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

GB/T 5169.12-2013

Replacing GB/T 5169.12-2006

**Fire hazard testing for electric and electronic products - Part 12:
Glowing/hot-wire based test methods - Glow-wire flammability
index (GWFI) test method for materials**

电工电子产品着火危险试验 第12部分：灼热丝/热丝基本试验方法 材料的灼热丝
可燃性指数(GWFI)试验方法

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1 Scope

This part of GB/T 5169 details the glow-wire test method by which the glow-wire

flammability index is determined on specimens of solid electrical insulating material or of other solid materials.

The test method is a material test carried out on a series of standardised specimens. The data obtained from it, together with the data obtained from the glow-wire ignition temperature test method of IEC 60695-2-13, are used in the preselection procedure of GB/T 5169.9-2013 to judge whether a material meets the requirements of GB/T 5169.11-2006.

A note adds that, as a result of carrying out a fire hazard assessment, a suitable series of flammability and ignitability preselection tests can reduce the number of tests on finished products.

3 Terms and definitions

The terms and definitions given in ISO/IEC 13943:2008 apply to this document; for convenience, some of them are reproduced in the text.

3.1 combustion: an exothermic reaction of a substance with an oxidant. A note adds that combustion usually gives off combustion effluent and is accompanied by flame or by glowing, or both.

3.3 flammability: the ability of a material or product to burn with a flame under specified conditions.

3.5 glowing combustion: combustion of a solid material without flame but giving off light, in the combustion zone.

3.8 molten drip: drips produced when a material softens or liquefies under heat. A note adds that the drips may be burning with a flame or without one.

3.9 preselection: the procedure of assessing and selecting candidate materials, components or assemblies for the manufacture of a finished product.

3.10 glow-wire flammability index, GWFI: the highest temperature of the material under test, measured by this standardised test method, at which the material does not ignite, or, if it does ignite, is extinguished within 30 s after the glow-wire is removed and is not completely burnt away, and at which any molten drips do not ignite the wrapping tissue paper.

4.1 Preparation of the test specimens

The specimens shall be made by a suitable ISO method, such as injection moulding to the ISO 294 series, compression moulding to GB/T 9352-2008 or GB/T 5471-2008, or die casting to the shape required. If those methods cannot be used, the specimens shall be cut from a representative sample of the material, for example from material made by the same manufacturing process as the moulded product part.

Once made or cut, the cut edges and cut faces shall be ground flat and smooth with fine abrasive paper, and all dust and particles shall be carefully removed from the surface.

4.2 Dimensions of the test specimens

The flat part of the specimen shall be at least 60 mm long and 60 mm wide, measured inside the clamp, and all thicknesses to be considered shall be provided. The preferred thickness values are 0.1 mm plus or minus 0.02 mm, 0.2 mm plus or minus 0.02 mm, 0.4 mm plus or minus 0.05 mm, 0.75 mm plus or minus 0.10 mm, 1.5 mm plus or minus 0.15 mm, 3.0 mm plus or minus 0.2 mm and 6.0 mm plus or minus 0.4 mm.

A note states that fifteen specimens of each thickness are usually enough to determine both the glow-wire ignition temperature of IEC 60695-2-13 and the glow-wire flammability index.

4.3 Formulation test range

4.3.1 For specimens differing in colour, thickness, density, molecular weight, type or direction of anisotropy, or containing different additives, fillers or reinforcements, the test results may differ. Where the parties concerned agree, the test procedures outlined in 4.3.2 and 4.3.3 may be used to assess those differences.

4.3.2 Specimens covering all the combinations of the minimum and maximum values of density, melt flow and filler or reinforcement content may be provided; if their test results give the same glow-wire flammability index, that range is regarded as representative. If the test results of all the specimens in the representative range do not give the same index, the assessment shall be limited to materials whose density, melt flow and filler or reinforcement content are the values tested. In addition, in order to settle the range that each index value represents, specimens with intermediate values of density, melt flow and filler or reinforcement content shall be tested. However, the material with the least favourable performance among certain specific values of density, melt flow and filler or reinforcement content may also be taken as representative of the intermediate value, and no additional test is then needed.

4.3.3 When full colour specimens are assessed, the following specimens are regarded as representative over the colour range if the test results give the same glow-wire flammability index: specimens without colourant; specimens with the highest content of organic pigment, colourant, dye or carbon black; specimens with the highest content of inorganic pigment; and specimens containing pigment, colourant or dye known to have an adverse effect on the burning behaviour.

5 Apparatus

The description of the test apparatus is given in clause 5 of GB/T 5169.10-2006.

The tissue paper and the wooden board placed under the specimen shall comply with 5.3 of GB/T 5169.10-2006.

6 Calibration of the temperature measuring system

The method of calibrating the temperature measuring system is given in 6.2 of GB/T 5169.10-2006.

7 Conditioning and test conditions

7.1 The specimens shall be conditioned for at least 48 h in an atmosphere at a temperature of 23 °C plus or minus 2 °C and a relative humidity of 40 % to 60 %. Once taken out of the conditioning atmosphere, they shall be tested within 4 h. Reference is made to clause 6 and Table 2, class 2, of ISO 291:2008.

7.2 The tissue paper and the wooden board placed under the specimen shall comply with 5.3 of GB/T 5169.10-2006. They shall be conditioned for at least 48 h in an atmosphere at a temperature of 23 °C plus or minus 2 °C and a relative humidity of 40 % to 60 %, and once taken out of the conditioning atmosphere they shall be used within 1 h. Reference is made to clause 6 and Table 2, class 2, of ISO 291:2008.

7.3 The test shall be carried out in a laboratory atmosphere at a temperature of 25 °C plus or minus 10 °C and a relative humidity of 45 % to 75 %.

8 Test procedure

8.1 The specimens shall be identified and examined visually. The basic test procedure is given in clause 8 of GB/T 5169.10-2006.

8.2 The glow-wire shall be heated to the test starting temperature of Table 1 judged to be just able to cause ignition. Where the temperature able to cause ignition is uncertain, the test starting temperature shall not exceed 650 °C. A note states that when both the glow-wire ignition temperature and the glow-wire flammability index are to be determined, it is advantageous to carry out the IEC 60695-2-13 procedure first, and that once the glow-wire ignition temperature has been measured that temperature should be used as the test starting temperature of the present test.

Table 1 has two rows and nine value columns. The test starting temperatures in degrees Celsius are 550, 600, 650, 700, 750, 800, 850, 900 and 960; the tolerance in kelvin is plus or minus 10 for the first five temperatures and plus or minus 15 for the last four.

8.3 At each test temperature a set of three specimens shall be tested. If one of the three specimens fails the test criteria of 10.1, the test shall be repeated on three new specimens and the test temperature should then be lowered by 50 K, or by 60 K in the case of 960 °C. If all three specimens pass the test criteria of 10.1, the test shall likewise be repeated on