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

GB/T 45860.1-2025

**Acceptance tests for fiber laser beam welding machines - Part
1: Laser assembly of machines with optical fibre delivery
(English Translation)**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is modified to adopt ISO 22827-1:2005 "Acceptance test for Nd:YAG laser beam welders - Optical fiber delivery machines - Part 1 Part. Laser Components.

The technical differences between this document and ISO 22827-1:2005 and their reasons are as follows.

---The scope of application was changed to fiber laser beam welding machine to suit the domestic technical environment;

--- Deleted the normative reference to ISO 17662 to apply to the domestic technical environment;

--- The normative reference GB/T 45860.2 replaces ISO 22827-2 (see 5.1); the normative reference GB/T 13863 replaces Replaces ISO 11554 (see 5.3.1); replaces ISO 11553-1, GB/T 5226.1-2019 replaces IEC 60204-1, GB 7247.1 replaces IEC 60825-1:2016 (see 5.4), and uses the normative references GB/T29710 replaces ISO 15614-11 (see Chapter 6) to apply my country's technical requirements;

--- Deleted the auxiliary explanatory clauses on equipment calibration (see 5.5) to facilitate the practical application of the standard.

The following editorial changes have been made to this document.

--- Change the name of the standard to "Acceptance test of fiber laser beam welder Part 1: Laser component of fiber optic conveyor".

Introduction

Fiber laser beam welding machine has become a new energy vehicle, consumer electronics, aviation and other industries due to its high energy density, flexible transmission and precision control advantages.

The core equipment for precision welding in aerospace and other fields. The performance of its key subsystem - optical fiber conveyor (including laser component output stability and the positioning accuracy of the moving mechanism directly affects the welding quality and process reliability.

GB/T 45860 Acceptance test for fiber laser beam welding machine aims to establish the verification of laser component parameters and the dynamic performance evaluation of moving mechanism.

The evaluation method focuses on the core subsystem of the fiber laser beam welding machine, realizes the full chain technology evaluation from optical path performance to mechanical accuracy, and standardizes the equipment.

The technical connection between manufacturers and users improves the stability and repeatability of the fiber laser welding process and supports equipment selection, acceptance and maintenance.

GB/T 45860 is intended to consist of the following two parts.

--- Part 1: Laser components for optical fiber conveyors. Aims to specify laser output power stability, beam quality (M2 factor), wave the test methods for core parameters such as

long-term consistency are established to clarify the performance acceptance criteria for laser components.

--- Part 2: Moving mechanism of optical fiber conveyor. Aims at positioning accuracy, repeatability and dynamic response characteristics of motion platform.

A measurement process was established to quantify the influence of mechanical transmission error on welding trajectory accuracy.

Acceptance test of fiber laser beam welding machine Part 1: Laser components for fiber optic conveyors

1 Scope

This document specifies the acceptance tests for laser diode pumped fiber laser beam welders with an average power exceeding 100W, including fiber delivery Basic requirements and test methods for machine testing.

This document applies to the acceptance of laser generation systems, optical transmission systems, and protective and auxiliary gas devices in fiber laser beam welders.

Nd:YAG laser beam welding machine acceptance test is performed as a reference.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

GB/T 5226.1 Electrical safety of machinery - Electrical equipment of machinery - Part 1: General technical requirements (GB/T 5226.1-2019, IEC 60204-1:2016, MOD) GB/T 7247.1 Safety of Laser Products Part 1: Equipment Classification and Requirements (GB 7247.1-2024, IEC 60825-1.

2014, IDT)

GB/T 13863 Laser radiation power and power instability test method (GB/T 13863-2011, ISO 11554:2006, MOD) GB/T 18490.1 Mechanical safety Laser processing machines Part 1: General safety requirements (GB/T 18490.1-2017, ISO 11553-1:2005, MOD) GB/T 29710 Electron beam and laser welding procedure qualification test method (GB/T 29710-2013, ISO 15614-11:2002, MOD) GB/T 45860.2 Acceptance test of fiber laser beam welding machine Part 2: Moving mechanism of fiber conveyor (GB/T 45860.2-2025, ISO 22827-2:2005, MOD)

3 Terms and Definitions

The following terms and definitions apply to this document.

laser assembly

A laser device consisting of specific optical, mechanical and/or electrical components used for laser beam processing and shaping.

4.1 Installation Environment

The laser beam welder shall be installed in a welding cell (including movement mechanisms for the machine head and/or the parts to be welded).