

ICS 29.030
CCS K 14



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

GB/T 3217-2013

**Permanent magnet (magnetically hard) materials -- Methods of
measurement of magnetic properties
(English Translation)**

Issued on: July 19, 2013

Implemented on: December 2, 2013

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine**

Table of Contents

Foreword...	3
1 Scope...	5
2 Normative references...	5
3 Terms and definitions...	5
4 Measurement principle...	7
5 Magnetizing device...	8
6 Test specimen...	10
7 Measurement of the magnetic flux density...	11
8 Measurement of the magnetic polarization...	12
9 Measurement of the magnetic field intensity...	14
10 Determination of the demagnetization curve...	14
11 Determination of the principal characteristics...	16
12 Calibration of the test equipment...	16
13 Test report...	17

Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 3217-1992, Method of test of the magnetic properties of permanent magnetic (magnetically hard) materials.

Compared with GB/T 3217-1992, the main changes of this Standard are as follows:

- Add the content of terms;
- Restructure according to the international standard;
- Change the positions of diagrams and figures in accordance with the international standard;
- Add measurement principles in accordance with the international standard (Chapter 4);
- Delete the content of measuring demagnetization curve and recoil permeability by impact method;

- Delete Appendix A and Appendix B of the original standard; adjust Appendix C of the original standard to Appendix B of this Standard and slightly modify the content;
- Add the influence of specimen temperature on measurement results (Appendix A);
- Add the corresponding chapter and article numbers of this Standard and IEC 60404-5:1993 Magnetic materials - Part 5: Permanent magnet (magnetically hard) materials - Methods of measurement of magnetic properties and its 2006 amendment (1) (Appendix C);
- Add the technical differences and their reasons between this Standard and IEC 60404-5:1993 Magnetic materials - Part 5: Permanent magnet (magnetically hard) materials - Methods of measurement of magnetic properties and its 2006 amendment (1) (Appendix D).

This Standard modifies and adopts IEC 60404-5:1993 Magnetic materials - Part 5: Permanent magnet (magnetically hard) materials - Methods of measurement of magnetic properties and its 2006 amendment (1) by the redrafting method.

This Standard is partially restructured compared to IEC 60404-5:1993 and its 2006 amendment (1). Appendix C lists the comparison of chapter and clause numbers between this Standard and IEC 60404-5:1993 and its 2006 amendment (1).

Permanent magnet (magnetically hard) materials - Methods
of measurement of magnetic properties

1 Scope

This Standard specifies the methods of measurement of magnetic properties for permanent magnet (magnetically hard) materials.

This Standard applies to the measurement of magnetic properties of Al-Ni-Co permanent magnet, ferrite permanent magnet, Fe-Cr-Co permanent magnet, rare earth permanent magnet and other permanent magnet materials.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 2900.4-2008, Electrotechnical terminology - Special alloys for electrical equipment

GB/T 2900.60-2002, Electrotechnical terminology - Electromagnetism [eqv IEC 60050(121):1998]

GB/T 9637-2001, Electrotechnical terminology - Magnetic materials and components [eqv IEC 60050(221):1990]

GB/T 24270-2009, Method of measurement of temperature coefficient of magnetic properties of permanent magnetic materials

IEC60050(151), International electrotechnical vocabulary - Part 151: Electrical and magnetic devices

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 2900.4-2008, GB/T 2900.60-2002, GB/T 9637-2001 and IEC 60050(151) as well as those given below apply.

3.1

demagnetization curve

10.3.6 The J search coil can also be replaced by the B search coil and the B(H) curve

can be drawn according to the above method. However, the air gap between the specimen and the B search coil must be small enough to reduce the measurement error.

11.1 Magnetic remanence, B_r

After drawing the demagnetization curve, take the magnetic flux density value at the intersection of the demagnetization curve and the B axis (see Figure 1).

11.2 Maximum BH product, $(BH)_{\max}$

The maximum BH product, $(BH)_{\max}$, is determined by the maximum value of the corresponding product of B and H on the demagnetization curve, or by the method of tangency of the demagnetization curve and the isomagnetic energy curve (see Figure 2).

11.3 Coercivity, H_{cB} and intrinsic coercivity, H_{cJ}

The magnetic field intensity value at the intersection of the B (H) demagnetization curve and the $B=0$ straight line is H_{cB} , and the magnetic field intensity value at the intersection of the J (H) demagnetization curve and the $J=0$ straight line is H_{cJ} (see Figure 1).

11.4 Determination of the recoil line and the recoil permeability, μ_{rec}

Take a certain point A (H_{rec} , B_{rec}), as required, on the demagnetization curve as the base point of the recoil line (see Figure 1). When the measurement of the demagnetization curve reaches point A (H_{rec} , B_{rec}), change the direction of the magnetization field so that the change amount is ΔH (reaching point C) and then return to point A (H_{rec} , B_{rec}), to obtain the recoil line. The recoil permeability μ_{rec} is obtained from the average slope of the recoil line (see Figure 1).

Generally, μ_{rec} is not a constant along the demagnetization curve, so the corresponding H_{rec} , B_{rec} and ΔH values shall be indicated.

12.1 The test equipment shall be calibrated regularly. The magnetic field detector, J

search coil, integrator, etc. used in the test equipment shall be sent to the metrology department for calibration regularly.

12.2 To ensure the accuracy and consistency of the measurement of magnetic parameters of permanent magnetic materials, use standard specimens verified by the national metrology department to compare the measurement results of various magnetic
.....