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British Standard Specification for  
**PVC-insulated cables for  
electricity supply**

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Câbles isolés au PVC pour alimentation électrique — Spécifications

Kabel mit PVC-Ummantelung für die Elektrizitätsversorgung

## Foreword

This new edition of this British Standard has been prepared under the direction of the General Electrotechnical Engineering Standards Policy Committee. The previous 1987 edition was a revision of BS 6346 : 1969, to satisfy the present requirements of PVC-insulated cables for electricity supply for rated voltages of 600/1000 V and 1900/3300 V. Unarmoured 1900/3300 V cables were no longer included. The 1987 revision has been withdrawn. This edition introduces 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 British Standard takes account of the conductor requirements given in BS 6360, which was revised in 1981 to align with IEC Publication 228 published by the International Electrotechnical Commission (IEC), this latter standard being the reference document for CENELEC\* Harmonization Document HD 383. Dimensional tables have been introduced to cater for every size of multicore auxiliary cable in the range five to 48 cores, with conductor sizes of 1.5 mm<sup>2</sup>, 2.5 mm<sup>2</sup> and 4 mm<sup>2</sup>.

Special sample tests that may be specified by the purchaser at the time of ordering are given in appendix D.

*Certification.* Attention is drawn to the certification services (see inside back cover) of the British Approvals Service for Electric Cables (BASEC)†. 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.

Amendments to the 1987 edition are indicated by a line in the margin.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

\*European Committee for Electrotechnical Standardization.

†British Approvals Service for Electric Cables, PO Box 390, Breckland, Linford Wood, Milton Keynes, Buckinghamshire, MK14 6LN.

Amendment No. 1  
published and effective from 28 February 1992  
to BS 6346 : 1989

Specification for PVC-insulated cables for  
electricity supply

## Revised text

AMD 6831  
February 1992

## Contents

Under the heading 'Appendices' insert the following:  
'F Guide to use'

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## Clause 10. Oversheath

Delete the first sentence of 10.1 and substitute the following:

'The oversheath of unarmoured or armoured cable shall be an extruded layer of TM1 PVC compound, complying with the appropriate requirements of table 3 and BS 6746'.

Between paragraphs 1 and 2 of 10.1 insert:

'NOTE. Oversheaths are normally black, but colours other than black may be provided by agreement between the manufacturer and purchaser, subject to their suitability for the particular exposure conditions under which the cables are to be used.'

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## Clause 11. Cable marking and end sealing

Delete 11.2 and 11.3 and substitute the following:

### '11.2 External marking

The external surface of all cables complying with this British Standard shall be legibly marked with the following elements:

| Element                                                                                                                                                  | Example of Marking                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| (a) Electric cable                                                                                                                                       | ELECTRIC CABLE                         |
| (b) Voltage designation                                                                                                                                  | 600/1000 V<br>3300 V<br>600/1000 V AUX |
| (c) British Standard number                                                                                                                              | BS 6346                                |
| (d) Manufacturer's identification                                                                                                                        | XYZ                                    |
| (e) Number of cores, type and nominal area of conductor                                                                                                  |                                        |
| (1) Copper conductor cables                                                                                                                              | 4 X 50                                 |
| NOTE 1. 4 X 50 indicates a four-core cable with 50 mm <sup>2</sup> copper conductors.                                                                    |                                        |
| (2) Copper conductor cables with reduced neutral                                                                                                         | 3 X 50/25                              |
| NOTE 2. 3 X 50/25 indicates a four-core cable with three 50 mm <sup>2</sup> copper phase conductors and one 25 mm <sup>2</sup> copper neutral conductor. |                                        |



(3) Aluminium conductor  
cables 4 × 50AL

NOTE 3. 4 × 50AL indicates a  
four-core cable with 50 mm<sup>2</sup>  
aluminium conductors.

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

For cables with tabulated approximate overall diameters above 15 mm, 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 either 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.

For cables with tabulated approximate overall diameters of 15 mm or smaller, the elements of marking shall be disposed as for cables above 15 mm 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 shall be not greater than 550 mm for items (a), (b) and (c), and not greater than 1100 mm for items (d) and (e).

Compliance shall be checked by visual examination and measurement.

### 11.3 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 be not 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 items (d) and (e) in 11.2 in respect of maximum distance between marks.

### 11.4 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.

If the 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 items (d) and (e) in 11.2 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.

### 11.5 Additional marking

The use of additional marking is permitted. Where such marking is made it shall be throughout the length of the cable, 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 11.2 to 11.4.

The additional marking, however made, shall be repeated at intervals not exceeding 1100 mm.



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Clause 11.4 End sealing  
Delete '11.4' and substitute '11.6'.

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## New appendix F

Following appendix E, insert the following:

### **'Appendix F. Guide to use**

#### **F.1 Aim**

The aim of this appendix is to inform users of characteristics and limitations of electric cables and thereby to minimize their misuse.

It is assumed that the design of installations and the specification, purchase and installation of cables in accordance with this British Standard is entrusted to suitably skilled and competent people.

In cases of doubt as to the suitability of cables specified in this British Standard for a particular use, further specific information should be obtained from the manufacturer.

#### **F.2 Cable selection and design**

**F.2.1** The products described in this British Standard are intended to be used for the supply of electrical energy up to the rated voltage indicated on the cable. **A.2** defines the voltage ratings of cables manufactured to the specification. These ratings should not be exceeded.

**F.2.2** These cables are intended for use at a nominal power frequency range of 49 Hz to 61 Hz.

**F.2.3** In addition to the thermal rating, due regard should be given to:

- (a) the capability of the cable to withstand the worst anticipated fault condition of the system;
- (b) the earth loop impedance;
- (c) the operating characteristics of the connected equipment;
- (d) the voltage drop requirements during normal load or motor starting conditions.

**F.2.4** The possible effects of transient over-voltages should be recognized as they can be detrimental to cables.

**F.2.5** In three-phase circuits, where third or higher multiple harmonics, or phase load unbalance may occur, consideration should be given to the use of cable with full sized neutral, e.g. in banks of discharge lighting.

#### **F.3 Environment and application**

**F.3.1** Reasonable protection against mechanical damage, appropriate to the choice of cable and the installation conditions, should be provided.

**F.3.2** Cables in this British Standard contain PVC and when exposed to the effects of external fire will produce harmful smoke and fumes, and where bundled together may propagate fire. Where circumstances dictate, consideration may be given to the use of materials with a lower risk of propagation.

**F.3.3** Cables may be damaged by exposure to corrosive products or solvent substances, especially petroleum based vapours.

**F.3.4** Special precautions are required when cables are to be installed in areas classified as hazardous and reference should be made to BS 5345.



**F.3.5** Cables in this British Standard are not specifically designed for use:

- (a) as self supporting aerial cables;
- (b) as submarine cable or for laying in water-logged conditions;
- (c) where subsidence is likely, unless special precautions are taken to minimize damage;
- (d) where any exposure to excessive heat is involved;
- (e) where the oversheath is subjected to a voltage test after installation.

**F.3.6** If cables to this specification are exposed to localized heat, solar radiation or high temperature ambient conditions, this will reduce the current-carrying capacity.

**F.3.7** The standard sheathing compounds supplied on these cables do not provide protection against damage by rodents, termites, etc.

**F.3.8** Loaded cables may have surface temperatures which require protection against accidental contact.

#### **F.4 Installation**

**F.4.1** Precautions should be taken to avoid mechanical damage to the cables before and during installation.

**F.4.2** Exceeding the manufacturer's recommended maximum pulling tensions may result in damage to the cable.

**F.4.3** If cables are to be installed in ducts, the correct size of duct should be used. Reference should be made to ERA Publication 69-30, Part III.

**F.4.4** The type of jointing and filling compounds employed has to be chemically compatible with the cable materials.

**F.4.5** The cable support system should be such as to avoid damage or danger under normal or fault conditions.

**F.4.6** Cables in this British Standard are designed for fixed installations only, e.g. they are not for use as trailing or reeling cables.

**F.4.7** Repeated over-voltage testing can lead to premature failure of the cable.

**F.4.8** The selection of cable glands, accessories and any associated tools should take account of all aspects of intended use.

#### **F.5 Storage and drum disposal**

**F.5.1** Cable drums should be regularly inspected during storage to assess their physical condition.

**F.5.2** Battens, where applied, should not be removed from drums until the cable is about to be installed.

**F.5.3** When handling drums reasonable precautions should be taken to avoid injury. Due regard should be paid to the mass of the drum, method and direction of rolling, lifting, protruding nails and splinters.

**F.5.4** Care should be taken with the disposal of empty drums and battens. These are normally returnable to the supplier/cable maker, and return should take place as soon as possible in order to avoid deterioration or their becoming a hazard to the general public, e.g. children.

**F.5.5** Small quantities of timber from drums or battens, which may have been treated with wood preservative, may be burnt under carefully controlled conditions in the open.

**F.5.6** A detailed guide to the safe handling of cable drums is available from the cable manufacturer.



## **F.6 Incineration**

The by-products of burning scrap cable can be a health hazard. Incineration should only be undertaken by a licensed contractor. For further information, HM Inspectorate of Pollution should be contacted.'

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**February 1992**

**Publications referred to**  
Insert the following:

'BS 5345      Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres  
(other than mining applications or explosive processing and manufacture)'

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**Amendment No. 2**  
**published and effective from 15 June 1993**  
**to BS 6346 : 1989**

**Specification for PVC-insulated cables for electricity supply**

**Revised text**

AMD 7636  
June 1993

**Clause 11.2 External marking (as amended by amendment No. 1)**

Delete the second paragraph and substitute the following.

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

AMD 7636  
June 1993

**Clause D.5 Tensile test for aluminium wires and strips**

Delete the first paragraph and substitute the following.

‘Take at random 10 % of the total number of wires or strips from one sample of completed cable. Measure the tensile strength of each wire or strip in accordance with BS EN 10002–1, except that in the case of the aluminium strip the cross-sectional area shall be determined, to an accuracy of  $\pm 1$  %, from the mass of a known length and a density of  $2.703 \text{ g/cm}^3$ . Take the average of all the measurements to be the tensile strength.’

AMD 7636  
June 1993

**Inside back cover**

In the list of publications referred to delete the entry for BS 18 entirely.

Insert the following new entry in correct numerical order.

‘BS EN 10002–1 Tensile testing of metallic materials  
Part 1 Method of test at ambient temperature’



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# Specification

## 1 Scope

This British Standard specifies requirements and dimensions for PVC-insulated cables for operation at nominal voltages up to and including 1900 V to armour or earth and 3300 V between conductors.

The standard covers cables intended for general use where the combination of the ambient temperature and temperature rise due to the loading current results in a conductor temperature not exceeding 70 °C.

The standard covers the following types of cable:

(a) 600/1000 V:

- (1) single-core copper conductor:
  - (i) unarmoured, sheathed,
  - (ii) wire-armoured, sheathed;
- (2) single-core solid aluminium conductor:
  - (i) unarmoured, sheathed,
  - (ii) wire-armoured, sheathed,
  - (iii) aluminium strip-armoured, sheathed;
- (3) single-core solid sectoral aluminium conductor:
  - (i) unarmoured, sheathed,
  - (ii) wire-armoured, sheathed,
  - (iii) aluminium strip-armoured, sheathed;
- (4) two-, three- and four-core copper conductor:
  - (i) unarmoured, sheathed,
  - (ii) wire-armoured, sheathed;
- (5) two-, three- and four-core solid aluminium conductor:
  - (i) unarmoured, sheathed,
  - (ii) wire-armoured, sheathed,
  - (iii) aluminium strip-armoured, sheathed;
- (6) multicore auxiliary copper conductor:
  - (i) wire-armoured, sheathed.

(b) 1900/3300 V:

- (1) single-core copper conductor:
  - (i) wire-armoured, sheathed;
- (2) single-core solid aluminium conductor:
  - (i) wire-armoured, sheathed,
  - (ii) aluminium strip-armoured, sheathed;
- (3) single-core solid sectoral aluminium conductor:
  - (i) wire-armoured, sheathed,
  - (ii) aluminium strip-armoured, sheathed;
- (4) three-core copper conductor:
  - (i) wire-armoured, sheathed;
- (5) three-core solid aluminium conductor:
  - (i) wire-armoured, sheathed,
  - (ii) aluminium strip-armoured, sheathed.

Appendix A gives recommendations for the selection and operation of cables, while recommendations for the installation of cables are given in appendix B, and appendix C lists information that should be given in any enquiry or order.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Definitions

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

**2.1 rated voltage,  $U_0$ .** The nominal power-frequency voltage between conductor(s) and armour or earth, for which the cable is suitable.

**2.2 rated voltage,  $U$ .** The nominal power-frequency voltage between phase conductors for which the cable is suitable.

**2.3 maximum voltage,  $U_m$ .** The maximum sustained power-frequency voltage between phase conductors, for which the cable is suitable.

**2.4 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.

**2.5 approximate value.** A value which is only indicative.

NOTE. In this standard, values described as 'approximate' do not constitute requirements to be checked by measurements.

## 3 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 600/1000 V and 1900/3300 V.

The maximum designated voltages ( $U_m$ ) for the purposes of this standard for 600/1000 V and 1900/3300 V cables are recognized as 1100 V and 3600 V respectively.

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

## 4 Conductors

The conductors shall be either annealed copper conductors or solid aluminium conductors, as given in tables 12 to 26 inclusive and shall comply with BS 6360. It is permissible for the copper wire to be tinned at the manufacturer's discretion.

The conductors shall be circular, circular sectoral or shaped solid (class 1), or circular, circular compacted or shaped stranded (class 2), as given for the type and rated voltage of the cable in tables 12 to 26 inclusive.