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Optics and photonics — Optical coatings —

Part 8: Minimum requirements for coatings used for laser optics

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Partie 8: Exigences minimales pour revêtements utilisés pour l'optique laser

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Foreword

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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).

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This document was prepared by ISO/TC 172, *Optics and photonics*, Subcommittee SC 3, *Optical materials and components*.

A list of all parts in the ISO 9211 series can be found on the ISO website.

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Optics and photonics — Optical coatings —

Part 8: Minimum requirements for coatings used for laser optics

1 Scope

This document specifies minimum requirements for the optical functions and especially for the laser power handling capability as well as for the resistance against mechanical, chemical and climatic stress of optical coatings. This document applies to optical coatings that are used in laser optics. Thereby the user is able to rely on defined numerical data while the manufacturer of thin films has the choice for the materials and production method.

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 9022-2, *Optics and photonics — Environmental test methods — Part 2: Cold, heat and humidity*

ISO 9211-1, *Optics and photonics — Optical coatings — Part 1: Vocabulary*

ISO 9211-2, *Optics and photonics — Optical coatings — Part 2: Optical properties*

ISO 9211-3, *Optics and photonics — Optical coatings — Part 3: Environmental durability*

ISO 9211-4, *Optics and photonics — Optical coatings — Part 4: Specific test methods*

ISO 11551, *Optics and optical instruments — Lasers and laser-related equipment — Test method for absorptance of optical laser components*

ISO 13696, *Optics and optical instruments — Test methods for radiation scattered by optical components*

ISO 10110-9, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 9: Surface treatment and coating*

ISO 11151-1:2015, *Lasers and laser-related equipment — Standard optical components — Part 1: Components for the UV, visible and near-infrared spectral ranges*

ISO 11151-2:2015, *Lasers and laser-related equipment — Standard optical components — Part 2: Components for the infrared spectral range*

ISO 21254-1, *Lasers and laser-related equipment — Test methods for laser-induced damage threshold — Part 1: Definitions and general principles*

ISO 21254-2, *Lasers and laser-related equipment — Test methods for laser-induced damage threshold — Part 2: Threshold determination*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9211-1 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Optical function

The scope of this document covers laser components with surface treatments and substrates identified in accordance with the definitions given in ISO 9211-1. In order to indicate the application in laser devices the letter code defined in ISO 9211-1 shall be extended by an additional leading symbol “L”.

5 Designation of optical functions, their parameters and limit deviations

The specifications of the optical properties and the representation of the spectral characteristics of the laser coatings shall be specified in accordance with ISO 9211-2.

NUMERICAL EXAMPLE

L-HR ISO 9211-8 ρ(1 064 nm) > 0,999

L-AR ISO 9211-8 ρ_s(1 030 nm, 45°) < 0,01

For low power applications see Clause 8. An additional symbol "LOW" shall be added to the designation.

NUMERICAL EXAMPLE

L-HR ISO 9211-8 ρ(633 nm) > 0,999 LOW

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6 Indication in drawings

When applying this document, the symbol for optical coating in accordance with ISO 10110-9 shall be indicated in conjunction with the designation in accordance with Clause 4.

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7 Materials and layout

The minimum requirements for the described types of function are defined by the area of application in the optical technologies and by the availability of suitable substrates and coating materials. The usable materials and typical layouts depend on the operating conditions and especially on the wavelengths at which the components shall be used.

8 Minimum requirements

The minimum requirements refer to unconditioned coatings. Prior to the test, cleaning of the coating is permissible in accordance with the manufacturer’s recommendation. Additional requirements may be agreed upon and shall be documented.

The coatings shall at least fulfil the minimum requirements for the various wavelength ranges as given in Tables 2 to 6. A distinction is made between low power and high power lasers. In the low power range typical applications have pulse energy densities below 5 mJ/cm^2 or linear power densities below 10 W/cm. The damage threshold values given in Tables 2 to 6 refer to the high power range only. The numerical values in Tables 2 to 6 are examples as measured for specific wavelengths.

All component types shall at least fulfil the minimum requirements for adhesion, cleaning, chemical durability, environmental durability and surface imperfections, as given in Table 1. The requirements are identical for all component types.

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