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

GB/T 23907-2009

Non-destructive testing - Shims for magnetic particle testing

无损检测 磁粉检测用试片

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1 Scope

China's national standard for the shims used in magnetic particle testing. It specifies the types, the materials, the dimensions, the artificial defects, the verification and the marking of magnetic particle testing shims. A shim answers a question the ring block of GB/T 23906 cannot. The ring verifies that the equipment, the ink and the operator are working; the shim verifies that the field is actually present, in the right direction and at sufficient strength, at the specific point on the specific part being examined. Those are different questions, and the second one is the harder. Magnetic particle testing only finds a discontinuity that lies across the flux: a crack parallel to the field produces no leakage and no indication at all, which is why every part is examined in two directions. But the field inside a real component is not uniform - it concentrates at changes of section, it is weak in the middle of a long part, it is diverted around holes, and its direction at a given point depends on the geometry and on how the current is applied. The operator cannot see it. A shim is a thin flexible foil carrying a defined artificial flaw on its underside, attached to the surface with the flaw against the part; when the part is magnetised, the shim behaves as though the flaw were in the surface, and an indication appearing on it demonstrates that a real flaw of that size and orientation at that point would have been found. The standard fixes the shim so that the

demonstration means something: the material and its permeability, the foil thickness, the geometry and depth of the artificial flaws and their tolerances, and the verification and handling, since a shim is consumable and creases and corrodes. Issued on 26 May 2009 and in force since 1 December 2009.

This standard specifies the classification, technical requirements, and inspection methods of shims (or sensitivity test panels) for magnetic particle testing. This standard applies to type inspection and factory inspection of shims. This standard can also be used as the acceptance basis for user orders.

2 Normative references

The provisions in the following documents become the provisions of this standard through reference in this standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this standard, however, parties who reach an agreement based on this standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest editions of the referenced documents apply to this standard. GB/T 6983 Magnetic iron

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

The terms and definitions defined in GB/T 12604.5 apply to this standard.

4 Classification

The shims to which this standard applies can be classified as follows:

- a) According to product type: 1) Type A; 2) Type C; 3) Type D.
 - b) According to heat treatment status: 1) After annealing treatment; 2) Without annealing treatment.
 - c) According to sensitivity level: 1) High sensitivity; 2) Medium sensitivity; 3) Low sensitivity.
- NOTE 1: Classification according to sensitivity level is only suitable for shims in the same heat treatment state. NOTE 2: Generally, for shims of the same type and the same sensitivity level, the sensitivity of the one without annealing treatment is about 1 time higher than that with annealing treatment.

5 Technical requirements

5.1 Materials The material of the shim shall be thin sheets rolled from DT4A ultra-high purity low carbon pure iron that complies with the requirements of GB/T 6983. The materials used to process shims include annealed and unannealed materials.

5.2 Shape and dimensions

5.2.1 The shapes of type A and type D shims are shown in Figure 1, and their dimensions are shown in Table 1. Appropriate methods shall be used for determination.

6.2 Dimensions

6.2.1 The thickness of the shim, and the depth and width of the artificial groove shall be measured by using appropriate methods with an accuracy better than $\pm 1 \mu\text{m}$ (0.001 mm).

6.2.2 The side length or length and width of the shim, the diameter of the circular artificial groove, the length of the cross artificial groove, and the interval between the dividing lines shall be measured by using appropriate methods with an accuracy better than $\pm 0.1 \text{ mm}$.

6.3 Surface roughness Appropriate methods shall be used for determination.

6.4 Surface appearance Inspection shall be carried out with the naked eye under white light.

7.1 Batch grouping rules

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

7.1.2 Shim Each batch consists of a shim individually.

7.2 Inspection classification

7.2.1 Type inspection Type inspection should be carried out under one of the following circumstances:

- a) New production, production transferring, or production resumption after suspension;
- b) When materials or processes change;
- c) When agreed in the contract; Symbol of heat treatment status -- Represented by Arabic numerals, that is: the annealed one is expressed as 1 or vacant, the unannealed one is

expressed as 2; Artificial groove depth -- Represented by Arabic numerals; the values are shown in Table 1 and Table 2, and the unit is μm (omitted and not marked); Shim thickness -- Represented by Arabic numerals; the values are shown in Table 1 and Table 2, and the unit is μm (omitted and not marked).

8.3 Examples

8.3.1 Taking the type A shim product that complies with GB/T 23907, has been annealed, has an artificial groove depth of 15 μm , and a shim thickness of 50 μm , as an example, its mark is as follows: A1-15/50 or A-15/

50 The meanings of each element in the mark are as follows: A -- type A shim; 1 (or vacant) -- annealed; 15 -- The depth of the artificial groove is 15 μm ; 50 -- The thickness of the shim is 50 μm .

8.3.2 Taking the type A shim product that complies with GB/T 23907, has not been annealed, has an artificial groove depth of 60 μm , and a shim thickness of 100 μm , as an example, its mark is as follows: A2-60/100 The meanings of each element in the mark are as follows: A -- type A shim; 2 -- unannealed; 60 -- The depth of the artificial groove is 60 μm ; 100 -- The thickness of the shim is 100 μm .

8.3.3 Taking the type C shim product that complies with GB/T 23907, has been annealed, has an artificial groove depth of 8 μm , and a shim thickness of 50 μm , as an example, its mark is as follows: C1-8/

50 The meanings of each element in the mark are as follows: C -- type C shim; 1 -- annealed; 8 -- The depth of the artificial groove is 8 μm ; 50 -- The thickness of the shim is 50 μm .

9 Marks and labels

9.1 The mark or label of the shim shall at least include the following content:

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

9.2 The mark or label shall appear on the packaging.

10 Packaging, transportation, and storage

10.1 After anti-rust treatment, the shim should be packed in a hard box to prevent rust and damage to the shim.

10.2 The manufacturer shall indicate transportation and storage requirements on the