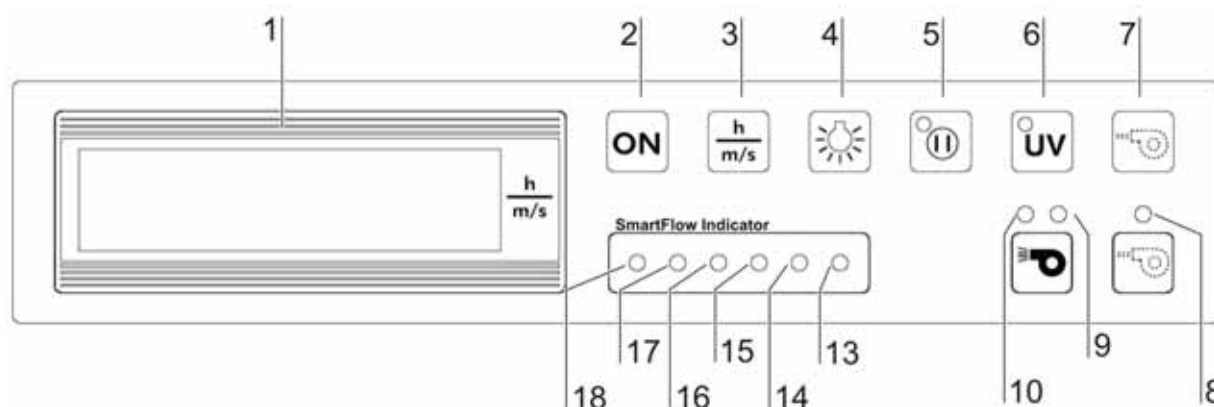


Fig. 12
Operating panel

For 120 V units $\frac{h}{m/s}$ is replaced by $\frac{h}{feet/min}$.

6

Handling and control

SmartFlow display:

The SmartFlow Indicator displays the compensation capability of the exhaust control, with window in working position and blower on. The LEDs that illuminate in pairs indicate the following:

[18] green + [17] green	sufficient compensation capability
[16] yellow + [15] yellow	compensation capability is nearly depleted
[14] red + [13] red	compensation capability is depleted



NOTE – Compensation capability!

If the display is steady yellow-yellow, there is a possibility that the filters of the device are fully loaded. In this case, the technical service should be informed.

6.1.2 Display during UV disinfection

If a UV lamp is installed, the display alternatingly shows **dIS** and the remaining disinfection time.

6.1.3 Failure messages

Failure messages are shown on the display as text/number combinations with the codes ER 3 to ER 6. If one of these codes appears on the display, contact Technical Service immediately.

6.2 Device start-up

1. Switch the device on, keep the **ON** key [2] depressed approx. 5 seconds until:
 - the blowers start (audible blower operation),
 - the status indicators [8] - [10] illuminate.

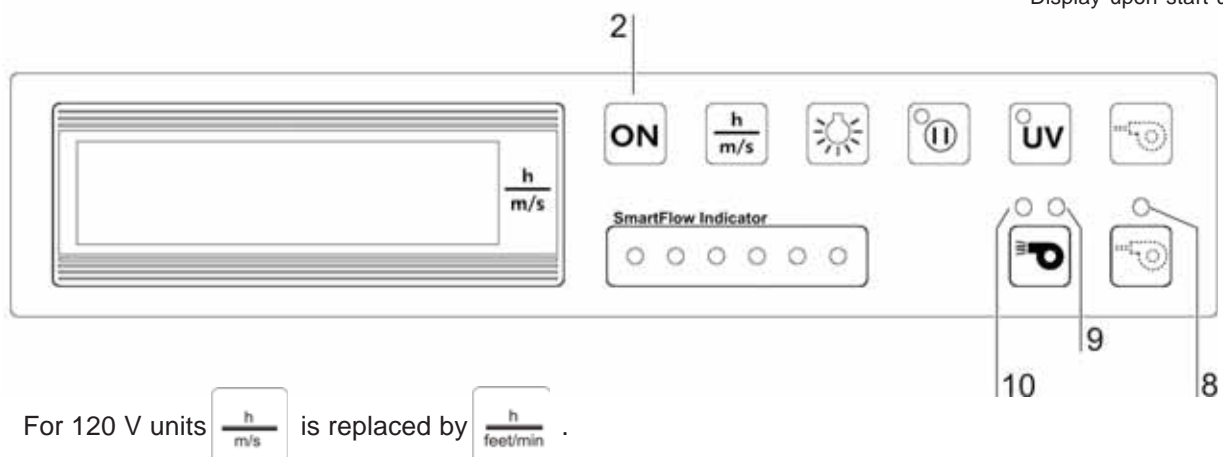


NOTE – Switch-on!

A time delay of several seconds may occur between key actuation and device response.

2. Wait until the green status indicator **AIRFLOW IS STEADY** [10] is illuminated.
3. The device is ready for operation.

Fig. 13
Display upon start-up



6**Handling and control****6.3 Description of the operating modes**

The following operating modes exist for the device:

- **OFF mode**
- **Work mode**
- **Standby mode**
- **UV mode (optional)**

OFF mode: Designates the idle state of the device.

- The device is switched off (air system blowers are switched off).
- The sample chamber illumination is enabled.
- The internal power supply within the sample chamber is enabled:
 - If the internal power supply is activated, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.

Work mode: In this operating state, the work process is carried out in the sample chamber. Work mode is active when the is operating steadily.

- The air system blowers are switched on to ensure steady airflow:
 - The green status indicator **AIRFLOW STEADY** is illuminated.
- The sample chamber illumination is enabled.
- The power supply for the sample chamber outlets is enabled:
 - If the internal power supply is ON, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.
- The switching state of the potential-free contact (monitor contact) is pass (if e.g. the gas supply solenoid is driven via this contact, gas is supplied in this mode only).
- The display can show values for: operating hours and air velocity.
- The clean workbench can be switched off with the "ON" button [2], keep pressed for approx. 5 seconds.

6**Handling and control**

Standby mode: The air system output is reduced to match the lower air requirement.

- The sample chamber illumination is enabled.
- The internal power supply in the sample chamber is enabled:
 - If the internal power supply is ON, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.
- The clean workbench can be switched off (in OFF mode):
 - Keep the ON key depressed until all indicators are off.

UV mode: For running the UV disinfection routine, the UV protection cover must be completely installed. The function can be enabled in switched OFF mode, only.

- The UV disinfection routine is activated:
 - The yellow status indicator **UV DISINFECTION ROUTINE ACTIVATED** is illuminated until the preset time for the routine has elapsed. Then, the UV lamps are switched off automatically, and the status indicator is switched off.
- The sample chamber illumination is disabled.
- The internal power supply in the sample chamber is disabled.
- The integral UV lamp (optional) is enabled.
- After the UV disinfection is finished the clean workbench is set to OFF mode.

7**Operation****7.1 Response to failure messages**

Failure messages are displayed in form of text/number combinations with a code between ER 3 to ER 6. If one of these codes is displayed, contact the Technical Service of Thermo Fisher Scientific immediately.

To isolate the cause of the failure, the operating personnel must perform only the following tests and measures:

- Check to see if the exhaust air opening on top of the cabinet is blocked.
- Ensure that the on-site exhaust air system is activated.
- Close doors and windows in the laboratory to prevent drafts.
- Switch off devices in the vicinity of the clean workbench that cause air turbulence or emit excessive heat.
- Open flames in the sample chamber may impair airflow conditions.

7
Operation
7.2 Work rules

The observance of work rules ensures a minimum of operational safety when handling the clean workbench.

Before starting an operation:

- Take off jewelry.
- Put on required personal protective gear, e.g. hand, face, or body protection.
- Clean and disinfect sample chamber surfaces at regular intervals.

During operation:

- Place samples only within the defined work area of the workplate.
- Do not place unnecessary items into the sample chamber.
- Use only disinfected and cleaned accessories for the work process.
- Do not cause air turbulence by quick hand, arm or body movement in the sample chamber or in front of the work opening.
- Do not place accessories into the sample chamber that cause air turbulence or emit excessive heat.

Sitting posture during work:

To prevent risks to health, a height-adjustable working chair with an adjustable seat back should be used during extended work periods at the clean workbench.

B When the upper leg is in a horizontal position, the angle between upper and lower leg should exceed 90°.

To ensure a compensation between floor and sitting height, a footrest (DIN 4556) should be used. The minimal effective surface of the footrest should be 45 x 35 cm (17,7 x 13,8 in).

C The slope should be adjustable within a range of 5° to 15°.

D The adjustable height should extend to a minimum of 11 cm (4,3 in) above the floor.

After finishing an operation:

- Remove samples from the working area and store them properly.
- Clean and disinfect the working area. Clean and disinfect all accessories.

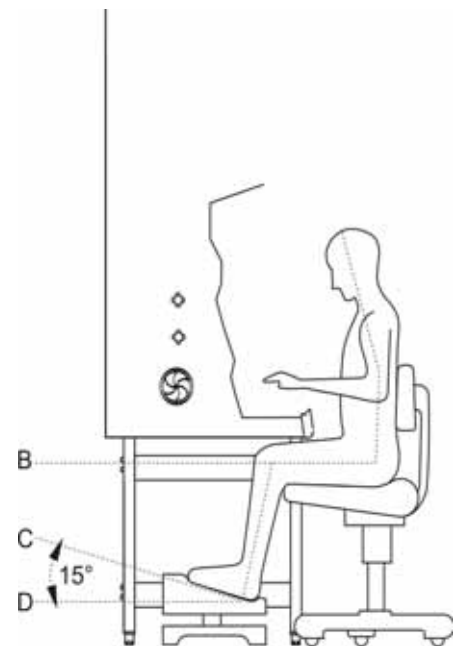


Fig. 14
Sitting posture

8**Shut-down****8.1 Interrupting an operation**

To interrupt a work process:

1. Remove all samples from the clean workbench and store them properly.
2. Remove accessories from the sample chamber and clean and disinfect them.
3. Clean and disinfect the sample chamber surfaces and the workplate.
4. Switch the device to standby mode: keep the ON key depressed until the indicators are off (the right indicator segment of the display shows a dot to indicate that voltage is present).

8.2 Shutting the device down

If the device is not to be used or stored for an extended period of time, it must be completely disinfected.

Therefore:

1. Disconnect the device from the power supply system.
2. Disinfect according to chapter 9.

9**Cleaning and decontamination****9.1 Wipe/spray disinfection**

The wipe/spray disinfection is performed in three stages:

- predisinfection,
- cleaning,
- final disinfection.

Recommended disinfectants:

**NOTE – Compatibility!**

Chloride-containing disinfectants may damage some surfaces, Therefore, use only chloride-free disinfectants or a disinfectant with a low enough chloride content to have been proved harmless for stainless steel finishes!

Disinfectants with an alcohol content of more than 70 % may cause embrittlement of plastic components after extended exposure. Use only disinfectants with a low alcohol content. When using a disinfectant with an alcohol content of more than 70 %, the release limit of 200 g (0,44 lbs) within 2 hours must not be exceeded. Also suited are disinfectants based on quaternary ammonium compounds.

Don't spray the filter with disinfectants to avoid malfunction of the clean workbench.

Predisinfection:

1. Remove all samples from the sample chamber and store them properly.
2. Remove accessories from the clean workbench and disinfect them using the disinfection procedure recommended by the manufacturer.
3. For predisinfection, spray disinfectant on all sample chamber surfaces or wipe the surfaces using disinfectant.
4. Do not remove the optional UV lamps from the sockets.
5. Switch the device to work mode.

Cleaning:

1. Remove dirt residues and deposits thoroughly using a solution of tepid water and commercially available dishwashing agent.
2. Wipe the surfaces clean using a clean cloth and plenty of clear water.
3. Remove the cleaning liquid and wipe all sample chamber surfaces dry.

9**Cleaning and decontamination****Final disinfection:**

1. Again, spray disinfectant on all sample chamber surfaces or wipe the surfaces clean using disinfectant.
2. Allow disinfectant to react as recommended by the manufacturer.

9.2 UV disinfection after a wipe/spray disinfection

A UV disinfection can be performed by using the optional integral UV lamps (see chapter 4.7).

9.2.1 UV disinfection using the integral UV lamp**To start the UV disinfection routine:**

- Start UV disinfection using the **UV** key at the operating panel (in switched off mode):
Keep the **UV** depressed until the display alternatingly shows dIS and the remaining disinfection time.

To interrupt / cancel the UV disinfection routine:

- Press the **UV** key (the display shows the operating hours).

9.2.2 Changing UV disinfection time

The UV disinfection time is preset; this setting can be changed, if required:

1. Switch the cabinet on.
2. Keep the UV key depressed until the preset time is displayed.
3. To increase the time:
Press the **INTERNAL POWER SUPPLY** key. Each pressing of the key increases the time by 30 minutes.
4. To reduce the time:
Press the **INTEGRAL SAMPLE CHAMBER ILLUMINATION** key. Each pressing of the key reduces the time by 30 minutes.
5. To save the values:
Press the **UV** key.
The display shows the operating hours again.

9**Cleaning and decontamination****9.3 Cleaning the exterior surfaces**

Wipe the exterior surfaces of the device clean using a solution of TAP water and commercially available dishwashing agent. Then, wipe the exterior surfaces dry using a soft, clean cloth.

9.4 Cleaning the working area

Clean the working area using a solution of tepid water and commercially available dishwashing agent.

1. Remove dirt residues and deposits thoroughly.
2. Wipe the working area clean using a clean cloth and plenty of clear water.
3. Remove the cleaning liquid from the working area and wipe the surfaces thoroughly clean.

9.5 Cleaning the side windows

ATTENTION – Squeezing hazard!

During inserting the side windows fingers can be squeezed.

9.6 Cleaning the UV protection cover

1. Basically use no solvents and highly alkaline cleaners, eg. Un-
gapon®, a product from Max Bail, chemical products. The
material can be damaged by the use of such products.
2. Rinse the surface dirt with cold or warm water.
3. Apply the recommended amount of cleaner, please follow
this, the manufacturer's recommendation. Apply the cleaner
either by spraying or with a cloth. After an exposure time of
up to 5 minutes wipe off with a cloth.
4. Rinse the dirt and the detergent with clean cold or warm
water. Then dry the wet surfaces with a cloth. Don't dry the
cleaned surface in the air, residues of cleaner may cause dis-
coloration. Never overheat the surface.
5. The material may only be stored in a clean and absolutely
dry condition.

10**Maintenance****10.1 Inspection**

The SmartFlow Indicator, the test routine for the clean workbench, determines the cabinet's system status by way of adjusting various device parameters.

- An inspection of the device should be performed if the SmartFlow Indicator displays steady 2 yellow LED`s.
- Regardless of the SmartFlow Indicator, the biological safety cabinet should be inspected annually.

The annual inspection comprises the following checks:

- Electrical safety in accordance with national regulations.
- Functional test of the device.
- Checking all components for possible damage.
- Checking the filter state.

**NOTE – Perforated plate!**

The perforated plate at the sample chamber ceiling serves as the protection of the HEPA-filter and prevents refluxing.

While scanning the filter surface for a leak test, the perforated plate must be installed.

- Checking the airflow conditions.

10.2 Service**HEPA filters:**

As the filter replacement is an interference with the safety system of the device, filters must only be replaced by Thermo Fisher Scientific or by adequately trained and authorized service personnel.

10

Maintenance

10.2.1 Sample chamber illumination

The sample chamber is illuminated by two fluorescent tubes. The spring-loaded sockets of the fluorescent tube [2] are installed to the light dome mounting frame in the sample chamber.

1. Switch the device off, disconnect it from the power supply system and protect it against accidental reconnection.
2. The fluorescent tubes are retained by rotatable sockets. Rotate the tube carefully by 90° into the removal position and remove it from the socket.
3. Insert the new tube und rotate it into the contact position.

10.2.2 Optional UV lamps

The optional, device-integral UV lamp [1] is installed to the sample chamber ceiling. The UV lamp should be replaced after 1500 operating hours.

1. Switch the device off, disconnect it from the power supply system and protect it against accidental reconnection.
2. Remove the UV lamp protection (2 knurled head screws).
3. Wear protective gloves to prevent skin fat residues from burning into the lamp tube.
The UV lamp is installed in rotating sockets. To remove, rotate the lamp counter-clockwise to disengage the latch and remove it from the sockets.
4. To install, slide the lamp contact pins into the rotating socket grooves and rotate the lamp clockwise to latch the sockets.

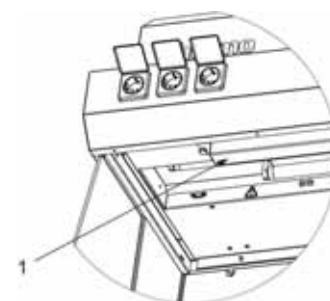
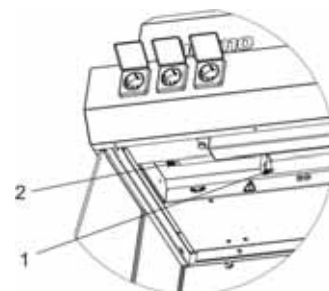


Fig. 15
UV lamp replacement

10.3 Retrofitting and repairs

External communication systems, e.g. failure report systems or components for supplying media such as gas solenoid valves, can be retrofitted and integrated into the device control.



NOTE – Retrofitting and repairs!

All retrofitting and repair works are interferences with the safety system of the device. Particularly modifications to the filter system and resulting changes of the airflow may impair personal and material protection. Such work must be carried out only by authorized service personnel.

10.4 Exchanging SmartPorts

1. First remove the grommet from the side panel opening.
2. Insert new grommet in the side panel opening.

11**Disposal****11.1 Disposal procedure**

Discarded cabinets or device components contain reusable materials. All components with the exception of the HEPA filters can be discarded after having been thoroughly cleaned and disinfected. The HEPA filters must be discarded in accordance with the applicable national and state regulations for special solid waste.

WEEE compliance

This product is marked with following symbol:



Thermo Fisher Scientific has contracted with companies for recycling/disposal in each EU Member State to discard/recycle, For further information email **to weee.recycle@thermofisher.com**.

12
Spare Parts and Accessories
12.1 Spare Parts

Material-No.	Description
50138442	Connecting side plate 200x953 SS version
50061664	Work table top, 9 38X600X918 Melamin
50139301	Work table top, stainless steel cpl. Heraguard ECO 0.9
50049861	Work table top, 12 38X600X1218 Melamin
50139302	Work table top, stainless steel cpl. Heraguard ECO 1.2
50053672	Work table top, 15 38X600X1518 Melamin
50139303	Work table top, stainless steel cpl. Heraguard ECO 1.5
50049862	Work table top, 18 38X600X1818 Melamin
50139304	Work table top, stainless steel cpl. Heraguard ECO 1.8
50060992	Work table top, 18 38X800X1818 Melamin
50139305	Work table top, SS cpl. Heraguard ECO 1.8/95
50136660	Front foil Heraguard ECO (SmartFlow) EU
50139475	Front foil Heraguard ECO (SmartFlow) USA
50077297	Flourescent bulb 590 mm 18W 230V
50043933	Flourescent bulb 895 mm 30W, white
50043931	Flourescent bulb 1200 mm 36W
50108651	UV-Lamp 36 W, 826 mm
50073605	Socket frame with cover, grey
50077703	Knurled head screw M4 X 10
50138231	Lower lighthood cover Heraguard ECO 0.9
50138232	Lower lighthood cover Heraguard ECO 1.2
50138233	Lower lighthood cover Heraguard ECO 1.5
50138234	Lower lighthood cover Heraguard ECO 1.8
50139370	Cover UV bulb Heraguard ECO
50140092	Retrofit kit UV radiator Heraguard ECO 0.9
50140093	Retrofit kit UV radiator Heraguard ECO 1.2
50140094	Retrofit kit UV radiator Heraguard ECO 1.5
50140095	Retrofit kit UV radiator Heraguard ECO 1.8
50140096	Retrofit kit UV radiator Heraguard ECO 1.8/95
50138898	Heraguard ECO CD Documentation
50073715	Fuse holder T5A 250V H
50141778	Fuse T5A 250V H
50125589	SmartPort, Grommet
50065157	Diffusor plate 1 x 1235 x 643
50065158	Diffusor plate 1 x 1535 x 643
50065161	Diffusor plate 1 x 935 x 643

12.2 Accessories

Material-No.	Description
50116441	Floor stand 0.9 m. Provides work height of 750 mm.
50109309	Floor stand 1.2 m. Provides work height of 750 mm.
50116442	Floor stand 1.5 m. Provides work height of 750 mm.
50109311	Floor stand 1.8 m. Provides work height of 750 mm.
50051982	KFR 09 Foot rest bar for non-electrical stands 0.9 m.
50051983	KFR 12 Foot rest bar for non-electrical stands 1.2 m.
50051984	KFR 15 Foot rest bar for non-electrical stands 1.5 m.
50051985	KFR 18 Foot rest bar for non-electrical stands 1.8 m.

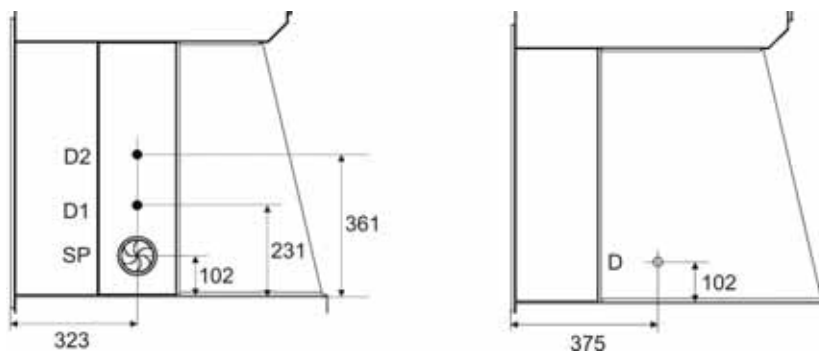
12

Spare Parts and Accessories

Material-No.	Description
50116443	Adjustable floor stand 0.9 m. Provides variable work height of 750 mm - 950 mm in 50 mm adjustable increments.
50109312	Adjustable floor stand 1.2 m. Provides variable work height of 750 mm - 950 mm in 50 mm adjustable increments.
50116444	Adjustable floor stand 1.5 m. Provides variable work height of 750 mm - 950 mm in 50 mm adjustable increments.
50109313	Adjustable floor stand 1.8 m. Provides variable work height of 750 mm - 950 mm in 50 mm adjustable increments.
50109977	Castors. Provides work height of 850 mm.
50044678	Vacuum tap G3/8 connection with long neck for installation in side walls.
50044679	Water tap G3/8 connection with long neck for installation in side walls.
50045959	Non-combustible gas G3/8 Non-combustible gas tap with long neck for installation in side
50046015	Tap for flammable gas cylinders G3/8 connection with long neck for installation in side walls - must be used with interlock solenoid gas valve 50749505 to ensure that gas is disconnected in the event of a power failure.
50074905	Solenoid valve for use with tap for flammable gas cylinders G3/8 connection
50047504	Lead through for hose connections for side wall use. Suitable for 10 - 13 mm inner diameter hose.
50076408	Lead through for hose connections for side wall use. Suitable for 3 mm inner diameter hose.
51901074	Stainless steel work surface for Heraguard ECO 0.9 width 900mm, depth 580mm
51901075	Stainless steel work surface for Heraguard ECO 1.2 width 1200mm, depth 580mm
51901076	Stainless steel work surface for Heraguard ECO 1.5 width 1500mm, depth 580mm
51901077	Stainless steel work surface for Heraguard ECO 1.8 width 1800mm, depth 580mm
51901078	Stainless steel work surface for Heraguard ECO 1.8/95 width 1800mm, depth 780mm
51901071	Left hand glass with metal sheet and 3 media valve holes for models: Heraguard ECO 0.9, 1.2, 1.5, 1.8, 1.8/95
51901072	Right hand glass with metal sheet and 3 media valve holes for models: Heraguard ECO 0.9, 1.2, 1.5, 1.8 and 1.8/95
51901073	UV Option, factory installed
50052208	Screen Wind protection kit, complete with hinges to fit the control unit for Heraguard ECO 0.9 sizes
50052460	Screen Wind protection kit, complete with hinges to fit the control unit for Heraguard ECO 1.2 sizes
50052461	Screen Wind protection kit, complete with hinges to fit the control unit for Heraguard ECO 1.5 sizes
50052462	Screen Wind protection kit, complete with hinges to fit the control unit for Heraguard ECO 1.8 sizes
50139417	Night Cover for Heraguard ECO 0.9
50139418	Night Cover for Heraguard ECO 1.2
50139419	Night Cover for Heraguard ECO 1.5
50139420	Night Cover for Heraguard ECO 1.8
50139421	Night Cover for Heraguard ECO 1.8/95
50073943	Hanging Bar 700 mm with set of 6 hooks for Heraguard ECO 0.9
50073944	Hanging Bar 1000 mm with set of 10 hooks for Heraguard ECO 1.2 - 1.8/95

13
Technical data
Technical Data for 230 V units

Dimensions					
Description		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8 ECO 1.8/95
Exterior dimensions					
Width	mm	1000	1300	1600	1900
Depth	mm	810			1010
Height	mm	1170			1475
Interior dimensions					
Width	mm	920	1220	1520	1820
Depth	mm	585			785
Height	mm	645			950
Working area height					
Seat position	mm	760			
Standing work position	mm	max. 960			
Stand height					
Stand	mm	680			
Sidewall feed throughs glass window					
Diameter	mm	23			
Distance lower egde	mm	102			
Sidewall feed through SmartPort					
Diameter	mm	76,2			
Distance lower egde	mm	102			
Distance lower egde D2	mm	231			
Distance lower egde D3	mm	361			
Distance from backpanel					
Durchführung Glasscheibe	mm	375			
SmartPort	mm	323			
Distance from rear wall D2	mm	323			
Distance from rear wall D3	mm	323			


 Fig. 16
 Positions feed-throughs

13

Technical data

Weights and loads						
		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8	ECO 1.8/95
Weights						
Cabinet	kg	110	125	140	160	170
Stand	kg	24	26	28	30	30
Load						
max. Load working area	kg	30				
Ambient conditions						
Temperature						
Max. ambient temperature during operation	°C	40				
Min. ambient temperature during operation	°C	5				
Humidity						
Max. humidity / operation	% r.H.	max. 80 at 31 °C and 50 at 40 °C				
Max. humidity / storage	% r.H.	95				
Heat dissipation to environment						
Room temperature 20 °C	kJ/s	0,15	0,2	0,28	0,34	
Operating altitude	m	max. 2000				
Ergonomics						
Noise level	dB(A)	< 55		< 60		
		The noise level was determined in accordance with EN ISO3744. The sound pressure level was measured at a distance of 1 m in front of the working opening. The measurement uncertainty is within a range of ± 2 dB.				
Air system						
Airflows / Airflow velocities						
Horizontal Flow	m/s	0,45 ± 20 %				0,4 ± 20 %
Reduced Flow	m/s	0,23 ± 20 %				
Filter						
Type		HEPA (H14 according to DIN EN 1822)				
Material		Glas fibre fleece				
Separability in MPPS	%	99,995				
Separability at 0,3 µm particle size	%	99,999				
Width	mm	915	1220	1525	1830	3 x 915
Depth	mm	457				
Height	mm	94				

13
Technical data

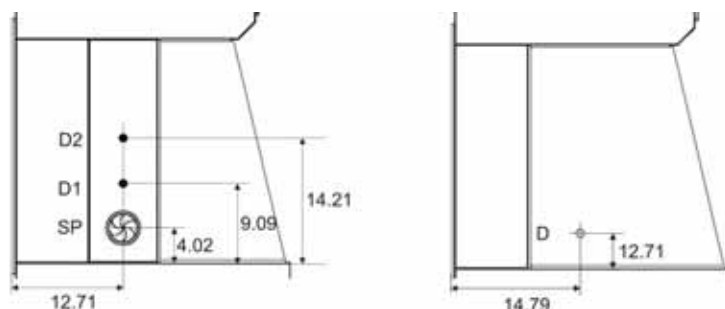
Electrical data 230 V unit						
		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8	ECO 1.8/95
Voltage						
Rated voltage	V	1N/PE, 230 V - 50/60 Hz				
Current						
Current consumption, max.	A	6,4	6,4	8	8	8
Leak current without chamber sockets (IEC 61010-1, EN 61010-1)	mA	≤ 3,5				
Motherboard fusing (F1+F2)	A	2 x T 15 A 250V H				
Socket fusing (F3+F4)	A	2 x T 5 A 250V H				
Power						
Max. power input	W	1570	1570	1650	1650	1650
Protection						
Protection class		I				
Protection type		IP 20				
Overvoltage category (IEC 61010-1, EN 61010-1)		II				
Contamination degree (IEC 61010-1, EN 61010-1)		2				
Illuminance intensity						
Working area	lx	> 1000				
Connecting line						
Mains connection		Cable (≥ 2 m)				

13

Technical data

Technical Data for 120 V units

Dimensions						
Description		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8	ECO 1.8/95
Exterior dimensions						
Width	in	39.37	51.18	62.99	74.8	
Depth	in	31.89				39.76
Height	in	46.06				58.07
Interior dimensions						
Width	in	36.22	48.03	59.84	71.65	
Depth	in	23. Mrz				30.90
Height	in	25.39				37.40
Working area height						
Seat position	in	29.92				
Standing work position	in	max. 37.95				
Fixed stand height	in	26.77				
Adjustable stand height	in	26.77 - 34.65				
Sidewall feed throughs glass window						
Diameter	in	0.90				
Distance lower egde	in	4.02				
Sidewall feed through SmartPort						
Diameter	in	3				
Distance lower egde	in	4.02				
Distance lower egde D2	in	9.09				
Distance lower egde D3	in	14.21				
Distance from backpanel						
Durchführung Glasscheibe	in	14.79				
SmartPort	in	12.71				
Distance from rear wall D2	in	12.71				
Distance from rear wall D3	in	12.71				


 Fig. 16
 Positions feed-throughs

13
Technical data

Weights and loads						
		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8	ECO 1.8/95
Weights						
Cabinet	kg	110	125	140	160	170
Stand	kg	24	26	28	30	30
Load						
max. Load working area	kg	30				
Ambient conditions						
Temperature						
Max. ambient temperature during operation	°F	104				
Min. ambient temperature during operation	°F	5				
Humidity						
Max. humidity / operation	% r.H.	max. 80 at 88 °F and 50 at 104 °F				
Max. humidity / storage	% r.H.	95				
Heat dissipation to environment						
Room temperature 20 °C	kJ/s	0,15	0,2	0,28	0,34	
Operating altitude	ft	max. 6560				
Ergonomics						
Noise level	dB(A)	< 55		< 60		
		The noise level was determined in accordance with EN ISO3744. The sound pressure level was measured at a distance of 1 m in front of the working opening. The measurement uncertainty is within a range of ± 2 dB.				
Air system						
Airflows / Airflow velocities						
Horizontal Flow	feet/min	89 ± 20 %				79 ± 20 %
Reduced Flow	feet/min	45 ± 20 %				
Filter						
Type		HEPA (H14 according to DIN EN 1822)				
Material		Glas fibre fleece				
Separability in MPPS	%	99,995				
Separability at 0,3 µm particle size	%	99,999				
Width	inch	36.02	48.03	60.04	74.05	3 x 36.02
Depth	inch	17.99				
Height	inch	3.70				

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Technical data

Electrical data 120 V/uni1						
		ECO 0.9	ECO 1.2	ECO 1.5	ECO 1.8	ECO 1.8/95
Voltage						
Rated voltage	V	IN/PE, 120 V - 50/60 Hz				
Current						
Current consumption, max.	A	7,6	7,6	10,3	10,3	10,3
Leak current without chamber sockets (IEC 61010-1, EN 61010-1)	mA	≤ 3,5				
Motherboard fusing (F1+F2)	A	2 x T 15 A 250V H				
Socket fusing (F3+F4)	A	2 x T 5 A 250V H				
Power						
Max. power input	W	950	950	1120	1120	1120
Protection						
Protection class		I				
Protection type		IP 20				
Overvoltage category (IEC 61010-1, EN 61010-1)		II				
Contamination degree (IEC 61010-1, EN 61010-1)		2				
Illuminance intensity						
Working area	lx	> 1000				
Connecting line						
Mains connection		Cable (≥ 2 m)				

[illegible]

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Declaration

Notification no.

Notification date

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Thermo Electron LED GmbH
Customer Center Germany
Robert-Bosch-Str. 1
D-63505 Langenselbold
Telephone 0 8001 112 110
Telefax 0 8001 112 114
www.thermofisher.com

Invoice recipient / Customer no.			Location address / Forwarding address		
Call type	Region	ID of technician	Name of technician		Appointed date
Order date	by	Customer order no. / PO		Service contract no.	
Device description (Type)		Material no. (order no.)	Date of last maintenance	Date of delivery	Customer cost center
Equipment no. (Factory no.)	Serial no.	Service device no.	Date of calibration	Date of start-up	Customer inventory no.

Safety Declaration

Dear customer,

When using biological and chemical agents within and outside of devices, hazards to the health of the operating personnel may be present and contamination of the surroundings of the device may occur when service or repair works are carried out. Within the scope of national and international legal regulations, such as

- responsibility of a company for the protection of its employees,
- responsibility of the operator for the operational safety of devices,

all possible hazards must absolutely be prevented. Prior to any calibration, service, and repair works, prior to any relocation of a device, and prior to the shut-down of a device, the device must be decontaminated, disinfected, and cleaned as required by the work to be carried out.

Therefore, we ask you to fill in this certificate of decontamination before you start with the required work.

Yours sincerely,
Thermo Electron LED GmbH

Works to be carried out (please mark where applicable)

Prevented maintenance	<input type="checkbox"/>	Filter replacement	<input type="checkbox"/>
Repair work	<input type="checkbox"/>	Transfer to new location	<input type="checkbox"/>
Calibration	<input type="checkbox"/>	Transport	<input type="checkbox"/>

Declaration of possible contamination (please mark where applicable)

The device is clear of biological material	<input type="checkbox"/>	The device is clear of dangerous chemical substances	<input type="checkbox"/>
The device is clear of radioactivity	<input type="checkbox"/>	The device is clear of other dangerous substances	<input type="checkbox"/>
The device is clear of cytostatic agents	<input type="checkbox"/>		

Certification

Prior to carrying out the required work, we have decontaminated, disinfected, and cleaned the device as described in the operating instructions of the device and in accordance with nationally applicable regulations.
The device does not present any hazards.

Note

Date, legally binding signature, stamp



Internet: <http://www.thermofisher.com>