



# SLOVENSKI STANDARD SIST EN 1837:2021

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Nadomešča:

SIST EN 1837:1999+A1:2009

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## Varnost strojev - Integralna razsvetljava strojev

Safety of machinery - Integral lighting of machines

Sicherheit von Maschinen - Maschinenintegrierte Beleuchtung

Sécurité des machines - Éclairage intégré aux machines

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### ICS:

13.110	Varnost strojev	Safety of machinery
91.160.10	Notranja razsvetljava	Interior lighting

**SIST EN 1837:2021**

**en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

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Supersedes EN 1837:1999+A1:2009

English Version

**Safety of machinery - Integral lighting of machines**

Sécurité des machines - Éclairage intégré aux machines

Sicherheit von Maschinen - Maschinenintegrierte  
Beleuchtung

This European Standard was approved by CEN on 18 October 2020.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (EN 1837:2020) 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 2021, and conflicting national standards shall be withdrawn at the latest by June 2021.

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

This document supersedes EN 1837:1999+A1:2009.

In comparison with EN 1837:1999+A1:2009, the following technical modifications have been made:

- reference to EN ISO 12100 added and all local definitions removed to prevent duplication with source terminology standards;
- adding of environmental requirements to Clause 5 Lighting equipment and installation;
- updating of Clause 6 Verification procedures;
- updating of Clause 7 Information for use;
- Annex ZA has been adapted to Directive 2006/42/EC and Annex ZB has been deleted.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This document is a type-B standard as stated in EN ISO 12100. The machinery concerned and the extent to which hazards are covered are indicated in the scope of this document.

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

## Introduction

To illuminate visual tasks within and/or at machines integral lighting systems (built in or at machines) can be required. These integral lighting systems require special characteristics that allow both safe use and efficient performance of the visual task by the operator during operation and service.

This document is a type-B standard as stated in EN ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

In addition, this document is intended for standardization bodies elaborating type-C standards.

The requirements of this document can be supplemented or modified by a type-C standard.

For machines that are covered by the scope of a type-C standard and have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.

## 1 Scope

This document specifies the parameters of integral lighting systems designed to provide illumination in and/or at both stationary and mobile machines to enable the safe use of the machine and the efficient performance of the visual task within and/or at the machine to be carried out by the operator.

This document does not specify lighting systems mounted on the machine to specifically illuminate visual tasks outside the machine. The function and requirements of these systems are specified in the European standard dealing with the lighting of work places, see EN 12464-1 and EN 12464-2 for further information.

This document does not specify additional requirements for the operation of lighting systems:

- in severe conditions (extreme environmental conditions such as freezer applications, high temperatures, etc.);
- subject to special rules (e.g. explosive atmospheres);
- where the transmittance is reduced by environmental conditions, such as smoke, splashing, etc.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

[SIST EN 1837:2021](https://standards.globalspec.com/catalog/standards/sist/en-1837-2021/9fbd306e8602/sist-en-1837-2021)

EN 12464-2:2014, *Light and lighting — Lighting of work places — Part 2: Outdoor work places*

[SIST EN 1837:2021](https://standards.globalspec.com/catalog/standards/sist/en-1837-2021/9fbd306e8602/sist-en-1837-2021)

EN 12665:2018, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN 1838:2013, *Lighting applications — Emergency lighting*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2016, modified)*

EN 60204-31:2013, *Safety of machinery — Electrical equipment of machines — Part 31: Particular safety and EMC requirements for sewing machines, units and systems (IEC 60204-31:2013)*

EN 60204-32:2008, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*

EN 60204-33:2011, *Safety of machinery — Electrical equipment of machines — Part 33: Requirements for semiconductor fabrication equipment (IEC 60204-33:2009, modified)*

EN 60529:1991,<sup>1</sup> *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

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<sup>1</sup> As impacted by EN 60529:1991/corrigendum May 1993 and EN 60529:1991/AC:2016-12.

**EN 1837:2020 (E)**

EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP Code)*  
(IEC 60529:1989/A1:1999)

EN 60529:1991/A2:2013,<sup>2</sup> *Degrees of protection provided by enclosures (IP Code)*  
(IEC 60529:1989/A2:2013)

EN 60598-1:2015,<sup>3</sup> *Luminaires — Part 1: General requirements and tests* (IEC 60598-1:2014, modified)

EN 60598-1:2015/A1:2018, *Luminaires — Part 1: General requirements and tests*  
(IEC 60598-1:2014/A1:2017)

EN 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)* (IEC 62262:2002)

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction* (ISO 12100:2010)

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 12100, EN 12464-1 and EN 12665 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

SIST EN 1837:2021  
<https://standards.iteh.ai/catalog/standards/sist/f2ae6b2a-db73-4a17-983b-9fbd306e8602/sist-en-1837-2021>

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<sup>2</sup> As impacted by EN 60529:1991/A2:2013/AC:2019-02.

<sup>3</sup> As impacted by EN 60598-1:2015/AC:2015, EN 60598-1:2015/AC:2016 and EN 60598-1:2015/AC:2017-05.



## 4 Lighting requirements

### 4.1 General

Machinery shall be supplied with integral lighting suitable for the operations concerned where the absence of the integral lighting is likely to cause a risk despite ambient lighting of normal intensity.

When arranging the lighting for machines, ergonomic and lighting-engineering principles shall be taken into account.

The visual tasks to be carried out in and/or at the machine vary in size, contrast, position and speed of movement. Thus for adequate vision, the exact lighting condition required shall be determined from detailed task analysis. This shall include consideration of the requirements given in 4.2 to 4.8.

The lighting requirements specified in this document are based on average difficulty of visual tasks, found in the work space during intended use of the machine (normal operation, abnormal operation, servicing).

For specific tasks, reference shall be made to the relevant standards on work place lighting (EN 12464-1:2011 and EN 12464-2:2014). The definition of the specific tasks considered shall be included in the information for use supplied with the machine (see Clause 7).

### 4.2 Illuminance

The required illuminance depends upon the visual task and shall be sufficiently high and uniform as to enable a safe and comfortable perception of the details of the visual task.

In general a maintained illuminance of at least 500 lx with a minimum uniformity of 0,7 on the task area shall be provided. If there is more than one task area in or at a machine, each task area shall be considered separately. The immediate surrounding areas shall have a maintained illuminance of at least 300 lx with a uniformity of at least 0,3.

Where a visual aid or protective visor is required for use with the machine, the illuminance shall be multiplied by the reciprocal value of the transmittance of this device. Where the transmittance is unknown the illuminance shall be increased by at least 50 %.

In control cabins or where processes are affected by light, the above illuminance may be reduced.

**NOTE** Lighting controls can be helpful for increasing and reducing the illuminance, e.g. by dimming or switching or by mechanical adjustment.

### 4.3 Glare

The integral lighting system shall avoid direct glare (disability and discomfort glare) both to the machine operator and other workers in adjacent areas by preventing any direct view onto the integral light source. Glare caused by reflections from the integral lighting of the machine during use shall be avoided within the task area

**NOTE** It is possible to achieve this by suitable shielding of the light source(s), by location and direction of the luminaire(s), and by the use of light, matt surface finishes.

### 4.4 Directionality

The lighting system shall be designed and adjusted to avoid disturbing shadows on the visual task.

The directionality of the lighting shall ensure a perception of form which is appropriate for the visual task.

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### 4.5 Colour quality

The colour rendering properties and colour appearance of the light source(s) and/or luminaires shall be suitable for colour discrimination of the visual task and for operator comfort. A minimum CRI = 80 light source shall be used for machines requiring significant human intervention or attention.

Where lighting controls are present to adjust the output of the light source(s) and/or luminaires it shall be ensured that this minimum CRI is achieved at all possible settings.

### 4.6 Stroboscopic effect

The lighting system shall be designed to avoid adverse stroboscopic effect [4] which can lead to dangerous situations by changing the perceived motion of rotating or reciprocating machinery.

**NOTE** This can usually be achieved by limitation of the magnitude of temporal light modulations of the lighting system and/or by avoiding that the modulation frequency of the light coincides with motion or rotation frequencies of the machinery, for example by use of DC electrical supply for light sources, or by operating the light sources at high frequencies. LED (light emitting diode) lighting or fluorescent lighting can be suitable lighting systems producing minimum adverse stroboscopic effect, provided the control gear modulation frequency is sufficiently high or the modulation depth of the residual light modulation is sufficiently low.

### 4.7 Ergonomic principles

Ergonomic principles shall be taken into consideration for integral lighting systems of a machine e.g.:

- adjustable luminaires shall be stable in their position, but easy to move if necessary, particularly if changing from a seated to a standing position;
- lighting shall be adjustable or installed in a way that right and left handed operators are able to work without disturbing shadows;
- requirements of EN ISO 13732-1:2008 shall be met;
- actuators shall be adequate for the intended use.

### 4.8 Emergency lighting

In machines that may be operational at times when the supply to the regular lighting of the machinery has failed, and where size or configuration of machinery reduces the effectiveness of site emergency lighting for machine operators, additional emergency lighting shall be provided (see EN 1838:2013).

## 5 Lighting equipment and installation

### 5.1 Light sources

Light sources shall be chosen to be safe in operation, energy efficient and not present a hazard to the machine operator. The chosen light source shall comply with the relevant standard for the light source technology installed (see bibliography for a non-exhaustive list).

**NOTE** It is advisable that in general light sources are enclosed to protect the operator from injury caused by e.g. damaged lamps, excessive heat or emission of harmful radiation.