



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

GB/T 5591.2-2017

**Combined flexible materials for electrical insulation -- Part 2:
Methods of test**

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1 Scope

This Part of GB/T 5591 specifies the requirements for test methods of combined flexible materials for electrical insulation.

This Part is applicable to the performance test of combined flexible materials for electrical insulation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 451.2-2002, Paper and board - Determination of grammage (eqv ISO 536.1995)

GB/T 11026.4-2012, Electrical insulating materials - Thermal endurance properties - Part 4. Ageing ovens - Single-chamber ovens (IEC 60216-41.2006, IDT)

GB/T 1408.1-2006, Electrical strength of insulating materials - Test methods - Part 1. Tests at power frequencies (IEC 60243-1.1998, IDT)

3 General requirements for test

Unless otherwise specified, specimens taken shall be processed at 23°C +/- 2°C and relative humidity 50% +/- 5% for 24 h. If the test is not carried out under the standard atmospheric conditions, the test shall be carried out within 5 min after the specimen is removed from the standard atmosphere.

4.1 Test apparatus

4.1.1 Spiral micrometer. the measuring surface diameter is 6mm~8mm; the individual material specification, the stretching speed shall be 100 mm/min, and the load shall be applied until one of the specimen components breaks. Record breaking load. If required, record elongation.

If the specimen is broken in the collet or at the collet of the testing machine, the result shall be invalidated and another specimen is used for testing.

When determining the tensile strength of the joint, the joint shall be placed approximately midway between the two collets of the testing machine.

NOTE. For some materials, special measures may be taken to prevent the specimen from slipping.

6.4 Test procedures for folding specimens Hand-fold the specimen halfway along the middle of its length. The crease is at right angles to the long side of the specimen. Then, the long side of the specimen is placed close to the guiding block of the folding device shown in Figure 1 and the specimen is fed into the drum along the length of the specimen.

Folding as above is the first step in the tensile test. After folding all 5 specimens, visually inspect the specimen for delamination or other effects caused by folding. If the specimen is damaged, it shall be recorded in the report and replaced with a new specimen. If the 5 specimens are delaminated after folding, the tensile test cannot be performed, and it shall be indicated in the report.

After the specimen is unfolded, test it according to the provisions of 6.3.

6.5 Results Tensile strength. calculate the tensile strength of the material by taking the median of the five fracture loads as the test result, in N/10mm width.

Elongation at break. take the median of the elongation at break as the test result. The test results are expressed as a percentage of the length of the specimen between the two clamps.

7 Layering Before performing the tensile test, visually determine whether the specimen folded according to 6.4 has delamination or other influence.

8 Edge tear resistance

8.1 Equipment The initial load of the test shall be as slowly as possible to increase the load applied to the specimen in order to minimize the abnormal deformation caused by inertia. Continue to increase the load, so that tearing starts in 5s~15s, in N, record this load.

8.4 Results Report the median of the material in both directions, in N. And record the thickness of the beam used, the loading rate and the width and thickness of the specimen.

9 Effect by heat A specimen with an area of approximately 100 cm² shall be subjected to a heat effect of 10min~11min at a temperature agreed by the supplier or the purchaser or at a temperature specified by the individual material specifications. In case of dispute, an oven that meets the requirements of GB/T 11026.4-2012 shall be used. When there are bubbles, delamination or other adverse effects, it shall indicate that the specimen has been destroyed.

10 Stiffness

10.1 Equipment The equipment shown in Figures 3 and 4 consists of the following parts.

a) A smooth stainless steel support platform with a center groove of 5mm +/- 0.05mm wide. The two upper edges on the support platform adjoining the central slot are rounded to a radius of 0.5 mm +/- 0.05 mm. The surface of the support platform and the center groove rounded edge shall be smooth (center line average is 0.25um~1.0um).

NOTE. Since the smoothness has no major influence on the test results, it is not necessary to specify a tolerance smaller than the above.

b) A flat metal pressure beam. The installation method is such that it can be inserted symmetrically into the center groove of the support platform and mechanically controlled to insert at a speed of 25 mm/min ~ 50 mm/min. The pressure beam has a thickness of 2 mm +/- 0.05 mm and an insertion depth of not less than 10 mm. Its length is longer than the maximum length of the specimen. The insertion end shall be inverted into a semicircular section.

Test experience has shown that if the thickness of the material to be tested does not change very much, and if the measured stiffness value is corrected based on the cubic theoretical relationship, satisfactory repeatability and reproducibility can be obtained.

11 Breakdown voltage

11.1 General Test according to GB/T 1408.1-2006.

11.2 Equipment

11.2.1 General requirements for test equipment The test equipment shall meet the requirements of GB/T 1408.1-2006.

11.2.2 Electrodes For sheet materials, dia. 25mm/dia. 75mm electrodes shall be used according to the provisions of GB/T 1408.1-2006. For the slitting material (belt), the dia.

6mm electrodes shall be used according to the provisions of GB/T 1408.1-2006.

The electrode surfaces shall be parallel to each other without pits or other defects.

11.2.3 Folding devices See Figure 5 and Figure 6.

11.3 Specimen and number of tests For sheet materials, the specimen size shall be at least 250mm x 250mm. The specimen size shall be sufficient to accommodate the electrode placement to avoid flashover.

For specimens with a thickness of 0.5 mm or less, the test shall be carried out without folding and after folding. On the same specimen, do 5 tests along the longitudinal fold line, 5 tests along the transverse fold line, and 5 tests in the unfolded area. For specimens with a thickness of 0.5mm or more, only 5 times of unfolding tests shall be performed. For slitting materials (belts), the specimen shall be 450 mm long and 25 mm wide. Test 5 times and one the same specimen.

NOTE. When the test material width is less than 25mm, the electrode can be placed properly to avoid flashover.