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

GB/T 23906-2009

Non-destructive testing - Rings for magnetic particle testing

无损检测 磁粉检测用环形试块

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1 Scope

China's national standard for the ring test blocks used in magnetic particle testing. It specifies the material, the dimensions, the artificial defects, the heat treatment, the verification and the marking of the ring-shaped reference blocks used to check the performance of magnetic particle examination. Magnetic particle testing detects surface and near-surface discontinuities in ferromagnetic material by magnetising the part and applying fine magnetic particles, which gather at the leakage field produced where a discontinuity interrupts the flux. It is fast, cheap and very sensitive, and it is the most widely used surface method in heavy engineering. It is also entirely dependent on a chain of variables that cannot be checked individually in service: the magnetising current and its waveform, the field strength and direction, the particle size, shape and magnetic properties, the concentration and condition of the suspension, the lighting, and the operator's eye. Any one of them can be wrong without any indication that anything is wrong - the examination simply finds nothing, and a part with a crack passes. The ring block is the standard answer to that. It is a ring of defined material and heat treatment containing artificial subsurface holes at graded depths from the surface, and passing current through it produces

indications from those holes; how many appear tells the operator directly whether the whole system, from the machine to the ink to the light to their own perception, is performing as it should. The standard fixes the ring so that the answer means the same thing everywhere: the material and its magnetic properties, the heat treatment that fixes them, the hole diameters and depths and their tolerances, the surface finish, and the verification of the block itself. Issued on 26 May 2009 and in force since 1 September 2009.

This Standard specifies the classification, technical requirements and inspection methods of rings (or blocks) for magnetic particle testing. This Standard applies to the type inspection and exit-factory inspection of rings. This Standard can also be used as the acceptance basis for user orders.

2 Normative references

The terms in the following documents become the terms of this Standard by reference to this Standard. For dated references, all subsequent amendments (not including errata content) or revisions do not apply to this standard. However, parties to agreements that are based on this Standard are encouraged to study whether the latest versions of these documents can be used. For undated references, the latest edition applies to this Standard.

GB/T 699-1999, Quality carbon structural steels

GB/T 1299-2000, Alloy tool steels

GB/T 12604.5, Non-destructive testing - Terminology - Magnetic particle testing

GB/T 19001, Quality management systems - Requirements (GB/T 19001-2008, ISO 9001.2008, IDT)

GB/T 27025, General requirements for the competence of testing and calibration laboratories (GB/T 27025-2008, ISO/ IEC 17025.2005, IDT)

3 Terms and definitions

Terms and definitions determined by GB/T 12604.5 are applicable to this Standard.

4 Classification

Rings, to which this Standard is applicable, shall be classified as follows:

- a) Type B test block (or DC ring);
- b) Type E test block (or AC ring). 1~3 - through-holes, the diameter of which is $(1+0.08-0.05)$ mm. 4 - type E test block; 5 - insulating bushing; 6 - conductive mandrel. The allowable tolerance of l is ± 0.05 mm. The allowable tolerance of the included angle of the through-hole is $\pm 0.5^\circ$, and the allowable tolerance of each circle center is $\pm$

0.5 mm. Figure 2 - Type E test block

6 Test methods

6.1 Chemical composition and grain size An appropriate method shall be used for determination.

6.2 Hardness and surface roughness An appropriate method shall be used for determination.

6.3 Through-hole angle (two surfaces) An appropriate method with an accuracy better than $\pm 0.1^\circ$ shall be used for determination.

6.4.1 An appropriate method with an accuracy better than $\pm$

0.01 mm shall be used to measure the through-hole diameter, and the distance from the through-hole center to the outer ring edge (two surfaces).

6.4.2 An appropriate method with an accuracy better than $\pm$

0.1 mm shall be used to measure the distance between the centers of two adjacent through-holes (two surfaces), the outer diameter, inner diameter and thickness of the test block, the outer diameter, inner diameter and thickness of the insulating bushing, and the diameter and length of the conductive mandrel.

6.4.3 An appropriate method shall be used to measure the tightness (between the test block and the insulating bushing, or between the insulating bushing and the conductive mandrel), the concentricity between the test block and the conductive mandrel.

7.1 Batch rules

7.1.1 Materials Each batch consists of the quantity of materials of the same heat number and the same heat treatment (annealed or unannealed) state.

7.1.2 Test block Each batch consists of a ring individually.

7.2 Inspection classification

7.2.1 Type inspection Type inspection should be carried out in any of the following situations.

- a) during new production, production change or resumption of production after suspension;
- b) when materials or processes are changed;
- c) when it is stipulated in the contract;
- d) when it is more than 24 months since the last type inspection. The type inspection of the

rings shall be carried out by a laboratory with ring type inspection and testing items approved by GB/T 270251. The type inspection laboratory shall issue an inspection report on the implementation of this Standard.

7.2.2 Exit-factory inspection (or batch inspection) The manufacturer of the rings shall carry out exit-factory inspection for each ring product, and issue an inspection certificate on the implementation of this Standard. The exit-factory inspection shall be defined and guaranteed by the quality system. The system should meet the requirements of GB/T 19001.

7.3 Inspection items

7.3.1 Type B test block See Table 1 for the inspection items of type B test block.

1 The list of relevant laboratories can be obtained from the Secretariat of the National Technical Committee 56 on B - Type B test block.

9 Marking and labeling

9.1 The marking or labeling of rings shall contain at least.

- a) manufacturer's name, trademark or identification mark, detailed address;
- b) product name, model and specification, product standard number, place of origin;
- c) traceable product number.

9.2 The marking or labeling shall be seen on the packaging.

10 Packaging, transportation and storage

10.1 After the ring is treated with anti-rust, each piece should be packed in a hard box separately to prevent the test block from rusting and damage.

10.2 The manufacturer shall indicate the requirements for transportation and storage on the packaging to avoid damage to the rings.

10.3 The documents accompanied when the product is delivered shall include.

- a) product certificate;
- b) product instruction manual;
- c) type inspection report (when agreed in the contract);