ICS 19.100
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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 33210-2025

Replacing GB/T 33210-2016

Non-destructive testing - Test method for determining residual stresses based on inverse magnetostrictive effect

无损检测 基于逆磁致伸缩效应的残余应力检测方法

Issued on: August 29, 2025 **Implemented on: August 29, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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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 replaces GB/T 33210-2016 "Electromagnetic testing method for non-destructive testing of residual stresses" and is consistent with GB/T 33210-2016.

In addition to structural adjustments and editorial changes, the main technical changes are as follows.

- Changed the scope (see Chapter 1, Chapter 1 of the 2016 edition);

- Added terms and definitions for sensitivity, extreme and shear stress difference methods (see 3.1, 3.2 and 3.3);

- Added detection principle (see Chapter 4);

- Added safety requirements (see Chapter 5);

- Deleted personnel qualifications (see Chapter 4 of the 2016 edition);

- Added general testing process regulations (see Chapter 6);

- Changed the detection system (see Chapter 7, Chapter 6 of the 2016 edition);

- Changed the test procedure (see Chapter 8, Chapter 7 of the 2016 edition);

- Changed the test records and reports (see Chapter 9, Chapter 8 of the 2016 edition).

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document is proposed and coordinated by the National Technical Committee for Standardization of Non-destructive Testing (SAC/TC56).

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This document was first published in 2016 and this is the first revision.

Nondestructive testing of residual Stress detection method

1 Scope

This document describes a method for detecting residual stress on the surface of ferromagnetic materials based on the inverse magnetostrictive effect.

This document is applicable to the surface residual stress detection of ferromagnetic structural parts (such as ferromagnetic structures in special equipment, transportation, energy and other fields). member).

2 Normative references

GB/T 12604.6

GB/T 20737

3 Terms and Definitions

The terms and definitions defined in GB/T 12604.6 and GB/T 20737 and the following apply to this document.

3.1 sensitivity

The output voltage or current value of the detection instrument under unit stress.

Note. The unit is millivolt per megapascal (mV/MPa) or milliampere per megapascal (mA/MPa).

3.2 pole

The claw part of the detection sensor where the excitation coil and detection coil are wound.

Note. Such as U-shaped two-pole sensor, four-pole sensor and nine-pole sensor, etc.

3.3

The principal stress difference and principal stress direction are directly obtained by the measurement method based on the inverse magnetostrictive effect, and the equilibrium method of elastic mechanics is used to obtain the principal stress difference and principal stress direction.

The analytical method for determining the various stress components of the plane stress state at a point is used.

Note. The shear stress difference method is a commonly used calculation method for principal stress separation in two-dimensional plane stress analysis.

4 Detection Principle

When residual stress exists inside ferromagnetic materials, the residual stress will produce magnetic characteristics (performance) in the structural parts due to the inverse magnetostrictive effect.

The residual stress in the structural parts can be detected by measuring the surface magnetic induction signal.

The residual stress detection principle of the expansion and contraction effect is shown in Figure 1.