

# Safety and User Manual

## UV AIR COMFORT by **EFSEN**

Version 1.0



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## 1 Preface

The "UV AIR COMFORT" is a device in accordance with the state of technology with respect to operational safety for the installation personnel, the operator and the maintenance personnel. Despite the above, the device can be hazardous if it is used incorrectly or not as intended. We describe potential dangers in the "Safety" 3 section and in the safety information provided throughout the entire document.

### NOTE

This documentation is intended for the safety conforming installation, operation and maintenance of the system. Adherence to the included safety information is mandatory. All persons who install, use or maintain the device must have this documentation available and must adhere to the information and references relevant for them. The documentation must always be complete and clearly readable.

### NOTE

EFSEN UV & EB Technology is not liable for technical or technical print deficiencies of this documentation. No liability will be assumed for damages that are directly or indirectly based on the delivery, service or usage of this documentation. The graphics used in this documentation are schematic illustrations. They can differ from the original.

## 1.1 Labelling / Type plate

The device is uniquely marked based on the content of the type plate as per:

- Machinery directive: DIRECTIVE 2006/42/EC
- EMC directive: DIRECTIVE 2014/30/EU
- RoHS directive: DIRECTIVE 2011/65/EU

The nameplate is installed in the area of the cable feed through (power supply).



## 1.2 Liability

No liability is assumed for damages that are caused by:

- Use of the device not in accordance with the intended use
- Disregarding the documentation
- Unauthorized modifications of the device
- Improper use of the device
- Operating the device with defective safety equipment
- Inadequate monitoring of device parts that are subject to wear
- Incorrectly performed repairs
- Unauthorized, incorrect changes to operating parameters
- Disasters, impacts caused by foreign objects and force majeure

## 2 Intended use

The device described here is a UV-C air disinfection device. This type of device was developed specifically for disinfecting air in waiting and treatment rooms, as well as in the hotel and restaurant industries, etc. due to its low noise level. 24h operation is possible, even with personnel present in the area. It kills up to 99.99% of germs.

The UV AIR COMFORT must only be used for the purpose listed above. Personnel may be endangered, or the device may be damaged if it is not used as intended. In addition, any liability and warranty claims are excluded if the device is used in a manner other than its intended use.

## 2.1 Usage Limits

The usage limits for the device are as follows:

- Ambient temperature range: 5°C to 30°C
- Do not use in explosive areas
- Do not use in extremely dusty environments
- Relative humidity: 0% to 80%

## 2.2 Target Group and Previous knowledge

This documentation has been established for the installation personnel, operators and maintenance personnel of the device.

The installation and maintenance personnel must have the following qualifications:

- Basic technical knowledge (mechanical and electrical education)
- Being able to read and understand these installation instructions is a prerequisite.
- The installation and maintenance personnel must have no visual impairments because they must be able to easily read the labels on the system and the references in the technical documents.
- Personnel must be strong enough to lift the system.
- Currently valid regulations on occupational safety and accident prevention.

The operator must fulfill the following prerequisites:

- The operators must not have any visual impairment because they must be able to read the safety information at the system and the references in the documentation without any problems.
- Being able to read and understand these installation instructions is a prerequisite.
- Currently valid regulations on occupational safety and accident prevention.

## 2.3 Basic Principles

The UV-C disinfection system is in accordance with the state of technology and the valid safety and health regulations. Despite the above, the following hazards can occur in case of faulty operation or misuse:

- to the health and the life of the operators or third parties
- to the system itself and other equipment of the operating company
- to the efficient use of the device

## 3 Safety

This documentation is designed in accordance with the valid EU regulations and it includes safety information. The operating company of the device must ensure that the operator receives the required safety-relevant information and that the operator has read and understood the documentation before use. The individuals themselves are responsible for adhering to the safety information. This section includes all important information for accident prevention.

### 3.1 Basic Safety Regulations

The following safety regulations and obligations generally apply when handling the device:

- The device must only be operated in proper and clean condition.
- Removing, modifying, bridging or bypassing any protection, safety or monitoring equipment is prohibited.
- Converting or modifying the system without written approval from EFSEN UV & EB Technology is prohibited.
- Faults or damages must be reported immediately to the operating company. They must be resolved immediately using original parts.
- The device must be de-pressurized and disconnected from the power source before completing repairs.
- The safety and operating information in the documentation must be complied with under all circumstances.
- Only trained, instructed or qualified personnel are permitted to perform maintenance on the device.
- The system may only be restarted following maintenance after all protective equipment/covers are installed.
- Domestic employee protection regulations and domestic safety and accident prevention regulations apply when operating the device.
- No objects or tools may be placed in the device.
- The device may never be operated with damaged components.
- Contact with moving parts and the switched on UV-C lamp is prohibited.

## 3.2 Signal Words Used In Safety Information



### **DANGER**

#### **Direct hazard to the life of persons**

A safety reference with the signal word HAZARD refers to the directly threatening hazard to the life and the health of persons!



### **WARNING**

#### **Risk of bodily injuries (severe injuries) and possibly additional property damage**

A safety reference with the signal word WARNING refers to a hazardous situation, which can have an impact on the health of persons!



### **CAUTION**

#### **Hazard of property damage and possibly additional low risk of injury**

A safety reference with the signal word CAUTION refers to a possible hazardous situation, which can primarily cause property damages!

### **NOTE**

This symbol with the note Information refers to supporting information for the installation, operation or maintenance and repair.



### 3.3 UV-C Protective Regulations

For the safe handling of UV-C radiation, adherence to the EU directive 2006/25/EG.

Possible health damages caused by UV-C radiation:

- Reddened skin (erythema = sunburn), skin aging in case of frequent repeats.
- Eye keratitis
- Eye conjunctivitis, comparable to damages caused by arc welding or "snow blindness" during mountaineering.

Symptoms for ophthalmitis: 6 to 8 h after short impact strong eye pain with tears (feeling of a grain of sand in the eye). Complete healing normally after 1 to 2 days.

UV-C radiations only damage the surface while UV-B and UV-A radiations penetrate deeper into the skin layer or the eye lens and can cause for many years eye lens cloudiness (cataract).

#### **DANGER**

##### **Danger due to UV-C radiation**

UV-C radiation is hazardous and can cause health damages.



All persons who are in the same room if the system is opened and UV-C radiation is emitted are obligated to wear completely closed protective equipment (protective clothing, protective helmet, protection goggles and gloves).

#### **NOTE**

You must see a physician in case of an eye inflammation or strong reddened skin.

The low pressure mercury lamps primarily emit UV-C radiation with a 254 nm wave length. However, small radiation shares can also be found in the UV-B, UV-A up to the visible blue light range.

After the installation, UV sterilization devices are only in accordance with the legal occupational regulations if the UV radiation emission is not possible or if it is reduced to a minimum. If radiation is emitted, then an adequate distance must be maintained, the length of stay must be restricted and protective equipment must be worn. Information signs must be placed and employees must be legally informed before the start of the work and afterwards once annually!

The daily UV exposure = radiation intensity in the exposure area multiplied by x of the daily exposure duration. When in doubt, protective equipment must be worn or the intensity of the UV radiation emitted from the opening, gap, etc., must be measured and an assessed daily exposure value must be established as per EU directive 2006/25/EC "Artificial optical radiation" and whether the 8 h daily exposure limit value is exceeded must be checked. The actual exposure distance to the radiation exit must be included. EFSEN UV & EB Technology provides consultations.

**Protective equipment:**

Long sleeve clothes, gloves, goggles, full protective visual mask

Window glass, transparent plastic (Plexiglas, Makrolon®) and basically all opaque materials shield UV-C radiation. Only few materials, such as quartz glass or Teflon are permeable.

**DANGER**

Danger due to UV radiation

Never look into the UV-C light (not even for a few seconds) without protective goggles/face protection. Protect your eyes and skin against UV light.

### 3.4 Residual dangers / Warnings

**CAUTION**

**Cutting hazard due to the components of the UV AIR COMFORT air disinfection device**

Cutting hazard due to the sharp edges of individual components.

**CAUTION**

**Crushing hazard during installation/dismantling of the UV-C lamp**

When assembling the air disinfecting device, watch out for potential crushing hazards between the housing and the fixed components.



### **DANGER**

#### **Danger due to UV-C radiation in the area of the UV AIR COMFORT surface air disinfection device**

Please keep yourself and other persons away from this area. During maintenance activities in this area, please ensure that the system is disconnected from electricity and especially that the lamps are switched off.



### **DANGER**

#### **Danger due to UV-C radiation while testing the UV AIR COMFORT air disinfection device**

When testing the UV-C lamp, wear eye protection against UV radiation, gloves and protective clothing. The protective equipment must protect reliably against UV-C radiation. During testing, please ensure that no other persons are close to the UV-C air disinfection device. The test must only be performed by an authorized and trained person.



### **CAUTION**

#### **Hazard due to hot surfaces of the UV-C lamps**

Wear appropriate hand protection when handling broken UV-C lamps. Let the UV-C lamps cool down before you handle the UV-C lamps.



### **CAUTION**

#### **Hazard due to hot surfaces on the housing of the UV-C air disinfection device**

Wear appropriate hand protection when handling the UV-C disinfection device. While carrying out maintenance work, clean the components of the fan to ensure optimal operation of the UV-C device.



### **WARNING**

#### **Cutting hazard on broken glass materials of the UV-C lamp**

Please ensure a thorough handling of the UV-C lamps. Wear protective gloves when handling broken UV-C lamps. Broken UV-C lamps must be adequately disposed of. Please use the dedicated special tools for the installation or dismantling of the UV-C lamps.



### **DANGER**

#### **Hazard of damaged electrical cable in case of improper handling**

The cable may not be used for purposes other than intended, to carry or hang operating equipment or to pull the safety plug from the outlet. Keep the cable away from heat and sharp edges. Damaged or entangled cables increase the risk of an electrical shock.



**DANGER**

**Electrical hazard due to defective installation**

Please handle the UV-C lamp carefully. When performing service activities, look for insulation damages and resolve them immediately.



**DANGER**

**Electrical hazard due to poor cleaning of the fan**

Please handle the UV-C lamps carefully. When carrying out maintenance work, ensure that the fan and fan openings are free from contamination. Check to ensure the fan works properly.



**DANGER**

**Danger of being pulled in due to fast fan movements**

Before carrying out maintenance work, ensure that power to the UV AIR COMFORT air disinfection device is shut off and that it is secured against restart.



**DANGER**

**Various dangers (cutting danger, crushing danger) due to improper or careless disposal.**

Please dispose of the materials and parts of the system correctly sorted and separated in accordance with the system. Please ensure the special disposal of problem materials (UV-C lamp) and hazardous waste.



**DANGER**

**Danger of electrical voltage on live components**

It must be possible to close and lock the switch cabinets. The junction boxes must be screwed in properly. Maintenance work on electrical components may only be carried out by licensed personnel. Work on the electrical components of the system may only be carried out when the system is shut down and disconnected from the power source.



**DANGER**

**Danger of electrical voltage on live components**

Work on the device's electrical components may only be carried out after the device has been powered down or shut down.

## 3.5 Personal Protective Equipment

The following protective equipment must be worn during installation, dismantling and maintenance work:



Protective gloves



Safety shoes

The following protective equipment must be worn when testing the UV-C lamp:



Eye protection against UV radiation



Protective gloves



Protective clothing

The following protective equipment must be worn when disposing the components:



Eye protection



Protective gloves



Protective clothing

### NOTE

Persons who perform cleaning work must additionally adhere to the specified measures for the respective cleaning agents (e.g. glass for cleaners, spray protection, etc.)!

## 4 Guarantee and liability

Basically apply the "General Conditions of Sale and Delivery". Always keep the operating instructions; they represent the handling and information basis for all activities to be performed for this equipment type. Warranty and liability claims for personal injury and property damage are excluded if the following conditions are met in one or more cases:

- In case of non-intended use of the UV-C disinfection device
- In case of improper installation, commissioning or operation
- Operating the device with damaged or non-functioning safety and protective precautions
- Non-adherence to the safety information in the operating instructions with respect to transport, installation, commissioning, operation and maintenance of the UV-C disinfection system
- Changes to the device that were not approved by the manufacturer
- Inadequate testing and maintenance of components that are subject to wear (e.g.: UV-C lamps)
- Improper repairs
- Disasters, external influence or force majeure

## 5 Transportation / Packing

Please adhere to the following transport and packing regulations:

Upon delivery, the delivered parts must be checked to ensure they are complete and undamaged. Any damage must be documented immediately and reported directly to EFSEN UV & EB Technology.

Please ensure that the device is only transported in the packing intended for this purpose. A transport in inadequate or insufficient packing can result in damages.

During long storage times, the device should be stored at a dry location in its original packing. This is intended to prevent corrosion and contamination.

### To make a warranty claim

Package the UV-C lamps and other individual components of the system in their original packing with at least 5 cm cushion immobile to ensure that they do not break. In case of a warranty, send the components to EFSEN UV & EB Technology.

## 5.1 Device Disposal (Weee Directive)

In accordance with EU directive 2002/96/EC on waste electrical and electronic equipment, this electrical product must not be disposed of with household waste. Please dispose of this product in appropriate local recycling facilities in your area or by returning it to the manufacturer. Check with local authorities to obtain information about recycling.

### NOTE

Please dispose of the packing in an environmentally friendly manner (paper to paper, plastic to plastic; etc.)

It is generally recommended to keep the packaging material for possible device dispatch or transport.

WEEE-Reg.-No.: DE 28984821

## 6 Commissioning and Operation

Before commissioning, it must be ensured that no fingerprints and/or other grease or other contaminations are on the UV-C lamp.

If necessary, the radiator must be carefully cleaned using a cloth and a cleaner on alcohol basis.

### NOTE

**Use textile protective gloves when installing/dismantling the UV-C lamp.**

Never touch the UV-C lamps with an unprotected hand, this can result in a shortened service life based on the different temperature dispersion (burn in) of the radiator.

The device will be delivered after a functional test and it is operational. The assembly on-site must be performed by qualified personnel. The operation of the device is reserved for trained and authorized personnel. The device achieves its highest radiation intensity or the optimum operating temperature after about 3 min.



### CAUTION

**Danger of tipping in version with base**

Only set up the device on a solid, flat surface. If it is set up on a soft or sloped surface, or if exposed to external forces, the device may tip over and cause injuries or property damage.

## 6.1 Wall or Ceiling Installation and Electrical Connection

An outlet (see section 13.2 Electrical data) is required for the electrical connection of the UV AIR COMFORT. The device must only be installed at properly installed electrical outlets with a protective conductor.

Connect the enclosed cable of the UV AIR COMFORT to the electrical outlet.

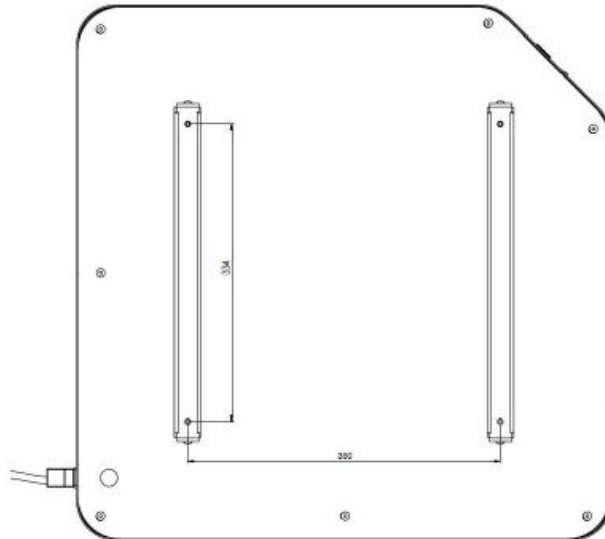
Because the UV-C radiation is not fully shielded, personnel may not stand in the direct vicinity while the device is in operation.

### NOTE

Wall or ceiling installation may only be carried out by qualified technicians.



The device is designed to be free-standing or to be mounted on the wall or ceiling. The following section lists dimensions required for installing the holding brackets for wall or ceiling installation:



Mount the 2 required ceiling brackets at the desired position with the hole spacing indicated above. Use dowels/screws with sufficient load-bearing capacity to do so.

Then mount the bracket on the device. To do so, insert the retaining pins into the holes and push them to the stop towards the top of the device. Fix the brackets onto the provided threaded holes using oval headed screws.





## 7.1.1 Switching the Device On

- After the device is switched on, the service indicator flashes green. The number of flashes indicates the version number of the service indicator.
- After the version number is displayed, the service indicator is illuminated green continuously.

### NOTE

3h are added to the operating hours each time the device is switched on.

### NOTE

Once the operating hours counter reaches the last hour of the service life, the service indicator starts flashing green.

### NOTE

Once the UV-C lamp has reached the end of its service life based on operating hours, the service indicator is illuminated red continuously.

If there is a fault in the service indicator, the LEDs will also be illuminated red continuously.

## 7.1.2 Setting Operating Hours Counter To Zero

- Press the reset button and hold for approx. 5 seconds until both LEDs alternate flashing red and green 3 times.
- Release the reset button and the operating hours will be set to zero.
- The LEDs will then be illuminated green continuously.

## 8 Device Description

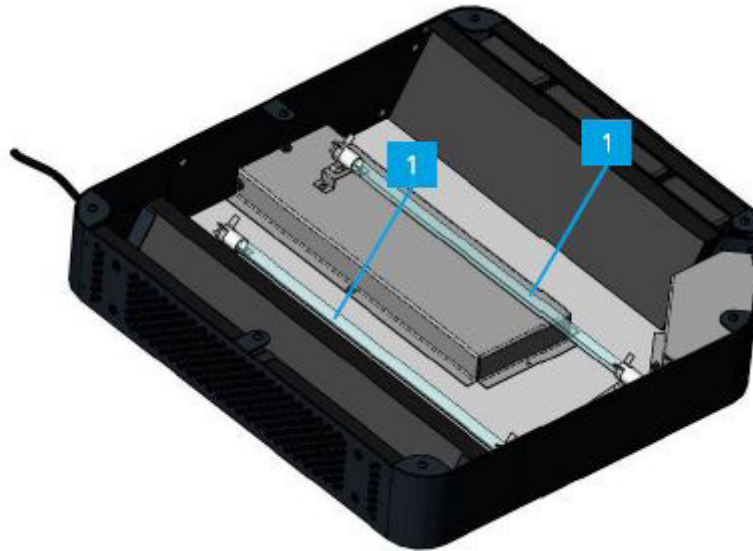
### 8.1 Device Types/Designs

The UV AIR COMFORT is produced using powder-coated stainless steel and rust-proof components. The high-grade surface fulfills even the highest demands. An integrated fan dis-tributes the disinfected air in the room. The ballast electronics in the housing are sup-plied with power via the device infeed line and a safety plug. This ensures fast access or allows for functional controlling.



Type	Article No.	Radiator No. UV-C	Power (W)
UV AIR COMFORT base	46E0500F11	46S0050001	53
UV AIR COMFORT wall/ceiling bracket	46E0500D11	46S0050001	53

## 8.2 Spare Parts and Ordering Information



No.	Spare part	Article No.	Quantity
1	UV-C lamp ST1 500mm	46S0050001	2

## 9 Maintenance

Qualified maintenance personnel must perform maintenance thoroughly and properly. For maintenance intervals for the UV-C lamps, see section 13.1 Data and ambient conditions.

### 9.1 Replacement of the UV-C Lamps

#### NOTE

Work on the device must only be performed if the voltage is disconnected. Unplug the power plug whenever dismantling or installing it.



#### DANGER

##### Danger due to UV radiation

Never look into the UV-C light (not even for a few seconds) without protective goggles/face protection. Protect your eyes and skin against UV light.



#### DANGER

##### Hazard due to electrical voltage

The electrical connection of the lamps is performed on one side. The power to the opposite 2nd cathode is routed through a wire placed on the outside of the lamp. Never touch igniting or ignited lamps for this reason.

- Plug in the lamp completely up to the stop in the 4-pin plug.

## 9.1.1 Replacing the UV-C Lamps

The installed UV-C lamps have an average service life or function duration of 16,000 operating hours. Although the actual burning time is approx. 25,000 h, performance is not guaranteed above 16,000 h. In addition, the burning time is reduced by approx. 3h per switching cycle.

Therefore, we recommend to perform a UV-C intensity measurement after 12 months. To do so, place the sensor on the surface of the lamp. For this purpose, use protective goggles and gloves.

Absolute radiation intensity measurement values in mW/cm<sup>2</sup> are not always directly comparable because UV measuring devices often have different spectral sensitivities. However, the relative performance drop can be measured properly and it should be less than 35%. UV-C measurement devices can be obtained through EFSEN UV & EB Technology .

The performance drop after 100 hours is approx. 10%. This performance drop must be considered for the dimensioning.

UV-C lamps with maximum radiation at a wavelength of 254 nm are significantly below the spectral range of visible light (380-780 nm). However, the lamp is not completely colorless, but slight bluish-purple, because a very small portion of the radiation emitted is in the range of visible light.

## 9.1.2 Exchanging Lamps on the UV AIR COMFORT

UV-C lamps are made of a quartz glass which is very sensitive to impacts. Handle replacement gently.

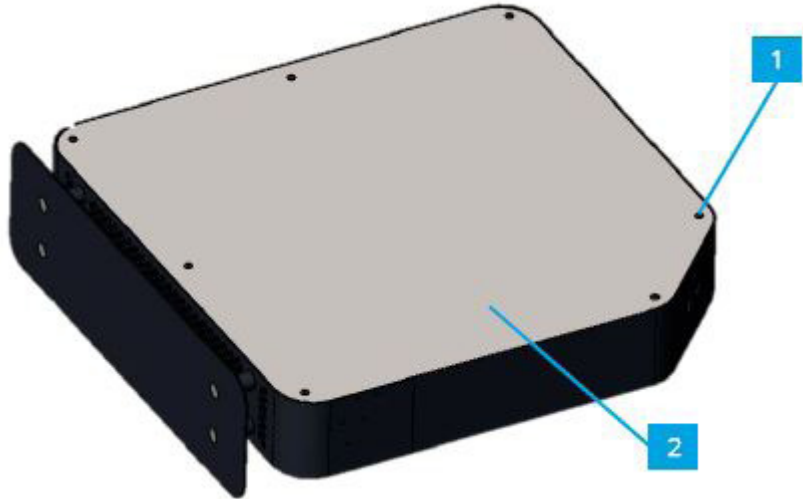
### NOTE

Only replace lamps while wearing cut resistant, textile gloves.

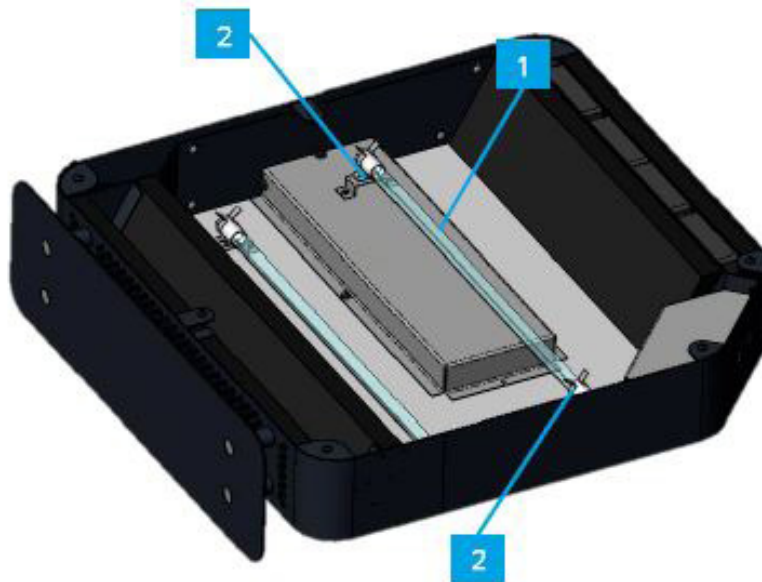
### NOTE

Work on the device must only be performed if the voltage is disconnected. Unplug the power plug whenever dismantling or installing it.

Loosen the 7 oval head screws (1) on the back of the housing (2) using a hex wrench and then remove the panel on the side of the housing.



- Pull the UV-C lamp (1) out of the spring terminals (2) and remove it from the ceramic plug. Protect the UV-C lamp against breakage by using fabric or foam material.



- The new UV-C lamp is installed by reversing these steps



## 10 Cleaning and Disinfection

The operators/cleaning personnel must perform the cleaning thoroughly and properly. The following cleaning intervals are only approximate values. The actual frequency of cleaning depends on the use or the contamination of the systems and the devices.



### **DANGER**

#### **Danger due to unauthorized commissioning during cleaning**

Before cleaning activities are initiated, the device must be disconnected from electricity or shut down and must be secured against unauthorized restart.

### 10.1 Cleaning of the UV-C Lamps

- Before each wet cleaning, switch the device/UV-C lamp off and let it cool down.
- It is recommended to use pure alcohol (>80% ETHANOL) for the cleaning of the radiator because pure alcohol evaporates completely and does not leave any residues on the surface.
- Use lint-free cloths.
- Avoid significant handling of the UV-C lamp. Mercury compounds can be emitted if the lamp breaks.
- Please adhere to the safety information about the cleaning and disinfection substances used.

### **NOTE**

Textile work gloves must be used for cleaning.

### 10.2 Disinfection of the UV-C Lamp

### **NOTE**

The same safety instructions apply that also apply to the cleaning.

Please review the safety data sheets of the disinfection agents used with respect to ignitable atmospheres and material/surface compatibility.

## 11 Troubleshooting

### 11.1 Identifying the Radiation Output

The exact radiation output can only be determined using a suitable measuring instrument because the UV radiation is outside of the visible light spectrum.

No light identification is possible if the work is performed to 100% within the optimum range of 254 nm. The blue in this case gives no indication of the performance of the lamp.

### 11.2 Help in Case of Failures

The following list informs you about possible disturbances and their causes as well as suggested solutions.

If a fault/failure occurs that cannot be resolved using the suggested solutions, then the user must contact the customer service of EFSEN UV & EB Technology in all cases.

<b>Faults</b>	<b>Troubleshooting</b>
The "OK" LED is not illuminated	<ul style="list-style-type: none"> <li>▪ The power plug is not plugged in</li> <li>▪ There is no power to the outlet</li> <li>▪ Check the power plug</li> <li>▪ Check fuses</li> </ul>
Lamps activated, germ count too high	<ul style="list-style-type: none"> <li>▪ Check the lamp's operating hours</li> <li>▪ Monthly check interval after 12,000h.</li> <li>▪ Check UV-C lamp for contamination</li> </ul>
The lamps do not ignite even though the system is turned on	<ul style="list-style-type: none"> <li>▪ Check connections to the device</li> <li>▪ Check hours of operation and/or performance</li> <li>▪ Check contact pins of the lamp (corrosion, broken or loose pins?)</li> <li>▪ Check socket for damages</li> <li>▪ Replace lamp</li> <li>▪ Replace the ballast unit (EVG)</li> </ul>
New UV-C lamp flickers (wave-like movements), does not ignite properly.	<ul style="list-style-type: none"> <li>▪ The balls can adhere to the cathode due to the transport</li> <li>▪ By repeatedly briefly turning on, there is evaporation and the function is working again</li> </ul>
UV-C lamp flashes briefly when turning on	<ul style="list-style-type: none"> <li>▪ The gas filling inside the lamp is faulty</li> <li>▪ The lamp must be replaced</li> </ul>
The lamp does not come on	<p>Possible causes:</p> <ul style="list-style-type: none"> <li>▪ Ballast device defective</li> <li>▪ UV-C lamp defective</li> </ul>

Faults	Troubleshooting
The service indicator / LED light is illuminated red	<ul style="list-style-type: none"> <li>▪ The UV-C lamp has reached its maximum operating hours</li> <li>▪ Replace the UV-C lamp</li> <li>▪ Complete maintenance</li> </ul>

## NOTE

Contact EFSEN UV & EB Technology in case of failures and unforeseen changes to the device.



## CAUTION

### Danger due to residual voltage

Residual energies may still be stored in the device, e.g., due to tilting, which can be released during the service and which can result in a danger to personnel.

If required, use appropriate tools for control.

## 12 Effect of the UV-C Radiation

The utilized germ-killing (germicidal) effect of the UV-C radiation at the wave length  $\lambda = 220 - 280$  nm is based on the destruction of the DNA. Photokinetic and electromagnetic energy decompose the cell membrane, swell the cell and cause it to burst. Therefore, the cells can no longer reproduce and cannot become resistant.

UV-C radiation only ionizes at a range below  $\lambda = 200$  nm and therefore generates ozone, and it can only be transmitted by lamp tubes produced using artificial, highly clean special quartz glass. The type of the microorganisms to be killed and the radiation dosage required to do so are included in the system dimensioning. The lamp output, the lamp distance and the impact duration are key.

## 13 Technical Data

### 13.1 Data and Ambient Conditions

Test Mark	CE	
Mounting type	Mounted by professional technicians	
Material	Steel powder-coated	
UV-C lamp Exchange interval	16.000h	less 3h/switching cycle
Ambient temperature	+5°C to +35°C	
Noise level	36dB(A)	
Fan power	160m <sup>3</sup> /h	
Throughput	115m <sup>3</sup> /h	
Humidity	0% to 80% rel. humidity	
Installation site	inside	

### 13.2 Electrical Data

Power supply		230 V (+/-10%)
Power frequency		50 Hz
Device performance	UV AIR COMFORT	53W

### 13.3 Weights

Type	Total length L1 [mm]	Total height H1 [mm]	Total width B1 [mm]	Weight incl. 3 m cable [kg]
UV AIR COMFORT	600	600 (650)	150 (160)	app. 15 kg

Values in parentheses = version with base