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

**GB/T 32288-2020**

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**Electrical steel cores for power transformers**

电力变压器用电工钢铁心

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### 1 Scope

China's national standard for the electrical steel cores of power transformers, and the current edition of GB/T 32288, replacing the 2015 edition. It specifies the ordering content, the model designation, the technical requirements, the test methods, the inspection rules, and the marking, packaging, transport and storage of these cores, with a normative annex giving the test method for the geometric characteristics of the core. It applies to laminated electrical steel cores for power transformers. The core is the part of a transformer that does the work: the magnetic circuit through which the flux passes from the primary winding to the secondary. It is built from thin laminations of grain-oriented electrical steel, insulated from one another, cut to shape and stacked with mitred joints, and it is bought as a component by transformer manufacturers who do not cut and stack their own. What makes it worth a standard of its own is that a core's performance is not a property of the steel alone. The steel is bought to GB/T 2521.2 with a guaranteed loss figure, and the core built from it always performs worse - the difference, known in the industry as the building factor, comes from the cutting, the burr at the cut edge, the joint geometry, the stacking and the clamping. A core assembled carelessly from excellent steel is worse than a careful core from ordinary steel. So the requirements here are about no-load loss and no-load current measured on the assembled core, about interlaminar insulation, about the geometry, and about sound level - because a transformer's hum is magnetostriction in the core and is decided by the same factors. Issued on 2 June 2020 and in force since 1 December 2020.

This Standard specifies the model representation method, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of electrical steel cores for power transformers. This Standard applies to electrical steel laminated core

(hereinafter referred to as core) for power transformers.

## 2 Normative References

The following documents are essential to the application of this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 1094.1 Power Transformers - Part 1: General

GB/T 1094.10 Power Transformers - Part 10: Determination of Sound Levels

GB/T 2521.2 Cold-Rolled Electrical Steel Delivered in the Fully-Processed State - Part 2: Grain-Oriented Steel Strip (Sheet)

GB/T 6451 Specification and Technical Requirements for Oil-Immersed Power Transformers

GB/T 10228 Specification and Technical Requirements for Dry-Type Power Transformers

JB/T 3837 Identification Method of Transformers Product Type

## 3 Ordering Content

The contract or order for ordering according to this Standard shall at least include the following contents:

- a) Transformer model;
- b) The number of this Standard;
- c) Core assembly drawing and core lamination drawing;
- d) Frequency (Hz);
- e) Low voltage (V);
- f) Number of low-voltage turns (turns);
- g) Core no-load loss (W);
- h) Core no-load current (%);
- i) Delivery status;
- k) Quantity (set);
- l) Other requirements.

## 4 Model Representation Method

The model of the core follows the representation method of the power transformer model

specified in JB/T 3837.

## 5.1 Core insulation

5.1.1 Under the condition that the relative humidity of the air is lower than 85%, the insulation value of the core with a voltage level of 35kV and below shall meet the following requirements:

- a) Dry-type transformer  $\geq 5\text{M}\Omega$ ;
- b) Oil-immersed transformer  $\geq 1\text{M}\Omega$ .

5.1.2 Under the condition that the relative humidity of the air is lower than 85%, the insulation value of the core with a voltage level of 35kV above shall meet the following requirements:

- a) Core-to-ground insulation  $\geq 0.5\text{M}\Omega$ ;
- b) The insulation between the core oil channels is  $\geq 0.5\text{M}\Omega$ .

5.2 No-load loss, no-load current and sound level The no-load loss, no-load current and sound level of the core shall meet the technical Cut a 2m-long electrical steel sheet; place its edge flat against the reference edge of the measuring platform; and use a plug gauge to measure the maximum distance between the edge of the electrical steel sheet and the reference edge.

6.3.4 Roughness Firstly, cut a section of 2m-long strip material with waves; and place it freely on the measuring platform. Use a plug gauge to measure the value  $h$  value; use a steel ruler to measure the  $L$  value; and calculate the roughness  $\lambda$  according to Formula (1). Where:  $\lambda$  - roughness;  $h$  - maximum height of the rough area, in mm;  $L$  - maximum length of the rough area, in mm.

6.3.5 Burr Use a micrometer to measure the burr value at any three points on the same shearing surface of the electrical steel sheet; and take the average value.

6.3.6 Residual curvature The residual curvature of electrical steel sheet shall comply with the provisions of GB/T 2521.2.

6.3.7 White edge The white edge of the fixed-length electrical steel strip (sheet) shall be observed by a 20 times magnifying glass with a scale; and the width of the white edge shall be measured.

6.3.8 Metal hair Visually measure the edge of the longitudinal shearing to check whether there are tiny hair-like metal strips at the cut.

## 6.4 Transverse shearing

6.4.1 Deviation The sheet length deviation, consistency deviation, angle deviation, hole

position deviation, aperture deviation, and V-notch deviation of the transverse shearing are measured by general measuring tools that meet the corresponding accuracy requirements.

6.4.2 Mechanical loss The mechanical loss of the transverse shearing shall be inspected visually.

6.5 Others Inspection methods for other items shall comply with the provisions in Tables 1, 2, and 3.

## 7 Inspection Rules

7.1 Each iron core should be inspected, the inspection items are 5.1, 5.2, 5.3, 5.5, and 5.4 according to the requirements of the order agreement.

7.2 The iron core shall pass the inspection according to this standard, and the quality certificate and quality inspection report shall be attached.

## 8 Marking, Packaging, Transportation and Storage

8.1 Marking The product marking shall have the following content:

- The name or trademark of the manufacturer;
- Transformer model;
- Core assembly drawing number and core lamination drawing number;
- product number;
- Inspection date, etc.

8.2 Packaging and transportation It shall be properly packaged according to the transportation requirements to ensure that the core shall not be deformed, loose, cracked, damaged on the end face, rusted or otherwise damaged during transportation.