

Focus on IFA's work

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Measurement and assessment of optical radiation exposure at workplaces

Problem

Exposure to optical radiation – ultraviolet (UV) and infrared (IR) and light in the visible spectrum – at the workplace may result in damage to employees' eyes and skin. Both acute (e.g. erythema, photo-keratitis and photoconjunctivitis) and late (e.g. skin cancer, cataracts) trauma may occur. The form of damage is dependent upon the type of radiation, its intensity, and the duration of exposure. Besides the sun, a natural source of radiation, artificial sources of radiation are encountered at workplaces which may lead to hazardous radiation exposure. These include the use of UV lamps for the manufacture, disinfection or testing of products, and the use of infrared lamps and furnaces for the drying, heating or melting of products. Radiation emissions arising in manufacturing processes (caused for instance by electric welding arcs) may also result in hazardous exposure. Measurements of radiation exposure at workplaces permit identification of the risks to employees and recommendations of the necessary safety measures.

Activities

In conjunction with the Institutions for Social Accident Insurance, the IFA conducts measurements and assessments of optical radiation at workplaces. The methods employed are described in the standards DIN EN 14255-1 (for UV radiation) and DIN EN 14255-2 (for IR and visible radiation). Analysis of the task to be performed constitutes a substantial element of the exposure assessment.



Emission of optical radiation during arc welding

The analysis first identifies the radiation sources which may result in employees' being exposed. The locations of exposure, their distance from the sources of radiation, and the duration of exposure at these locations are then determined for all tasks and all exposed parts of the employee's body. Exposure to UV, IR, or visible radiation is then measured at the identified locations.

For assessment of the radiation exposure, reference is made to the exposure limit values for protection of the eyes and skin listed in Annex I of directive 2006/25/EC, in accordance with the German Occupational Health and Safety Ordinance on Artificial Optical Radiation (OStrV).

Results and Application

The measured optical radiation exposure values form the basis for decisions by the businesses concerning the necessity for safety measures, and

their form. The measurements performed to date indicate that in certain cases, radiation exposure may reach the limit values after a duration of only a few minutes or even seconds. Among the reasons identified for this were missing radiation shields, the performance of maintenance work on live radiation-emitting equipment, and welding work performed without the use of personal protective equipment.

Area of Application

Prevention services of the Institutions for Social Accident Insurance; OH&S departments of businesses in which machinery, installations or methods involving artificial sources of optical radiation are employed.

Additional Information

- DIN EN 14255-1: Messung und Beurteilung von personenbezogenen Expositionen gegenüber inkohärenter optischer Strahlung – Teil 1: Von künstlichen Quellen am Arbeitsplatz emittierte ultraviolette Strahlung (06.05). Beuth, Berlin 2005
- DIN EN 14255-2: Messung und Beurteilung von personenbezogenen Expositionen gegenüber inkohärenter optischer Strahlung – Teil 2: Sichtbare und infrarote Strahlung künstlicher Quellen am Arbeitsplatz (03.06). Beuth, Berlin 2006
- Verordnung zum Schutz der Beschäftigten vor Gefährdungen durch künstliche optische Strahlung (Arbeitsschutzverordnung zu künstlicher optischer Strahlung – OStrV). BGBl. I (2010) Nr. 38, S. 960-967

- 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). OJ EC (2006) No. L 114, pp. 38-59

Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

Literature Requests

IFA, Zentralbereich