

Specification for

**Cables with extruded
cross-linked
polyethylene or
ethylene propylene
rubber insulation for
rated voltages
from 3800/6600 V up
to 19 000/33 000 V**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Cables and Insulation Standards Policy Committee (CIL/-) to Technical Committee CIL/20, upon which the following bodies were represented:

- Aluminium Federation
- Association of Consulting Engineers
- Association of Manufacturers of Domestic Electrical Appliances
- British Approvals Service for Cables
- British Cable Makers' Confederation
- British Plastics Federation
- British Railways Board
- British Steel Industry
- British Telecommunications plc
- Department of the Environment (Property Services Agency)
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- ERA Technology Ltd.
- Electricity Supply Industry in United Kingdom
- Engineering Equipment and Materials Users' Association
- Institution of Electrical Engineers
- London Regional Transport

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

- Association of Supervisory and Executive Engineers
- British Steel plc
- Electrical Contractors' Association
- London Underground Ltd.

This British Standard, having been prepared under the direction of the Cables and Insulation Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 June 1991

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Voltage designation	1
3 Conductors	1
4 Conductor screen	1
5 Insulation	2
6 Insulation screen	2
7 Laying-up	3
8 Inner covering	3
9 Collective metallic screen	3
10 Armour	3
11 Oversheath	5
12 Marking	5
13 Sealing and drumming	6
14 Schedule of tests	6
15 Test conditions	6
16 Routine tests	8
17 Regular sample tests	9
18 Special sample tests	10
19 Type tests	10
20 Dimensions	11
21 Optional requirements	12
Appendix A Recommendations for the selection of cables	24
Appendix B Information to be provided with enquiry or order	25
Appendix C Recommendations for the installation of cables	25
Appendix D Special sample tests	28
Appendix E Method of measuring resistivity of extruded semi-conducting conductor and insulation screens	29
Appendix F Regular sample thickness test	31
Appendix G Information on type tests	32
Appendix H Partial discharge test	33
Appendix J Type tests	34
Appendix K Impulse voltage test	35
Appendix L Methods of test for semi-conducting unvulcanized rubber compound	36
Appendix M Guide to use	39
Figure 1 — Test piece and arrangement of electrodes for measurement of resistivity of conductor screen of circular core	30
Figure 2 — Test piece and arrangement of electrodes for measurement of resistivity of insulation screen of circular core	30
Figure 3 — Arrangement of test piece, electrodes and insulating strips for measurement of resistivity of conductor and insulation screens of shaped core	31
Figure 4 — Dimensions of test piece for measurement of resistivity of semi-conducting unvulcanized rubber compound	38
Figure 5 — Test arrangement for measurement of resistivity of semi-conducting unvulcanized rubber compound	39

	Page
Table 1 — Dimensions of shaped solid aluminium conductors	1
Table 2 — Cross-linked polyethylene (XLPE) and ethylene propylene rubber compound (EPR) insulation	4
Table 3 — Mass of zinc coating	5
Table 4 — Schedule of tests	7
Table 5 — Routine tests	8
Table 6 — D.C. resistance of copper wire screen	8
Table 7 — Voltage for partial discharge test	8
Table 8 — Voltage for test on complete cable	9
Table 9 — Regular sample tests	9
Table 10 — Special sample tests	10
Table 11 — Type tests	10
Table 12 — Power factor with relation to voltage	11
Table 13 — Power factor with relation to temperature	11
Table 14 — Voltage for impulse withstand test	11
Table 15 — 4 h voltage test	11
Table 16 — Compatibility requirements	13
Table 17 — Single-core cables 3 800/6 600 V	14
Table 18 — Three-core cables 3 800/6 600 V	15
Table 19 — Single-core cables 6 350/11 000 V	16
Table 20 — Three-core cables 6 350/11 000 V	17
Table 21 — Single-core cables 8 700/15 000 V	18
Table 22 — Three-core cables 8 700/15 000 V	19
Table 23 — Single-core cables 12 700/22 000 V	20
Table 24 — Three-core cables 12 700/22 000 V	21
Table 25 — Single-core cables 19 000/33 000 V	22
Table 26 — Three-core cables 19 000/33 000 V	23
Table 27 — Selection of cables for three-phase a.c. systems	24
Table 28 — Minimum bending radius during installation	26
Table 29 — Minimum bending radius with cable adjacent to joints or terminations	26
Table 30 — Voltage for test after installation	27
Table 31 — Special 4 h voltage test	29
Publication(s) referred to	42

Foreword

This new edition of BS 6622 has been prepared under the direction of the Cables and Insulation Standards Policy Committee, and it supersedes BS 6622:1985, which is withdrawn.

This edition includes some technical changes to bring the standard up-to-date but it does not reflect a full review of the standard, which will be undertaken in due course. This edition introduces the following changes:

- a) new marking requirements (see clause 12);
- b) updated formulae for the calculation of short circuit current requirements (see 21.4.2);
- c) the extension of tables to include 400 mm² cross-sectional area (see Table 18, Table 20, Table 22, Table 24 and Table 26);
- d) revised definitions of voltage ratings to align with IEC 183 (see Appendix A);
- e) a new guide to use (see Appendix M).

This standard deals with cables in the rated voltage range from 3 800/6 600 V up to 19 000/33 000 V insulated with cross-linked polyethylene (XLPE) or ethylene propylene rubber compound (EPR).

Armoured cables with basically the same types of insulation for the rated voltages of 600/1 000 V and 1 900/3 300 V are covered by BS 5467.

The cables for voltage in this standard are all of the screened type, having semi-conducting layers over the conductor and over the insulation. They may be armoured or unarmoured, but all include a metallic layer surrounding the cores, either individually or collectively.

The requirements are generally designed to provide compliance with IEC Publication 502. The one exception is that the designs of 3 800/6 600 V EPR insulated cables included herein incorporate core screening, whereas IEC Publication 502 provides for EPR cables of this voltage rating without core screening and on this account specifies a greater insulation thickness for EPR than for XLPE at this voltage. In this British Standard the screened 3 800/6 600 V EPR insulated cable has the same insulation thickness as the corresponding XLPE insulated cable.

While providing for compliance with IEC Publication 502 in all other respects, this British Standard includes some additional requirements. In particular, requirements for the semi-conducting layers are included, there being no international agreement at present for these, and there is some detail given of metallic screening, which in IEC Publication 502 is left to national requirements. Also the thickness of oversheath applied to copper tape or wire screens with unarmoured cables is specified as minimum average and minimum at a point, whereas IEC Publication 502 specifies values only as nominal and minimum at a point.

The standard allows for variation in construction within the specified parameters in much the same way as IEC Publication 502, but gives preference to particular constructions that are expected to be suitable for most installations by providing tabular data for them.

Some of the tests similar in character to those in IEC Publication 502 have more onerous requirements, e.g. bending test for armoured cables, heating cycle test and discharge test levels, to meet the demands of users in Great Britain.

Recommendations for the selection of cables are given in Appendix A.

Differences in the text between this edition and BS 6622:1985 are indicated by a vertical line in the margin.

Certification. Attention is drawn to the certification services (see inside back cover) of the British Approvals Service for Cables (BASEC)¹⁾. These services include licensing manufacturers to use BASEC certification trade marks as independent assurance that cables or cords have been designed and manufactured to appropriate British Standards.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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 to iv, pages 1 to 42, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ British Approvals Service for Cables Ltd., Silbury Court, 360 Silbury Boulevard, Milton Keynes MK9 2AF.

1 Scope

This British Standard specifies requirements for construction and describes tests for cables with thermosetting synthetic insulation for rated nominal voltages from 3 800/6 600 V up to 19 000/33 000 V inclusive.

The cables are either single- or three-core, with conductor and insulation screening, either armoured or unarmoured, and have suitable protective coverings.

The cables are designed for a maximum continuous conductor operating temperature of 90 °C and for a maximum short circuit conductor temperature of 250 °C.

Three optional requirements are given. When required by the purchaser, the appropriate options are to be stated on the enquiry or order using the designations given in clause 21.

Appendix A gives detailed guidance on the selection of cables of appropriate voltage designations for particular systems, and includes reference to metal sheaths.

Cable designs having alternative means of restricting radial penetration of water and also means of restricting longitudinal penetration of water will be taken into account in an addition to, or later edition of, this standard.

Appendix B lists the information required with an enquiry/order for cables together with those tests that will only be carried out when requested.

Appendix C gives recommendations for the installation of cables.

NOTE The titles of the publications referred to in this standard are listed on page 42.

2 Voltage designation

The cables are designated by the rated voltages U_0 and U , expressed in the form U_0/U , where:

U_0 relates to the power frequency voltage to earth for which the cable is suitable;

U relates to the power frequency voltage between conductors for which the cable is suitable.

The rated voltages U_0/U of the cables included in this standard are:

3 800/6 600 V, 6 350/11 000 V, 8 700/15 000 V, 12 700/22 000 V and 19 000/33 000 V.

In addition, in the heading of each of the Table 17 to Table 26 the value of U_m is shown in parentheses where U_m is the maximum sustained power frequency voltage between conductors for which the cable is suitable.

3 Conductors

The conductors shall be either plain annealed copper conductors or plain aluminium conductors and, with the exception of the dimensions of shaped solid aluminium conductors which shall be as given in Table 1, shall comply with BS 6360. When tested in accordance with D.2, the minimum corner radii for shaped solid aluminium conductors shall be as given in Table 1.

Copper conductors shall be stranded (class 2) conductors. Aluminium conductors shall be either solid (class 1) or stranded (class 2) conductors.

The conductors shall be circular, except that the use of shaped conductors, as an alternative to the use of circular conductors, is permitted for three-core cables of rated voltages 3 800/6 600 V and 6 350/11 000 V having conductor cross-sectional areas not less than the following:

3 800/6 600 V : 70 mm²

6 350/11 000 V : 95 mm²

Stranded circular conductors shall be compacted or uncompacted.

4 Conductor screen

4.1 General

A conductor screen consisting of an extruded layer of semi-conducting compound, which shall be cross-linked during the manufacture of the cable, shall be applied over the conductor. The extruded conductor screen shall be applied in the same operation as the insulation and be fully bonded to the insulation.

Table 1 — Dimensions of shaped solid aluminium conductors

Nominal cross-sectional area of conductor	Nominal dimensions of conductor				Minimum corner radius of conductor
	Width	Depth	Back radius	Corner radius	
mm ²	mm	mm	mm	mm	mm
70	11.3	7.9	9.9	2.8	2.6
95	13.9	9.1	11.4	2.8	2.6
120	15.8	10.2	12.6	3.0	2.8
150	17.9	11.3	13.9	3.0	2.8
185	20.5	12.6	15.4	3.0	2.8
240	24.0	14.5	17.5	3.0	2.8
300	27.3	16.2	19.5	3.0	2.8

A semi-conducting tape applied prior to the extruded layer at the discretion of the manufacturer is permitted.

The extruded conductor screen shall be applied in the same operation as the insulation.

4.2 Materials

The resistivity of the extruded conductor screen shall not exceed 500 Ω m at 90 °C when measured in accordance with Appendix E. As a part of the complete cable, the screen shall comply with the compatibility requirements of **19.3**.

5 Insulation

5.1 General

The insulation shall be either cross-linked polyethylene (XLPE) or ethylene propylene rubber compound (EPR) in accordance with Table 2.

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

The colour of the insulation shall be such that it is easily distinguishable from the screening materials.

5.2 Thickness of insulation

The thickness of the insulation, when determined by taking the average of a number of measurements in accordance with Appendix F, shall be not less than the relevant value given in Table 17 to Table 26 for the minimum average thickness; the smallest of the measured values shall be not less than the value specified for the minimum thickness at a point.

The thickness of any tape or extruded conductor or insulation screen shall not be included in the measured insulation thickness.

6 Insulation screen

6.1 General

An insulation screen shall be applied to all cables and shall consist of a semi-conducting layer in combination with a metallic layer.

The semi-conducting layer shall be applied directly over the insulation of each core and the metallic layer shall either be applied around each core (see **6.3**) or be a collective screen applied at a stage after the cores have been laid up together (see clauses **8**, **9** and **10**).

NOTE The types of metallic screen for the designs of cables given in the tables are described in clause **20**. These may be modified to meet particular service conditions.

6.2 Semi-conducting layer

6.2.1 General. The semi-conducting layer shall be one of the following:

- a) a semi-conducting tape applied over a semi-conducting coating; or
- b) an extruded layer of semi-conducting compound.

6.2.2 Semi-conducting taped screens. When a taped form of screening is used, the semi-conducting coating shall be applied to cover completely the surface of the insulation and this coating shall be followed by a semi-conducting tape applied helically with an overlap.

6.2.3 Semi-conducting extruded screens. Extruded screens shall consist of semi-conducting compound, which shall be cross-linked during the manufacture of the cable. The semi-conducting layer shall be continuous and shall cover the surface of the core completely.

The extruded layer shall be applied in the same operation as the insulation.

The resistivity of the extruded insulation screen shall not exceed 500 Ω m at 90 °C when measured in accordance with Appendix E. As part of the complete cable, the screen shall comply with **19.3**.

The insulation screen shall be capable of removal without impairing the performance of the insulation. If the screen is cold strippable, the force required to remove the screen, when tested in accordance with **D.3**, shall be not less than 18 N and not more than 80 N.

NOTE Whether or not a specific type of insulation screen is required and, if it is extruded, whether or not it is cold strippable, are subject to the purchaser's contract (see Appendix B).

6.3 Metallic screen on each core

If a metallic screen is applied directly over the core of single-core cables or each core in three-core cables, it shall consist of either helically applied copper tape (s) or a concentric layer of copper wires applied helically or in waveform. The metallic screens of the cores in three-core cables shall be in contact with each other.

NOTE 1 Semi-conducting tape or a semi-conducting extruded layer is permitted to be applied over the semi-conducting insulation screen as a bedding for the metallic layer at the discretion of the manufacturer and shall conform to the requirements of **6.2.3**.

If the copper wires are applied as the only metallic screen, i.e. there is no further metallic layer, the average gap between adjacent wires shall not exceed 4 mm, with no gaps between them exceeding 8 mm.

NOTE 2 A copper equalizing tape applied at the discretion of the manufacturer is permitted.

NOTE 3 The technical requirements are subject to the purchaser's contract (see Appendix B).

7 Laying-up

For three-core cables, the cores shall be laid-up with a right-hand direction of lay. Fillers shall be used if necessary to form a substantially compact and circular cable. The fillers shall be compatible with adjacent materials. For cables not having a metallic screen on each core, the shape of the filler shall not prevent electrical contact between the insulation screen and the semi-conducting inner covering.

NOTE For cables to which an extruded inner covering is to be applied, a binder over the laid-up cores applied at the discretion of the manufacturer is permitted.

If a binder is applied and the individual cores are not metal screened, then the binder, unless semi-conducting, shall have a maximum cover of 50 %.

8 Inner covering

Three-core cables that are to have a collective metallic screen (see clause 9) shall have an inner covering, extruded or lapped, applied around the laid-up cores unless the separation layer (see 10.1) serves as the inner covering. For cables not having a metallic screen on each core, the inner covering shall be semi-conducting.

NOTE If the inner covering is extruded, the fillers are permitted to be applied integrally with the inner covering.

The materials used for the inner covering shall be suitable for the operating temperature of the cable and compatible with the other materials used in the cable construction. Compliance shall be checked by the compatibility test described in 19.3.

9 Collective metallic screen

Three-core cable not having a metallic screen over each individual core shall have a collective screen applied over the inner covering.

NOTE 1 Where armouring is applied, it is permitted to serve as a collective screen.

NOTE 2 This does not preclude three-core cables having a metallic screen over each individual core from having a collective screen.

Unless the cable has a metallic sheath (see Appendix A) or armour (see clause 10), the collective screen shall consist of a concentric layer of copper wires applied helically or in waveform. The average gap between adjacent wires shall not exceed 4 mm, with no gaps between them exceeding 8 mm.

10 Armour

10.1 Separation layer

When armour is to be applied to a cable having another screen of dissimilar metal, an extruded separation layer shall be applied between the two layers of metal. The material used shall comply with clause 11.

Nominal and minimum thicknesses of separation layer are specified in Table 17 to Table 26. When the thickness is measured in accordance with Appendix F, the smallest of the measured values shall be not less than the relevant value specified in Table 17 to Table 26 for the minimum thickness at a point.

10.2 Metal layer

For the armouring of three-core cables, round galvanized steel wires shall be used.

For the armouring of single-core cables either round aluminium wires or aluminium strips shall be used.

The armouring shall comply with the following.

- a) When determined in accordance with D.4, the diameter of the round armour wires, whether galvanized steel or plain aluminium, shall not fall below the relevant nominal value specified in Table 17 to Table 26 by more than 5 %.
- b) When determined in accordance with D.6, the mass of the zinc coating of galvanized steel armour wire shall be not less than that given in Table 3.
- c) When determined in accordance with D.5, the thickness and width of individual strips of aluminium armour shall not differ from the relevant values specified in Table 17 to Table 26 as appropriate by more than 5 %.
- d) When subjected to the test given in D.7, the mechanical characteristics of the galvanized steel armour wires shall be such that none of the wires shall break.
- e) When tested in accordance with D.8, the tensile strength of aluminium wires shall be not less than 125 N/mm².
- f) When tested in accordance with D.8, the tensile strength of the individual strips of aluminium armour shall be not less than 145 N/mm².

Armour shall be applied helically in a single layer with a left-hand lay.

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

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

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

Table 2 — Cross-linked polyethylene (XLPE) and ethylene propylene rubber compound (EPR) insulation

Test		Requirements		Test method in accordance with BS EN 60811-		Category of test (see clause 14)
		XLPE	EPR	Section	Clause	
Properties in the state as delivered				1-1:1995	9	T
Minimum tensile strength	N/mm ²	12.5	4.2			
Minimum elongation at break	%	200	200			
Properties after ageing in air oven				1-2:1995	8.1	T
Temperature	°C	135 ± 2	135 ± 2			
Duration	h	7 × 24	7 × 24			
Maximum variation for tensile strength ^a	%	25	30			
Maximum variation for elongation at break ^a	%	25	30			
Properties after ageing in air bomb				1-2:1995	8.2	T
Temperature	°C	—	127 ± 1			
Duration	—	—	40			
Maximum variation for tensile strength ^a	%	—	30			
Maximum variation for elongation at break ^a	%	—	30			
Shrinkage test				1-3:1995	10	T
Temperature	°C	130 ± 2	—			
Duration	h	1	—			
Maximum shrinkage	%	4	—			
Ozone resistance test				2-1:1995	8.1	T
Temperature	°C	—	25 ± 2			
Duration	h	—	30			
Ozone concentration	ppm	—	250 – 300			
Requirement			no cracks	2-1:1995	9	RS
Hot set test						
Temperature	°C	200 ± 2	250 ± 3			
Duration	min	15	15			
Mechanical stress	N/mm ²	0.2	0.2			
Requirements						
Maximum elongation under load	%	175	175			
Maximum elongation after unloading	%	15	15			

^a The variation is the difference between the respective values obtained prior to and after heat treatment expressed as a percentage of the former.

Table 3 — Mass of zinc coating

Nominal diameter of armour wire	Minimum mass of zinc coating per square metre
mm	g
1.6	172
2.0	180
2.5	195
3.15	206

11 Oversheath

11.1 General

The material for a PVC extruded oversheath shall comply with the requirements of BS 7655-4.2 for type 9 compound.

NOTE Oversheaths are normally black but colours other than black, or oversheaths of polyethylene compound of the same thickness may be provided by agreement between the manufacturer and the purchaser, subject to their suitability for the particular conditions under which the cables are to be used.

11.2 Thickness for unarmoured cables

For unarmoured cables, the thickness of PVC oversheath, when determined by taking the average of a number of measurements in accordance with Appendix F, shall be not less than the relevant value specified in Table 17 to Table 26 for the minimum average thickness; the smallest of the measured values shall be not less than the value specified for the minimum thickness at a point.

11.3 Thickness for armoured cables

For armoured cables, the nominal and the minimum thickness of PVC oversheath are specified in Table 17 to Table 26. The smallest of the measured values shall not be less than the relevant value specified in Table 17 to Table 26 for the minimum thickness at a point, when the thickness is measured in accordance with Appendix F.

11.4 Spark test on oversheath

When tested in accordance with BS 5099, no failure shall occur.

11.5 Graphite layer (optional)

When the purchaser specifies that a d.c. voltage test is to be carried out on the oversheath (see A.3), a coating of graphite shall be applied over its surface and the cable shall comply with 21.2.

12 Marking

12.1 Marking of oversheath

The external surface of all cables in this standard shall be legibly marked with the following elements of marking.

Element	Example of marking
a) Electric cable	ELECTRIC CABLE
b) Voltage designation	3 800/6 600 6 600 V 6 350/11 000 11 000 V 8 700/15 000 15 000 V 12 700/22 000 22 000 V 19 000/33 000 33 000 V
c) British Standard number	BS 6622
d) Manufacturer's identification	XYZ
e) The number of cores, type and nominal area of conductor as follows:	1) Copper conductor cables 3×50 NOTE 1 3×50 indicates a three-core cable with 50 mm^2 copper conductors. 2) Aluminium conductor cables $3 \times 50 \text{ AL}$ NOTE 2 $3 \times 50 \text{ AL}$ indicates a three-core cable with 50 mm^2 aluminium conductors.

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

Items a), b) and c) shall appear, in any sequence that is deemed to neither confuse nor conflict, on two or more primary lines along the axis of the cable, approximately equally spaced around the circumference of the cable. Items d) and e) shall appear on at least one line, which can be one of the primary lines, or a secondary line or lines. They can appear in any sequence that is deemed to neither confuse nor conflict, and need not all be on the same line.

The letters and figures shall consist of upright block characters. The characters shall have 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 not be greater than 550 mm, for items a), b) and c), and not greater than 1 100 mm for items d) and e).

Compliance shall be checked by visual examination and measurement.

12.2 Identification of year of manufacture

A means of identifying the year of manufacture of the cable shall be provided throughout the length of the cable, either internally or by marking on the surface of the cable.

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

NOTE As an alternative internal marking, an identification thread may be used.

If the identification is by marking on the surface it shall comply with 12.1 d) and e) in respect of maximum distance between marks.

12.3 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.

If this mark is applied to the cable it shall be on the surface in the form of the symbol(s) specified by the approval organization, and shall comply with 12.1 d) and e) in respect of maximum distance between marks.

NOTE As an alternative to the mark of the approval organization, an identification thread may be incorporated into the cable, as specified by the approval organization.

12.4 Additional marking

Where additional marking is made it shall be throughout the length of the cable, and can be 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. If the additional marking is applied to the surface of the cable it shall not render illegible the marking specified in 12.1 to 12.3.

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

13 Sealing and drumming

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

Cable drums shall be lagged in order to protect the cable from damage, and the end of the cable projecting from the drum shall also be protected from damage.

Each drum shall bear a distinguishing number on the outside of the flange and particulars of the cable, i.e. voltage, length, conductor size and cable type. The gross mass shall be shown and the direction for rolling shall be indicated by an arrow.

14 Schedule of tests

NOTE Table 4 lists the complete 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. R, RS, SS and T.

The categories and corresponding designations are as follows.

- a) *Routine tests* (R): tests made at the manufacturer's works on all cables in the finished state or, as appropriate, e.g. spark test, during manufacture.
- b) *Regular sample tests* (RS): tests made at the manufacturer's works on representative samples selected regularly by the manufacturer, or as specified by the purchaser at the time of enquiry or order.
- c) *Special sample tests* (SS): tests made on samples if specified by the purchaser at the time of enquiry or order at a frequency agreed between the purchaser and the manufacturer, provided that the quantity ordered exceeds 10 km (see Appendix D).
- d) *Type tests* (T): tests made on specimens of cables as produced by a specific manufacturer to demonstrate the manufacturer's ability to satisfactorily produce a range of cables designed to comply with this standard. These tests, after they have been successfully completed, need not be repeated unless changes are made which might affect compliance with the requirements (see Appendix G).

15 Test conditions

15.1 Ambient temperature

Tests shall be made at an ambient temperature of 20 ± 15 °C unless otherwise specified in the particular test.

15.2 Frequency and waveform of power frequency test voltages

Unless otherwise specified in the particular test alternating test voltages shall have a frequency between 49 Hz and 61 Hz. The waveform shall be substantially sinusoidal.

Table 4 — Schedule of tests

Test	Requirements (clause reference)	Test procedure	Category
<i>Tests on components</i>			
Conductor:			
a) construction	3	Visual examination	RS
b) corner radii of shaped solid aluminium conductor	3	D.2	SS
Conductor screen:			
a) application	4.1	Visual examination	RS
b) resistivity	4.2	Appendix E	T and SS
Insulation:			
a) material	—	See Table 2	See Table 2
b) colour	5.1	Visual examination	RS
c) thickness	5.2	Appendix F	RS
Semi-conducting insulation screen:			
taped screen: application	6.2.2	Visual examination	RS
Extruded screen:			
a) application	6.2.3	Visual examination	RS
b) resistivity	6.2.3	Appendix E	T and SS
c) cold strippability	6.2.3	D.3	SS
Laid-up cores	7	Visual examination	RS
Inner covering	8	Visual examination	RS
Collective metallic screen construction	9	Visual examination	RS
Armour:			
a) separation layer:	material	10.1	T
	thickness	10.1	RS
b) metal layer			
1) galvanized steel wires:	diameter of wires	10.2 a)	SS
	mass of zinc coating	10.2 b)	SS
	wrapping test	10.2 d)	SS
2) aluminium wires (round):	diameter	10.2 a)	SS
	tensile test	10.2 e)	SS
3) aluminium strips:	dimensions	10.2 c)	SS
	tensile test	10.2 f)	SS
Oversheath:			
a) material	11.1	BS 7655-4.2	T
b) thickness, unarmoured cables	11.2	Appendix F	RS
c) thickness, armoured cables	11.3	Appendix F	RS
d) spark test	11.4	BS 5099	R

Table 4 — Schedule of tests

Test	Requirements (clause reference)	Test procedure	Category
<i>Tests on complete cables</i>			
Cable marking	12	Visual examination	R
Conductor resistance test	16.2	BS 6360	R
Copper wire screen resistance test	16.3	BS 6360	R
Voltage test on complete cable length	16.5	16.5.2	R
Partial discharge test	16.4	Appendix H	R
D.C. voltage test on oversheath (optional)	21.2	21.2.2	R
4 h voltage test on sample	18.2	D.9	SS
Sequential type tests	19.2	19.2	T
Compatibility test	19.3	J.4	T
Test under fire conditions (optional)	21.3	BS 4066-1	T
Adherence of screens of short circuit temperatures (optional)	21.4	21.4.2	T

16 Routine tests

16.1 General

Routine tests shall be as given in Table 5.

Table 5 — Routine tests

Test	Requirement	Test procedure
Cable marking	12	Visual examination
Spark test on oversheath	11.4	BS 5099
Conductor resistance	16.2	BS 6360
Screen resistance	16.3	BS 6360
Voltage test on complete cable	16.5	16.5
Partial discharge	16.4	Appendix H
DC voltage tests on oversheath (optional)	21.2	21.2

16.2 Conductor resistance

The d.c. resistance of each conductor shall comply with BS 6360 when measured and corrected to 20 °C in accordance with that standard.

16.3 Copper wire screen resistance

The d.c. resistance of copper wire screen of a specified cross-sectional area shall not exceed the relevant value given in Table 6 when measured on the complete cable with the wires bunched together at the ends. The measurements shall be made and corrected to 20 °C in accordance with BS 6360.

Table 6 — D.C. resistance of copper wire screen

Nominal cross-sectional area of screen mm ²	Maximum d.c. resistance at 20 °C per 1 000 m of cable Ω
16	1.19
25	0.759
35	0.542
50	0.379
70	0.271
95	0.200

16.4 Partial discharge

When tested in accordance with Appendix H, the magnitude of the discharge on each core at the voltage given in Table 7 shall not exceed 10 pC.

Table 7 — Voltage for partial discharge test

Rated voltage, U_0 kV	Test voltage r.m.s. kV
3.8	5.7
6.35	9.6
8.7	13.1
12.7	19.1
19.0	28.5

16.5 Voltage test on complete cable

16.5.1 Requirement. No breakdown of the insulation shall occur when the completed cable is subjected to a power frequency voltage of the magnitude given in Table 8.

Table 8 — Voltage for test on complete cable

Rated voltage U_0 kV	Test voltage r.m.s. kV
3.8	11
6.35	15
8.7	22
12.7	30
19.0	45

16.5.2 Method. Apply the voltage between the conductor(s) and the metallic screen(s) with the metallic screen(s) earthed. Raise the voltage gradually and maintain at the full value for 5 min.

17 Regular sample tests

Regular sample tests shall be as given in Table 9.

Table 9 — Regular sample tests

Test	Requirement	Test procedure
Conductor construction	3	Visual examination
Conductor screen application	4.1	Visual examination
Insulation		
colour	5.1	Visual examination
thickness	5.2	Appendix F
Semi-conducting insulation screen		
taped screen application	6.2.2	Visual examination
Extruded screen application	6.2.3	Visual examination
Laid-up cores		
collective metallic	7	Visual examination
screen construction	9	Visual examination
Armour separation layer thickness	10.1	Appendix F
Oversheath thickness		
unarmoured cables	11.2	Appendix F
armoured cables	11.3	Appendix F