

Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire —

Part 1: Multicore cables

ICS 29.060.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/20, Electric cables, upon which the following bodies were represented:

Association of Consulting Engineers
 Association of Manufacturers of Domestic Electrical Appliances
 BEAMA (Electrical Cable and Conductor Accessory Manufacturers' Association)
 British Approvals Service for Cables
 British Cables Association
 British Iron and Steel Producers' Association
 British Plastics Federation
 British Railways Board
 British Steel Industry
 Department of Trade and Industry (Consumer Safety Unit)
 Electricity Association
 Engineering Equipment and Materials Users' Association
 Institution of Electrical Engineers
 London Transport

The following bodies were also represented in the drafting of the standard, through Subcommittee GEL/20/1, Wiring cables below 1 kW:

Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
 British Non-Ferrous Metals Federation
 Chartered Institution of Building Services Engineers
 Electrical Installation Equipment Manufacturers' Association
 Energy Industries Council
 Engineering Industries Association
 ERA Technology Ltd.
 GAMBICA (BEAMA Ltd.)
 Institution of Incorporated Executive Engineers
 Lighting Industry Federation
 London Underground Ltd.
 National Association of Lift Makers
 Portable Electric Tool Manufacturers' Association
 Transmission and Distribution Association (BEAMA Ltd.)

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Foreword

BS 7629 has been prepared by Technical Committee GEL/20 at the request of the British Cable Makers Confederation.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **[A1]** **[A1]**. Tags indicating changes to the text carry the number of the amendment. For example, text altered by amendment No. 1 is indicated by **[A1]** **[A1]**.

Part 1 of BS 7629 includes multicore cables with 2-, 3-, 4-, 7-, 12- or 19-cores. It supersedes BS 7629:1993 which is withdrawn.

Part 2 of BS 7629 covers multipair cables.

All cables within the scope of this standard are designed to maintain circuit integrity under fire conditions for longer periods than can be achieved by cables of conventional construction. In addition, they are designed to produce low levels of smoke and corrosive gases when affected by fire.

Amendment No. 1:2004 implements the changes to the identification of cores by colours, in accordance with HD 308 S2. The principal identification colours are now:

Single phase – Green-and-yellow (Earth); blue (Neutral); brown (Live).

Three phase – Green-and-yellow (Earth); blue (Neutral); brown, black, grey (Live).

Users should ensure that any interconnection between cables with these new colours and those with the pre-existing ones is carried out safely. BS 7671, as amended in parallel with this standard, gives some guidance in this respect, but does not cover all installation conditions or cable uses.

The provisions introduced by amendment No. 1:2004 are effective from 1st April 2004. The original version of this standard remains current until 31st March 2006.

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 enquiries to the relevant association.

WARNING This standard calls for the use of substances and/or procedures that may 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.

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 does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 19 and a back cover.

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1 Scope

This British Standard specifies requirements for construction and performance and describes methods of test for cables with thermosetting insulation of rated voltage 300/500 V which, when assessed for fire resistance characteristics, meet the requirements of categories B, S, W and X specified in BS 6387:1994. For cables of diameter greater than 20 mm, for which tests in respect of categories W and X are not specified in BS 6387, analogous provision is made in this standard.

[A1] This part of BS 7629 applies to cables which have a rated voltage of 300/500 V. The 2-, 3- and 4-core circular cables have an uninsulated full size circuit protective conductor. The 7-, 12- and 19-core circular cables have an uninsulated drain conductor of not less than 0.5 mm². They all contain a metallic layer which provides electrostatic screening.

The cables specified in this standard, when assessed under the fire conditions specified in BS EN 50268-2 and BS EN 50267-2-1 **[A1]**, have a limited evolution of smoke and corrosive gases. They are suitable for operation at a maximum sustained conductor temperature of 70 °C, although the insulation is suitable for operation at higher temperatures. Circuit integrity performance under fire conditions is assessed on the basis of tests which measure resistance to fire, resistance to fire with water and resistance to fire with mechanical shock. A summary of the tests applicable to the cables covered by this standard is given in Table 1.

Use at temperatures exceeding 70 °C is subject to the sheath being terminated in an outer temperature zone not exceeding 70 °C in accordance with the recommendations given in Annex A.

A guide to the use of the cables is given in Annex A.

Cables within the scope of this standard are primarily intended for use in fire alarms and emergency lighting circuits, in accordance with BS 5839-1 and BS 5266-1, and conform to the performance requirements for cables required to maintain circuit integrity in accordance with BS 6387, supplemented by the provisions of Annex E of this standard.

In this standard, the level of corrosive (and acid) gases is determined by measurement of hydrochloric acid (HCl) in accordance with **[A1]** BS EN 50267-2-1 **[A1]**.

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.

[A1] *Text deleted* **[A1]**

BS 4727-2-08:1992, *Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms — Part 2: Terms particular to power engineering — Group 08: Electric cables.*

BS 5099:1992, *Specification for spark testing of electric cables.*

BS 6360:1991, *Specification for conductors in insulated cables and cords.*

BS 6387:1994, *Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.*

[A1] *Text deleted* **[A1]**

BS 7655-1.1: 1993, *Specification for insulating and sheathing materials for cables — Part 1: Elastomeric insulating compounds — Section 1.1: Harmonized types.*

BS 7655-1.2:1993, *Specification for insulating and sheathing materials for cables — Part 1: Elastomeric insulating compounds — Section 1.2: General 90 °C application.*

BS 7655-5.1:1994, *Specification for insulating and sheathing materials for cables — Part 5: Cross-linked insulating compounds having low emission of corrosive gases, and suitable for use in cables having low emission of smoke when affected by fire — Section 5.1: Harmonized cross-linked types.*

BS 7655-6.1:1994, *Specification for insulating and sheathing materials for cables — Part 6: Thermoplastic sheathing compounds having low emission of corrosive gases, and suitable for use in cables having low emission of smoke when affected by fire — Section 6.1: General application thermoplastic types.*

[A1] BS EN 50265-2-1, *Common text methods for cables under fire conditions — Test for resistance to vertical flame propagation for a single insulated conductor or cable — Part 2-1: Procedures — 1 kW pre-mixed flame.*

BS EN 50267-2-1, *Common test methods for cables under fire conditions — Tests on gases evolved during combustion of material from cables — Part 2-1: Procedures — Determination of the amount of halogen acid gas.*

BS EN 50268-2, *Common test methods for cables under fire conditions — Measurement of smoke density of cables burning under defined conditions — Part 2: Procedure.* 

BS EN 60811-1-1:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1: General application — Section 1-1: Measurement of thickness and overall dimensions — Tests for determining the mechanical properties.*

BS EN 60811-1-4:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-4: Tests at low temperatures.*

BS EN 60811-3-1:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 3-1: Pressure test at high temperature — Tests for resistance to cracking.*

PD 2379:1994, *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

rated voltage U_o

the nominal power-frequency voltage between conductor(s) and earth, for which the cable is suitable

3.2

rated voltage U

the nominal power-frequency voltage between phase conductors for which the cable is suitable

3.3

maximum voltage U_m

the maximum sustained power-frequency voltage between phase conductors for which the cable is suitable

3.4

nominal value

the value by which a quantity is designated, and which is often used in tables

NOTE Usually, in this standard, nominal values give rise to values to be checked by measurements taking into account specified tolerances.

3.5

approximate value

a value which is only indicative

NOTE In this standard, values described as “approximate” do not constitute requirements to be checked by measurement.

3.6

fire resistance

the ability of a cable to maintain circuit integrity for a stated period of time and under conditions as specified in a standard test

NOTE The designation “fire resistant” given to a cable implies that it fulfils the requirements of the relevant standard fire resistance test.

4 Voltage designation

The cables shall be designated by the rated voltages U_0 and U , expressed in the form U_0/U .

For the purpose of this British Standard, the rated voltage is 300/500 V.

5 Conductors and drain wire

5.1 General

The conductors shall conform to BS 6360, class 1, 2 or 5. The insulated conductors shall be plain or tinned annealed copper. The uninsulated circuit protective conductors shall be tinned annealed copper and shall be of the same nominal cross-sectional area as the insulated conductors.

5.2 Conductors

The class of conductor shall be the same for all insulated conductors in any cable. Where an uninsulated circuit protective conductor is provided it shall be of the same class as the insulated conductors.

5.3 Drain wire

The drain wire shall comprise one or more tinned annealed copper wires with a total nominal cross-sectional area of not less than 0.5 mm^2 , and shall meet the relevant resistance requirements specified in BS 6360.

NOTE Drain wires that are of the same class and have the same nominal cross-sectional area as the insulated conductors may also serve the function of a circuit protective conductor.

6 Insulation

6.1 Type

The insulation shall be either type EI 2 or EI 3, as specified in BS 7655-1.1, or type GP 4 or GP 6, as specified in BS 7655-1.2, or insulation type EI 5 as specified in BS 7655-5.1. When the insulation is applied in two layers (see 6.2), all tests shall be applied to the complete insulation, which shall be subject to the specified requirements for that insulation type.

When necessary in order to meet the performance requirements of this specification, a tape or tapes shall be applied either over the conductor or over the insulation.

6.2 Application

The insulation shall be applied closely to the conductor or conductor taping by the extrusion process and cross-linked to form a compact and homogeneous layer.

NOTE When the insulation is type EI 5 it may be applied in two layers.

It shall be possible to remove the insulation without damage to the insulation itself, the conductor, or the tin coating, if any.

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

6.3 Thickness of insulation

The thickness of insulation, when determined by taking the average of a number of measurements in accordance with 15.2, shall be not less than the value given in Table 2, and the smallest of the measured values shall not fall below the value given in Table 2 by more than $0.1 \text{ mm} + 10 \%$.

The thickness of any tape(s) over the conductor or over the insulation shall not be included in the measurement of thickness of insulation.

6.4 Spark testing of insulation

The core insulation shall conform to the requirements for spark testing specified in BS 5099.

6.5 Corrosive and acid gas emission from insulation and tapes during combustion

When tested in accordance with BS EN 50267-2-1, the level of HCl shall be not greater than 0.5 %.

7 Identification

7.1 General

The cores for all cables shall be identified by colours or by numbers, in accordance with the following sequence. The colour shall be applied either throughout the insulation or on its external surface.

[A1] Number of cores	Identification
2-core + uninsulated circuit protective conductor	Brown, blue
3-core + uninsulated circuit protective conductor	Brown, black, grey
4-core + uninsulated circuit protective conductor	Blue, brown, black, grey
7-, 12- and 19-cores + uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards, or, for identification by colour, all cores shall be of an identical colour (excluding brown and black), except for two adjacent cores in each layer which shall be distinctively coloured brown and black (see Figure 1). [A1]

The height of the individual number shall be not less than 1.5 mm.

The spacing shall be such that each number is repeated at intervals not greater than 70 mm.

7.2 Clarity and durability

The colour or the number used for core identification shall be clearly identifiable and durable such that it cannot be removed when rubbed lightly 10 times with a piece of cotton wool soaked in water.

8 Laying-up

8.1 General

The cores of 2-, 3- and 4-core cables shall be laid-up using the sequence of colours specified in Clause 7, together with an uninsulated circuit protective conductor.

The 7-, 12- and 19-core cables shall be laid up in number sequence or as shown in Figure 1, and shall have a non-hygroscopic binder tape applied over the laid up cores.

The drain wire shall be run over the binder tape.

If necessary a tape or tapes shall be applied over the insulated laid-up cores to meet the performance requirements of this specification.

Where tape(s) are used, the uninsulated circuit protective conductor or drain wire shall be applied over the tape(s).

Conformity shall be checked by visual examination.

8.2 Corrosive and acid gas emission from tapes during combustion

When tested in accordance with **[A1]** BS EN 50267-2-1 **[A1]**, the level of HCl of any binder tape(s) shall be not greater than 0.5 %.

9 Screen

[A1] The screen shall consist of the following:

One or more metallic or laminated metallic tape(s), which shall be applied with a metallic element in contact with the uninsulated circuit protective conductor or drain conductor. The tapes may be applied either longitudinally or helically or a combination of both. If a tape is applied longitudinally it shall have a minimum overlap of 1 mm, or if applied helically shall have a minimum overlap of 25 %.

The minimum thickness of the metallic element of a laminated tape shall be 0.008 mm.

The minimum thickness of the metallic tape (non-laminated) shall be 0.075 mm.

The selection and application of tapes shall be such as to meet the performance requirement of this specification. **[A1]**