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PEOPLE'S REPUBLIC OF CHINA**

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**Metal materials - Method of electromagnetic acoustic
inspection**

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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.

This document integrates and revises GB/T 20935.1-2018 "Electromagnetic ultrasonic testing methods for metallic materials - Part 1: Electromagnetic ultrasonic transducers" Guide to Electromagnetic Instruments, GB/T 20935.2-2018 "Metallic Materials Electromagnetic Ultrasonic Testing Methods Part 2: Utilizing Electromagnetic Ultrasonic Transducer Technology" Methods for Ultrasonic Testing, GB/T 20935.3-2018 "Metallic Materials Electromagnetic Ultrasonic Testing Methods Part 3: Using Electromagnetic Ultrasonic Testing" A method for ultrasonic surface inspection using acoustic transducer technology.

Compared with GB/T 20935.1-2018, GB/T 20935.2-2018 and GB/T 20935.3-2018, this document has the following changes except for structural adjustments.

Aside from editorial changes, the main technical changes are as follows.

- a) The scope of application has been changed (see Chapter 1, Chapter 1 of GB/T 20935.1-2018);
- b) The detection principle has been changed (see Chapter 4 of GB/T 20935.1-2018 and Chapter 4 of GB/T 20935.2-2018).
Chapter 4 of GB/T 20935.3-2018);
- c) General requirements have been added (see Chapter 5);
- d) Additional testing equipment was added (see Chapter 6);
- e) Additional samples were added (see Chapter 7);
- f) The detection method has been changed (see Chapter 8, Chapter 9 of GB/T 20935.2-2018, and Chapter 9 of GB/T 20935.3-2018). (10 chapters).

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.

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The document replaced by this document has been released in the following versions.

- GB/T 20935.1, first published in 2007, first revised in 2018;
- GB/T 20935.2, first published in 2009, first revised in 2018;
- GB/T 20935.3, first published in 2009, first revised in 2018.

Introduction

Ultrasonic technology has firmly established its position in the field of nondestructive testing. Initially, ultrasound was mainly generated through the piezoelectric effect.

The conversion of electrical energy into mechanical energy is an effective method for generating ultrasound. However, its drawback is that in order for ultrasound to enter smoothly...

The material under test requires a liquid as a coupling medium. When using a coupling agent, the material under test is typically immersed in the liquid or a thin layer is applied to the surface of the material. liquid.

Electromagnetic ultrasonic transducers can emit and receive ultrasonic waves without contacting the material being tested. However, electromagnetic ultrasonic testing has limitations.

The image is a metallic material (ferromagnetic or non-ferromagnetic). The ultrasonic transmitter of an electromagnetic ultrasonic transducer consists of a metal coil, which is placed on a metallic material.

Ultrasonic waves are generated by exciting a material (ferromagnetic or non-ferromagnetic) in a steady magnetic field using an alternating current. The surface of the metallic material is affected by the alternating current...

The principle of the device is to induce a current, and the current in the magnetic field is subjected to the Lorentz force to generate an oscillating stress wave (sometimes in ferromagnetic conductive materials, magnetostriction).

(The combined effect of contractile force and Lorentz force). When receiving ultrasound, the conductor surface oscillates in the magnetic field, inducing a voltage in the coil. The above-mentioned...

The entire exchange process occurs within the electromagnetic skin layer of the material. An electromagnetic ultrasonic transducer is a non-contact ultrasonic transmitter with excellent repeatability. and receiving system.

1 Scope

This document specifies the testing principles, general requirements, testing equipment, and test procedures for ultrasonic testing using electromagnetic ultrasonic transducers (EMAT).

Sample, testing method, result determination and test report.

This document applies to thickness measurement and surface inspection of materials (including ferromagnetic or non-ferromagnetic metallic materials) whose sound waves are generated by electromagnetic methods.

For other waveforms, the detection should be performed in accordance with this document.

2 Normative references

GB/T 9445

GB/T 12604.1

GB/T 12604.6

3 Terms and Definitions

The terms and definitions defined in GB/T 12604.1 and GB/T 12604.6, as well as the following terms and definitions, apply to this document.

3.1

An electromagnetic device that converts electrical energy into acoustic energy in a magnetic field.

3.2 Lorentz forces

The force experienced by an electric current in a magnetic field.

Note. The Lorentz force is perpendicular to both the magnetic field and the direction of the current, which is the same principle as that of an electric motor.

3.3

The force generated by the movement of magnetic domain walls when a ferromagnetic material is magnetized.

3.4 return coil meandercoil

Periodically wound, non-intersecting electromagnetic ultrasonic transducer coils with uniform spacing.

3.5 flat (spiral) coil pancake (spiral) coil

A spirally wound electromagnetic ultrasonic transducer coil with uniform spacing.

3.6 bulkwave

Ultrasonic waves are used in nondestructive testing to detect volumetric materials.

Note. It is either a longitudinal wave or a transverse wave.