Measurement and assessment of personal exposures to incoherent optical radiation - Part 2: Visible and infrared radiation emitted by artificial sources in the workplace

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EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN 14255-2:2006 sisaldab Euroopa standardi EN 14255-2:2006 ingliskeelset teksti. Käesolev dokument on jõustatud 27.02.2006 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 14255-2:2006 consists of the English text of the European standard EN 14255-2:2006. This document is endorsed on 27.02.2006 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This European Standard specifies procedures for the measurement and assessment of personal exposures to visible (VIS) and infrared (IR) radiation emitted by artificial sources, where adverse effects cannot be readily excluded.	**Scope:** This European Standard specifies procedures for the measurement and assessment of personal exposures to visible (VIS) and infrared (IR) radiation emitted by artificial sources, where adverse effects cannot be readily excluded.

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Measurement and assessment of personal exposures to incoherent optical radiation - Part 2: Visible and infrared radiation emitted by artificial sources in the workplace

Mesure et évaluation de l'exposition des personnes aux rayonnements optiques incohérents - Partie 2 : Rayonnements visibles et infrarouges émis par des sources artificielles sur les lieux de travail

Messung und Beurteilung von personenbezogenen Expositionen gegenüber inkohärenter optischer Strahlung - Teil 2: Sichtbare und infrarote Strahlung künstlicher Quellen am Arbeitsplatz

This European Standard was approved by CEN on 4 November 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This European Standard (EN 14255-2:2005) has been prepared by Technical Committee CEN/TC 169 “Light and lighting”, the secretariat of which is held by DIN.

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 June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

EN 14255 *Measurement and assessment of personal exposures to incoherent optical radiation* is published in four parts:

Part 1: Ultraviolet radiation emitted by artificial sources in the workplace.

Part 2 (this part): Visible and infrared radiation emitted by artificial sources in the workplace.

Part 3: UV-Radiation emitted by the sun (in preparation).

Part 4: Terminology and quantities used in UV-, visible and IR-exposure measurements.

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

Introduction

People may be exposed to adversely high levels of visible (VIS) and/or infrared (IR) radiation in the workplace. The most important natural source for such VIS/IR-radiation is the sun. There are also artificial VIS/IR-radiation sources, where VIS- and/or IR-radiation is either intentionally emitted to achieve the purpose of the source's application or is unintentionally emitted.

Visible optical radiation (VIS-radiation): Common applications for sources intentionally emitting visible optical radiation are: general lighting, signalling devices, initiation of industrial-, medical- or agricultural-photochemical processes and phototherapy of patients (e.g. hyperbilirubinemia- and bright light therapy, physiotherapy and photodynamic therapy). Some examples of sources where visible radiation is unintentionally emitted are: welding arcs, industrial furnaces and some types of UV-sources. When people are irradiated by intense VIS-radiation, injuries may occur. VIS-radiation can cause damage to the retina through thermal or photochemical mechanisms. Photosensitization of the skin to visible light, usually due to the action of certain drugs, plants, or other substances, may occur shortly after administration of the drug (phototoxic sensitivity), or may occur only after a latent period which can vary from days to months (photoallergic sensitivity, or photoallergy). VIS-radiation may also induce or aggravate some diseases like porphyria.

Infrared optical radiation (IR-radiation): Common applications for sources intentionally emitting infrared optical radiation are: radiative heaters, military nightsight devices, phototherapy of patients (e.g. physiotherapy and photodynamic therapy), industrial photochemical or photothermal processes. Some examples of sources, where infrared radiation is unintentionally emitted, are: welding arcs, some types of visible light sources (e.g. high power tungsten lamps) and industrial furnaces. When people are irradiated by intense IR-radiation, injuries may occur. The anterior structures of the eyes (cornea) and the skin may be damaged by short term IR-irradiation of high irradiance. Depending on the wavelength a certain fraction of IR radiation can also cause damage to the retina through thermal or photochemical mechanisms. But additionally, long term less intense IR-irradiation may also result in cumulative damage to the eyes and skin, such as cataracts and skin aging.

In order to avoid short term injuries and reduce additional risks from long term overexposure to VIS- and/or IR-radiation, national regulations and international recommendations require restriction of VIS/IR-exposure levels in the workplace. To achieve this, it is necessary to determine the level of VIS/IR-exposure and assess its gravity.

The determination of the level of VIS/IR-exposure can be done by measurement of the VIS/IR-exposure of the people likely to be exposed. Determination of the severity of a VIS/IR-exposure is normally done by comparison of the determined exposure level with the required or recommended limit value. When the exposure level complies with the limit value no further action is necessary. When the limit value is exceeded protective measures have to be applied in order to decrease the VIS/IR-exposure. As the exposure situation at the workplace may change, it may be necessary to repeat the determination and assessment of VIS/IR-exposure at a later time.

VIS/IR radiation exposure measurements are often costly and time consuming. So it is reasonable to avoid measurements if possible, i. e. if the personal VIS/IR radiation exposure can be estimated and either exceeds the limit values by far or is far below the limit values. In some cases, the manufacturer may have classified a device according to European and International Standards such as EN 12198 and CIE S009. Knowledge of the classification of all potential sources of VIS/IR may allow a sufficiently precise assessment of hazard to be made without further measurement. Another approach could be to use known spectral data of sources in combination with calculation software in order to estimate exposure level [5]. VIS/IR-exposure measurements are only necessary if it cannot be estimated in advance whether the limit values will be exceeded or not. So as a first step of the assessment procedure it is useful to carry out a preliminary review including an exposure estimation.

This European Standard does not specify VIS/IR-exposure limit values. VIS/IR-exposure limit values are set in national regulations or provided by international organizations, such as the International Commission for Non-ionizing Radiation Protection (ICNIRP) [1]. This European Standard specifies the procedures for measurement and assessment of VIS/IR-exposures in the workplace. As the results of measurement and assessment of

VIS/IR-exposure depend on the method of implementation, it is important to carry out measurements and assessments in a standardised way.

1 Scope

This European Standard specifies procedures for the measurement and assessment of personal exposures to visible (VIS) and infrared (IR) radiation emitted by artificial sources, where adverse effects cannot be readily excluded.

NOTE 1 Adverse effects will normally not occur in exposures caused by normal lighting or room heating.

This European Standard applies to VIS- and IR- exposures in indoor and outdoor workplaces. It does not apply to VIS- and IR-exposures in leisure time.

This European Standard does not apply to VIS- and IR- exposures caused by the sun.

NOTE 2 Part 3 of this standard will deal with UV-exposures caused by the sun.

This European Standard does not specify VIS- and IR-exposure limit values. It supports the application of limit values set by national regulations or international recommendations.

This European Standard applies to VIS- and IR- exposures by artificial incoherent sources, which emit spectral lines as well as continuous spectra. This European Standard does not apply to coherent radiation sources.

NOTE 3 Coherent optical radiation sources are covered by standards for lasers, like EN 60825-1 etc.

This European Standard applies to visible (VIS) and infrared (IR) radiation exposures in the wavelength band 380 nm to 3 µm. It also applies to radiation exposures that may present a blue-light hazard in the wavelength band 300 nm to 700 nm.

This European Standard does not apply to other effects of which the action spectra lie solely within the UV-region 180 nm to 400 nm.

NOTE 4 Part 1 of EN 14255 addresses these effects.

This European Standard does not apply to radiation emissions of products.

NOTE 5 For radiation emissions of products other standards apply, such as EN 12198 for radiation emissions of machinery, EN 60335-2-27 for household appliances for skin exposures to ultraviolet and infrared radiation and CIE S009 for the safety of lamps and lamp systems.

This European Standard does not apply to heat stress, i.e. long term heating of the humans body with strain of the cardiac/circular system caused by climatic environmental conditions including VIS/IR radiation.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ENV 13005, *Guide to the expression of uncertainty in measurement*

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

CIE 17.4:1987, *International electrotechnical vocabulary, Chapter 845: lighting*