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

GB/T 46075.6-2025

**Acceptance inspection of electron beam welding machines -
Part 6: Measurement of stability of spot position**

电子束焊机验收检验 第6部分：束斑位置稳定性的测量

(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 part 6 of GB/T 46075 Acceptance test of electron beam welding machines. GB/T 46075 has been published in the following parts.

- Part 1: Principles and acceptance conditions;
- Part 2: Measurement of accelerating voltage characteristics;
- Part 3: Measurement of electron beam current characteristics;
- Part 4: Measurement of welding speed;
- Part 5: Measurement of runout;
- Part 6: Measurement of beam spot position stability.

This document is modified to adopt ISO 14744-6:2000 "Acceptance testing of electron beam welding machines Part 6: Beam position stability" Determination".

The technical differences between this document and ISO 14744-6:2000 and their reasons are as follows.

--- Replaced ISO 14744-3:2000 (see 4.1) with the normative reference GB/T 46075.3-2025. The consistency of the two documents the degree of modification is to facilitate the application of the standard;

--- ISO 1302 (see 4.2) is replaced by the normative reference GB/T 131 to facilitate standard application;

--- Replaced ISO 14744-1:2008 (see 5.1.1) with the normative reference GB/T 46075.1-2025. The two documents are consistent the degree of specificity is modified to facilitate the application of the standard.

The following editorial changes have been made to this document.

--- Change the name of the standard to "Electron beam welding machine acceptance test Part 6: Measurement of beam position stability".

Introduction

As a high-precision welding equipment, electron beam welding machine is widely used in high-end manufacturing fields such as aerospace, precision instruments, and nuclear energy equipment.

Core performance parameters (such as acceleration voltage, beam characteristics, welding speed and beam spot stability) directly determine welding quality and process reliability.

GB/T 46075 "Acceptance Test of Electron Beam Welding Machines" aims to standardize the performance evaluation methods and key parameter measurements of electron beam welding machines in my country.

GB/T 46075 has realized the basic principle through hierarchical structure design.

The implementation of this system will standardize the acceptance process of electron beam welding machines and improve the quality of equipment.

GB/T 46075 is intended to consist of the following six parts.

--- Part 1: Principles and acceptance conditions. Clarify the basic principles, general technical conditions and judgment criteria of acceptance inspection, and provide a basis for subsequent specialized inspection.

This trial provides a normative framework.

--- Part 2: Measurement of accelerating voltage characteristics. Specifies the test method for the stability, accuracy and fluctuation range of the accelerating voltage to ensure Controllability of electron beam energy output.

--- Part 3: Measurement of electron beam current characteristics. Establish a test process for beam intensity, dynamic response and ripple factor to ensure welding Consistency of heat input.

--- Part 4: Measurement of welding speed. Quantify the welding speed accuracy through a standardized motion platform and a synchronous signal acquisition system.

Influence on weld formation.

--- Part 5: Measurement of runout accuracy. A detection and evaluation method is proposed for the dynamic positioning error of the electron beam deflection system.

--- Part 6: Measurement of beam spot position stability. By monitoring the amount of beam spot drift, the stability of the equipment in long-term continuous operation is evaluated.

Qualitative.

Electron beam welding machine acceptance inspection Part 6: Measurement of beam spot position stability

1 Scope

This document specifies the process and instrument requirements for measuring the beam position stability of electron beam welding machines.

This document is applicable to the acceptance of electron beam welding machines, welding machine modification, long-term use of welding machines, and measurement of welding machines without position correction devices.

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 131 Product Geometric Specification (GPS). Representation of surface structure in technical product documentation (GB/T 131-2006, ISO 1302:2002, IDT) GB/T 46075.1-2025 Acceptance test of electron beam welding machines Part 1: Principles and acceptance conditions (ISO 14744-1:2008, MOD) GB/T 46075.3-2025 Acceptance test of electron beam welding machines Part 3: Measurement of electron beam current characteristics (ISO 14744-3.

2000, MOD)

3 Terms and Definitions

The following terms and definitions apply to this document.

beam spot position

When the electron beam is emitted and bombards the surface of the specimen, the electron beam spot is at the corresponding geometric position of the coordinate system perpendicular to the beam axis.

Electron beam focal distance the focal distance along the beam axis corresponds to the focal position when the electron beam is focused to the focal position after being converged by the focusing lens.

4.1 General requirements

During the detection cycle, under given power conditions, the energy transferred from the electron beam is transferred to the heat dissipation target block A or Faraday cage.

It absorbs scattered electrons and metal vapor to avoid the influence of heat conduction of excess energy, in line with the standard GB/T 46075.3-2025 (see Figure

1) as described.

For actual measurement, a specially prepared workpiece B should be positioned in the coordinate system where the beam/beam spot is located, and the electron beam power can be adjusted.

Adjust according to the actual welding task (small diameter melting spot or melting track).

The beam focal length should be selected as the maximum distance that can be actually welded in the vacuum chamber.