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

GB/T 16601.4-2017

**Lasers and laser-related equipment -- Test methods for
laser-induced damage threshold -- Part 4: Inspection, detection
and measurement**

激光器和激光相关设备 激光损伤阈值测试方法 第4部分：检查、探测和测量
(English Translation)

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Foreword

GB/T 16601 "Laser and laser related equipment laser damage threshold test method", divided into the following four parts.

- Part 1. Definitions and general principles;
- Part 2. Threshold determination;
- Part 3. Laser power (energy) withstandability is convinced;
- Part 4. Inspection, detection and measurement.

This part is the fourth part of GB/T 16601.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This section uses the redrafting method to modify the laser damage threshold for lasers and laser-related equipment using ISO/T R21254-4.2011 Test Methods Part 4. Inspection, Detection and Measurement.

The technical differences between this part and ISO/T R21254-4.2011 and their reasons are as follows.

---About the normative reference documents, this part has made technical adjustments to adapt to China's technical conditions, adjustments the situation is reflected in Chapter 2, "Regulatory References", and the specific adjustments are as follows.

- Replaced ISO 11145 with GB/T 15313-2008 modified to adopt international standards;
- Replaced ISO 21254-1 with GB/T 16601.1-2017 modified to adopt international standards;

Introduction

Laser damage threshold detection procedures often require techniques that are sensitive to surface inspection and damage detection. Typical detection in the protocol, each sample was examined microscopically prior to testing to assess its surface quality and grade of disease. S to 1 damage test Various online monitoring schemes can be applied during the irradiation of the sample.

Examples of such methods include detection of scattered light in a sample test area, acquisition of sample plasma radiation, or a photothermal detection scheme.

In most cases, the detection system is directly connected to the laser source to quickly interrupt laser irradiation of the sample after the damage has occurred. this is okay Avoid catastrophic damage to the sample and accurately determine the number of laser pulses at the time the damage first occurred. And tested continuously in the process, the direct information of the damage state can be processed to determine the optimal value of the subsequent test laser energy, and the uncertainty of the detection is reduced.

For the same reason, complex detection schemes based on direct imaging and online image processing are often used in 1-to-1 damage testing equipment.

After the sample is irradiated with laser pulses, appropriate inspection techniques are used to identify the damage points and obtain information on the mechanism of the damage. In order to obtain Accurate damage thresholds are necessary for testing test points because this is the ultimate and most sensitive assessment of the damage state.

This section describes the inspection techniques for optical surfaces before and after damage testing and the damage detection techniques integrated in the detection equipment. Headquarters the damage detection method described by the sub-division is an example of a damage test solution that has been tested and often applied to detection equipment. This section the application of other solutions that can be used for optical component damage detection or inspection is not excluded.

Laser and laser related equipment laser damage threshold Test methods - Part 4.
Inspection, detection and measurement

1 Scope

This part of GB/T 16601 specifies methods for inspection, detection and measurement of laser damage on the surface and inside of optical components.

This section applies to the inspection, detection and measurement of laser damage on the surface and internal of optical components.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 15313-2008 Laser terminology (ISO 11145:2006, MOD) GB/T 16601.1-2017 Laser and laser related equipment - Test methods - Part 1 . Definitions and general (ISO 21254-1:2011, MOD)

3 Terms and definitions

The terms and definitions defined in GB/T 15313-2008 and GB/T 16601.1-2017 apply to this document.

4.1 Overview

For damage detection methods involving multi-pulse irradiation of a single test point, a suitable online damage detection system is required to follow the provisions of GB/T 16601.1-2017 evaluate the state of the surface of the optical component under test. Recommended online damage detection system should have A device that cuts off subsequent pulses and stops pulse counting after the damage is detected.

Online damage detection can use any suitable detection principle. Techniques for online damage detection include online microscopy for sniffer, photoacoustic and photothermal detection, and scatter detection, scatter detection can use laser radiation that damages the laser, or a separate laser source can be used.

The online damage detection methods described in this section are based on sample radiation detection, sample specific properties detection and photothermal detection. In addition, for the example of non-optical online detection methods, the detection technique based on transient pressure sensing is also briefly described. The detection technology described in this section is public Develop the scheme in the table literature as an example. The choice of these examples is only for the purpose of describing the detection scheme, rather than indicating a preference or Recommend these programs.

4.2 Summary of damage detection methods

Table 1 summarizes the main features of the online damage detection method described in this section. In addition to the basic principles, it also takes into account the detection method specific

Advantages and disadvantages.