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

GB/T 13888-2024

Replacing GB/T 13888-2009

**Methods of measurement of the coercivity(up to 160 kA/m) of
magnetic materials in an open magnetic circuit
(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 is required.

This document replaces GB/T 13888-2009 "Method for measuring the coercive force of magnetic materials in an open magnetic circuit" and is consistent with GB/T 13888-2009.

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

Changed the applicable range for all magnetic materials from 0.2 A/m to 160 kA/m (see Chapter 1, Chapter 1 of the 2009 edition); a) the definition of "coercivity" has been changed, and the term and definition of "demagnetization" have been added (see 3.1, 3.2, Chapter 3 of the 2009 edition); b) the method of placing the probe in the solenoid in Method B and the description of the diagram have been changed (see Chapter 4, Chapter 4 of the 2009 edition); c) the requirements for test specimens have been changed (see Chapter 5, Chapter 5 of the 2009 edition); d) Added requirements for solenoids, geomagnetic fields, compensation for static and dynamic magnetic noise fields, and magnetic shielding of the measurement area (see 6, 7 and 8);

The requirements for measurement have been changed (see Chapter 9, Chapter 6 of the 2009 edition); f) the reproducibility requirements have been changed, and the reproducibility requirements have been refined according to different measurement ranges (see 9.4, 6.4 of the 2009 edition); g) Added the coercivity measurement of complex shape samples, optimization of the magnetization intensity amplitude and duration of soft magnetic material samples, and solenoid Mechanical stress and temperature requirements of the test (see Appendix A, Appendix A of the 2009 edition);

Added Method C-Measurement of the coercivity of magnetic materials in an open magnetic circuit using a vibrating sample strong magnetometer (see Appendix B). i) this document is equivalent to IEC 60404-7:2019 "Magnetic materials Part 7: Measurement of the coercivity of magnetic materials in an open magnetic circuit (up to 160 kA/m) method.

The following minimal editorial changes were made to this document.

The name of the standard is changed to "Method for measuring the coercive force (up to 160 kA/m) of magnetic materials in an open magnetic circuit";

Changed the note of Chapter 1.-

1 Scope

This document describes a method for measuring the coercivity of magnetic materials in an open magnetic circuit.

This document applies to magnetic materials with a coercivity between 0.2 A/m and 160 kA/m.

Note: The magnetic materials in this document include soft magnetic materials (such as iron, low carbon steel, silicon steel, other steel, nickel-iron alloy, iron-cobalt alloy, Soft magnetic materials,

amorphous soft magnetic materials, nanocrystalline soft magnetic materials) and hard magnetic materials [such as magnetostrictive alloys, permanent (hard) magnetic alloys, permanent (hard) magnetic Ceramics, other permanent (hard) magnetic materials, bonded (hard) magnetic materials][2].

For the measurement of coercivity below 40 A/m, high conductivity materials and non-elliptical specimens, the special measures in Appendix A shall be used.

2 Normative references

This document has no normative references.

3 Terms and definitions

The following terms and definitions apply to this document.

The URLs for terminology databases used for standardization maintained by ISO and IEC are as follows.

Coercivity

H_{KDJ}

By applying a reverse external magnetic field, the magnetic flux density or magnetic polarization and magnetization of the material are reduced from the magnetic saturation state value to zero.

The coercive magnetic field strength in the material.

Note: Use appropriate symbols as follows. H_{cB} is the coercive force corresponding to the magnetic flux density, H_{cJ} is the coercive force corresponding to the magnetic polarization intensity, and H_{cM} is the coercive force corresponding to the magnetization intensity.

The corresponding coercivity. The first two symbols replace H_{cB} and H_{cJ} respectively.

[Source. GB/T 2900.60-2002, 2.1, modified] 3.2 Demagnetize the magnetic flux density of the magnetized material decreases along the demagnetization curve.

Note: The coercivity H_{cB} and the coercivity H_{cJ} are distinguished based on the hysteresis loop defined in the B = f(H) coordinate system or the J = f(H) coordinate system (see Figure 1).

Now, for materials with large incremental permeability in the B = 0 region, the difference between the coercivity H_{cJ} and the coercivity H_{cB} is negligible because.

$$H_{cB} = H_{cJ}(1 \pm 0.001)$$

Where.

H_{cB} - coercive force corresponding to magnetic flux density, in amperes per meter (A/m);

H_{cJ} - coercive force corresponding to magnetic polarization intensity, in amperes per meter (A/m);

ΔB - the increment of magnetic flux density (B = 0 region), in Tesla (T);