

## TEST

Evaluation of the UV radiation emitted according to the standards:

- Test according to UNE-EN ISO 15858:2017: UV-C Devices. Safety information. Permissible human exposure.
- UNE-EN 12198-1/2:2001+A1:2008: Safety of machinery. Assessment and reduction of risks arising from radiation emitted by machinery. Part 1: General principles. And part 2: Radiation emisión measurement procedure.
- IEC 60335-2-65:2015. Amendment 2: Household and similar electrical appliances – Safety-part 2-65: Particular requirements for air-cleaning appliances. Point 33.102.

Compliance evaluation with the DIRECTIVE 2006/25/EC (artificial optical radiation).

Compliance evaluation with the Technical Specification UNE0068: Safety requirements for UV-C equipment used for room air disinfection and surfaces.

## APPLICANT'S INFORMATION

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Test date: 28/12/2020

Elaborado por:



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10/03/2021

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10/03/2021

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## 1. DESCRIPTION OF THE MACHINE EVALUATED

**Identification:** EE200487-1

Test sample EE20048 with parts: EE200487-1

**Descripción:** Machine intended for air disinfection using UV-C radiation

Information provided by the applicant:

*Dimensions: (LxWxH) (20 x 20 x 15.5) cm*

*Model/Reference: SANICOOL SH 60. S/N: SH602010-31*

EE200487-1: housing, electrical equipment, UV lamp and forced ventilation system.





**Identifying marks:**

Marks on the housing:



**Date of receipt:** 21/12/2020

**Sample supplier:** The applicant.

“The laboratory is not responsible for the information provided by the applicant, as well as for the identifying marks that the sample incorporates”

## 2. UNE-EN ISO 15858:2017: UV-C DEVICES. SAFETY INFORMATION. PERMISSIBLE HUMAN EXPOSURE.

The UNE-EN ISO 15858: 2017 standard indicates that the measurement of UVC radiation must be carried out in accordance with the measurement method of the standard EN 14255-1:2005 Measurement and assessment of personal exposures to incoherent optical radiation. Part 1: Ultraviolet radiation emitted by artificial sources in the workplace. For “in situ” measurements of UVC energy, portable radiometers should be used as regulated sensors for the reading of a wavelength from 240 nm to 270 nm. Measurements should be made during commissioning and prior to commissioning of the UVGI installation for UVC duct and top air disinfection devices.

Since we are not carrying out an “in situ” measurement, but rather an evaluation of the device in the laboratory, the instructions given in clause 5: preliminary review of the EN 14255-1 standard are followed.

### **5 Preliminary Review**

The preliminary review is required to determine whether or not a detailed hazard assessment based on measurements is necessary. All available information about the radiation source and the possible personal UV-exposure shall be gathered. It shall then be decided if an exposure measurement is necessary or if a statement can be made without a measurement that the exposure limit values are met or are exceeded.

**NOTE** If UV irradiances are known to be either insignificant or extreme, a precise assessment may be unnecessary. Where all sources have emission characteristics which can be described as trivial, or where occupancy is minimal, it may be impossible for a person to exceed the chosen exposure limits. Conversely, where emissions are significant and/or occupancy is high, it may be obvious that the limits will be exceeded and that some form of protective measures (see Clause 9) will be required. Useful information towards the preliminary review might be found from several origins:

- A device may have been classified according to standards such as EN 12198 [11 – 13] and CIE S009 [5]. Knowledge of the classification of all potential sources of UV- radiation may allow a sufficiently precise assessment of hazard to be made without further measurement.
- If sufficient UV radiation emission data are available for a device it may be possible to estimate the personal UV exposure.
- If data like spectrum (e.g. derived from the source temperature), geometry and exposure duration are available calculation of the personal exposure may be performed (e.g. by computer software [6]).

To carry out this preliminary review, a measure is carried out in accordance with the EN 12198 standard, which allows the machine to be assigned a category based on its risk.

## 3. OPTICAL RADIATION RISK ASSESSMENT ACCORDING TO UNE-EN 12198-1/2:2001+A1:2008: SAFETY OF MACHINERY

### **Testing method**

Test performed according to standards: UNE-EN 12198-1:2001+A1:2008 y UNE-EN 12198-2:2001+A1:2008. All measurements of irradiance are performed at distances defined in the standard.

At each testing point, the spectral power distribution is measured (in the range 200 to 600 nm) with an spectroradiometer, three measurements are recorded and the average is calculated.

The machine is evaluated in its normal operating function. Cleaning and maintenance operations are carried out with the machine switched off according to the indications of the applicant, so the machine is not evaluated for these operations.



Since the main radiation of the lamps incorporated in the machine is UV-C, only the risk due to ultraviolet light is analysed.

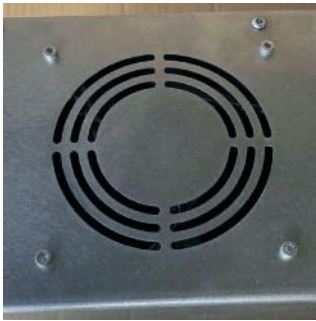
### Selection of testing points

After visual inspection, the areas where radiation can escape from inside the machine are detected. 3 areas are detected where radiation can be seen. In each zone the point of maximum emission is located and measurements are made at that point.

**Point 1:** In the fan located on the top of the machine

**Point 2:** In the logo.

**Point 3:** In an opening at the bottom of the machine



Point 1



Point 2



Point 3

### Test equipment

- Spectroradiometer StellarNet Blue-Wave UV-50 (E0015). S/N: 16020409  
Calibration certificate: P198212-DMSI/1
- Thermo-hygrometer PCE 313-A (E0020). S/N: Q899064  
Calibration certificate: C-10017.00006
- Calliper Insize 1108-150 (E0050). S/N: 0810162082  
Calibration certificate: 8852-12578

### Environmental conditions during the test<sup>i</sup>

Temperature:  $(24.77 \pm 0.39) \text{ }^{\circ}\text{C}$

Humidity:  $(26.3 \pm 2.9) \% \text{ Hr}$

**Test distance<sup>i</sup>:**  $(100.00 \pm 0.10) \text{ mm}$

### 3.1. RESULTS

Effective Irradiance values calculated from data measured in the [200-400] nm range and weighted by the function  $s(\lambda)$  and uncertainties<sup>i</sup>

| Measurement point | UV Risk<br>[200-400] nm                           |                                    |
|-------------------|---|------------------------------------|
|                   | $E_{\text{eff}}$ ( $\text{W}\cdot\text{m}^{-2}$ ) | U ( $\text{W}\cdot\text{m}^{-2}$ ) |
| Point 1           | $0.185\cdot 10^{-4}$                              | $0.098\cdot 10^{-4}$               |
| Point 2           | $0.24\cdot 10^{-4}$                               | $0.19\cdot 10^{-4}$                |
| Point 3           | $0.72\cdot 10^{-6}$                               | $0.48\cdot 10^{-6}$                |

### 3.2 CATEGORY OF THE MACHINE ACCORDING TO STANDARD UNE-EN 12198-1: 2001 + A1: 2008 AND UNE-EN 12198-2: 2001 + A1: 2008

The category of the machine is determined according to tables B.2, B.4 and B.5 of the UNE-EN 12198-1: 2001 + A1: 2008 standard, where the radiation emission categories are established.

For the determination of the category, the measured value and its corresponding uncertainty are considered.

Correlation between effective irradiance and radiation emission category:

| $E_{\text{eff}}$ (180 nm -400 nm)<br>( $\text{W}\cdot\text{m}^{-2}$ ) | Radiation emission<br>category |
|---|--------------------------------|
| $E_{\text{eff}} \leq 0.1\cdot 10^{-3}$                                | 0                              |
| $0.1\cdot 10^{-3} < E_{\text{eff}} \leq 1.0\cdot 10^{-3}$             | 1                              |
| $E_{\text{eff}} > 1.0\cdot 10^{-3}$                                   | 2                              |

| UV [200-400] nm   |   |          |
|-------------------|---|----------|
| Measurement point | $E_{\text{eff}} + U$ ( $\text{W}\cdot\text{m}^{-2}$ ) | Category |
| Point 1           | $< 0.1\cdot 10^{-3}$                                  | 0        |
| Point 2           | $< 0.1\cdot 10^{-3}$                                  | 0        |
| Point 3           | $< 0.1\cdot 10^{-3}$                                  | 0        |

|                         |          |
|-------------------------|----------|
| <b>MACHINE CATEGORY</b> | <b>0</b> |
|-------------------------|----------|

#### 4. EVALUATION ACCORDING TO THE ARTIFICIAL OPTICAL RADIATION DIRECTIVE (2006/25/CE)

The machine does not exceed the exposure limits given by the directive for the following exposure times: (selecting the most unfavourable result).

| Wavelength range (nm) | Exposure limits                                   | Result <sup>i</sup>             |
|-----------------------|---|---------------------------------|
| 180 – 400 nm          | $H_{\text{eff}} = 30 \text{ J/m}^2 \text{ (8 h)}$ | $(0.69 \pm 0.56) \text{ J/m}^2$ |

#### 5. TEST ACCORDING TO IEC 60335-2-65:2015. AMENDMENT 2: HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY-PART 2-65: PARTICULAR REQUIREMENTS FOR AIR-CLEANING APPLIANCES. CLAUSE: 32.102.

##### Test method

Test carried out according to IEC 60335-2-65:2015. Amendment 2: Household and similar electrical appliances – Safety-part 2-65: Particular requirements for air-cleaning appliances. Clause: 32.102

The spectral power distribution is measured (in the range 200 to 600 nm) with a spectroradiometer, three measurements are recorded and the average is calculated in the most unfavorable zone.

##### Test equipment

- Spectroradiometer StellarNet Blue-Wave UV-50 (E0015). S/N: 16020409  
Calibration certificate: P198212-DMSI/1
- Thermo-hygrometer PCE 313-A (E0020). S/N: Q899064  
Calibration certificate: C-10017.00006
- Telemeter Bosch (E0016). S/N: 510062991  
Calibration certificate: 191038001\_M1

##### Environmental conditions during the test<sup>i</sup>

Temperature:  $(24.77 \pm 0.39) \text{ }^\circ\text{C}$

Humidity:  $(26.3 \pm 2.9) \text{ \% Hr}$

Test distance <sup>i</sup>:  $(300.00 \pm 0.10) \text{ mm}$

## 5.1 RESULTS AND EVALUATION OF COMPLIANCE

Appliances shall meet the following requirements:

- The total irradiance shall not exceed  $0.003 \text{ W/m}^2$  for wavelengths between 200 nm and 280 nm.

$$I = \sum_{200 \text{ nm}}^{280 \text{ nm}} E_{\lambda} \Delta\lambda$$

- The spectral irradiance shall not exceed  $10^{-5} \text{ W/m}^2 \cdot \text{nm}$  in the spectral range [200 -280] nm.
- The total irradiance weighted by the weighting curve  $s(\lambda)$ , shall not exceed  $1 \text{ mW/m}^2$  for wavelengths between 250 nm and 400 nm.

$$E = \sum_{250 \text{ nm}}^{400 \text{ nm}} S_{\lambda} E_{\lambda} \Delta\lambda$$

| Measured values       |                         |                       |
|-----------------------|-------------------------|-----------------------|
| I (W/m <sup>2</sup> ) | E (W/m <sup>2</sup> nm) | E (W/m <sup>2</sup> ) |
| $1.66 \cdot 10^{-6}$  | $1.65 \cdot 10^{-6}$    | $7.99 \cdot 10^{-7}$  |

The device complies with the requirements established by the standard.

## 6. COMPLIANCE EVALUATION WITH THE TECHNICAL SPECIFICATION UNE0068: SAFETY REQUIREMENTS FOR UV-C EQUIPMENT USED FOR ROOM AIR DISINFECTION AND SURFACES.

The UNE0068 specification is intended to cover product, installation, and maintenance requirements for the safe and efficient use of equipment that use UV-C radiation for professional room air disinfection and surfaces.

As general requirements, it establishes compliance with the following directives:

Devices or equipment with UV-C radiation must include in the product documentation an EU declaration of conformity to provide the required information on compliance with the applicable regulation, including at least the following Directives:

– DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

– DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.



- DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE).
- DIRECTIVE 2006/25/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).

From the point of view of optical radiation, the application directive is “Directive 2006/25 / CE”, in addition, the UNE0068 specification indicates that:

“There is another standard (UNE-EN ISO 15858) that has been drawn up in response to a worldwide demand for minimum UV-C safety specifications for devices that use UV-C lamps, mainly intended for air disinfection. In this standard, limits of dangerous UV-C radiation are included, which would be the ones that should be met.”

#### **Conclusion:**

**The measurements made and the results obtained from the product “SANICOOL SH 60”, tested in the laboratory and whose results are presented in this report, meet the requirements set by the UNE0068 specification from the point of view of emitted UV radiation.**

***NOTE: This report is a translation of the original IE200318 report in Spanish.***

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<sup>i</sup> All the expanded uncertainties that appear in this test report have been calculated with a coverage factor  $k=2$  (which, for a normal distribution, defines a level of confidence of approximately 95%).