



Plastics — Determination of flammability characteristics of rigid plastics in the form of small specimens in contact with an incandescent rod

Plastiques — Détermination des caractéristiques d'inflammabilité de plastiques rigides sous forme de petites éprouvettes au contact d'un barreau incandescent

First edition — 1981-12-15

ITeH STANDARD PREVIEW
(standards.iteh.ai)

ISO 181:1981

<https://standards.iteh.ai/catalog/standards/sist/17d757cc-c379-4fa4-a271-abf53317c313/iso-181-1981>



UDC 678.5/.8-40 : 678.01 : 536.495

Ref. No. ISO 181-1981 (E)

Descriptors : plastics, electrical insulating materials, rigid plastics, tests, fire tests, flammability testing, test equipment.

Price based on 4 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 181 was developed by Technical Committee ISO/TC 61, *Plastics*, and was circulated to the member bodies in May 1977.

It has been approved by the member bodies of the following countries :

Australia	Israel	South Africa, Rep. of
Austria	Italy	Spain
Belgium	Japan	Sweden
Bulgaria	Korea, Rep. of	Switzerland
Canada	Mexico	Turkey
Czechoslovakia	Netherlands	United Kingdom
Egypt, Arab Rep. of	New Zealand	USA
France	Peru	USSR
Germany, F. R.	Poland	Yugoslavia
Hungary	Portugal	
Iran	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

Ireland

This International Standard cancels and replaces ISO Recommendation R 181-1961, of which it constitutes a technical revision.

Plastics — Determination of flammability characteristics of rigid plastics in the form of small specimens in contact with an incandescent rod

1 Scope and field of application

This International Standard specifies a method for determining the relative flammability characteristics of small specimens of rigid plastics when brought into contact with an incandescent rod.

2 References

ISO 293, *Plastics — Recommended practice for compression moulding test specimens of thermoplastic materials*.¹⁾

ISO 294, *Plastics — Injection moulding test specimens of thermoplastic materials*.

ISO 295, *Plastics — Compression moulding test specimens of thermosetting materials*.

ISO 2818, *Plastics — Preparation of test specimens by machining*.

3 Principle

Supporting of a test specimen horizontally by one end. Assessment of the flammability characteristics of the test specimen after bringing its free end into contact, for a specified period of time, with a silicon carbide rod electrically heated to a temperature of 955 ± 15 °C.

4 Significance of the test

IMPORTANT — This method must not be used to assess potential fire hazards in use.

Tests made on materials under the conditions described in this International Standard can be of considerable value in comparing the flammability characteristics of various materials under the precise conditions of the test, in checking manufacturing processes, or as a measure of the deterioration or change in flammability prior to or during use. The test is designed for

quality control and product evaluation and must not be regarded as significant for the behaviour of materials under conditions other than those specified in the test; in particular, it is not predictive of behaviour in real fire situations.

5 Apparatus

5.1 Test chamber, draught-free, with a capacity of approximately 1 m³, and permitting observations. For safety and convenience, it is desirable that this enclosure (which can be completely closed) be fitted with a device, such as an exhaust fan, to remove products of combustion which may be toxic. However, it is important to note that the device must be turned off during the actual test and started again immediately after the test to remove the products of combustion.

5.2 Test unit (see the figure), comprising the following items.

5.2.1 Clamp (A), to fix the test specimen (B), as shown in the figure (section X-X), mounted on top of an upright holder (C), provided with a sliding base (D), so that specimens of different lengths can be tested.

5.2.2 Igniting source : a bar consisting of a silicon carbide rod (E) of diameter 8 mm with a usable length of about 100 mm and metallized contact ends.

The rod shall be capable of being heated to a temperature of 955 ± 15 °C by alternating current or by direct current using, respectively, a regulating transformer or a rheostat. A suitable voltmeter and ammeter or wattmeter shall be used to adjust the electrical output to about 350 W.

5.2.3 Insulated (ceramic or asbestos material) **holder** (F) in which the silicon carbide rod (E) is mounted, arranged to rotate about a horizontal axis in two bearings (G), fixed on the base plate (H). By this means the silicon carbide rod may be removed completely away from the test specimen (B), when necessary. The dimensions of the base plate (H) are approximately 275 mm × 250 mm.

1) At present at the stage of draft. (Revision of ISO 293-1974.)

5.2.4 Counterweight (I), dimensioned so that the incandescent rod (E) exerts a force of about 0,3 N on contacting the test specimen (B).

5.2.5 Stop screw (J), placed by means of the pivoting plate (K) so as to permit the incandescent rod (E) to remain in contact with the test specimen (B) until about 5 mm of the latter has been burnt away.

5.2.6 Pivoting metal rod (M), of diameter 8 mm and length 150 mm, to locate, before the test, the front end of the clamped specimen in a flatwise position as shown in the figure (section X-X). This rod shall be capable of being rotated into the exact position occupied by the incandescent rod during the test.

5.3 Means of checking the temperature of the incandescent rod.

5.4 Stop-watch.

6 Test specimens

Five test specimens, of length 120 to 130 mm, width $10 \pm 0,2$ mm, and thickness $4 \pm 0,2$ mm shall be tested. Each specimen shall be marked by a line perpendicular to the longitudinal axis of the bar, 95 mm from the end which is to be burnt. The line can be engraved into the surface of the test specimen. Test specimens can be moulded by compression, transfer, injection or casting processes, or machined from moulded articles, plates, tubes or rods in accordance with the relevant methods described in ISO 293, ISO 294, ISO 295 and ISO 2818.

Unless otherwise specified or agreed upon by the interested parties, specimens shall be tested in the "as received" condition.

7 Procedure

7.1 Adjustment of the test unit

Tilt the holder (F) with the rod (E) down and away from its normal position to permit the metal rod (M) to be turned into the position to be occupied by the incandescent rod during the test. Set up the specimen so that the distance between the clamp (A) and the line on the test specimen (see clause 6) is approximately 10 mm. Adjust the clamp (A) and the upright holder (C) to locate the front end of the specimen in contact with the metal rod (M).

7.2 Ignition

Heat the rod (E) to a temperature of 955 ± 15 °C in its tilted-down position. When the temperature reaches the correct value and remains constant (i.e. when the readings of the ammeter or the wattmeter become constant), turn the metal rod (M) back to its original position, and tilt the holder (F) up so that the incandescent rod comes into contact with the front

end of the specimen. After 3 min, remove the incandescent rod from the specimen by rotating the support (F). Determine the burning time, t , in seconds, using the stop-watch (5.4), starting with the first appearance of flames and ending with the disappearance of flames or when they reach the 95 mm mark.

7.3 Termination of test

7.3.1 If no flame is visible on the specimen, terminate the test 30 s after the incandescent rod has been removed.

7.3.2 If a specimen stops burning before the flame front reaches the line (95 mm from the end to be burnt), terminate the test, but not until 30 s after the incandescent rod has been removed.

7.3.3 If the flame reaches the line, terminate the test and extinguish the flame.

7.4 Additional measurements

After the test is terminated, measure the smallest undestroyed distance between the line and the nearest destroyed area on all surfaces of the specimen. Record the smallest of these measurements of undestroyed length, p , in millimetres.

The undestroyed length shall be taken as the distance from the line to the nearest evidence of damage to the test specimen due to flame impingement, including areas of complete or partial consumption, charring or embrittlement, but not including areas sooted, stained, warped or discoloured, nor (where this can be assessed with confidence) where the material has shrunk or melted away from the heat source.

8 Expression of results

Calculate

- the average burning time, t , in seconds, of the five test specimens;
- the average destroyed length, L , in millimetres, of the five test specimens.

For an individual specimen,

$$L = 95 - p$$

9 Test report

9.1 The test report shall contain the following particulars :

- a) reference to this International Standard;
- b) full identification of the product tested : type, source and manufacturer's number and code;
- c) description of the preparation of the test specimen and, if applicable, conditioning of the test specimens;

- d) the average burning time, t , in seconds;
- e) the average destroyed length, L , in millimetres;
- f) any special observations made during the test (how specimens ignited, smoke formation and colour, whether there was melting without burning, glowing, falling burning particles, or sagging or buckling of the burning section, any unusual behaviour of the test specimens, etc.).

9.2 The test report shall also include the following statement :

“IMPORTANT — These test results relate only to the behaviour of test specimens under the particular conditions of the test; they are not intended, and must not be used, as a means of assessing the potential fire hazards of the material in use.”

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Figure – Test unit