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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 16601.1-2017

Replacing GB/T 16601-1996 Partial

**Lasers and laser-related equipment -- Test methods for
laser-induced damage threshold -- Part 1: Definitions and
general principles
(English Translation)**

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Table of Contents

Foreword
Introduction
1 Scope
2 Normative references
3 Terms and definitions
4 Measurement data symbols and units
5 Test sample
6 Test method
6.1 Principle
6.2 Test device
6.2.1 Laser
6.2.2 Variable Attenuator and Beam Transmission System
6.2.3 Convergence system
6.2.4 Sample holder
6.2.5 Damage detection
6.2.6 Beam diagnosis
6.3 Preparation of test samples
6.4 Test Procedure
7 Accuracy
8 Test report
Appendix A (Informative) Units and projections of laser damage threshold
Reference

Foreword

GB/T 16601 "laser and laser-related equipment laser damage threshold test method" is divided into the following sections.

- Part 1. Definitions and general rules;
- Part 2. Threshold determination;
- Part 3. Confirmation of laser power (energy) affordability;
- Part 4. Inspection, detection and measurement.

This section GB/T 16601 Part 1.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This section replaces GB/T 16601-1996 "optical surface laser damage threshold test method Part 1 .1 to 1 test", and GB/T 16601-1996 compared to the main technical changes are as follows.

--- Increased surface damage, body damage, S related to the 1 test terms and definitions (see Chapter 3);

--- Increased toxic damage may be caused by the health hazards and examples (see Appendix A);

--- Modify the beam diameter on the target plane, from 0.4mm to 0.8mm (see 6.2.3).

This section uses the redrafted law revision using ISO 21254-1:2011 "laser and laser-related equipment laser damage threshold test Methodology Part 1 Definitions and General Rules.

This part of ISO 21254-1:2011 technical differences and the reasons are as follows.

--- On the normative references, this section made a technical difference with the adjustment to adapt to China's technical conditions, adjust the situation Concentration reflected in the second chapter "Normative references", the specific adjustments are as follows.

- Replace ISO 10110-7 with GB/T 1185 that does not adopt equivalent international standard;
- Replaced ISO 11145 with GB/T 15313-2008 modified to adopt international standards;
- Equivalent to the international standard GB/T 26599.1 instead of ISO 11146-1;
- GB/T 16601.2-2017 modified to adopt international standards instead of ISO 21254-2;
- GB/T 16601.3-2017 modified to adopt international standards instead of ISO 21254-3;
- GB/T 16601.4-2017 modified to adopt international standards instead of ISO 21254-4;
- Add Figure 1 beam splitter number, and in the description of Figure 1 increase 8 --- beam splitter;
- Removed some references.

Please note that some of this document may be patentable. The issuing agencies of this document do not bear the responsibility of identifying these patents.

This part is proposed by China North Industries Group Corporation.

This part of the National Optical and Photonics Standardization Technical Committee

(SAC/TC103) centralized.

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Introduction

Optical elements may damage under sufficiently high laser energy or power radiation, and at certain levels of laser radiation and laser light sources Mode, the probability of laser damage on the surface of the optical element is usually higher than that on the inside. Therefore, the limit of the optical element to the laser radiation is usually the case Determined by the damage threshold of their surface, these surfaces may be coated with a film that changes the optical properties. If the internal electric field intensity due to self-focusing components, Interference, scattering or other reasons to strengthen, you may damage within the components. In addition, the internal impurities, dislocation, color centers, unevenness and so on Defects also reduce the laser power capability within the optical component. Damage caused by a single laser pulse is usually due to defects, film stress, Surface contaminants or light absorption caused by the surface caused by a large number of fever. For multi-pulse conditions, not only can it be observed due to heat and deformation Lead to reversible damage, but also can be observed due to aging, micro-damage, moisture damage, defects or expansion caused by the irreversible damage hurt. Parts of GB/T 16601 relate to the measurement of the irreversible damage threshold of the surface and interior of an optical element under different laser beam radiations set. Under certain environmental conditions, the damage threshold and material properties and laser parameters, especially the laser wavelength, spot size and irradiation time related.

This section gives the basic principles and general principles of the laser damage threshold test method. In this section and Part 2, Part 3 Based on the description of the test set-up and the method of measurement, this section also provides an overview of the test procedure for damage under different conditions. Part 2 described 1 to 1 and S to 1 damage threshold test method. The 1-to-1 test is conducted with only 1 laser at each test point on the test specimen surface Damage threshold testing process. Correspondingly, the S-to-1 test is performed at the same energy density at each test point on the test sample surface Secondary laser radiation damage threshold testing process. This test reflects the test sample in a typical application of working conditions. Relative to 1 to 1 Test, S-1 required a significant increase in the test workload. Part 3 focuses on the ability of the optical surface to withstand power or energy density it is believed that the test sample can be passed without damage. Section 4 describes the damage threshold detection method and the test surface inspection A technical report supplemented by this part.

Laser and laser related equipment laser damage threshold Test methods - Part 1. Definitions and general rules Caution --- Examine the damage data may overestimate the laser damage threshold. In testing toxic materials (such as ZnSe, GaAs, CdTe, ThF4,

Sulfide, Be, Cr, Ni) may cause serious health hazards, see Appendix A for details.

1 Scope

This section GB/T 16601 specifies the laser damage threshold to determine and laser laser optical components to withstand laser radiation test side Law related terms and general rules.

This section applies to the laser damage threshold and laser optical components to withstand laser radiation test.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version applies to this article Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 1185 optical surface defects (GB/T 1185-2006, ISO 10110-7:1996, NEQ) GB/T 15313-2008 Laser terms (ISO 11145:2006, MOD) GB/T 26599.1 laser and laser-related equipment laser beam width, divergence angle and beam transmission ratio test method Part 1 Points without astigmatism and simple astigmatic beams (GB/T 26599.1-2011, ISO 11146-1:2005, IDT) GB/T 16601.2-2017 laser and laser-related equipment laser damage threshold test method - Part 2. Threshold determination (ISO 21254-2:2011, MOD) GB/T 16601.3-20 lasers and laser-related equipment laser damage threshold test method - Part 3. Laser power (Energy) Affirmability (ISO 21254-3:2011, MOD) GB/T 16601.4-20 lasers and laser-related equipment laser damage threshold test method - Part 4. Inspection, detection and measurement (ISO/T R21254-4.2011, MOD) ISO 11146-2 Test methods for laser beam width, divergence angle and beam delivery ratio for laser and laser related equipment Part 2 Points. Generalized astigmatic beams
(Lasersandlaser-relatedequipment-Test methodsfor laserbeam widths, divergenceanglesandbeampropagationratios-Part 2: Genelalastigmaticbeams)

3 Terms and definitions

GB/T 15313-2008 defined and the following terms and definitions apply to this document.

Surface damage by the laser radiation caused by the sensitivity of the product to meet the requirements of the use of detection techniques can be observed on the permanent optical properties of the test sample Sexual change.

Note Damage may occur on the front or rear surface of the optical element, and damage thresholds may not be the same on the front and back surfaces.