SLOVENSKI STANDARD
oSIST prEN ISO 15858:2014

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UV-C-naprave - Varnostne zahteve - Dovoljena izpostavljenost ljudi (ISO/DIS 15858:2014)

UV-C Devices - Safety information - Permissible human exposure (ISO/DIS 15858:2014)

UV-C Einrichtungen - Sicherheitsinformationen - Zulässige Exposition von Personen (ISO/DIS 15858:2014)

Appareil UV-C - Information sur la sécurité - Limites admissibles pour l'exposition humaine (ISO/DIS 15858:2014)

Ta slovenski standard je istoveten z: **prEN ISO 15858**

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13.280 Varstvo pred sevanjem Radiation protection

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UV-C Devices — Safety information — Permissible human exposure

Appareil UV-C — Information sur la sécurité — Limites admissibles pour l'exposition humaine

ICS: 91.140.30

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 15858 was prepared by Technical Committee ISO/TC 142, *Cleaning equipment for air and other gases*.

Introduction

This 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 document, when it comes to personal damage of UV disinfection, the whole UVC band range are 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 [1] and absorbed in the first 2 µm of the stratum corneum. Hence, the amount of UVC transmitted through the epidermis is minimized [2].

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. Some examples of warning signs are provided in Annex A.

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 [3].

UV-C Devices — Safety information — Permissible human exposure

1 Scope

This standard specifies minimum human safety requirements for the use of UVC lamp fixtures.

It is applicable to in-duct UVC systems, upper-air 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 referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 170:2002, Personal eye-protection – Ultraviolet filters – Transmittance requirements and recommended use

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

CDC/NIOSH: Recommended Exposure Limit (REL)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in 2011 ASHRAE Handbook – HVAC Applications Chapter 60 [4] and the following apply:

3.1
wavelength
Distance between repeating units of a wave pattern, commonly designated by the Greek letter lambda (λ).

3.2
waveband
Waveband is also called spectrum section, or spectrum band. Usually the electromagnetic spectrum is divided into large and small section, the large area is called spectral region, the small one is called band; the most narrow one is called spectral lines. Waveband is commonly expressed as a specific wavelength range of values, sometimes use numbers or letters as code.

3.3
ultraviolet radiation

Optical radiation with a wavelength shorter than that of visible radiation. The range between 100 nm and 400 nm is commonly subdivided into [5]:

UVA: 315 nm to 400 nm
UVB: 280 nm to 315 nm
UVC: 200 nm to 280 nm
Vacuum UV: 100 nm to 200 nm

3.4
UV dose
Product of UV irradiance and specific exposure time on a given microorganism or surface, typically reported in millijoules per square centimetre (mJ/cm^2).

3.5
fluence rate
The fluence across a surface, often expressed as J/m^2, J/cm^2, or $W \cdot s/cm^2$.

3.6
irradiance
Power of electromagnetic radiation incident on a surface per unit surface area, typically reported in microwatts per square centimetre ($\mu W/cm^2$) [6].

3.7
effective irradiance
The power of UVC radiation from electromagnetic radiation received on a surface per unit surface area.

3.8
disinfection
It is a less lethal process of inactivating microorganisms compared to sterilization

3.9
ultraviolet germicidal irradiation (UVGI)
UVGI is generated by germicidal lamps that kill or inactivate microorganisms by emitting radiation predominantly at a wavelength of 254 nm.

3.10
radiometer
An instrument used to measure radiometric quantities, particularly UV irradiance or fluence.

3.11
in-duct systems
UVC lamp fixtures placed up- or down-stream of the cooling coil or in other enclosed sections of the HVAC duct system [7].

3.12
upper-air systems
UVC lamp fixtures mounted underneath room ceilings with UVC energy directed upward with adjustable louvers to keep UVC rays above eye and head level [7].

3.13
portable in-room disinfection UVC device
Portable in-room disinfection UVC device may be moved into place temporarily to disinfect surfaces (such as walls, etc.), for example, UVC device installed on mobile car [7].

3.14
exposure
Being subjected to infectious agents, irradiation, particulates, or chemicals that could have harmful effects.

3.15