BRITISH STANDARD

BS 7629-2:1997
Incorporating Amendments Nos. 1 and 2

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

Part 2: Multipair cables

ICS 29.060.20

BSI British Standards

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 Engineer

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.)

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 April 1997

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14199	5 February 2004	See foreword
15655	29 April 2005	Certification text in foreword changed

Contents

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 No. 1 is indicated in the text by tags [A1] 〈A1]. Tags indicating changes to 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 only low levels of smoke and corrosive gases when affected by fire.

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 stability 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 17 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 multipair cables with 1, 2, 5, 10 or 20 pairs having a collective metallic layer and drain wire 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, 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. [A1]

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 BS 6425-1.

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:Group 8:1992*, Electric cable terminology — Terms particular to power engineering — Electric cable terminology*.

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 — Elastomeric insulating compounds — Harmonized types.*

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

BS 7655-5-1:1994*, Specification for insulating and sheathing materials for cables — 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 — Harmonized cross-linked types.*

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

[A1] BS EN 50265-2-1, *Common test 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.* [A1]

A1 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.* A1

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

BS EN 60811-3-1:1995, *Insulating and sheathing materials of electric cables — Common test methods — Methods specific to PVC compounds — 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.

5.2 Conductors

The class of conductor shall be the same for all insulated conductors in any cable.

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.

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. [A1] 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. [A1]

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 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 [A1] BS EN 50267-2-1 [A1], the level of HCl shall be not greater than 0.5 %.

7 Formation and identification of pairs and quads

7.1 Pairs

Cores forming a pair shall be identified either by having a different number printed, in a contrasting colour, on the insulation of each core, or by colour.

NOTE The preferred colour combination is black and white.

Numbering on cores shall be in accordance with **7.3**.

When cores are identified by colour, the colour shall be applied either throughout the insulation or on its external surface.

The cores shall be uniformly twisted together to form a pair.

The pair shall be identified by the colour combination of cores, a printed number on one or both cores, or by a numbered tape applied over the twisted cores.

If the cores of the pair are identified only by printed number, the pair shall be identified by numbered tape.

7.2 Quads

Cores forming a quad shall be identified either by having a different number printed, in a contrasting colour, on the insulation of each core or by colour.

Numbering on cores shall meet the requirements of **7.3**.

NOTE Any colour combination may be used subject to agreement between the purchaser and the manufacturer.

The cores shall be uniformly twisted together to form a quad.

7.3 Numbering on cores

The height of the individual numbers on a core shall not be less than 1.5 mm.

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

7.4 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 cable shall be so constructed that the pairs are in concentric layers. The 2-pair cable shall be assembled as a quad.

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 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 one of the following:

One or more metallic or laminated metallic tape(s), which shall be applied with the metallic element in contact with the 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]

10 Sheath

10.1 Type

The sheath shall be LTS 3 compound conforming to BS 7655-6.1.

10.2 Application

The sheath shall be applied by the extrusion process. It shall be possible to remove the sheath without damaging the insulation of the cores.

[A1] *Text deleted* [A1].

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

10.3 Thickness of sheath

The thickness of the sheath, 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 an amount more than 0.1 mm +15 %.

10.4 Spark testing of sheath

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

10.5 Corrosive and acid gas emission from sheath during combustion

When tested in accordance with [A1] BS EN 50267-2-1, [A1] the level of HCl shall be not greater than 0.5 %.

11 Cable marking

The cable shall be marked with the number of this British Standard[1)] on the outer surface by printing, indenting or embossing.

All cables shall be provided with an indication of origin consisting either of an identification thread or threads or the continuous marking of the manufacturer's name or trademark.

If coloured threads are used, the colours shall conform to those registered in PD 2379, where applicable. The colours shall be easy to recognize or shall become recognizable by cleaning if necessary.

The marking of the manufacturer's name or trademark, if used, shall be by printing, indenting or embossing on the sheath.

Any marking shall be legible and regarded as continuous if the gap between the end of one complete inscription and the beginning of the next does not exceed 550 mm.

12 Schedule of tests

Table 1 lists the range of tests applicable to the cables covered by this standard and refers to the relevant clauses of the standard specifying the requirements and test methods. The last column shows the category of each test i.e. T, S or R.

The categories and corresponding designations are as follows.

a) ***Type tests (T)***: Tests required to be made before supplying a type of cable covered by this standard on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the cable material, design or type of manufacturing process which might change the performance characteristics.

b) ***Sample tests (S)***: Tests made on samples of completed cable, or components taken from a completed cable adequate to verify that the product meets the design requirements.

c) ***Routine test (R)***: Tests made on all production cable lengths to demonstrate their integrity.

[1)] Marking BS 7629-2 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which also may be desirable.

Table 1 — Schedule of tests

Test	Requirement given in clause	Test method	Category
Tests on components			
Conductor construction	**5**	BS 6360	S
Insulation:			
material	**6.1**	BS 7655-1.1 or BS 7655-1.2or BS 7655-5.1	T
application	**6.2**	Visual examination and manual test	S
thickness	**6.3**	**15.2** and BS EN 60811-1-1	S
spark test	**6.4**	BS 5099	R
corrosive and acid gas	**6.5**	[A1] BS EN 50267-2-1 [A1]	T
Cores:			
identification	**7**	Visual examination	S
laying-up	**8.1**	Visual examination	S
corrosive and acid gas on binder tape	**8.2**	[A1] BS EN 50267-2-1 [A1]	T
Sheath:			
material	**10.1**	BS 7655-6.1	T
application	**10.2**	Visual examination and manual test	S
thickness	**10.3**	**15.2** and BS EN 60811-1-1	S
spark test	**10.4**	BS 5099	R
corrosive and acid gas	**10.5**	[A1] BS EN 50267-2-1 [A1]	T
Tests on complete cables			
Cable marking	**11**	Visual examination and measurement	R
Check on absence of faults on insulation	**14.2.1**	**14.2.2**	R
Conductor resistance	**15.3**	BS 6360	S
Voltage test on completed cable	**15.4.1**	**15.4.2**	S
Bending test	**16.2**	Annex B	T
Impact test	**16.3**	Annex C	T
Tests under fire conditions			
Flame propagation test on single cable	**15.5**	[A1] BS EN 50265-2-1 [A1]	S
Resistance to fire	**15.6**	**D.2** of BS 6387:1994	S
Resistance to fire with water	**16.4**	**D.3** of BS 6387:1994 and **E.1** of BS 7629-2	T
Resistance to fire with mechanical shock	**16.5**	**D.4** of BS 6387:1994 and **E.2** of BS 7629-2	T
Smoke emission	**15.7**	[A1] BS EN 50268-2 [A1]	S

13 Test conditions

CAUTION. The tests given in this standard involve the use of dangerous voltages and temperatures. Suitable precautions should be taken against shock, burning, fire and explosive risks that may be involved and against any noxious fumes that may be produced.

13.1 Ambient temperature

Tests shall be made at an ambient temperature of (20 ± 10 °C unless otherwise specified in the details for the particular test.

13.2 Frequency and waveform of power frequency test voltages

Unless otherwise specified in the particular test, the frequency of the alternating test voltages shall be in the range 49 Hz to 61 Hz. The waveform shall be substantially sinusoidal. The ratio peak value/root mean square value shall be equal to $\sqrt{2}$ with a tolerance of ±7 %.

14 Routine tests

14.1 General

Routine tests are identified in Table 1.

14.2 Test to check on the absence of faults on insulation

14.2.1 *Requirement*

When the completed cable is tested in accordance with **14.2.2**, without immersion in water, the insulation shall not break down.

14.2.2 *Method*

Make the test at ambient temperature with a single-phase a.c. supply of 2 000 V r.m.s or with a d.c. supply of 5 000 V on each drum length of cable.

Apply the test voltage, increasing this gradually and maintaining it at the full value for 1 min, between each insulated conductor in turn and all the others connected together and also connected to the drain wire, metallic layer and earth.

15 Sample tests

15.1 General

Sample tests are identified in Table 1.

15.2 Thickness measurement

15.2.1 *Sampling*

The measurements of thickness of insulation and sheath (see **6.3** and **10.3**) shall be made on a sample taken from one end of each length of cable selected for the test, having discarded any portion which may have suffered damage.

15.2.2 *Interpretation of results*

If any of the thicknesses measured do not conform to the requirements specified in **6.3** and **10.3**, two further samples shall be checked. If both of the further pieces meet the specified requirements, the cable is deemed to conform, but if either does not meet the requirements, the cable is deemed not to conform.

15.2.3 *Method*

Make measurements for each component by the method specified in BS EN 60811-1-1. Make thickness measurements on the sheath after removal of the screen, if the two adhere.

15.2.4 *Expression of results*

The average of all the values obtained from a sample shall be calculated to two decimal places and then rounded to obtain the mean value for both insulation and sheath thickness. If the calculation gives 5 or more for the second decimal figure, the first shall be raised to the next number; thus, for example, 1.75 shall be rounded to 1.8 and 1.74 to 1.7.

The smallest of all the values obtained shall be taken as the minimum thickness for both insulation and sheath at any place.

15.3 Conductor resistance

The d.c. resistance of each conductor shall conform to BS 6360 when measured in accordance with that standard and corrected to 20 °C. The sample of cable shall be at least 1 m in length.

15.4 Voltage test on completed cable

15.4.1 *Requirement*

When a sample of completed cable is tested in accordance with **15.4.2**, no breakdown of the insulation or sheath shall occur.

15.4.2 *Method*

Immerse a sample of completed cable, a minimum of 20 m long, in water at a temperature of (20 ± 5) °C for a minimum period of 24 h. Ensure that the ends of the cable protrude above the water by a distance sufficient to prevent excessive surface leakage when the test voltage is applied between the conductor and the water.

Apply a test voltage of 2 000 V a.c., increasing the voltage gradually and maintaining it at the full r.m.s value for 15 min, between each conductor in turn and all the others connected together and to the water, and between all the conductors connected together and the water. In both cases earth the drain wire but do not include it in the conductors to be tested.

Whilst the sample is still immersed, perform the following additional test. Disconnect the drain wire from the water and apply a voltage of 1 000 V a.c. for 5 min between this and the water.

15.5 Flame propagation on single cable

[A1] Cables shall be tested in accordance with BS EN 50265-2-1. The test shall be carried out on a sample of completed cable. After the test, the cable shall conform to the performance recommendations given in BS EN 50265-2-1, Annex A. [A1]

15.6 Resistance to fire

The completed cables shall be tested in accordance with **D.2** of BS 6387:1994, except that in respect of the procedure described in **D.2.4** of that standard, the conductors shall be divided into two equal groups, ensuring that the a-core of each pair is connected to one phase and the b-core of each pair is connected to another phase.

The cables shall, as a minimum, conform to category B and category S of BS 6387:1994.

15.7 Smoke emission

[A1] Cables shall be tested in accordance with BS EN 50268-2.

The smoke generated shall result in light transmittance values of 80 % or more for cables up to and including 20 mm in diameter, and 60 % or more for cables of diameter greater than 20 mm and up to 40 mm. [A1]

16 Type tests

16.1 General

Type tests are identified in Table 1.

16.2 Bending

A sample of the completed cable shall be tested in accordance with the procedure given in Annex B. After the test the sheath shall be free from splits and no breakdown of the insulation shall occur during the test.

16.3 Impact

A sample of the completed cable shall be tested in accordance with the procedure given in Annex C. There shall be no breakdown of the insulation of any of the samples.

16.4 Resistance to fire with water

The completed cable shall be tested in accordance with **D.3** of BS 6387:1994 and shall conform to category W of that standard.

For cables of a diameter greater than 20 mm, the additional provisions given in **E.1** shall apply.

16.5 Resistance to fire with mechanical shock

The completed cable shall be tested in accordance with **D.4** of BS 6387:1994 and shall, as a minimum, conform to category X.

For cables of a diameter greater than 20 mm, the additional provisions given in **E.2** shall apply.

Table 2 — Dimensions of cables

Number of pairs	Nominal cross-sectional area of conductor mm^2	Radial thickness of insulation mm	Radial thickness of sheath mm	Approximate overall diameter mm
1	1.0	0.6	0.9	8.0
1	1.5	0.7	0.9	8.5
1	2.5	0.8	1.0	10.5
2[a]	1.0	0.6	1.0	9.0
2[a]	1.5	0.7	1.0	10.5
2[a]	2.5	0.8	1.2	13.0
5	1.0	0.6	1.2	16.5
5	1.5	0.7	1.3	20.5
5	2.5	0.8	1.4	23.0
10	1.0	0.6	1.4	20.5
10	1.5	0.7	1.5	26.0
10	2.5	0.8	1.7	29.5
20	1.0	0.6	1.6	26.5
20	1.5	0.7	1.8	34.0
20	2.5	0.8	2.0	38.5

[a] Two pair cables are assembled as a quad

Annex A (informative)
Recommendations for selection, operation and installation of cables

A.1 General

Attention is drawn to statutory requirements, regulations and codes of practice governing installation, particularly in special environments. Details given in this annex are intended only as general technical guidance and not as an interpretation of any such documents.

The cables specified in this British Standard are intended primarily for use in fire alarm and emergency lighting circuits (see BS 5839-1 and BS 5266-1).

The cables are intended for installation in air (which includes installation in trunking or other closed systems). When cables are to be installed in any other environment, reference should be made to the cable manufacturer.

A.2 Temperature limitations

The cables are suitable for use where the combination of ambient temperature and temperature rise due to load results in a conductor temperature not exceeding 70 °C and, in the case of short-circuit conditions not exceeding 5 s in duration, the maximum conductor temperature does not exceed 250 °C.

However, when installed in an enclosure, subject to the sheath being terminated upon entry and the combination of ambient temperature and temperature rise due to load resulting in a conductor temperature not exceeding 70 °C outside the enclosure, the conductor temperature in the enclosure may be increased to a temperature not exceeding 90 °C for type GP 4, GP 6 or EI 5 insulation, 110 °C for type EI 3 insulation or 180 °C for EI 2 insulation.

NOTE The short-circuit temperature is based on the intrinsic properties of the insulating materials. It is essential that the accessories which are used in the cable system with mechanical and/or soldered connections are suitable for the temperature adopted for the cable.

A.3 Voltage ratings

The cables specified in this standard have a rated voltage (U_o/U) of 300/500 V.

The maximum sustained system voltage (U_m) is 550 V and this is the highest voltage between phases which may be sustained under normal conditions at any time and at any point in the system. No consideration is made for transient voltage variations due, for example, to lightning impulses, fault conditions and rapid disconnection of loads.

The 300/500 V cables are suitable for d.c systems up to 750 V between conductors. However, consideration should be given to peak value when determining the voltage of a d.c. system derived from rectifiers, bearing in mind that smoothing does not modify the peak value when the rectifiers are operating on an open circuit.

A.4 Current ratings

For guidance on current ratings, reference should be made to the cable manufacturer, stating the precise installation conditions.

A.5 Minimum installation radius

During installation, the cables specified in this standard should not be bent to a radius smaller than six times the overall diameter of the cable.

A.6 Minimum temperature during installation

It is desirable that the cables should be installed when both the cable temperature and the ambient temperature are above 0 °C and have been so for the previous 24 h. If this is not possible, special precautions should be taken to maintain the cables above this temperature.

A.7 Installation practice

Care should be exercised during installation to avoid any damage to cable coverings. For guidance on installation practice, reference should be made to the cable supplier. Any special accessories or methods of installation recommended by the cable manufacturer should be employed.

Annex B (normative)
Test for bending characteristics

B.1 Preparation

Take a sample of cable and, together with the test mandrel, cool it for 2 h at 0 °C. Then immediately subject it to the bending test in accordance with the test method given in **B.2**.

B.2 Test method

B.2.1 *Apparatus*

A test mandrel having a diameter of $12D \pm 5$ % where D is the external diameter of the completed cable.

B.2.2 *Procedure*

Take a cable sample of length at least five times the mandrel diameter and not less than 1 500 mm. Mount the test mandrel on a horizontal or vertical axis about which it is free to rotate. Lay out the cable sample straight on a level surface and secure one cable end to the test mandrel through a swivel connection. Draw a reference line along the top of the cable parallel to its longitudinal axis.

Rotate the mandrel steadily so that all the cable is wound on in a closely wrapped coil, and prevent the cable from twisting during the operation. Then rotate the mandrel in the opposite direction so that the cable is unwound and again laid straight on the level surface. Rotate the cable through 180° around its longitudinal axis and repeat the winding and unwinding processes.

Then apply a test voltage of 2 000 V a.c., increasing the voltage gradually and maintaining it at the full r.m.s value for 1 min, between each conductor in turn and all the other conductors connected together and also connected to the drain wire, metallic layer and earth.

Annex C (normative)
Test for resistance to impact at ambient temperature

Cables are tested for resistance to impact at a temperature of (20 ± 5) °C, using the apparatus illustrated in Figure C.1, both with a chisel edged intermediate piece placed with its longitudinal axis at right angles to that of the cable and with a radiused intermediate piece.

Stand the impact test apparatus on a firm base. Draw a reference line along the top of the cable parallel to its longitudinal axis prior to cutting the samples. For each set of three samples, the impact position on each successive sample is approximately 120° from the previous position.

Take six samples of cable, each approximately 500 mm long, and remove 100 mm of sheath from each end to allow the cores to be separated. Place the samples successively in position on the impact test apparatus and allow the 500 g hammer to fall from a height of 250 mm, three samples being tested with the chisel edged intermediate piece and three with the radiused intermediate piece.

Then apply the test voltage, increasing the voltage gradually and maintaining it at a value of 2 000 V r.m.s. for 1 min, to each of the samples, between each conductor in turn and all the other conductors connected together and also connected to the drain wire and metallic layer, if any.

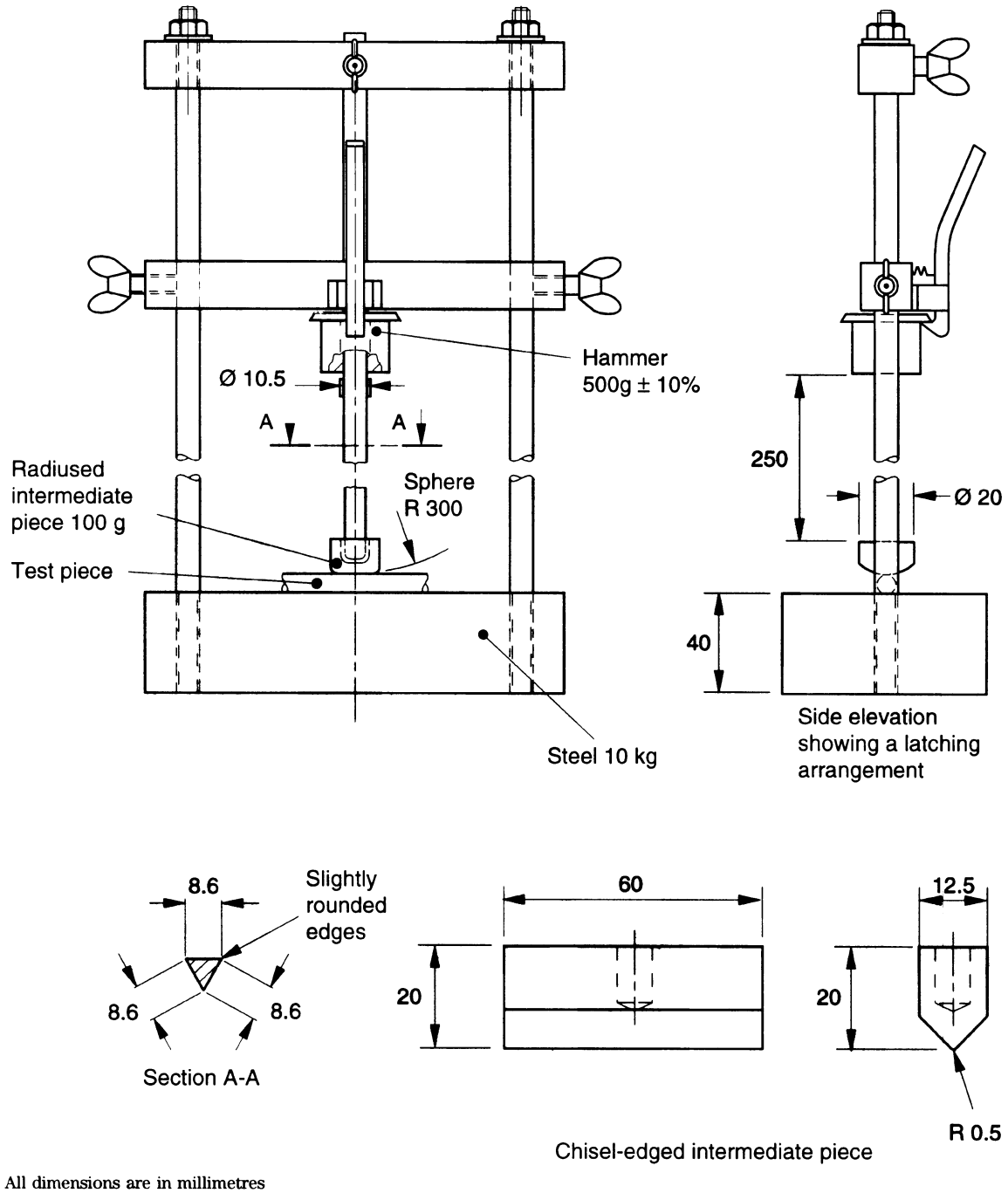


Figure C.1 — Apparatus for test for resistance to impact

Annex D (informative)
Guidance for the selection of samples for the manufacturer's demonstration of conformity

D.1 Selection of samples

For manufacturers wishing to demonstrate conformity with the requirements of this standard, it is necessary to select for testing a limited number of samples as being representative of the complete range, or part of the range. In this Part of BS 7629, these tests are those listed in Table 1 as routine (R) or sample (S), plus the following type (T) tests:

16.2 Bending test
16.3 Impact test
16.4 Test for resistance to fire with water
16.5 Test for resistance to fire with mechanical shock

Other tests listed in Table 1 as type (T) tests should be carried out on samples of any representative cable.

D.2 Conformity testing

To claim conformity for the complete range specified, the tests should be carried out on approximately the smallest conductor size and the largest number of pairs and approximately the largest conductor size and the smallest numbers of pairs, plus any representative cable for the other type tests.

Annex E (normative)
Additional provisions relating to cables of a diameter exceeding 20 mm

E.1 Test for resistance to fire with water

Cables of a diameter greater than 20 mm shall be tested generally in accordance with **D.3** of BS 6387:1994, adjusting the positions of the cable and burner in accordance with **D.3.1.4** without reference to the particular dimensions given in Figure 5 of that standard.

E.2 Test for resistance to fire with mechanical shock

Cables greater than 20 mm in diameter shall be tested in accordance with **D.4** of BS 6387:1994, except that the following modifications shall be made.

a) The source of heat shall be a ribbon propane or natural gas burner at least 500 mm in length.

b) The cable shall be bent to form an appropriate "U" shape. The internal radius of each bend shall be the manufacturer's declared bending radius and the overall distance between the vertical portions of the cable shall be approximately 475 mm as shown in Figure E.1.

c) The cable shall be mounted as shown in Figure E.1 unless its diameter or bending radius makes this impossible with the 475 mm limit, in which case the cable shall be mounted as shown in Figure E.2.

d) The position of the thermocouple shall be aligned with the lower surface of the cable shown in Figure E.1 and Figure E.2.

e) The copper "P" clips shall be positioned as shown in Figure E.1 and Figure E.2. The clips shall support the cable at either end of the radiused section and in the centre as shown in Figure E.1 and Figure E.2.

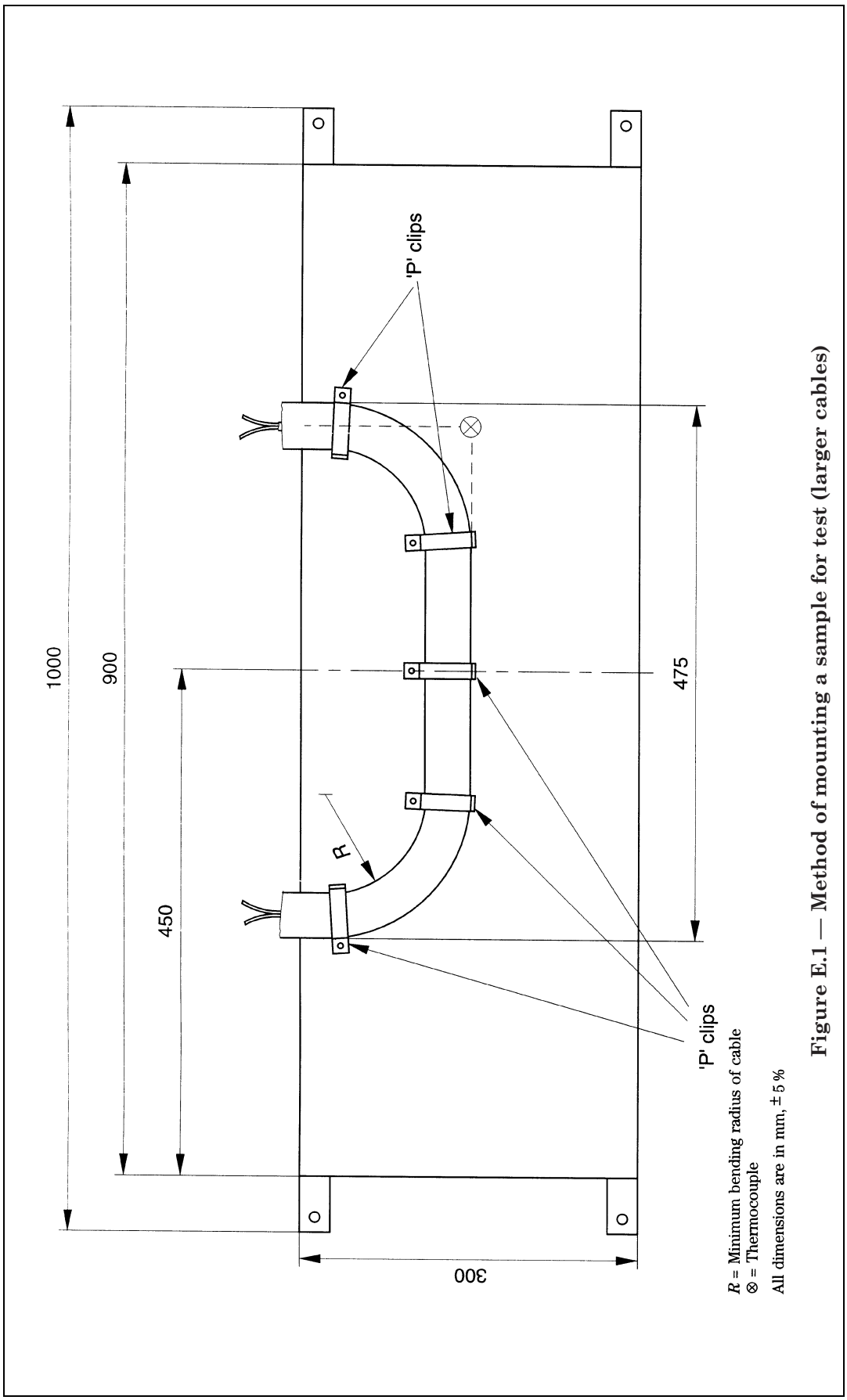
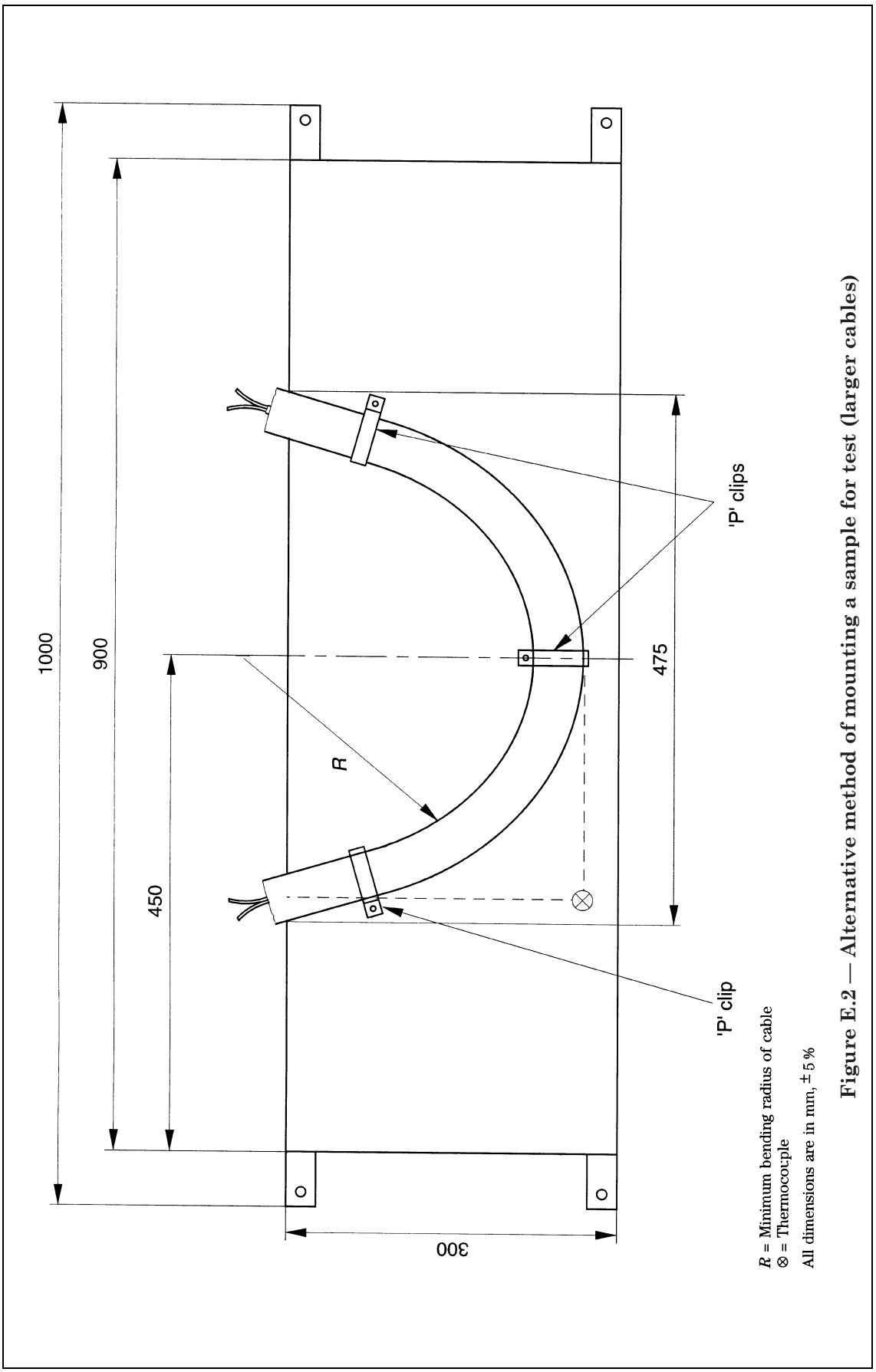


Figure E.1 — Method of mounting a sample for test (larger cables)



R = Minimum bending radius of cable
⊗ = Thermocouple
All dimensions are in mm, ± 5 %

Figure E.2 — Alternative method of mounting a sample for test (larger cables)

Bibliography

BS 5266, *Emergency lighting*

BS 5266-1:1988, *Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment.*

BS 5839, *Fire detection and alarm systems for buildings.*

BS 5839-1:1988, *Code of practice for system design, installation and servicing.*

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