INTERNATIONAL STANDARD

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Lasers and laser-related equipment — Laser device — Minimum requirements for documentation

Lasers et équipements associés aux lasers — Source laser — Exigences minimales pour la documentation

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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 11252 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 9, *Electro-optical systems*.

This third edition cancels and replaces the second edition (ISO 11252:2004), which has been technically revised.

Introduction

This document is a type B1 standard as stated in ISO 12100.

The provisions of this document may be supplemented or modified by a type C standard.

NOTE For machines which are covered by the scope of a type C standard and which have been designed and built according to the provisions of that standard, the provisions of that type C standard take precedence over the provisions of this type B1 standard.

ISO 11252 covers both laser systems and laser products according to IEC 60825-1, and laser devices, units or laser processing machines according to ISO 11145, ISO 11553-1 and ISO 11553-2. Although within these standards different terminology, terms and definitions are used, ISO 11252 brings together basic requirements for documentation.

Lasers and laser-related equipment — Laser device — Minimum requirements for documentation

1 Scope

This International Standard specifies the minimum documentation, marking and labelling for all laser products classified in accordance with IEC 60825-1 including laser diodes and all laser devices defined in ISO 11145.

It is applicable to laser systems being integrated in a laser product in accordance with IEC 60825-1 and laser devices being integrated in a laser unit or processing machine in accordance with ISO 11553-1 and ISO 11553-2.

This International Standard is not applicable to (ready-to-use) complete laser products, embedded laser products without external laser emission by means of protective enclosure or laser processing machines that incorporate a laser device.

This International Standard is not applicable to incoherent lamps and other similar sources such as LEDs that are required to comply with IEC 62471.

This International Standard specifies requirements for technical data sheets (see Clause 5) and information for the user (see Clause 6).

The requirements in this International Standard augment but do not supersede any of the requirements in IEC 60825-1.

NOTE 1 The provision of technical data and safety information is an integral part of a product and is essential for its safe use. The documentation covers the whole life cycle, transport, assembly, system integration, normal operation, maintenance, service, decommissioning and disposal.

NOTE 2 For incomplete (not ready-to-use) machines, the manufacturer/supplier is responsible for the documentation with regard to all components provided by him.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 11146-1, *Lasers and laser-related equipment — Test methods for laser beam widths, divergence angles and beam propagation ratios — Part 1: Stigmatic and simple astigmatic beams*

ISO 11146-2, *Lasers and laser-related equipment — Test methods for laser beam widths, divergence angles and beam propagation ratios — Part 2: General astigmatic beams*

ISO 11553-3, *Safety of machinery — Laser processing machines — Part 3: Noise reduction and noise measurement methods for laser processing machines and hand-held processing devices and associated auxiliary equipment (accuracy grade 2)*

ISO 11554, *Optics and photonics — Lasers and laser-related equipment — Test methods for laser beam power, energy and temporal characteristics*

ISO 11670, *Lasers and laser-related equipment — Test methods for laser beam parameters — Beam positional stability*

ISO 12005, *Lasers and laser-related equipment — Test methods for laser beam parameters — Polarization*

ISO 13694, *Optics and optical instruments — Lasers and laser-related equipment — Test methods for laser beam power (energy) density distribution*

ISO 13695, *Optics and photonics — Lasers and laser-related equipment — Test methods for the spectral characteristics of lasers*

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

ISO 15367-1, *Lasers and laser-related equipment — Test methods for determination of the shape of a laser beam wavefront — Part 1: Terminology and fundamental aspects*

ISO 15367-2, *Lasers and laser-related equipment — Test methods for determination of the shape of a laser beam wavefront — Part 2: Shack-Hartmann sensors*

ISO 17526, *Optics and optical instruments — Lasers and laser-related equipment — Lifetime of lasers*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11145 and IEC 60825-1 apply.

4 Units

All values shall be stated in SI units.

5 Technical data sheet

5.1 General

The documentation to be provided by the manufacturer/supplier shall include the following information where appropriate:

a) model type;

b) manufacturer (or supplier);

c) type of the laser device;

d) intended use of the laser device;

e) system boundary and interfaces (of the laser device);

f) technical characteristics of the laser device within the fields of use for which the device is designed;

g) lifetime or maintenance information in accordance with ISO 17526;

h) hazards associated with the use of the laser device.

A model technical data sheet is shown in Annex A.

5.2 Beam output characteristics

The manufacturer/supplier shall indicate the following characteristics, when applicable, and the measurement method used as given in Table 1:

Table 1 — Information guidelines

Characteristics	In accordance with
Beam width and/or diameter	ISO 11146-1 or ISO 11146-2
Beam waist location	ISO 11146-1 or ISO 11146-2
Divergence angle	ISO 11146-1 or ISO 11146-2
Beam propagation ratio[a]	ISO 11146-1 or ISO 11146-2
Beam parameter product	ISO 11146-1 or ISO 11146-2
Beam position stability	ISO 11670
Spectral characteristics, such as wavelengths or bandwidths	ISO 13695
Maximum power (energy) and nominal (guaranteed) power (energy)	ISO 11554
Power (energy) stability of the beam	ISO 11554
Power (energy) density distribution	ISO 13694
Temporal pulse shape with its characteristics	ISO 11554
State and degree of polarization	ISO 12005
Shape of a laser beam wavefront	ISO 15367-1 and ISO 15367-2
Pulse width range	ISO 11554
Repetition rate range	ISO 11554

[a] It is recommended to indicate additionally the beam parameter product, if applicable.

5.3 Electrical and non-electrical power supply

5.3.1 Electrical power supply

The following items shall be specified by the manufacturer/supplier, if applicable, stating the referenced standards:

a) for alternating current supplies – voltage, current, number of phases, frequency, permissible fluctuations and maximum power (given in VA);

b) for direct current supplies – voltage, current, permissible fluctuations and maximum power;

c) for battery operated devices – the type and characteristic of the battery, indicating if a battery is provided with the laser device.

5.3.2 Non-electrical power supply

For laser devices requiring an external optical power source, the manufacturer/supplier shall specify the characteristics for the proper operation of the laser device.

For laser devices requiring other external power source(s), the manufacturer/supplier shall specify the characteristics for the proper operation of the laser device.

For liquid and gas power sources, see 5.4.

5.3.3 Electrical and electronical interfaces

The manufacturer/supplier shall specify the electrical interfaces together with connectors used and all controls of the laser device.

This information should include all input/output signals specifying voltage, current, logic condition, etc.

5.4 Liquids and gases

The manufacturer/supplier shall provide information for each type of liquid or gas to be used with the laser device (e.g. active medium, solvent, heating and cooling agents) and specify, if applicable, the following:

a) type of liquid and/or gas;

b) quality/characteristics;

c) flow rate and pressure.

The manufacturer/supplier shall specify the kind of interfaces and connectors to be used.

5.5 Environmental conditions

The manufacturer/supplier shall specify the environmental conditions for the laser device.

Environmental conditions may include:

— temperature, relative humidity range, ambient pressure and air cleanliness;

— shock and vibration;

— electromagnetic compatibility (immunity, susceptibility and operating environment);

— degree of protection provided by the enclosure (in accordance with IEC 60529).

5.6 Mechanical parts and interfaces

5.6.1 Mechanical parts

The manufacturer/supplier shall provide the following characteristics with the corresponding tolerances:

a) dimensions and mass;

b) location and orientation of the beam relative to a reference surface;

c) location, characteristics and interfaces of the attachments (state whether they are provided or not).

5.6.2 Mechanical interfaces

The manufacturer/supplier shall specify the kind of mechanical interfaces and (if applicable) mechanical properties with the corresponding tolerances.

5.7 Safety

5.7.1 Information on hazards

The manufacturer/supplier shall inform the user about all hazards related to the laser device and related to the intended use of the laser device and shall specify to which safety specifications the laser device complies.

This includes for example:

a) optical radiation hazards;

b) secondary radiation hazards (e.g. UV, X-rays);

c) hazards by improper design of safety related parts of the control system;

d) mechanical hazards;

e) hazards by improper ergonomic design;

f) electrical hazards;

g) hazards by chemical agents and harmful substances (e.g. laser gases, optics);

h) hazards by laser generated air contaminants (LGACs) (e.g. harmful fumes and gases);

i) fire and explosion hazards;

j) hazards by heat;

k) hazards by noise (e.g. noise emission declaration) and vibration;

l) hazards by improper perception of information (e.g. warning signals).

5.7.2 Safety information

The manufacturer/supplier shall provide where appropriate:

a) laser safety information including all warnings, labelling and required instructions appropriate to the laser classification as defined in IEC 60825-1;

b) safety information including all warnings and instructions for any secondary radiation hazards;

c) the IP code indicating the physical protection provided by the laser device protective housing or enclosure as defined in IEC 60529 together with the measures taken to provide adequate protection from electrical shock and energy hazards;

d) the information including warnings, labelling (hazards symbols) and instructions as required by any applicable standards for any chemical agents or toxic substance used in the laser device.

A noise emission declaration shall be provided in accordance with ISO 11553-3. If appropriate, additional noise emission measures (quieter operating conditions, enclosures, etc.) shall be given.

With regard to a safe isolation/deactivation of the laser beam, the manufacturer/supplier shall indicate the requirements and/or the performance on/of safety-related parts of the control system within the laser device (as regards machines, in accordance with ISO 13849-1).

5.7.3 Information on residual risks

The manufacturer/supplier shall indicate residual safety risks associated with the use of the laser device. The manufacturer shall give information on possible protective measures, such as technical measures (e.g. additional safeguarding, engineering controls, LGACs extraction) safe working procedures (work practices) and use of personal protective equipment (PPE).

6 Information for the user

Information provided by the manufacturer/supplier and to be supplied with the device shall contain the following:

a) transportation, storage, installation and connecting instructions (e.g. power supply, gas and fluid connections); appropriate diagrams if required;

b) assembling and/or operating instructions (for hardware and software);

c) safety instructions (e.g. complementary protective measures/additional safeguarding, safe working procedures, use of personal protective equipment, training);

d) instructions for waste disposal including any special precautions that should be observed together with a reminder to comply with any local legislation or requirements;