

JIS

JAPANESE INDUSTRIAL STANDARD

**Testing methods of power
transformers for
electronic equipment**

JIS C 5311—1994

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Testing methods of power transformers
for electronic equipment

C 5311-1994

1. Scope This Japanese Industrial Standard specifies testing methods of single phase power transformers of frequency 50 Hz or 60 Hz, rated output not more than 1 kVA, mainly used for electronic equipment (hereafter referred to as "transformers").

Remarks 1. The following standards are cited in this Standard:

JIS B 0252 Limit gauges for metric fine screw threads

JIS B 7502 Micrometer callipers for external measurement

JIS B 7507 Vernier, dial and digital callipers

JIS B 7516 Metal rules

JIS C 0010 Environmental testing Part 1: General and guidance (IEC 68-1:1988)

JIS C 0040 Basic environmental testing procedures Part 2: Tests, Test Fc and guidance: Vibration (sinusoidal)

JIS C 1303 High insulation resistance meters

JIS C 5310 General rules of power transformers for electronic equipment

2. The International standard corresponding to this Standard is given below.

IEC 1007 (1990) Transformers and inductors for use in electronic and telecommunication equipment—Measuring methods and test procedures

2. Definitions For the purpose of this Standard, the definitions given in JIS C 0010 and JIS C 5310 apply.

3. Condition for test

3.1 Standard conditions Unless otherwise specified, the test and measurement shall be carried out under the standard conditions (temperature 15°C to 35°C, relative humidity 25 % to 85 % and air pressure 86 kPa to 106 kPa), specified in 5.3.1 of JIS C 0010. However, in case of doubt about decision based on this standard conditions or when required specially, the test conditions shall be as specified in 3.3 given below.

3.2 Reference conditions The reference conditions shall be the reference condition (temperature 20°C, relative humidity 65 % and air pressure 101.3 kPa) specified in 5.1 of JIS C 0010. However, unless doubt arises on the decision, only the temperature may be employed as the reference condition.

3.3 Referee conditions The referee conditions shall be the referee condition, i.e. temperature $20 \pm 2^\circ\text{C}$, relative humidity 60 % to 70 % and air pressure 86 kPa to 106 kPa specified in 5.2 of JIS C 0010.

4. Testing apparatus and equipment

4.1 A.C. power source The a.c. power source shall be of low internal impedance, and be able to supply nearly sinusoidal a.c. voltage at low power factor.

4.2 D.C. power source The d.c. power source shall have sufficiently small ripple voltage compared with the test voltage.

5. Tests for appearance, construction and dimensions

5.1 Appearance and construction Tests for appearance and construction shall be carried out visually.

5.2 Marking Test for marking shall be carried out visually.

5.3 Dimensions Test for dimensions shall be carried out using the metal rule of Class 2 or better specified in JIS B 7516, the vernier callipers specified in JIS B 7507 or the micrometer callipers for external measurement specified in JIS B 7502, and for the dimensions of screw, using the gauges specified in JIS B 7502 and JIS B 0252. However, other measuring instruments may be used unless doubt arises on the decision.

6. Electrical performance tests

6.1 Insulation resistance test

6.1.1 Equipment The equipment shall be the high insulation resistance meter specified in JIS C 1303. However, other equipments may be used unless doubt arises on the decision.

6.1.2 Preparation Whole terminals or lead wires belonging to the same winding of the transformer under test shall be short-circuited, and the electrostatic shielding shall be connected to the iron core or case.

6.1.3 Test method Apply the test voltage (d.c.) specified in the detail specification between windings to be tested and also between winding and iron core or case, keep the voltage for 1 min, and then measure the insulation resistance with the voltage being applied. If the reading of the meter stabilizes or tends to rise more, in the range exceeding the specified insulation resistance within the specified time, the judgement may be made based on such phenomena.

6.1.4 Items to be specified in detail specification In detail specifications, the following items shall be specified:

- (1) Measuring point (refer to 6.1.3)
- (2) Test voltage (refer to 6.1.3)
- (3) Duration of application (if necessary) (refer to 6.1.3)
- (4) Relative humidity of test place (if necessary)

6.2 Dielectric withstand voltage test

6.2.1 Equipment The equipment shall have sufficient performances to carry out the test of 6.2.3.

The power source shall comply with 4.1.

6.2.2 Preparation Whole terminals or lead wires belonging to the same winding of the transformer under test shall be short-circuited, and the electrostatic shielding shall be connected to the iron core or case and be grounded.

6.2.3 Test method Apply the specified voltage of the specified frequency between windings to be tested and also between winding and iron core or case, unless otherwise specified, for 1 min, and then examine for the existence of abnormality such as dielectric breakdown, flashover, electric arc.

For the voltage application, raise the voltage from nearly 0 V up to the specified test voltage at a rate of not more than 500 V (effective value)/s, keep it for 1 min, and then lower it gradually down to nearly 0 V.

6.2.4 Items to be specified in detail specification In detail specifications, the following items shall be specified:

- (1) Measuring point (refer to 6.2.3)
- (2) Test frequency (refer to 6.2.3)
- (3) Method of test voltage application (if necessary) (refer to 6.2.3)
- (4) Test voltage (refer to 6.2.3)
- (5) Breaking current (if necessary)
- (6) Duration of application (if necessary) (refer to 6.2.3)

6.3 Layer withstand voltage test

6.3.1 Equipment The equipment shall have sufficient performances to carry out the test of 6.3.3.

The power source shall comply with 4.1.

The measuring instruments which can measure the voltage and current at the specified frequency, shall be able to detect sudden change of the input current.

It is recommended to provide a device to protect the test equipment and transformer at short circuit.

6.3.2 Preparation Whole windings other than specified, shall be opened, the terminals to be grounded at the time of use shall be connected to the iron core or case.

6.3.3 Test method Apply a voltage equal to twice the rated input voltage with a specified frequency (f) of not less than twice the rated frequency (F) for $120 \times \frac{F}{f}$ s, to the specified winding and examine for the existence of abnormality.

The test duration shall be 60 s at the longest and 15 s at the shortest. As for the voltage application, raise the voltage from nearly 0 V up to the test voltage at a rate of not more than 500 V (effective value)/s, keep it for the specified time, and then lower it gradually down to nearly 0 V.

6.3.4 Items to be specified in detail specification In detail specifications, the following items shall be specified:

- (1) Measuring point (refer to 6.3.3)
- (2) Test frequency (refer to 6.3.3)
- (3) Method of test voltage application (refer to 6.3.3)
- (4) Test voltage (refer to 6.3.3)
- (5) Breaking current