

BRITISH STANDARD

Electric cables – Rubber or silicone rubber insulated flexible cables and cords for coil end leads

ICS 29.060.20

Confirmed January 2012

BSi
British Standards

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

Documents
Document Sharing Hub

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI July 2006

ISBN 0 580 48588 9

The following BSI references relate to the work on this standard:

Committee reference GEL/20/17

Draft for comment 05/30138596DC

Publication history

First published, December 1969

Second edition, May 1993

Third edition, July 2006

Amendments issued since publication

Amd. no.	Date	Text affected
-----------------	-------------	----------------------

Contents

Foreword *ii*

1	Scope	<i>1</i>
2	Normative references	<i>1</i>
3	Terms and definitions	<i>2</i>
4	Voltage categories	<i>2</i>
5	Conductors	<i>2</i>
6	Insulation	<i>3</i>
7	Identification	<i>3</i>
8	Cable marking	<i>4</i>
9	Routine tests for finished cables	<i>4</i>
10	Sample tests for finished cables	<i>5</i>
11	Type tests for finished cables	<i>6</i>

Bibliography *16*

List of figures

Figure C.1 – Method of measuring the surface resistivity of semiconducting tape *11*

List of tables

Table 1 – Voltage categories	<i>2</i>
Table 2 – Dimensional requirements for cables	<i>6</i>
Table B.1 – Schedule of tests	<i>9</i>
Table H.1 – Diameters of mandrels for bending in different tests	<i>13</i>
Table H.2 – Test voltages	<i>13</i>

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard was published by BSI and came into effect on 15 July 2006. It was prepared by Subcommittee GEL/20/17, *Low voltage cables*, under the authority of Technical Committee GEL/20, *Electric cables*.

Supersession

This British Standard supersedes BS 6195:1993, which is withdrawn.

Information about this document

This new edition of BS 6195 retains requirements in respect of cable types 4 and 5 only. Requirements for other types have been withdrawn as they are no longer considered to be market relevant.

The other principal changes introduced in this edition are to call up CENELEC harmonized test methods in place of earlier national methods.

Product certification/inspection/testing

Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity with this British Standard. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquires to the relevant association.

WARNING

This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard specifies requirements for various types of insulation, voltage categories and dimensions for a standard range of insulated flexible cables and flexible cords (commonly known as “coil end leads”), that are intended to be connected directly and permanently to a coil winding or other component of electrical apparatus.

The types of cable specified in this standard are as follows:

Type 4 cable, voltage categories A, C, D, E and F, for a designated temperature of 90 °C (flame retardant, rubber insulated coil leads);

Type 5 cable, voltage categories A, C, D, E and F, for a designated temperature of 180 °C (180 °C silicone rubber insulated coil leads).

NOTE A guide to the use of the cables specified in this British Standard is given in Annex A. A summary of the tests applicable to the cables is given in Annex B.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 4727-2: *Group 08, Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms — Part 2: Terms particular to power engineering — Group 08: Electric cables.*

BS 5099 *Electric cables — Voltage levels for spark testing.*

BS 5629-3:1979 *Insulating varnishes containing solvent — Part 3: Method for specifying requirements for individual materials*

BS 7655 *Specification for insulating and sheathing materials for cables — Part 1: Cross-linked elastomeric insulating compounds — Section 1.5 Flame retardant composites*

BS EN 50356, *Method for spark testing of cables.*

BS EN 50363-1, *Insulating, sheathing and covering materials for low voltage energy cables — Part 1: Cross-linked elastomeric insulating compounds*

BS EN 60228, *Conductors of electric cables*

BS EN 60332-1-2, *Tests on electric and optical fibre cables under fire conditions — Part 1—2: Test for vertical flame propagation for a single insulated wire or cable — Procedure for 1 kW pre-mixed flame*

BS EN 60811-1-1, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-1: General application — Measurement of thickness and overall dimensions — Tests for determining the mechanical properties.*

BS EN 60811-1-2, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-2: General application — Thermal ageing methods*

PD 2379, *Register of colours of manufacturers' identification threads for electric cables and cords.*

3 Terms and definitions

For the purposes of this British Standard the definitions given in BS 4727-2: Group 08 apply, together with the following.

3.1 values

3.1.1 approximate value

value which is only indicative

NOTE Values described as “approximate” do not constitute requirements to be checked by measurement.

3.1.2 nominal value

value by which a quantity is designated

NOTE Nominal values usually give rise to values to be checked by measurements taking into account specified tolerances.

4 Voltage categories

The cables shall be divided into the voltage categories listed in Table 1, which are defined by the appropriate maximum voltage between conductors, or between conductor and earth, to which the cable is liable to be subjected during a 1 min test of the equipment to which it is connected.

Table 1 Voltage categories

Voltage category	Maximum equipment test voltage (a.c.) r.m.s. kV
A	2.5
C	4.0
D	9.5
E	17
F	27

5 Conductors

5.1 Type

The conductors shall conform to BS EN 60228, class 5. The conductors shall be circular, tinned annealed copper.

NOTE For these cables tinned conductors are not required to meet a test for tinning.

5.2 Tapes

If required, a tape or tapes shall be applied over the conductor.

In the case of voltage categories E and F, if a tape is used it shall be a semi-conducting tape consisting of a textile fabric proofed with a suitable semi-conducting compound with a surface resistivity not exceeding 100 000 ohms per square. Conformity shall be checked by the test method in Annex C.

6 Insulation

6.1 Types

The insulation shall be as follows:

- for type 4 cable in voltage categories A and C, composite insulation type FR 1 as specified in BS 7655-1.5;
- for type 4 cable in voltage categories D, E and F, composite insulation type FR 2 as specified in BS 7655-1.5;
- for type 5 cable, insulation type EI 2 as specified in BS EN 50363-1.

6.2 Application

The insulation shall be applied closely to the conductor or conductor taping by the extrusion process.

When the application is tested by removing the insulation from the conductor, there shall be no damage to the insulation itself, the conductor, or the tin coating.

In the case of type 4 cable, there shall be no voids between the composite layers of insulation which shall be continually adherent.

Conformity shall be checked by visual examination and by a manual test.

6.3 Thickness

The thickness of the insulation, when determined by taking the mean of six measurements in accordance with BS EN 60811-1-1, **8.1**, shall be not less than the appropriate value given in Table 2 for the type and voltage category of cable.

The smallest of the measured values shall not fall below the value given in Table 2 by more than $0.1 \text{ mm} + 10 \%$.

In the case of Type 4 cable, the thickness of the outer layer of the composite insulation shall be the following percentage of the total thickness of the insulation:

- for voltage categories A, C, D and E: 25% to 50%;
- for voltage category F: 20% to 35%;

7 Identification

7.1 General

All cables shall be identified by colour. The colour shall be either throughout the insulation or on its external surface.

The colour of the inner layer for type 4 cable shall be of a contrasting colour to that of the outer layer.

NOTE This standard does not require a specific colour for any particular cable.

7.2 Bi-colour combination

Where the bi-colour combination green-and-yellow is used, the distribution of these colours shall be such that for every 15 mm length