

Electric cables — Thermosetting insulated, armoured cables for voltages of 600/1 000 V and 1 900/3 300 V, having low emission of smoke and corrosive gases when affected by fire

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
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Electricity Association
- London Transport

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

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

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Foreword

This British Standard has been prepared by Technical Committee GEL/20. BS 6724:1997+A3:2008 supersedes BS 6724:1997+A2:2005, which is withdrawn.

The start and finish of text introduced or altered by Amendments No. 1 and No. 3 is indicated in the text by tags **A1** **A1** and **A3** **A3**.

This edition makes changes to the scope so as to reflect those cable types in common use in the construction and industrial sector. The range of 600/1 000 V cables has been widened by adding 400 mm² sizes for four-core cables, and four-core cables with reduced neutral and a range of 5-core cables. The range of multicore auxiliary cables has been increased up to 48 core.

The opportunity has also been taken to refer to BS 7655 and BS 7622 for details of requirements for materials and of the smoke emission test, respectively.

Further changes have been made to update and improve this standard in line with the corresponding revision of BS 5467.

As with the previous editions, performance under fire conditions is assessed on the basis of tests which measure, under defined conditions, the flame propagation and emission of smoke and corrosive gases.

The dimensions are nominally as for cables conforming to BS 5467 and the cables are for the same voltage ranges of 600/1 000 V and 1 900/3 300 V.

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 cannot confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 41 and a back cover.

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1 Scope

This British Standard specifies requirements for construction and describes methods of test for armoured cables with thermosetting insulation of rated voltages 600/1 000 V and 1 900/3 300 V which, when assessed by the specified tests, produce lower levels of smoke and corrosive products under exposure to fire compared with cables conforming to BS 5467 ^[A3] *Text deleted* ^[A3]. Cables specified in this standard are intended for use in fixed installations in industrial areas, buildings and similar applications.

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].

The insulation and other components are suitable to permit operation of the cables at a maximum sustained conductor temperature of 90 °C and for a maximum short-circuit conductor temperature of 250 °C.

NOTE 1 Limitation on the temperature of the cables may be imposed in situations where they may be touched.

NOTE 2 Due to the relatively high conductor temperature, there is a risk of drying out the surrounding soil causing an increase in thermal resistivity which in turn would lead to the cable temperature rising to a higher value than anticipated. For cable laid directly in the ground, a suitable de-rating factor should be applied or a lower maximum sustained conductor operating temperature should be assumed to take into account the possible effects of soil drying out.

NOTE 3 In installations which include cable joints and terminations, the performance of these accessories should be taken into account in deciding the maximum operating temperature of the cable.

The cables specified in the standard are all wire armoured and oversheathed, as follows:

- a) 600/1 000 V:
 - single-core stranded copper conductor;
 - single-core solid aluminium conductor;
 - two-, three-, four- and five-core stranded copper conductor;
 - two-, three-, and four-core solid aluminium conductor;
 - multicore auxiliary stranded copper conductor.
- b) 1 900/3 300 V:
 - single-core stranded copper conductor;
 - single-core solid aluminium conductor;
 - three-core stranded copper conductor;
 - three-core solid aluminium conductor.

Annex A gives recommendations for the selection and operation of cables while recommendations for the installation of cables are given in Annex B. Annex C lists the information that should be given with an enquiry or order.

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]

^[A3] BS 5099:2004, *Electric cables — Voltage levels for spark testing*. ^[A3]

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

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 7655-1.3:1993, *Specification for insulating and sheathing materials for cables — Part 1: Elastomeric insulating compounds — Section 1.3: XLPE*.

^[A3] *Text deleted* ^[A3]

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*.

BS EN 10002-1:1990, *Tensile testing of metallic materials — Part 1: Method of test at ambient temperature.*

A1 BS EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings on steel wire.*

A3 Text deleted **A3**

BS EN 50266-2-4, *Common test methods for cables under fire conditions — Test for vertical flame spread of vertical-mounted bunched wires or cables — Part 2-4: Procedures — Category C.*

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.* **A1**

A3 BS EN 50363-5, *Insulating, sheathing and covering materials for low voltage energy cables — Halogen-free, cross-linked insulating compounds.*

BS EN 60228, *Conductors of insulated cables.*

BS EN 60332-1-2:2004, *Tests on electric and optical fibre cables under fire conditions — Test for vertical flame propagation for a single insulated wire or cable — Procedure for 1kW pre-mixed flame.* **A3**

BS EN 60811-1-1:1995, *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 60811-1-2:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-2: General application — Thermal ageing methods.*

BS EN 60811-1-3:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-3: General application — Methods for determining density — Water absorption tests — Shrinkage test.*

A3 BS EN 61034-2, *Measurement of smoke density of cables burning under defined conditions — Test procedure and requirements.*

BS EN 62230, *Electric cables — Spark-test method.*

IEC 60050-461, *International Electrotechnical Vocabulary — Part 461: Electric cables.* **A3**

3 Terms and definitions

For the purposes of this British Standard the definitions given in **A3** IEC 60050-461 **A3** apply together with the following.

3.1

rated voltage U_0

the nominal power-frequency voltage between conductor(s) and armour or 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 In this standard, nominal values usually 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

type tests (symbol T)

Tests made before supplying, on a general commercial basis, a type of cable covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application

NOTE 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 materials or design or manufacturing process which might change the performance characteristics.

3.7

sample tests (symbol S)

tests made on samples of completed cable, or components taken from a completed cable adequate to verify that the finished product meets the design specifications

3.8

routine tests (symbol R)

tests made on all production lengths to demonstrate their integrity

3.9

tests after installation

tests intended to demonstrate the integrity of the cable and its accessories as installed

4 Voltage designation

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

The rated voltages recognized for the purposes of this standard are 600/1 000 V and 1 900/3 300 V.

The maximum designated voltages (U_m) for the purposes of this standard for 600/1 000 V and 1 900/3 300 V cables are recognized as 1 200 V and 3 600 V respectively.

NOTE Guidance on the selection of cables of appropriate voltage designations for particular systems is given in A.2.

5 Conductors

The conductors shall be either annealed copper or solid aluminium, as given in Table 4 to Table 18 inclusive, and shall conform to the requirements detailed in Table 2 and to BS EN 60228. Where the manufacturer deems it necessary to use tinned copper conductors, they shall conform to the requirements of BS EN 60228 for metal coated conductors.

The conductors shall be circular, circular sectoral or shaped solid (class 1), or circular, circular compacted or shaped stranded (class 2), as specified in Table 4 to Table 18 inclusive.

6 Insulation

6.1 General

The insulation shall be GP 8 conforming to BS 7655-1.3, or GP 6 conforming to BS 7655-1.2, or EI 5 conforming to BS EN 50365-5. For the assessment of halogens on the insulation taken from a completed cable, only 6.4 shall apply.

NOTE 1 Other tests for assessment of halogens, for instance to BS EN 50267-2-2 and BS EN 60684-2, are not required.

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

The insulation may be applied in a single layer, or in a number of coherent layers. Where more than one layer is used, the complete insulation shall be tested as though it were a single layer.

NOTE 2 Insulation applied in more than one layer does not conform to the definition of "Double insulation" given, for instance, in BS 7671.

The manufacturer shall, where necessary to meet the compatibility requirements specified in 18.2, apply a protective barrier between the conductor and the insulation and/or over the insulation. This barrier shall not be included as part of the insulation thickness.

6.2 Thickness of insulation

The thickness of insulation, when determined by taking the average of a number of measurements in accordance with Annex D, shall be not less than the value given in Table 4 to Table 18, as appropriate, and the smallest of the measured values shall not fall below the value given in Table 4 to Table 18, as appropriate, by more than (10 % + 0.1 mm).

6.3 Spark testing of insulation

A3 When tested in accordance with the a.c or d.c test methods specified in BS EN 62230, and using the test voltages specified in BS 5099, there shall be no breakdown of the insulation. **A3**

6.4 Corrosive and acid gas emission of insulation and protective barrier

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

7 Identification of cores

7.1 General

The cores of all cables shall be identified either by colour or by numbers. Numbers shall be marked sequentially starting with the number 1. Colour coding shall be in accordance with the following sequence.

Number of cores	Identification
A1 Single-core	Brown or blue
Two-core	Brown, blue
Three-core	Brown, black, grey
Four-core	Blue, brown, black, grey
Five-core	Green-and-yellow, blue, brown, black, grey A1

A3 NOTE Depending on their intended use, the cables might be subject to the core colour requirements specified in BS 7671 or other standards, or in statutory requirements. **A3**

The colour shall be applied either throughout the insulation or on its external surface. **A3** Where surface colouring is applied, the surface colour shall be of essentially the same material as the underlying material and shall be applied as part of the extrusion process. The surface colour shall not be separable from the underlying material. **A3**

Numbers on each core shall be printed in a colour contrasting with that of the insulation.

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.

Conformity shall be checked by visual examination and measurement.

7.2 Bi-colour combination

On the core marked with the bi-colour combination green-and-yellow, the distribution of the colours shall be such that for every 15 mm length of core, one of these colours shall cover at least 30% and at most 70 % of the surface of the core, while the other colour covers the remainder of the surface.

NOTE 1 In cases of dispute and where appropriate to the method of colour marking of the insulation, a suitable test for checking conformity is given in **A3** BS EN 50396:2005, 5.2.

NOTE 2 Depending on their intended use, the cables might be subject to core colour requirements specified in BS 7671 or other standards, or in statutory requirements. **A3**

7.3 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 10 times with a piece of cotton wool or cloth soaked in water.

8 Laying-up

8.1 General

The cores of cables having two-, three-, four- or five-cores shall be laid-up with a right-hand or right-and-left-hand alternating direction of lay. For multicore auxiliary cables the direction of lay shall alternate for each successive layer. Auxiliary cables having up to and including seven cores may be laid-up with a right-hand or left-hand or with a right-and-left-hand alternating direction of lay. Cores shall be laid-up in the sequence given in 7.1.

Conformity shall be checked by visual examination.

If necessary, the formation of a compact and reasonably circular cable shall be achieved either by the bedding (see 9.1), or by the application of synthetic fillers and binder tape.

It shall be possible to strip the fillers, if any, from the cable without damaging the insulation of the cores.

8.2 Corrosive and acid gas emission of binder tape(s) and fillers

When tested in accordance with A_1 BS EN 50267-2-1 A_1 , the level of HCl of filler and binder tape(s) shall be not greater than 0.5 %.

9 Bedding

9.1 General

The bedding shall consist of an extruded layer of polymeric material compatible with the operating temperature of the cable. When tested in accordance with BS EN 60811-1-1, it shall have a tensile strength of not less than 4 N/mm² and elongation at break not less than 50 %.

It shall be possible to remove the bedding without damaging the insulation of the core(s).

9.2 Thickness of bedding

The minimum thickness of extruded bedding, measured in accordance with Annex D, shall not fall below the value given in Table 4 to Table 18, as appropriate, by an amount more than (20 % + 0.2 mm).

9.3 Corrosive and acid gas emission of bedding

When tested in accordance with A_1 BS EN 50267-2-1 A_1 , the level of HCl shall be not greater than 0.5 %.

10 Armour

10.1 General

The armour shall consist of a single layer of wires having nominal dimensions as given in Table 4 to Table 18, as appropriate. The armour shall be applied helically with a left-hand lay for cables having up to and including five-cores. For multicore auxiliary cables the armour shall be applied helically with a direction of lay opposite to that of the final layer of cores, except that for cables which have been laid-up with alternating right-and-left-hand lay the armour may be applied with either a right-hand or a left-hand lay.

The manufacturer shall, where necessary, apply a suitable binder tape over the armour.

No protective compounds, e.g. bitumen, shall be applied over the armour.

10.2 Corrosive and acid gas emission of binder tape

When tested in accordance with A_1 BS EN 50267-2-1 A_1 , the level of HCl shall not be greater than 0.5 %.

10.3 Wire armour

Wire armour for cables having two or more cores shall consist of a single layer of galvanized steel wires. Wire armour for single-core cables shall consist of a single layer of aluminium wires.

The armour wire shall conform to the following.

- a) When determined in accordance with G.1, the diameter of the round armour wires, whether of galvanized steel or plain aluminium, shall fall within the minimum and the maximum wire diameters given in Table 1.
- b) When determined in accordance with G.2, the mass of zinc coating of galvanized steel armour wire shall be not less than the value given in Table 1.

c) When tested in accordance with **G.3**, the mechanical characteristics of galvanized armour wires shall be such that none of the wires shall break.

d) When tested in accordance with **G.4**, the tensile strength of aluminium armour wires shall be not less than 125 N/mm².

Table 1 — Diameter of armour wire and mass of zinc coating

Nominal wire diameter mm	Wire diameter		Minimum mass of zinc coating g/m ²
	Minimum mm	Maximum mm	
0.9	0.85	0.95	112
1.25	1.18	1.32	150
1.6	1.51	1.69	172
2.0	1.90	2.10	180
2.5	2.37	2.63	195
3.15	2.99	3.31	206

10.4 Joints

Joints in steel wire armour shall be brazed or welded and any surface irregularity shall be removed.

Joints in aluminium wire shall be made by cold pressure or fusion welding and all surface irregularities shall be removed.

A joint in any wire shall be not less than 1 m from the nearest joint in any other armour wire in the complete cable.

10.5 Armour resistance

When measured and corrected to 20 °C in accordance with **G.5**, the d.c. resistance of the armour of the completed cable shall not exceed the appropriate value given in Table H.1, Table H.2 or Table H.3.

11 Oversheath

11.1 General

The oversheath shall be an extruded layer of polymeric material conforming to the requirements for LTS 1 specified in BS 7655-6.1.

A3 NOTE Oversheaths are normally black and, when properly formulated and compounded, this provides good resistance to deterioration from outdoor exposure to light. Colours other than black may be provided by agreement between the manufacturer and the purchaser but, unless such oversheaths also include additives to protect the cable from UV, the cables will not be suitable for all exposure conditions. **A3**

11.2 Thickness of oversheath

The minimum thickness of the oversheath, when measured in accordance with Annex D, shall not fall below the value given in Table 4 to Table 18, as appropriate, by an amount exceeding (20 % + 0.2 mm).

11.3 Spark testing of oversheath

A3 When tested in accordance with the a.c or d.c test methods specified in BS EN 62230, and using the test voltages specified in BS 5099, there shall be no breakdown of the oversheath. **A3**

11.4 Corrosive and acid gas emission of oversheath

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

12 Cable marking

12.1 End marking

The ends of each factory length of cable having three or more cores of conductor size 25 mm² and above shall be marked red or green. The end at which the sequence of core colours, as specified in Clause 7, is clockwise shall be marked red and the other end shall be marked green.

12.2 External marking

The external surface of all cables conforming to this British Standard shall be legibly marked with the following elements.

Element	Example of marking
a) Electric cable	ELECTRIC CABLE
b) Voltage designation	600/1 000 V 3 300 V 600/1 000 V AUX
c) British Standard number	BS 6724 ¹⁾
d) Manufacturer's identification	XYZ
A1 e) Number of cores, type and nominal area of conductor	
1) Copper conductor cables	4 × 50
NOTE 1 4 × 50 indicates a four-core cable with 50 mm ² copper conductors.	
2) Aluminium conductor cables	4 × 50AL
NOTE 2 4 × 50AL indicates a four-core cable with 50 mm ² aluminium conductors. A1	

The marking of the items a) to d) shall be by embossing or indenting on the oversheath.

For cables with tabulated approximate overall diameters greater than 15 mm, items a), b) and c) shall appear, in any sequence that is deemed neither to confuse nor conflict, on two or more primary lines along the axis of the cables, approximately equally spaced around the circumference of the cable.

Items d) and e) shall appear either on one of the primary lines, or on a secondary line or lines, in any sequence that is deemed neither to confuse nor conflict.

A1 NOTE 3 **A1** Items d) and e) need not both appear on the same line.

For cables with tabulated approximate overall diameters up to and including 15 mm, the elements of the marking shall be disposed as for cables of greater than 15 mm diameter except that the marking for items a), b) and c) shall appear on one or more primary lines.

The letters and figures shall consist of upright block characters with a minimum height of 3 mm.

The distance between the end of one element of marking and the beginning of the next identical element of marking shall be not greater than 550 mm for items a), b) and c) and not greater than 1 100 mm for items d) and e).

Conformity shall be checked by visual examination and measurement.

12.3 Identification of year of manufacture

A means of identifying the year of manufacture shall be provided throughout the length of cable, either by marking or by an identification thread.

If the identification is by internal marking, the distance between the end of one mark and the beginning of the next mark shall be not greater than 550 mm.

If the identification is by marking on the surface, the maximum distance between marks shall be not greater than 1 100 mm.

12.4 The mark of an approval organization

If the mark of an approval organization is used it shall be provided throughout the length of the cable, either on the surface or as an identification thread.

If the mark is applied to the surface of the cable, it shall be in the form of symbol(s) specified by the approval organization, and the maximum distance between marks shall be not greater than 1 100 mm.

If the mark is in the form of an identification thread, it shall be as specified by the approval organization.

A3 ¹⁾ Marking BS 6724 or BS 6724:1997 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. **A3**

12.5 Additional marking

Any additional marking shall be throughout the length of the cable, and shall be either on the external surface of the cable, or by means of a tape or thread within the cable, or by a combination of these methods.

Such marking, however made, shall be repeated at intervals not exceeding 1 100 mm.

If the additional marking is applied to the surface of the cable, it shall not be such as to render illegible the marking specified in 12.2, 12.3 and 12.4.

13 End sealing

Before dispatch, the manufacturer shall cap the ends of the cable in order to form a seal to prevent the ingress of water during transportation and storage.

14 Schedule of tests

The tests to be performed on cables specified in this standard shall be as scheduled in Table 2, which refers to the relevant clauses of the standard specifying the requirements and test methods as well as the category of each test which applies, i.e. T, S or R (as defined in Clause 3). Table 2 also indicates which tests relate to complete cable, and which relate to components.

15 Test conditions

15.1 Ambient temperature

Tests shall be performed at an ambient temperature of $(20 \pm 15) ^\circ\text{C}$ unless otherwise specified in the details for the particular test.

15.2 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 of 49 Hz to 61 Hz. The waveform shall be substantially sinusoidal.

16 Routine tests

16.1 General

Routine tests shall be performed as indicated by the symbol R in Table 2.

NOTE Those requirements for which routine testing is specified, and which are not fully covered by earlier clauses, are detailed in 16.2 and 16.3.

16.2 Conductor resistance

The d.c. resistance of each conductor shall conform to A_3 BS EN 60228 A_3 when measured in accordance with that standard and corrected to $20 ^\circ\text{C}$.

NOTE For convenience, maximum conductor resistance values are given in Table H.1, Table H.2 and Table H.3.

16.3 Voltage test on completed cables

When the completed cable is tested in accordance with Annex K, the insulation shall not break down.

17 Sample tests

17.1 General

Sample tests shall be performed as indicated by the symbol S in Table 2.

NOTE Those requirements for which sample testing is specified, and which are not fully covered by earlier clauses, are detailed in 17.2 and 17.3.

17.2 Flame propagation on single cable

A_1 Cables shall be tested in accordance with A_3 BS EN 60332-1-2 A_3 . 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 A_3 BS EN 60332-1-2:2004, Annex A. A_3 A_1

17.3 Smoke emission

When a sample of the complete cable is tested in accordance with **A3** BS EN 61034-2 **A3**, the values for the light transmittance shall not fall below 70 % at any time during the test.

The samples of cable shall be tested as a flat horizontal unit. The number of samples of cable shall be determined in accordance with **A3** BS EN 61034-2 **A3** using the values of approximate overall diameter given in Table 4 to Table 18.

18 Type tests

18.1 General

Type tests shall be performed as indicated by the symbol T in Table 2 (see also Annex P).

NOTE Those requirements for which type testing is specified, and which are not fully covered by earlier clauses, are detailed in 18.2 to 18.7.

18.2 Compatibility

When a sample of complete cable is aged in accordance with **M.2**, the insulation and oversheath shall conform to the requirements given in Table 3. In addition, at the end of the test period in the oven, the blotting paper shall be free of stains.

18.3 Shrinkage of insulation

When a 200 mm sample of core is tested at $(130 \pm 2)^\circ\text{C}$ for 1 h in accordance with BS EN 60811-1-3, the shrinkage of the insulation shall not exceed 4 %.

The test shall only be performed on cores insulated with GP 8 compound. For cables having up to five-cores, each core shall be tested. For multicore auxiliary cables, five-cores selected at random shall be tested.

18.4 Abrasion

When a sample of the complete cable is tested in accordance with Annex E, the oversheath shall be deemed to be satisfactory provided that, following the test, examination of the sample without magnification reveals no cracks or splits in the internal and external surfaces.

18.5 Flame propagation on multiple cables

A1 Cables shall be tested in accordance with BS EN 50266-2-4. 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 50266-2-4:2001, Annex B. **A1**

18.6 Shrinkage of oversheath

When a sample of complete cable is tested at $(80 \pm 2)^\circ\text{C}$ for 4 h in accordance with Annex J, the shrinkage of the oversheath shall not exceed 4 %.

18.7 Insulation resistance constant of oversheath

When a sample of complete cable is subjected to the test in Annex F, the value of K shall be not less than $0.0035 \text{ M}\Omega \cdot \text{km}$.