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

GB/T 46592-2025

**Metallic materials - Mechanical testing of miniature specimen -
Sampling and specimen preparation methods**

金属材料 微试样力学试验 取样和试样制备方法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the China Iron and Steel Association. This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183). This document was drafted by: East China University of Science and Technology, Metallurgical Industry Information and Standardization Research Institute, and State Energy Group New Energy Technology Research Institute Co., Ltd. The company, Shenyang Chemical Research Institute Co., Ltd., Hengyang Valin Steel Pipe Co., Ltd., National Standard (Beijing) Inspection and Certification Co., Ltd., Deyang Yiwei Technology Co., Ltd. Technology Co., Ltd., Guohe General (Qingdao) Testing and Evaluation Co., Ltd., and Huacai Technology Test Site (Luoyang) Co., Ltd. The main drafters of this document are. Tu Shandong, Wang Ning, Hou Huining, Wang Qiongqi, Du Jinfeng, Tan Jianping, Liu Jilin, Qiu Peng, Zhang Xiancheng, and Yang Mingliang. Li Zhutie, Zhang Jianrui, Zhou Guoyan, Dong Li, Jin Xiaokun, He Le, Cui Yu, Hu Nianyou, Liang Xibing, Xue Chao, Sun Binhan, Cheng Chunsheng, Guo Bicheng, Zhuo Hua Hu Xiang, Zang Haoliang, Zhang Yuanbo, Huang Jun, Xia Xianxi.

Micro-sample mechanical testing technology was developed in the 1980s and.1990s to address the irradiation embrittlement of nuclear power equipment, and is currently being applied in fire... It is widely used in the structural integrity evaluation of major equipment in industries such as power, petrochemicals, and chemicals. Micro-sample mechanical testing is suitable for the following situations. a)

a) The size of the material to be tested is limited, and it cannot be processed into conventional mechanical property test specimens;

- b) Performance testing of irradiated materials requires a limited irradiation space and... Reduce the exposure of test personnel;
- c) In situations where it is necessary to obtain the mechanical properties of microstructures or different micro-regions of a structure, such as the heat-affected zone of welded joints, coatings, Thin films, gradient materials, etc.;
- d) Situations where the amount of material cut for routine testing would cause significant damage or destruction to the equipment or structure;
- e) Situations where it cannot be broken. Major equipment for sampling, such as hydrogenation reactors, is susceptible to damage. For the first three cases, only direct preparation of microsamples is required; however, for the latter two cases, it is necessary to first... Microsample preparation can only proceed after the equipment or structure has been prepared using a minimally destructive method. Microsample sampling is a process of sampling samples from the surface of critical equipment. The sampling method of "excavating" very small amounts of in-service materials can be used when sampling is required for in-service equipment or major structures, utilizing existing sampling techniques and methods. A suitable sample is obtained for subsequent testing of the mechanical and other properties of the microsample. This document outlines the basic requirements and principles for microsample sampling, the principles for defect assessment and repair after sampling, and the requirements for sample preparation. Sample types and preparation requirements for micro-sample mechanical property testing. Mechanical testing of micro specimens of metallic materials Sampling and Sample Preparation Methods

1 Scope

GB/T 46592-2025 is the Chinese national standard covering taking a miniature specimen out of a component still in service - where it may be removed from without weakening the part, the cutting method that must not heat the material, the machining to final size, and the orientation recorded with it. First edition, under the China Iron and Steel Association, and it underpins the small punch and miniature fatigue methods issued the same day. In force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026.

This document specifies the general requirements for sample acquisition and preparation, sample preparation, microsample selection, and microsample testing for mechanical testing of microsamples. Requirements for sample preparation. This document applies to the sampling and preparation of micro-samples for mechanical testing. If the product standard or the agreement between the supplier and the buyer specifies otherwise regarding sampling and sample preparation, those specifications shall apply.

2 Normative references

The contents of the following documents, through normative references within the text,

constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 2975 Sampling Location and Specimen Preparation for Mechanical Property Testing of Steel and Steel Products

GB/T 10623 Terminology for Testing Mechanical Properties of Metallic Materials

GB/T 20832 Marking of the axis of a metallic material specimen relative to the texture of the product

3 Terms and Definitions

The terms and definitions defined in GB/T 2975 and GB/T 10623, as well as the following terms and definitions, apply to this document.

3.1 Destructive sampling Products, equipment, or structures that fail to meet structural integrity or safe operation requirements after sample cutting for testing need repair or maintenance. Sampling methods for changing the operating parameters of equipment.

3.2 After cutting test samples from a product, equipment, or structure, if the assessment confirms that it still meets the requirements for structural integrity or safe operation, no repairs are necessary. Sampling methods for supplementing or changing equipment operating parameters.

3.3 micro-sample A specimen whose size is significantly smaller than that of a standard specimen, yet still reflects the macroscopic mechanical properties of the material. Note

1. Micro specimens can be standard specimens scaled down proportionally, or scaled down proportionally with appropriate geometric changes, or they can be of a special shape. Generally, micro... The volume of the working section of the sample is less than 1/8 of the volume of the working section of the corresponding standard sample. Note

2. The critical size of the microsample is related to the material type and the mechanical parameters being tested. It is characterized by the grain size of the material, typically 4 to 10 times the grain size. Grain size determination method is specified in GB/T 6394.

3.4 Small punch specimen Sheet-shaped micro-samples used for small punch tests.