JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 2140 : 2009

(IEEJ/JSA)

Solid electrical insulating materials—Methods of determination of the insulation resistance

ICS 17.220.99; 29.035.01

Reference number : **JIS C 2140 : 2009 (E)**

Date of Establishment: 2009-05-20

Date of Public Notice in Official Gazette: 2009-05-20

Investigated by: Japanese Industrial Standards Committee
Standards Board
Technical Committee on Electricity Technology

JIS C 2140: 2009, First English edition published in 2010-02

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

Printed in Japan

Contents

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by the Institute of Electrical Engineers of Japan (IEEJ)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Solid electrical insulating materials— Methods of determination of the insulation resistance

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **IEC 60167** published in 1964 without any modification of the technical contents, but with some changes in clause numbers and in construction for the purpose of bringing the text into harmony with the **JIS** standard format.

A list of these modifications, with respective explanations, is given in Annex JA.

1 Scope

This Standard specifies test methods which cover procedures for the determination of insulation resistance without discrimination between the volume and surface resistances involved. Because the test specimens are simply and easily prepared, these methods are particularly useful for rapidly determining values which will give a general indication of quality when great accuracy is not required.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

IEC 60167: 1964 *Methods of test for the determination of the insulation resistance of solid insulating materials* (MOD)

The symbols which denote the degree of correspondence in the contents between **JIS** and the corresponding International Standard are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21.**

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this Standard. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS C 2139 *Solid electrical insulating materials— Methods for the determination of volume resistivity and surface resistivity*

NOTE : Corresponding International Standard: IEC 60093 *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials* (MOD)

3 Terms and definitions

For the purpose of this Standard, the following of certain terms apply

3.1 Insulation resistance

the insulation resistance between two electrodes which are in contact with, or embedded in, a specimen, is the ratio of the direct voltage applied to the electrodes to the total current between them at a given time after the application of that voltage

It is dependent upon both the volume and surface resistances of the specimen.

4 Significance

4.1 The methods for determining the insulation resistance of solid insulating materials give values of resistance which include, without discrimination, both volume and surface resistance. These methods consequently do not give well defined constants for the material, in contrast to **JIS C 2139.** However, they give empirical values which can be used for the comparison of the quality of different insulating materials.

4.2 These methods are very useful for determining the influence of moisture on hygroscopic insulating materials, in which conditioning appreciably modifies not only the insulating properties of the surface but also those of the body of the material.

5 Test equipment

5.1 The insulation resistance may be determined either by a bridge method or by measuring the current and voltage specified in **JIS C 2139.**

5.2 The applied voltage during the measurement shall be a direct voltage which is steady enough so that the charging current appearing when the voltage varies is negligible compared with the current flowing through the specimen. In some cases this may require the use of batteries.

6 Electrodes

6.1 General

The electrodes shall be made of such a material that they will not corrode under the conditions of test or react with the material being tested. The electrodes as given in the following **6.2** to **6.4** have been found to be satisfactory. The taper pin electrodes **(6.2)** are generally used when the volume resistance is of primary interest. The conducting paint electrodes **(6.3)** and bar electrodes **(6.4)** are used when the surface resistance is of primary interest.

6.2 Taper pin electrodes (for flat plates, tubes and rods)

Clean brass or steel pins of approximately 5 mm diameter and having a taper of approximately 2 % are used, the length being sufficient to comply with the requirements of **7.1.** These electrodes may be used with flat specimens (see figure 1), tubes and rods (see figure 2), and are used by inserting them in two transverse parallel holes whose centres are 25 mm ± 1 mm apart (see **7.1).**

6.3 Conducting paint electrodes (for flat plates; tubes and rods)

Conducting paint may be used as an electrode material. The vehicle of the conducting paint should be of such a nature that it will not have any effect on the insulation resistance to be measured. In the case of plate specimen, the electrodes are two parallel stripes of conducting paint, 1 mm wide; the total length of each electrode is 100 mm ± 1 mm, and they are spaced 10 mm ± 0.5 mm apart (see figure **3).** In the case of tube and rod specimens, two equidistant stripes of conducting paint 1 mm wide are applied around tubes and rods so that the nearest edges are 10 mm ± 0.5 mm apart (see figure **4).** This can be easily done by mounting the tube or rod in a lathe and rotating it against a small brush or drawing pen containing the paint.