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**BS EN ISO 15858:2016**



**BSI Standards Publication**

# **UV-C Devices — Safety information — Permissible human exposure (ISO 15858:2016)**

**bsi.**

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This British Standard is the UK implementation of EN ISO 15858:2016.

The UK participation in its preparation was entrusted to Technical Committee MCE/21, Filters for gases and liquids.

A list of organizations represented on this committee can be obtained on request to its secretary.

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## UV-C Devices - Safety information - Permissible human exposure (ISO 15858:2016)

Appareil UV-C - Information sur la sécurité - Limites admissibles pour l'exposition humaine (ISO 15858:2016)

UV-C Einrichtungen - Sicherheitsinformationen - Zulässige Exposition von Personen (ISO 15858:2016)

This European Standard was approved by CEN on 5 May 2016.

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**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (EN ISO 15858:2016) has been prepared by Technical Committee ISO/TC 142 "Cleaning equipment for air and other gases" in collaboration with Technical Committee CEN/TC 195 "Air filters for general air cleaning" the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### Endorsement notice

The text of ISO 15858:2016 has been approved by CEN as EN ISO 15858:2016 without any modification.

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 142, *Cleaning equipment for air and other gases*.

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## Introduction

This International Standard was developed in response to a worldwide demand for minimum specifications on UVC safety for products and equipment utilizing UVC lamp fixtures. In this International Standard, when it comes to personal damage of UV disinfection, the whole UVC band range is more likely to be included. As for lamps of product equipment, UVC prefers to the 254 nm wavelength.

UVC radiation is a low-penetrating form of UV as compared to UVA or UVB radiation. Measurements of human tissue show that 4 % to 7 % of UVC radiation, along with a wide range of wavelengths from 250 nm to 400 nm, is reflected<sup>[6]</sup> and absorbed in the first 2 µm of the stratum corneum. Hence, the amount of UVC transmitted through the epidermis is minimized.<sup>[7]</sup>

UVC radiation is invisible to humans and exposure to UVC radiation may have an effect on health. Ocular damage generally begins with photokeratitis but can also result in photokeratoconjunctivitis. Symptoms, which may not be evident until several hours after exposure, can include an abrupt sensation comparable to sand in eyes, tearing, and eye pain of various degrees. Such symptoms may appear within 1 h to 12 h after UVC exposure and resolve fully within 24 h to 48 h. Acute overexposure to UVC band radiation may cause incapacity due to eye discomfort, but this generally regresses after several days, leaving no permanent damage.

Cutaneous damage consists of erythema, a reddening of the skin akin to sunburn but without tanning. The maximum effect of erythema occurs at a wavelength of 297 nm in the UVB band. UVC radiation at a wavelength of 254 nm is less effective in causing erythema. Therefore, the areas subject to exposure should be marked. Warning signs should be placed in certain locations to protect personnel or passers-by from UV hazards. Appropriate locations include access doors, air handling unit outside walls, equipment room doors, etc.

The International Commission on Illumination (CIE) 2010 completed a review of UVC photocarcinogenesis risks from germicidal lamps using basic biophysical principles due to the attenuation provided by the stratum corneum and epithelial tissues of the skin. Upper air disinfection could be safely used without significant risk for long-term delayed effects such as skin cancer.<sup>[5]</sup>

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# UV-C Devices — Safety information — Permissible human exposure

## 1 Scope

This International Standard specifies minimum human safety requirements for the use of UVC lamp devices.

It is applicable to in-duct UVC systems, upper-air in room UVC systems, portable in-room disinfection UVC devices, and any other UVC devices which may cause UVC exposure to humans.

It is not applicable to UVC products used for water disinfection.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 170, *Personal eye-protection — Ultraviolet filters — Transmittance requirements and recommended use*

EN 14255-1, *Measurement and assessment of personal exposures to incoherent optical radiation — Part 1: Ultraviolet radiation emitted by artificial sources in the workplace*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### wavelength

distance between repeating units of a wave pattern

Note 1 to entry: Commonly designated by the Greek letter lambda ( $\lambda$ ).

### 3.2

#### waveband

spectrum section

spectrum band

electromagnetic spectrum that is usually divided into a large spectral region, small spectral band and narrow spectral lines

Note 1 to entry: Waveband is commonly expressed as a specific *wavelength* (3.1) range of values, sometimes uses numbers or letters as code.

### 3.3

#### ultraviolet radiation

*wavelength* (3.1) of the electromagnetic spectrum of radiation from 10 nm to 400 nm

Note 1 to entry: The range between 100 nm and 400 nm is commonly subdivided into:<sup>[1]</sup>

- UVA: 315 nm to 400 nm;
- UVB: 280 nm to 315 nm;
- UVC: 200 nm to 280 nm;