

JIS

JAPANESE INDUSTRIAL STANDARD

Testing methods of plastic films for electrical purposes

JIS C 2151—1990

Translated and Published

by

Japanese Standards Association

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

JAPANESE INDUSTRIAL STANDARD

J I S

Testing methods of plastic films for electrical purposes C 2151-1990

1. Scope

This Japanese Industrial Standard specifies testing methods of plastic films to be used for electrical equipment, electronic equipment, wires, general electrical insulation, capacitors, etc. (hereafter referred to as "films").

Remarks 1. Standards cited for this Standard are given below.

JIS H 4160-Aluminium and aluminium alloy foils

JIS K 7112-Methods for determining the density and specific gravity of plastics

JIS Z 8703-Standard atmospheric conditions for testing

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

IEC 674-2 Specification for plastic films for electrical purposes.

Part 2: Methods of test

2. Test Items

The test items shall be as follows:

- (1) Thickness
- (2) Width
- (3) Density
- (4) Coefficient of friction
- (5) Tensile strength and elongation
- (6) Edge tearing resistance
- (7) Surface resistivity
- (8) Volume resistivity
- (9) Dielectric dissipation factor
- (10) Permittivity
- (11) Dielectric breakdown voltage
- (12) Electrical weak spots
- (13) Dimensional change
- (14) Flame retardance

3. Test Conditions

The test conditions shall be as follows:

- (1) At least first three layers shall be discarded from the roll to be tested prior to sampling the test specimens.
- (2) The roll to be tested shall be exposed to the standard atmosphere at least for 24 h prior to sampling the test specimen. Atmospheric condition of a temperature $23 \pm 2^\circ\text{C}$ and a relative humidity $50 \pm 5\%$ is recommended as the standard atmosphere, but the ordinary temperature and ordinary humidity of JIS Z 8703 [a temperature $20 \pm 15^\circ\text{C}$ and a humidity $65 \pm 20\%$] may be employed.
- (3) Unless otherwise specified the test specimen shall be preconditioned for 1 h in a constant standard atmosphere and then shall be tested in the same atmosphere.

4. Thickness

The thickness test shall be made by micrometer technique or gravimetric technique as given below.

- (1) Micrometer Technique The test by this technique is applicable to films with smooth surface and shall be as follows:
 - (1.1) The measuring apparatus shall be a micrometer. The micrometer shall have such accuracies with respect to the film thickness that $0.1\ \mu\text{m}$ for a thickness less than $20\ \mu\text{m}$, $1\ \mu\text{m}$ for a thickness $20\ \mu\text{m}$ to $100\ \mu\text{m}$ (excl.), $2\ \mu\text{m}$ for a thickness $100\ \mu\text{m}$ (incl.) to $250\ \mu\text{m}$ (excl.) and $3\ \mu\text{m}$ for a thickness $250\ \mu\text{m}$ or over.
 - (1.2) Three test specimens shall be prepared in such a manner that the sample is cut into a length of about 1 m, and then the sheet is cut longitudinally into three strips each having a width of about 100 mm.
 - (1.3) The measurement shall be carried out as follows:
 - (a) The measuring force shall be $5 \pm 1\ \text{N}$. Carry out the measurement at three points on each strip test specimen at almost equal intervals, at nine points in total.
 - (b) Take the central value of the values so measured as the thickness.
- (2) Gravimetric Technique The test by this technique is applicable to films with smooth surface and films with uneven surface (embossed film or the like) and shall be as follows:
 - (a) The measuring apparatus shall be a balance and the balance shall have an accuracy of $0.0001\ \text{g}$.
 - (b) Test specimens of each $100 \pm 0.5\ \text{cm}^2$ shall be taken, from three places per about 1 m in machine direction, of a sample with a width less than 1000 mm, from five places of ones with a width 1000 mm and over but less than 1500 mm, and from ten places of ones with a width of 1500 mm or over.

- (c) The test specimen shall be placed on a balance and measured currently to the nearest 0.0001 g.
- (d) The thickness of film shall be calculated from the following formula:

$$t_s = \frac{100m_s}{\rho}$$

where, t_s : thickness of film (μm)
 m_s : mass of film (g)
 ρ : density⁽¹⁾ (g/cm^3)

Note (1) The density shall be measured by the method specified in 6.

5. Width

The width test is applicable to films of a width 5 mm or more and shall be as follows:

- (1) Films having a width of 5 mm or more but less than 100 mm shall be tested as follows:
 - (1.1) The measuring apparatus shall be a metal rule and a magnifier complying with the following requirements:
 - (a) The metal rule shall be graded 1 mm
 - (b) The magnifier shall have a magnification not less than 10, and longitude and latitude marks on the glass.
 - (1.2) The test specimen shall be prepared by cutting the sample to 5 m length.
 - (1.3) The measurement shall be carried out as follows:
 - (a) Spread the test specimen on a flat board, and measure the dimensions correctly to the nearest 0.1 mm by using the metal rule and magnifier.
 - (b) Measure the dimensions at five positions and take the central value of the measured values as the width.
- (2) Films having a width of 100 mm or more shall be tested as follows:
 - (2.1) The measuring apparatus shall be a metal rule graded 1 mm.
 - (2.2) The test specimen shall be prepared by cutting the sample to 5 m length.
 - (2.3) The measurement shall be carried out as follows:
 - (a) Spread the test specimen on a flat board, and measure the dimensions correctly to the nearest 1 mm by using the metal rule.
 - (b) Measure the dimensions at five positions and take the central value of the measured values as the width.