

**MASINATE OHUTUS. LASERTÖÖTLUSSEADMED. OSA 1:  
LASERI OHUTUSNÕUDED**

**Safety of machinery - Laser processing machines - Part 1:  
Laser safety requirements (ISO 11553-1:2020)**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 11553-1:2020+A11:2020 sisaldab Euroopa standardi EVS-EN ISO 11553-1:2020 ja selle muudatuse A11:2020 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 11553-1:2020+A11:2020 consists of the English text of the European standard EVS-EN ISO 11553-1:2020 and its amendment A11:2020.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.  Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 15.04.2020, muudatus A11 11.11.2020.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.  Date of Availability of the European standard is 15.04.2020, for A1 11.11.2020.
Muudatusega A11 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega <b>A11</b> ja <b>A11</b> .  Standard on kättesaadav Eesti Standardikeskusest.	The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags <b>A11</b> and <b>A11</b> .  The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

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English Version

**Safety of machinery - Laser processing machines - Part 1:  
Laser safety requirements (ISO 11553-1:2020)**

Sécurité des machines - Machines à laser - Partie 1:  
Exigences de sécurité laser (ISO 11553-1:2020)

Sicherheit von Maschinen -  
Laserbearbeitungsmaschinen - Teil 1: Anforderungen  
an die Sicherheit von Lasern (ISO 11553-1:2020)

This European Standard was approved by CEN on 13 January 2020. Amendment A11 was approved by CEN on 14 October 2020.

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This European Standard and its Amendment A11 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.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## European foreword

This document (EN ISO 11553-1:2020) has been prepared by Technical Committee ISO/TC 172 "Optics and photonics" in collaboration with Technical Committee CEN/TC 123 "Lasers and photonics" 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 October 2020, and conflicting national standards shall be withdrawn at the latest by October 2020.

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 ISO 11553-1:2008.

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

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, 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.

## Endorsement notice

The text of ISO 11553-1:2020 has been approved by CEN as EN ISO 11553-1:2020 without any modification.

**A11 Amendment 11 European foreword**

This document (EN ISO 11553-1:2020/A11:2020) has been prepared by Technical Committee CEN/TC 123 “Lasers and photonics” the secretariat of which is held by DIN.

This Amendment to the European Standard EN ISO 11553-1:2020 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 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.

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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)).

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 9, *Laser and electro-optical systems*, in collaboration with IEC/TC 76, *Optical radiation safety and laser equipment*.

This second edition cancels and replaces the first edition (ISO 11553-1:2005), which has been technically revised with the following main changes:

- the terms "beam delivery systems", "beam path components", "beam shaping components", "beam switching components" and "fibre optic cable" and "fibre connector" were added;
- the document was restructured;
- the Title was adapted;
- other hazards than laser radiation hazards are not considered in this document but are described in Annex A;
- operating modes (automatic mode, setting mode, manual intervention mode, service mode) and the operating mode selector switch were added;
- Clause 5 is separated in requirements regarding different locations and the different modes of operation;
- in Clause 6 the verification procedures were described in more detail;
- Annex B was deleted.

A list of all the parts of ISO 11553 can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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## Introduction

The Machinery Safety Directive issued by the European Parliament and the Council of the EC outlines essential and mandatory requirements that must be met in order to ensure that machinery is safe. In response, CEN/CENELEC initiated a programme to produce safety standards for machines and their applications. This document is one in that series.

It has been prepared as a harmonized standard to provide a means of conforming to the essential safety requirements of the Machinery Directive and associated EFTA Regulations.

This document is a type B standard as stated in ISO 12100. The provisions of this document may be supplemented or modified by a type C standard.

For machines which are covered by the scope of a type C standard and which have been designed and built according to the provision of that standard, the provisions of that type C standard take precedence over the provisions of this type B standard.

The purpose of this document is to prevent injuries to persons by

- listing potential laser radiation hazards generated by machines containing lasers,
- specifying safety measures and verifications necessary for reducing the risk caused by specific hazardous conditions,
- providing references to pertinent standards, and
- specifying the information which is to be supplied to the users so that they can establish proper procedures and precautions.

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# Safety of machinery — Laser processing machines —

## Part 1: Laser safety requirements

### 1 Scope

This document describes laser radiation hazards arising in laser processing machines, as defined in 3.7. It also specifies the safety requirements relating to laser radiation hazards, as well as the information to be supplied by the manufacturers of such equipment (in addition to that prescribed by IEC 60825).

Requirements dealing with noise as a hazard from laser processing machines are included in ISO 11553-3:2013.

This document is applicable to machines using laser radiation to process materials.

It is not applicable to laser products, or equipment containing such products, which are manufactured solely and expressly for the following applications:

- photolithography;
- stereolithography;
- holography;
- medical applications (per IEC 60601-2-22);
- data storage.

### 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.

ISO 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

ISO 11145:2018, *Optics and photonics — Lasers and laser-related equipment — Vocabulary and symbols*

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

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 13850:2012, *Safety of machinery — Emergency stop function — Principles for design*

IEC 60204-1:2016, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60825-1:2014, *Safety of laser products — Part 1: Equipment classification and requirements*

IEC 60825-4:2006, *Safety of laser products — Part 4: Laser guards*

IEC 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11145:2018, ISO 12100:2010, IEC 60825-1:2014 and IEC 60825-4:2006 and the following apply.

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

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

#### 3.1

##### **beam delivery system**

system comprised of all components, including all optical beam components and potential beam paths and enclosures, which when combined, transfer laser radiation emitted from the laser (according to definition in IEC 60825-1:2014) to the workpiece. The beam delivery system can include all elements for guiding, shaping and switching the laser beams as well as the enclosure of and support for the beam path components

[SOURCE: IEC 60825-4:2006/AMD 2:2011, G.2.1, modified — replaced "workpiece. These components may include" by "workpiece and where the components can include" and changed laser beam to laser beams.]

#### 3.2

##### **beam path component**

optical component which lies on a defined beam path

Note 1 to entry: See IEC 60825-1:2014, 3.16.

EXAMPLE A beam steering mirror, a focus lens, a fibre optic cable or a fibre optic cable connector.

#### 3.3

##### **beam shaping component**

optical component integrated in the beam path to transform the profile or cross-section of the laser beam by means of apertures, reflective, refractive or diffractive optical components

EXAMPLE Lens or integrating optical element for hardening applications.

#### 3.4

##### **beam switching component**

optical component or an assembly of components introduced in the beam path to direct or divert, under external control, the beam path along (a) predetermined direction(s)

Note 1 to entry: The external control allows the beam path to be switched from one predetermined direction to another.

#### 3.5

##### **fibre optic cable**

optical beam guiding component that enables the transfer of laser radiation along a transparent medium

Note 1 to entry: The fibre optic cable can be equipped with sensors to monitor breakage and/or temperature.