

Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V —

Part 1: General guidance

(Implementation of CENELEC
HD 516 S2)

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Committees responsible for this British Standard

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- BEAMA Installation Ltd.
- British Approvals Service for Cables
- British Cables Association
- British Plastics Federation
- Chartered Institution of Building Services
- Department of Trade and Industry — Consumer Safety Unit
- Electricity Association
- Energy Industries Council
- Engineering Industries Association
- ERA Technology Ltd.
- Ministry of Defence — UK Defence Standardization

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Foreword

This part of BS 7540 has been prepared by Subcommittee GEL/20/17. Together with BS 7540-2 and BS 7540-3 it supersedes BS 7540:1994, which is withdrawn.

BS 7540 is published in three parts:

- a) Part 1: *General guidance*;
- b) Part 2: *Harmonized cable types from HD 21 and HD 22*;
- c) Part 3: *National standard cables not included in HD 21 or HD 22*.

BS 7540-1 and BS 7540-2 together form the UK implementation of the European Committee for Electrotechnical Standardization (CENELEC) Harmonization Document HD 516 S2.

This part of BS 7540 should be read in conjunction with either BS 7540-2 or BS 7540-3 as appropriate for the cable type. BS 7540-2 gives guidance on those cable types that are specified in Harmonized Documents HD 21 and HD 22 as implemented in BS 638-4, BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919. BS 7540-3 gives guidance on cables specific to the United Kingdom that are specified in these standards but not included in HD 21 or HD 22.

NOTE BS 7540 is applicable only to cable types that are specified in British Standards, so the parts of HD 516 that cover non-BS cables are not included in the main body of BS 7540. These non-BS cables are, however, listed in BS 7540-2:2005, Annex A, with references to the relevant clauses in HD 21 and HD 22.

Attention is drawn to the Electrical Equipment (Safety) Regulations 1994 [1].

Additional information on installation practice is given in BS 7671.

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 15 and a back cover.

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Introduction

This British Standard provides guidance for equipment manufacturers, installers and end-users on the properties of low voltage electric cables, and the limitations that are deemed to be necessary in order to safeguard life, buildings and goods.

The information is given in the form of limiting values and is illustrated by examples, which are not exhaustive but which indicate ways by which safety can be obtained.

1 Scope

This part of BS 7540 provides general guidance for the safe use of electric cables with a rated voltage not exceeding 450/750 V. It is applicable to those cables that are specified in BS 638-4, BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919.

NOTE 1 These British Standards specify requirements for two categories of cable type. For cable types specified in Harmonized Documents HD 21 and HD 22 as implemented in these British Standards, specific guidance is given in BS 7540-2. For cable types specific to the United Kingdom that are specified in these standards but not included in HD 21 or HD 22, specific guidance is given in BS 7540-3.

The guidance given in this part of BS 7540 can also be applicable to low-voltage cables of a similar type to those specified in BS 638-4, BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919 but not specifically mentioned in those standards.

NOTE 2 In such cases it is advisable to seek additional advice from BSI or the cable manufacturer.

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.

BS 638-4:1996, *Arc welding power sources, equipment and accessories — Specification for welding cables*.

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

BS 6004:2000, *Electric cables — PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring*.

BS 6007:2000, *Electric cables — Single core unsheathed heat resisting cables for voltages up to and including 450/750 V, for internal wiring*.

BS 6500:2000, *Electric cables — Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments*.

BS 7211:1998, *Specification for thermosetting insulated cables (non-armoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire*.

BS 7540-2, *Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V — Part 2: Harmonized cable types from HD 21 and HD 22*.

BS 7540-3, *Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V — Part 3: National standard cables not included in HD 21 and HD 22*.

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition*.

BS 7919:2001, *Electric cables — Flexible cables rated up to 450/750 V, for use with appliances and equipment intended for industrial and similar environments*.

3 Terms and definitions

For the purposes of this part of BS 7540, the terms and definitions given in BS 7671 and BS 4727-2: Group 08 and the following apply.

3.1

internal wiring

wiring mechanically protected by being enclosed within a casing of equipment or by other equivalent means

4 Safety

4.1 General

Safety of a cable means that the product does not present an unacceptable risk of danger to life or property whilst being used in its intended manner.

The limiting conditions under which the cables can reasonably be expected to operate safely under normal circumstances are given in BS 7540-2 and BS 7540-3. Cables should be used only within these limits and in accordance with the relevant British Standard for each cable type.

NOTE 1 Annex A shows how the table numbers in the cable product standards correspond to the table numbers in BS 7540-2 and BS 7540-3.

These limiting conditions are those considered capable of ensuring a length of life in service which has been accepted as reasonable by experience of the particular type of cable and in particular conditions of use. The duration of acceptable performance of a particular type of cable depends upon the type of use, installation or electrical apparatus and on the particular combination of influences relating thereto. For example, the duration of acceptable performance considered as reasonable for a cable used in a fixed installation for the distribution of electricity in a building is more than that for flexible cord.

Cables should not be buried directly in the ground, and unless otherwise stated, should not be used for any purpose other than the transmission and distribution of electricity.

NOTE 2 The test methods and test parameters described in the British Standards referred to in Clause 1 are only for the purposes of checking design with respect to safety and quality assurance. They do not necessarily indicate that the cables are suitable for service under conditions equivalent to the test conditions.

4.2 Selection and installation

4.2.1 All conductors and cables should be selected so as to be suitable for the voltages and currents likely to occur under all conditions which are anticipated in the equipment or installations or that part thereof in which they are used.

4.2.2 Cable should be so constructed, installed, protected, used and maintained as to prevent danger so far as it is reasonably practicable.

4.2.3 Cables should be selected so that they are suitable for the intended operating conditions and equipment classification. Examples of operation conditions are:

- a) voltage;
- b) current;
- c) protective measures;
- d) grouping of cables;
- e) method of installation;
- f) accessibility.

4.2.4 Cables should be selected so that they are suitable for any external influences which might exist. Cables should not be installed under any of these conditions unless they are of a type specifically designed to withstand such conditions. Examples of external influences are:

- a) ambient temperature;
- b) presence of rain, steam or accumulation of water;
- c) presence of corrosive, chemical or polluting substances;
- d) mechanical stresses (such as through holes or sharp edges in metal work);
- e) fauna (such as rodents);
- f) flora (such as mould);
- g) radiation (such as sunlight).

NOTE 1 The colour of the cable is an important factor with regard to radiation. Black gives a higher degree of protection against radiation than a light colour.

NOTE 2 Classes of external influence are shown in Annex B.

NOTE 3 Annex C gives an explanation of the different types of usage (i.e. indoor/outdoor). BS 7540-2 and BS 7540-3 give recommendations as to which types of usage are appropriate for particular cable types.

4.3 Fixed cables

4.3.1 Cables should not be installed in contact with or close to hot surfaces unless they are of a type intended for such conditions.

4.3.2 Cables should be supported adequately. The recommended maximum spacing of supports is given in Table 1. In deciding the actual spacing, the mass of the cable between the supports should be taken into account so that the limiting value of tension (see 5.6.2) is not exceeded. The cable should not be damaged by any mechanical restraint used for its support.

NOTE Cables which have been in use can be damaged if they are disturbed. This can arise from the effect of natural ageing on the physical properties of the materials used for cable insulation and sheathing which can ultimately result in hardening of these materials.

Table 1 — Spacing of supports for non-armoured cables in accessible positions

Overall diameter of cable ^a mm	Maximum spacing of clips ^b			
	General		In caravans	
	Horizontal mm	Vertical mm	Horizontal mm	Vertical mm
≤9	250	400	250	400
>9 ≤15	300	400	250	400
>15 ≤20	350	450	250	400
>20 ≤40 ^c	400	550	250	400

^a For flat cables this is taken as the measurement of the major axis.
^b The spacings stated for horizontal runs may also be applied to runs at an angle of more than 30° from the vertical. For runs at an angle of 30° or less than the vertical, the vertical spacings are applicable.
^c For the spacing of supports for cables of overall diameter exceeding 40 mm, and for single core cables having conductors of cross-sectional area 300 mm² and larger, the manufacturer's recommendations should be observed.

4.4 Flexible cables or cords

4.4.1 Flexible cables or cords should be used for connections to all mobile equipment. The length of such cables should not be so great as to prevent the short circuit protective device from operating correctly (see 5.3). Such cables should also be of a minimum practical length to reduce the risk of mechanical damage.

4.4.2 Flexible cables and cords should be selected and used with due reference to the appropriate class of duty.

NOTE Annex D gives information on classes of duty.

4.4.3 Where thermoplastic flexible cables and cords are acceptable, consideration should be given to the use of extensible leads as a means of limiting the length of the connection.