International Standard

ISO 11551

Optics and photonics — Lasers and laser-related equipment — Test method for absorptance of optical laser components

Optique et photonique — Lasers et équipements associés aux lasers — Méthode d'essai du facteur d'absorption des composants optiques pour lasers

Fourth edition
2026-08

Reference number
ISO 11551:2026(en)

© ISO 2026



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Symbols and units of measure ... **1**
5 Preparation of test sample and measuring arrangement ... **2**
6 Characteristic features of the laser radiation ... **4**
7 Test procedure ... **5**
7.1 General ... 5
7.2 Calibration ... 5
7.2.1 Calibration of the radiant power signal ... 5
7.2.2 Calibration of the temperature signal ... 5
7.2.3 Calibration of the thermal response ... 5
7.2.4 Measurement of the background signal ... 6
7.3 Determining the absorptance ... 6
8 Evaluation ... **6**
8.1 General ... 6
8.2 Elimination of drift ... 7
8.3 Exponential method ... 7
8.4 Pulse method ... 8
9 Test report ... **9**
Annex A (informative) **Effects changing absorptance** ... **11**
Annex B (informative) **Influence of signal distortions** ... **14**
Annex C (informative) **Algorithm for parameterizing the temperature data** ... **17**
Bibliography ... **18**

© ISO 2026 – All rights reserved

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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.

This document was prepared by Technical Committee 172, *Optics and photonics*, Subcommittee SC 9, *Laser and electro-optical systems,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 123, *Lasers and photonics,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 11551:2019), which has been technically revised.

The main changes are as follows:

— harmonization of terms and environmental conditions to current laser measurement standards;

— minor adjustments of formulae and figures;

— modified text and additional figures in A.1 and A.3.

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.

© ISO 2026 – All rights reserved

Introduction

To characterize an optical component, it is important to know its absorptance. When radiation impinges upon a component, a part of that radiation is absorbed, increasing the temperature of the component. In this document only the part of the absorbed radiant power/energy, that is converted into heat, is measured. If enough radiant energy is absorbed, the optical properties of the component can change, and the component can even be destroyed. Absorptance is the ratio of the radiant flux absorbed to the radiant flux of the incident radiation.

In the procedures described in this document, the absorptance is determined calorimetrically as the ratio of radiant power or radiant energy absorbed by the component to the total radiant power or radiant energy, respectively, impinging upon the component. The assumption is made that the absorptance of the test sample is constant within the temperature fluctuations experienced by the component during the measurement.

© ISO 2026 – All rights reserved

Optics and photonics — Lasers and laser-related equipment — Test method for absorptance of optical laser components

WARNING — Laser calorimetric measurements may involve high power lasers, the use of which may come with significant risks, which may include, but are not limited to; eye injury to people; laser burns to people or equipment; ignition of materials; generating debris of toxic materials in the substrate or coating; electrical hazards. It is the responsibility of the user to comply with local guidelines and regulations for their particular set-up.

1 Scope

This document specifies procedures and techniques for obtaining comparable values for the absorptance of optical laser components.

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

ISO 14644-1, *Cleanrooms and associated controlled environments — Part 1: Classification of air cleanliness by particle concentration*

ISO 80000-7, *Quantities and units — Part 7: Light and radiation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11145 and ISO 80000-7 and the following apply.

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

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

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

3.1
absorptance
a
ratio of the radiant flux absorbed to the radiant flux of the incident radiation

Note 1 to entry: The definition of absorptance used for this document is limited to absorptance processes which convert the absorbed radiant energy to heat. For certain types of optics and radiation, additional non-thermal processes can result in absorption losses which will not be detected by the test procedure described here (see Annex A).

4 Symbols and units of measure

The symbols and units of measurement used are the following:

© ISO 2026 – All rights reserved