JB

MACHINERY INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

K 41

JB/T 9646-1999

Replacing ZB K43 003-1988

Small dry-type transformers for control or lighting

控制或照明用小型干式变压器

Issued on: August 1, 1999 **Implemented on: January 1, 2000**

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Foreword

This Standard is an amendment of ZB K43 000-88 *Small dry-type transformers for control or lighting*.

This Standard was amended as follows:

1 This Standard was drafted in strict accordance with GB/T 1.1-1993.
2 The composition of the product model was amended, canceling the representation methods of standard codes and sequence numbers, complemented with the code of the environment for special use.
3 The normative references were validated in accordance with the current standards, with the content in the standard text amended accordingly.

This Standard shall replace ZB K43 003-88 as of the date of implementation.

This Standard was proposed by and shall be under the jurisdiction of the National Technical Committee for Standardization of Transformers.

Drafting organizations of this Standard: Shenyang Transformer Research Institute, Harbin Explosion-proof Electric Apparatus Factory.

Drafters of this Standard: Lin Ran, Zhang Hongbin, Wang Zhaoping, Xu Jingyi.

This Standard was first formulated in 1988; first amended in 1998.

Small dry-type transformers for control or lighting

1 Scope

This Standard specifies the product classification, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of small dry-type transformers for control or lighting.

This Standard **is applicable to** the air self-cooling, fixed or mobile, built-in or other types of, single-phase or multi-phase small dry-type transformers for control or lighting (hereinafter referred to as **transformers**), with a rated supply voltage of not exceeding 1 000V, a rated frequency of 50Hz and an unlimited rated output capacity. For isolation transformers or electric power transformers, unless otherwise specified, this Standard shall also be used in reference.

This Standard **is not applicable to** the mining flameproof dry-type transformers, liquid dielectric transformers and powdered material transformers.

2 Normative references

The provisions in the following standards become the provisions of this Standard through reference in this Standard. At the time of publication of this Standard, the editions shown are valid. All standards will be amended and the parties using this Standard shall explore the possibility of using the latest editions of the following standards.

GB 1094.1-1996 *Power transformers - Part 1: General (eqv IEC 600 76-1:1993)*

GB/T 2423.16-1990 *Basic environmental testing procedures for electric and electronic products - Test J: Mould growth*

GB/T 2423.17-1993 *Basic environmental testing procedures for electric and electronic products - Test Ka: Salt mist*

GB/T 2828-1987 *Sampling procedures and tables for lot-by-lot inspection by attributes*

GB/T 2900.1-1992 *Electrotechnical terminology - Fundamental terms*

GB/T 2900.15-1997 *Electrotechnical terminology - Transformer, instrument transformer, voltage regulator and reactor [neq IEC 600 50(421):1990, IEC 600 50(321):1986]*

3.15 Double insulation

Basic insulation and additional insulation are available at the same time.

3.16 Reinforced insulation

Insulation system on a live part, whose degree of protection against electric shock is equivalent to double insulation.

The insulation system is an insulation consisting of one or more materials, which may be composed of several layers of material, and cannot be individually tested for insulation, as is the case with basic insulation or additional insulation.

3.17 Mobile transformer

A transformer that is able to be moved during operation, or moved from one place to another easily when connected to a power source.

3.18 Fixed transformer

A transformer that is permanently installed in operation, which is not easily moved from one place to another.

3.19 Housing

The protective body of the transformer is called housing, including all accessible metal parts such as axles, handles, knobs, operating levers, metal fastening screws, metal foils affixed to the surface of insulating materials, and other similar structural members, but not including inaccessible metal parts.

3.20 Rated ambient temperature

Under normal operating conditions, the maximum ambient temperature, code-named t_a, at which a transformer is able to run continuously.

Specified rated ambient temperature does not rule out the condition that a transformer is able to make short-term operation at an ambient temperature not exceeding t_a + 10°C.

3.21 Electric clearance

The minimum air gap between exposed live parts, or between an exposed live part and other metal parts.

3.22 Creepage distance

c) Insulation that meets the requirements must be used for separation between the input windings and the output windings; MAKE sure that there is no electrical connection between them on the insulation structure.

5.6.2 Short-circuit and overload protection

During normal operation, protective devices (such as fuses, thermal releases, etc.) may be provided to ensure the safety of the transformer in the event of a short circuit or overload. Such devices shall be able to function reliably under the specified capacity limits.

5.6.3 Structure

a) The transformer structure must meet all the specified requirements of mechanical strength and electromagnetic properties, etc., and shall meet the specified requirements for heat resistance, moisture resistance and water resistance;
b) Flammable materials (such as celluloid, etc.) are not allowed to be used as the structural materials of the transformer;
c) In the transformer structure, the fastener connection and the connection between terminals and wires in use shall take reliable measures to prevent loosening;
d) In addition to those with special requirements, the lighting transformer shall be equipped with a protective housing; the protective housing is optional for the control transformer.

Unless otherwise specified (e.g. lighting transformers for machine tools), IP11 level specified in GB 4208 shall apply to the protective housing.

5.6.4 Components

a) In addition to the relevant articles in this Standard, transformer components such as switches, plug fuses, flexible wires, flexible cables and similar components shall also comply with the requirements of the corresponding standards.

   In general, the long-term operating current of fuses shall be 1.1 times the rated current.

b) Thermal releases, overload releasers and other protective devices shall have sufficient breaking capacity.

   The thermal releases, which use the soldering method for positioning, shall not be used for overload protection.

   Overload protective devices shall not make actions when the power is switched on.

specified in Table 11, inspections shall be carried out according to the requirements of the standards related to the complete set.

6 Test methods

6.1 General test requirements

6.1.1 The test shall be generally carried out at room temperature.

6.1.2 The AC voltage applied during the test shall be an approximate sinusoidal waveform.

6.1.3 In the event that the transformer under test is able to function at more than one rated supply voltage, unless otherwise specified, a supply voltage that enables the test object to be subjected to the harshest conditions shall be selected for the test.

6.1.4 Whenever possible, USE instrumentation that has no significant effect on the measured value. Where necessary, the effects shall be corrected.

During the measurement of no-load loss, if the measured value is not greater than the standard value, it will be unnecessary to use a mean voltmeter for correction. Otherwise, correction shall be performed according to 10.5 in GB 1094.1-1996.

The measured values of load loss and short-circuit impedance shall be corrected to the reference temperature (SEE Table 1 in 3.11). In the measured values, care shall be taken to deduct the line loss, instrument loss and pressure drop.

6.1.5 Unless otherwise specified, the test shall be carried out in the order specified in the inspection rules.

6.2 No-load output voltage measurement

APPLY rated supply voltage to the input end of the transformer. MEASURE the output voltage value. During measurement, USE a voltmeter at Level 0.5.

The measurement results shall not exceed the requirements of 5.3.6.

6.3 Insulation resistance measurement

USE a 500V DC voltage megger for insulation resistance measurement. READ the value after at least 1-minute application. When possible, USE an insulation resistance tester for measurement.

6.9.4 After treated in accordance with 6.9.1, the anti-corrosion ability specified in Item b) of 5.5.2 shall be determined according to the requirements of Item b) in 5.5.2.

6.10 Corrosion resistance test of iron parts

The requirements of Item a) in 5.5.2 shall be inspected by the following test.

IMMERSE the specimen in trichloroethane for 10min. CLEAR the grease on its surface. Then, IMMERSE the specimen in 10% ammonium chloride aqueous solution at a temperature of (20 ± 5) °C for 10min. TAKE it out and SHAKE off the solution drops. Drying is not required. PUT the specimen in a cabinet at a temperature of (20 ± 5) °C with saturated air temperature for 10min. REMOVE it into a heating cabinet. DRY at a temperature of (100 ± 5) °C for 10min.

REMOVE for checking. In case of no rust on the specimen surface, it can be considered to meet the requirements.

6.11 Special test requirements

In general, the transformers, except for the ones with special requirements, shall not be conducted with the mould-growth test and the salt mist test. If required, the mould-growth test shall be carried out in accordance with GB/T 2423.16 for 28d. The mould-growth grade shall be of Grade II at most. The salt mist test shall be carried out in accordance with the requirements of GB/T 2423.17 for 16h. There shall be no corrosion.

6.12 Grounding connectivity test

USE a multimeter at level Ω × 1 to carry out the conduction test between the transformer's iron core and the grounding device, and between the housing and the grounding device.

Good conduction (that is, the pointer points to zero position) indicates the conformity with the requirements.

7 Inspection rules

7.1 Inspection classification

The product inspection is classified into routine inspection and type inspection.

7.2 Routine inspections

Normally, a normal inspection sampling scheme shall be adopted. AQL is taken as 2.5, according to the general inspection level II specified in GB/T 2828.

7.3.4 Decision rules

The transformers designed and manufactured may be regarded as conforming to the requirements of this Standard only if all the items of the type inspection (including the exit-factory inspection) are qualified.

7.3.5 Under one of the following circumstances, the type inspection shall be carried out:

a) in the case of trial production and finalization inspection for new products or old products when transferring plant for production;
b) after normal production, if there are any major changes in structure, materials or techniques, which might affect the product performance;
c) during normal production, the inspection shall be carried out periodically every three years;
d) when the production resumes after long-term halt in production;
e) when there are major differences between the exit-factory inspection results and the last type inspection results;
f) when the national quality supervision agency requires the type inspection.

8 Marking, packaging, transportation and storage

8.1 Marking

8.1.1 Basic requirements

Marking content shall be easy to understand. Wording shall be refined. Patterns shall be eye-catching and clear, easy to identify and meet the requirements of relevant standards. Marking must be durable and placed in an obvious position on the product.

8.1.2 Product nameplate and sign

Each transformer shall be provided with a nameplate and indicated with:

a) name, model, serial number, year of manufacture and standard code of the product;
b) number of phases and connection series number (in accordance with GB 1094.1), which are not compulsory for single-phase transformers;
c) rated frequency, Hz;
d) rated output capacity, VA;
e) rated supply voltage and rated output voltage, V;
f) manufacturer’s name and trademark;

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