



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 3216-6 : 2011

(JCMA)

**Winding wires—Test methods—
Part 6: Thermal properties**

ICS 29.060.10

Reference number : JIS C 3216-6 : 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 3216-6:2011, 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Consequently, **JIS C 3003:1999** and **JIS C 3006:1999** have been withdrawn and replaced with this Standard.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 6: Thermal properties

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **IEC 60851-6** published in 1996, its Amendment 1 (1997) and Amendment 2 (2003). Some of the technical contents of the said International Standard, however, are modified in this Standard, such as by adding **JIS** original specifications not given in the International Standard, as a transitional measure until consensus of harmonization with **IEC** can be gained in the market. Amendments are edited and incorporated into this Standard.

The portions given dotted underlines and Annex JA are the matters not given in the corresponding International Standard. A list of modifications with the explanations is given in Annex JB.

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

1 Scope

This Standard specifies the methods of test for thermal 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 60851-6:1996 *Winding wires—Test methods—Part 6: Thermal properties*, Amendment 1:1997 and Amendment 2:2003 (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 1501 *Rolling bearings—Balls*

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)

IEC 60172:1987 *Test procedure for the determination of the temperature index of enamelled winding wires*

3 Heat shock (applicable to enamelled and tape wrapped wire)

Heat shock is the potential of the wire to withstand exposure to the temperature specified in the particular standard after the wire has been stretched and/or wound or bent around a mandrel.

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

3.1 Specimen

3.1.1 Round wire

A specimen shall be prepared in accordance with:

- **5.1.1** of **JIS C 3216-3** for enamelled wires with a nominal conductor diameter up to and including 1.600 mm;
- **5.2** of **JIS C 3216-3** for enamelled wires with a nominal conductor diameter over 1.600 mm;
- **5.1.1** of **JIS C 3216-3** for tape wrapped wires with a nominal conductor diameter up to and including 1.600 mm;
- **5.5.4** of **JIS C 3216-3** for tape wrapped wires with a nominal conductor diameter over 1.600 mm.

3.1.2 Rectangular wire

A specimen shall be prepared in accordance with **5.1.2** of **JIS C 3216-3**, bent however, only on the thickness (flatwise).

3.2 Procedure

The specimen is heated in an oven with forced air circulation for a period of 30 min and at the specified temperature (the temperature specified in the particular standard ± 5 °C). After removal from the oven, the specimen shall be allowed to cool to room temperature and shall be examined for cracks in the coating under a magnification according to table 1.

Three round wire specimens and two rectangular wire specimens shall be tested.

Table 1 Magnification

Wire dimension	Magnification
Round wire of nominal conductor diameter up to and including 0.040 mm	10 to 15 times
Round wire of nominal conductor diameter over 0.040 mm up to and including 0.500 mm	6 to 10 times
Round wire of nominal conductor diameter over 0.500 mm	1 to 6 times
Rectangular wire	6 to 10 times

3.3 Result

The number of cracks detected shall be reported.

4 Cut-through (applicable to enamelled round wire with a nominal conductor diameter over 0.100 mm up to and including 1.600 mm and tape wrapped wire)

Cut-through is expressed as the temperature at which a short circuit occurs between two pieces of wire crossing each other at right angles with a specified load applied to the crossing point.

NOTE : In many cases, the cut-through temperature includes decomposition of the insulation.

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

4.1 Equipment

The following equipment shall be used (see figure 1).

The metal block of brass or copper shall be provided with means for electrical heating and temperature measurement and control, with two slots for inserting two wire specimens, which cross each other at right angles with the crossing point in the centre of the block, and with a ceramic piston to apply a load on the crossing point.

The transformer of at least 100 VA shall provide an alternating test voltage of (100 ± 10) V, connected to an overcurrent device operating at a current of (5 ± 1) mA, and to a resistor limiting the current to 50 mA maximum.