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

GB/T 20935.2-2018

**Metal materials -- Method of electromagnetic acoustic
inspection -- Part 2: Standard practice for ultrasonic testing
using electromagnetic acoustic transducer (EMAT) techniques**

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Foreword

GB/T 20935 "Electromagnetic Ultrasonic Testing Method for Metal Materials" is divided into the following three parts.

--- Part 1. Guide to electromagnetic ultrasonic transducers;

--- Part 2. Methods for ultrasonic testing using electromagnetic ultrasonic transducer technology;

--- Part 3. Ultrasonic surface detection using electromagnetic ultrasonic transducer technology.

This part is the second part of GB/T 20935.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This part replaces GB/T 20935.2-2009 "Electromagnetic Ultrasonic Testing Methods for Metallic Materials - Part 2. Using Electromagnetic Ultrasonic Transducers

The method of technology for ultrasonic testing", compared with GB/T 20935.2-2009, the main technical changes are as follows.

--- The items in the scope were merged, and the original standard "1.7 This part is based on international units as standard units" and "1.8 parts"

Do not discuss security issues related to use. It is the responsibility of the user to establish procedures for the safety and health of the person before use.

Set its scope of application. (see Chapter 1,.2009 editions 1.7 and 1.8);

--- Revised the normative reference document (see Chapter 2, Chapter 2 of the.2009 edition);

--- Amend the qualification requirements of Chapter 6 to "If the contract requires, the personnel performing this part of the inspection should be obtained by the relevant department.

Technical qualifications identified in GB/T 9445 or equivalent standards and authorized by the employer. Standard for the basis of qualification (including version number)

It should be stated in the contract. " (see 6.1,.2009 edition 6.1).

This part was proposed by the China Iron and Steel Association.

This part is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183).

This section drafted by. Iron and Steel Research Institute, Steel Research Institute Testing Technology Co., Ltd., Metallurgical Industry Information Standards Institute.

1 Scope

This part of GB/T 20935 gives an overview and significance of the principle of using ultrasonic ultrasonic transducer (EMAT) for specific ultrasonic testing.

And use, and specify the application conditions, equipment, calibration, testing methods, results determination and test reports.

This section is applicable to users who think that the electromagnetic ultrasonic transducer technology is superior to the traditional piezoelectric technology; it is not suitable for traditional technology.

More advantageous occasions.

This section applies to all materials that can generate sound waves by electromagnetic methods, including ferromagnetic or non-ferromagnetic metal materials.

Note. This section describes the application of some proven electromagnetic ultrasonic transducer technology, but does not mean that these technologies are the best or only, only provide one

The choice of some applications.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 9445 Non-destructive testing personnel qualification and certification

GB/T 11344 non-destructive testing contact ultrasonic pulse echo method for thickness measurement

GB/T 12604.1 Non-destructive testing terminology ultrasonic testing

GB/T 12604.6 Non-destructive testing term eddy current testing

GB/T 20935.1 Electromagnetic Ultrasonic Testing Methods for Metallic Materials - Part 1. Guide to Electromagnetic Ultrasonic Transducers

GB/T 23900 Non-destructive testing material ultrasonic speed measuring method

3 Terms and definitions

The terms and definitions defined in GB/T 12604.1, GB/T 12604.6 and GB/T 20935.1 apply to this document.

4.1 Surface inspection

4.1.1 Surface waves excited in the material being tested can detect surface discontinuities sensitively, which is reflected back through the discontinuous interface.

Wave or transmission wave attenuation to sense discontinuity, that is, pulse reflection technology or one-shot technology.

4.1.2 A typical electromagnetic ultrasonic transducer that excites surface waves or lamb waves is shown in Figure 1. The applied external magnetic field B_0 is parallel to the non-ferromagnetic

Or the surface of the ferromagnetic material, the fold-back coil is placed in parallel on the

surface of the material and is pulsed with radio frequency (RF) electric pulses, which are generated on the surface of the material by induction.

Current, surface current is affected by Lorentz force in the magnetic field, and Lorentz force excites stress waves perpendicular to the surface vibration of the material to generate surface

wave. Electromagnetic ultrasonic transducers generally produce bidirectional surface waves, and special designs can also produce the same unidirectional waves as conventional ultrasonic testing.

Description.

2 --- surface acoustic wave pulse;

B0---additional magnetic field;

FL---Lorentz force.

Figure 1 Typical electromagnetic ultrasonic transducer producing surface waves or Lamb waves

4.1.3 Surface discontinuities can cause reflection or attenuation of surface waves. Reflected or attenuated ultrasound near the electromagnetic ultrasonic transducer receiving coil

The wave causes the conductor placed in the magnetic field to vibrate, thereby inducing a measurable voltage in the coil.

4.2 Internal testing

4.2.1 In order to discover discontinuities within the material, ultrasonic bulk waves should be used for testing. Same principle as surface inspection, internal inspection

The discontinuity is perceived by the reflected echo or transmitted wave attenuation of the discontinuous interface.

4.2.2 P-wave or shear wave detection can be selected depending on the object. Although the direct beam pulse reflection method is the most intuitive, but based on the position of the discontinuity

It may be more desirable to select the oblique beam bundle one-shot technique for factors such as orientation and orientation.

4.2.3 A typical electromagnetic ultrasonic transducer device for exciting body waves is shown in Fig. 2. The applied external magnetic field B0 is perpendicular to non-ferromagnetic or ferromagnetic

On the surface of the material, the spiral flat coil is placed in parallel on the surface of the material and is pulsed, and current is generated on the surface of the material by induction.