

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 3216-4 : 2011

(JCMA)

**Winding wires—Test methods—
Part 4: Chemical properties**

ICS 29.060.10

Reference number : JIS C 3216-4 : 2011 (E)

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Date of Establishment: 2011-03-22

Date of Public Notice in Official Gazette: 2011-03-22

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Electricity Technology

JIS C 3216-4:2011, First English edition published in 2012-06

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

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Printed in Japan

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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 Japan Electric Wire & Cable Makers' Association (JCMA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Consequently, **JIS C 3003:1999** and **JIS C 3006:1999** have been withdrawn and replaced with this Standard.

This **JIS** document is protected by the Copyright 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 or utility model right. 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 or utility model right.

This Standard has been established for the purpose of standardization of test methods of enameled wires and fibre or paper insulated wires, and with the aim of harmonizing **JIS** test standards with relevant **IEC** standards. In deliberations carried out on harmonization of this Standard with **IEC** standard, however, it was anticipated that some of the changes from the conventionally applied **JIS** specifications, being so significant, would cause confusion in the market. Therefore, as a transitional measure, this Standard was decided to be established mainly as an **IEC** harmonized standard, but with **IEC** test specifications partially replaced with the conventional **JIS** test specifications. Establishment of this Standard is aimed at gaining consensus in the market in harmonization with the **IEC** standards. In the next revision of this Standard, efforts for a full harmonization will be made.

JIS C 3216 series consists of the following 6 parts under the general title “*Winding wires—Test methods*”:

Part 1: General

Part 2: Determination of dimensions

Part 3: Mechanical properties

Part 4: Chemical properties

Part 5: Electrical properties

Part 6: Thermal properties

Winding wires—Test methods— Part 4: Chemical properties

Introduction

This Japanese Industrial Standard has been prepared based on Edition 2.2 of **IEC 60851-4** published in 2005. Some of the technical contents of the said International Standard, however, are modified in this Standard as a transitional measure until consensus of harmonization with **IEC** can be gained in the market.

The portions given dotted underlines are the matters in which the contents of the original International Standard have been modified. A list of modifications with the explanations is given in Annex JB. Annex JA contains matters which are not given in the corresponding International Standard.

The requirements are given in particular standards which cite this Standard.

1 Scope

This Standard specifies the methods of test for chemical properties of enamelled copper wires, enamelled aluminium wires, fibre or paper insulated copper wires and fibre or paper insulated aluminium wires, that are used for winding wires.

The general notes on methods of test are given in **JIS C 3216-1**.

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

IEC 60851-4:2005 *Winding wires—Test methods—Part 4: Chemical properties* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and the revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent editions (including amendments) shall be applied.

JIS C 2300-3-1 *Cellulosic papers for electrical purposes—Part 3-1: Specifications for individual materials—Electrical insulating paper*

JIS C 2320 *Electrical insulating oils*

NOTE : Corresponding International Standard: IEC 60296:1982 *Specification for unused mineral insulating oils for transformers and switchgear* (MOD)

JIS C 3216-1 *Winding wires—Test methods—Part 1: General*

NOTE : Corresponding International Standard: IEC 60851-1:1996 *Winding wires—Test methods—Part 1: General* (MOD)

JIS C 3216-3 *Winding wires—Test methods—Part 3: Mechanical properties*

NOTE : Corresponding International Standard: IEC 60851-3:1996 *Winding wires—Test methods—Part 3: Mechanical properties* (MOD)

JIS C 3216-5 *Winding wires—Test methods—Part 5: Electrical properties*

NOTE : Corresponding International Standard: IEC 60851-5:1996 *Winding wires—Test methods—Part 5: Electrical properties* (MOD)

JIS K 8271 *Xylene (Reagent)*

JIS K 8322 *Chloroform (Reagent)*

JIS K 8891 *Methanol (Reagent)*

JIS S 6006 *Pencil, coloured pencils and leads for them*

JIS Z 3282 *Soft solders—Chemical compositions and forms*

IEC 60554-1:1977 *Specification for cellulosic papers for electrical purposes—Part 1: Definitions and general requirements*

3 Resistance to solvents (applicable to round wire with a nominal conductor diameter over 0.250 mm and applicable to rectangular wire)

The test is not suitable for round wires with a nominal conductor diameter up to and including 0.250 mm.

Resistance to solvents is expressed by the pencil hardness of the wire after solvent treatment.

The method of test given in **JA.3** may be applied upon agreement between the purchaser and the supplier.

3.1 Equipment

The standard solvent which is a mixture of the following, or the solvent as agreed between the purchaser and the supplier shall be used:

- 60 vol % liquid paraffin or white spirit (with maximum aromatic content of 18 %);
- 30 vol % xylene;
- 10 vol % butanol.

The pencil to be used shall be as specified in **JIS S 6006**.

Before each test, the point of the pencil shall be sharpened with a smooth-cut file to form an angle of 60° symmetrical about the axis of the lead according to figure 1.

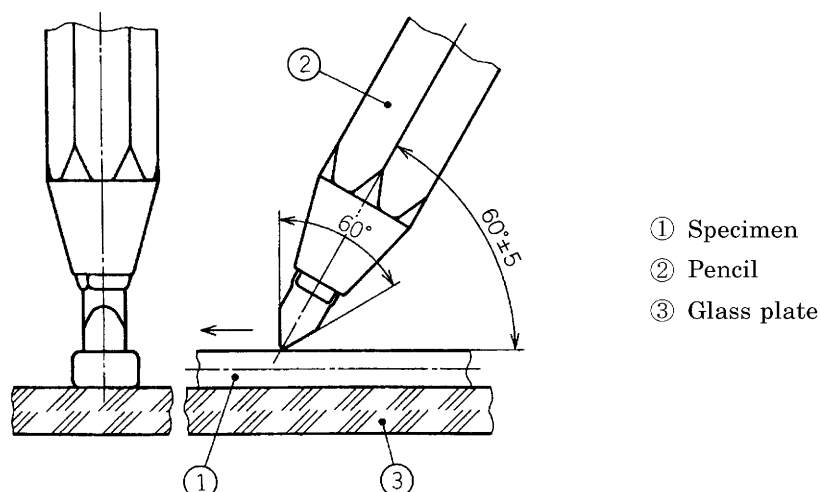


Figure 1 Pencil and specimen for solvent test

3.2 Procedure

A straight piece of wire specimen, approximately 150 mm in length, shall be pre-conditioned for 10 min at $(130 \pm 3)^\circ\text{C}$ in an oven with forced air circulation. The specimen shall then be immersed in standard solvent contained in a glass cylinder and shall be maintained therein at a temperature of $(60 \pm 3)^\circ\text{C}$ for a period of 30 min. The specimen shall then be removed from the solvent. The hardness of the specimen surface shall then be determined in the following manner within a period of 30 s after removal from the solvent.

The specimen to be tested shall be laid on a smooth hard surface according to figure 1 in the case of rectangular wires, the test shall be carried out on the largest side of the specimen. The pencil shall be placed on the surface of the specimen at an angle of approximately $(60 \pm 5)^\circ$ and the sharpened edge shall be pressed slowly along the surface of the specimen with a force of approximately $(5 \pm 0.5) \text{ N}$.

Three tests shall be made. It shall be reported, if the coating is removed with exposure of the bare conductor.

NOTE 1 This method can also be used for testing resistance to other fluids, for example transformer oil.

NOTE 2 Where it is desired to determine the hardness of the insulation, the hardness of the lead pencil which just fails to remove the coating from the surface of the conductor shall be taken as the hardness of the wire surface, expressed by the pencil hardness. The pencil hardness series is as follows:

6B	5B	4B	3B	2B	B	HB	H	2H	3H	4H	5H	6H	7H	8H	9H
4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

4 Resistance to refrigerants (applicable to enamelled round wire)

Resistance to refrigerant is expressed by the quantity of matter extracted from the coating of the wire specimen and by the breakdown voltage after exposure to a refrigerant.

NOTE 1 The data in this test method apply to monochlorodifluoromethane (refrigerant R-22). Other refrigerants may be used, in which case the critical data for such fluid should be observed and operation of the pressure vessel should comply with the revised test conditions.

NOTE 2 Refrigerant and rinsing fluid should be agreed upon between customer and supplier.

The method of test given in JA.4 may be applied upon agreement between the purchaser and the supplier.

4.1 Extraction

4.1.1 Principle

A siphon cup containing the wire specimen is placed in the pressure vessel. The extractable matter is determined after exposure of the wire specimen to the refrigerant under pressure and at elevated temperature.

4.1.2 Equipment

The following equipment shall be used:

- siphon cup according to figure 2, of 450 ml volume up to the siphoning level;
- pressure vessel of 2 000 ml volume with an internal diameter of approximately 100 mm and a pressure capacity of 20 MPa, preferably of unwelded construction and provided with a controlled heating system;
- top closure of the vessel containing a condenser coil according to figure 3;
- oven with forced air circulation.

Height of cup: (82 ± 5) mm
Diameter of cup: (84 ± 5) mm
Diameter of tubing: (5 ± 1) mm

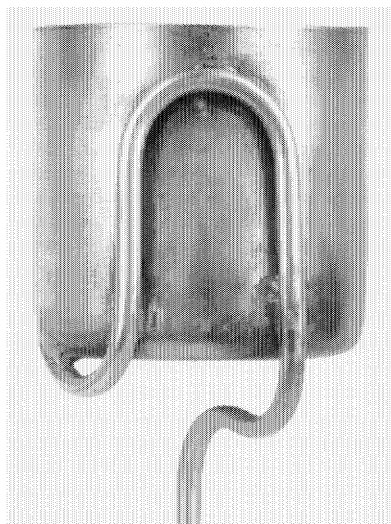


Figure 2 Refrigerant extractable test siphon cup