BRITISH STANDARD

BS 7540-3: 2005

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

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Contents

Foreword

This part of BS 7540 has been prepared by Subcommittee GEL/20/17. Together with BS 7540-1 and BS 7540-2 it supersedes BS 7540:1994, which is withdrawn.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.

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.

This part of BS 7540 should be read in conjunction with BS 7540-1, which gives general recommendations and guidance.

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 consists of a front cover, an inside front cover, pages i and ii, pages 1 to 21 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 guidance for the safe use of electric cables with a rated voltage not exceeding 450/750 V. It is applicable to those cable types specific to the United Kingdom that are specified in BS 638-4, BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919.

NOTE These British Standards also specify requirements for cable types specified in Harmonized Documents HD 21 and HD 22. Guidance on these cables is given in BS 7540-2. The classes of external influence (environmental conditions) used in this part of BS 7540 are as listed in BS 7540-1:2005, Annex B.

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 7540-1:2005, *Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V — Part 1: General guidance.*

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 7540-1, BS 7671 and BS 4727-2:Group 08 apply.

4 Specific cable types

Specific guidance for each cable type is organised in tabular format.

— BS 638-4 is covered by Table 1;

— BS 6004 is covered by Table 2;

— BS 6007 is covered by Table 3;

— BS 6500 is covered by Tables 4 and 5;

— BS 7211 is covered by Table 6;

— BS 7919 is covered by Table 7.

There are two tables for each British Standard.

Table A for the relevant British Standard shows:

— where to find the specific cable type in the British Standard;

— applicable national codes;

— constructional details for the cable;

— recommendations for installation (fixed cable types) or conditions and limits of operation (flexible cords and cables);

— recommended temperature limits.

Table B shows, for each generic cable type in the relevant British Standard:

— recommended use;

— comments about limitations and suitability.

NOTE Annex A shows how the table numbers in the cable product standards correspond to the table numbers in this part of BS 7540.

Table 1A — Arc welding cables conforming to BS 638-4 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature					
		BS 638-4:1996, Table 1	BS 638-4:1996, Table 2	BS 638-4:1996, Table 3	BS 638-4:1996, Table 3	BS 638-4:1996, Table 6	BS 638-4:1996, Table 7
Constructional details							
Nominal voltage rating	V	100/100	100/100	100/100	100/100	450/450	450/450
Conductor material		Copper	Copper	Aluminium	Aluminium	Copper	Aluminium
Conductor class[a]		D	E	A	A	D	A
Outer covering material compound code		RS5	RS5	EM5	RS5	EM5 or RS3	EM5 or RS3
Number of cores		1	1	1	1	1	1
Cross-sectional area size range	mm^2	10 to 185	10 to 185	25 to 240	25 to 240	10 to 185	25 to 240
Duty[b]							
Extra light		+	+	+	+	+	+
Light		+	+	+	+	+	+
Ordinary		+	+	+	+	+	+
Heavy		+	+	+	+	+	+
Presence of water							
Condition AD1		+	+	+	+	+	+
Condition AD2		+	+	+	+	+	+
Condition AD6		—	—	—	—	—	—
Condition AD7		—	—	—	—	—	—
Condition AD8		—	—	—	—	—	—
Corrosive or polluting substances condition AF3		—	—	+	—	+	+
Impact condition AG2		+	+	+	+	+	+
Vibrations condition AH3		+	+	+	+	+	+
Flora condition AK2		—	—	—	—	—	—
Fauna condition AL2		—	—	—	—	—	—
Solar radiation condition AN2		—	—	—	—	—	—
Outdoor use[c]							
Intermittent and temporary periods of short duration[d]		+	+	+	+	+	+
Permanent[d]		+	+	—	—	+	—

Table 1A — Arc welding cables conforming to BS 638-4 — Constructional details, method of installation and temperature (*continued*)

Parameter	Unit	Constructional details, method of installation and temperature					
		BS 638-4:1996, Table 1	BS 638-4:1996, Table 2	BS 638-4:1996, Table 3	BS 638-4:1996, Table 3	BS 638-4:1996, Table 6	BS 638-4:1996, Table 7
Flexing and torsion							
Frequent flexing		+	+	+	+	+	+
Frequent torsion		+	+	+	+	+	+
Temperature							
Maximum continuous conductor operating	°C	85	85	85	85	85	85
Maximum conductor short circuit[e, f]	°C	250	250	250	250	250	250
Maximum cable surface[g]	°C	80	80	80	80	80	80
Maximum storage[h]	°C	40	40	40	40	40	40
Minimum installation and handling	°C	–40	–40	–20	–40	–20	–20

"+" = Acceptable
"—" = Not suitable

[a] Conductor class designations:
A = aluminium welding;
D = normal flexible welding;
E = extra flexible welding.
[b] See BS 7540-1:2005, Annex D.
[c] Only relevant classification given for duty.
[d] See BS 7540-1:2005, Annex C.
[e] Maximum allowable time 5 s.
[f] Values in excess of 160 °C are reduced under certain conditions (see BS 7540-1:2005, **5.3.4**).
[g] See BS 7540-1:2005, **5.4.3**.
[h] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 1B — Arc welding cables conforming to BS 638-4 — Guide to use

Cable type	Standard reference BS 638-4:1996	Recommendations for use	Comments
Cables with flexible copper conductor and elastomeric covering	Tables 1, 2 and 6	The cables are **suitable** for: — use with hand-held electrodes at 100 V.	Cables conforming to BS 638-4:1996, Table 6 may also be used for voltages not exceeding 450 V if adequately protected from damage. Duty cycles, current ratings and voltage drop should conform to BS 7540-2:2005, Annex B.
Cables with flexible aluminium conductor and elastomeric covering	Tables 3 and 7	The cables are **suitable** for: — use as an extension cable to be connected to the flexible copper welding cable at 100 V. The cables are **not suitable** for: — direct connection to hand-held electrodes at 100 V.	Cables conforming to BS 638-4:1996, Table 7 may also be used for voltages not exceeding 450 V if adequately protected from damage. Duty cycles, current ratings and voltage drop should conform to Annex B.

Table 2A — Cables conforming to BS 6004 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature						
		BS 6004:2000, Table 5	BS 6004:2000, Table 7 618-Y[a] 619-Y	BS 6004:2000, Table 7 618-Y[a] 619-Y	BS 6004:2000, Table 8 624-Y[a]	BS 6004:2000, Table 8 624-Y[a]	BS 6004:2000, Table 9 6192-Y[a] 624-Y	BS 6004:2000, Table 12
Constructional details								
Nominal voltage rating	V	300/500	300/500	300/500	300/500	300/500	300/500	300/500
Conductor class[b]		5	1	2	1	2	2	5
Number of cores		2[c]	1 to 3	1 to 3	1 to 3	2 and 3	1 to 2	2[c]
Cross-sectional area size range	mm^2	0.5 to 1.0	1.0 to 2.5	4 to 35	1.0 to 2.5	4 to 16	1.5 to 2.5	0.5 to 1.0
Method of installation[d]								
In conduit		—	+	+	+	+	+	—
In cable trunking		+[e]	+	+	+	+	+	+[e]
In cable ducting		—	+	+	+	+	+	—
In cable wiring of electric appliances and equipment		+	+	+	+	+	+	+
Clipped direct		—	+	+	+	+	+	—
On cable tray		—	+	+	+	+	+	—
Embedded		—	+	+	+	+	+	—
Temperature								
Maximum continuous conductor operating[f]	°C	70	70	70	70	70	70	90
Maximum conductor short circuit[g, h]	°C	160	160	160	160	160	160	160
Maximum cable surface[i]	°C	70	70	70	70	70	70	90
Maximum storage[j]	°C	40	40	40	40	40	40	40
Minimum installation and handling	°C	5	5	5	5	5	5	5

"+" = Acceptable
"—" = Not suitable

[a] CMA code designation.
[b] Conductor class designations:
1 = solid wire;
2 = stranded;
5 = flexible.
[c] Two insulated-only cores twisted together (with no additional sheath covering).
[d] The presence of water in contact with the cable is not acceptable.
[e] Signalling and control circuit only.
[f] The maximum conductor temperature at which the particular cable should operate depends upon the limiting temperature of the other cables and accessories with which it is in contact.
[g] For conductor sizes above 300 mm^2 this temperature is reduced to 140 °C.
[h] Maximum allowable time 5 s.
[i] See BS 7540-1:2005, **5.4.3**.
[j] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 2B — Cables conforming to BS 6004 — Guide to use

Cable type	Standard reference BS 6004:2000	Recommendations for use	Comments
Twisted twin, non-sheathed, for internal wiring with flexible conductor	Table 5	The cables are **suitable** for: — fixed protected installation inside appliances and in, or on, lighting fittings.	In surface-mounted or embedded conduits, the cables are only permitted for signalling or control circuits.
Single core, flat twin and 3 core, PVC sheathed with and without protective conductor with rigid (solid and stranded) conductors	Tables 7, 8 and 9	The cables are **suitable** for: — fixed installation in dry or damp premises; — installation in walls, on boards and in channels or embedded in plaster.	—
Twisted twin, non-sheathed, for internal wiring with flexible conductor	Table 12	The cables are **suitable** for: — internal wiring only. The cables are **not suitable** for: — fixed installations in distribution systems.	The maximum conductor temperature in normal use is 90 °C. These cables should not be used in contact with objects higher than 85 °C.

Table 3A — Cables conforming to BS 6007 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature
		BS 6007:2000, Table 8
Constructional details		
Nominal voltage rating	V	300/500
Conductor class[a]		5
Number of cores		2[b]
Cross-sectional area size range	mm^2	0.5 to 16
Method of installation[c]		
In conduit		+[d]
In cable trunking		+[d]
In cable ducting		+[d]
In cable wiring of electric appliances and equipment		+
Clipped direct		—
On cable tray		—
Embedded		—
Temperature		
Maximum continuous conductor operating	°C	180
Maximum conductor short circuit[e, f]	°C	350
Maximum cable surface	°C	180
Maximum storage[g]	°C	40
Minimum installation and handling	°C	–25

"+" = Acceptable
"—" = Not suitable

[a] Conductor class designation 5 = flexible.
[b] Two insulated-only cores twisted together (with no additional sheath covering).
[c] The presence of water in contact with the cable is not acceptable.
[d] Only in sizes 1.5 mm^2 or greater.
[e] Values in excess of 160 °C are reduced under certain conditions (see BS 7540-1:2005, **5.3.4**).
[f] Maximum allowable time 5 s.
[g] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 3B — Cables conforming to BS 6007 — Guide to use

Cable type	Standard reference BS 6007:2000	Recommendations for use	Comments
Twisted twin, non-sheathed, for internal wiring with flexible conductor	Table 8	The cables are **suitable** for: — use at high temperatures; — fixed installation in and on lamps and in appliances; — internal wiring at high ambient temperatures and in protected locations.	The maximum conductor temperature in normal use is 180 °C. Cables having a conductor cross-section of 1.5 mm^2 or more are permitted for installation in visible or embedded conduits.

Table 4A — Cables with cross-linked insulation conforming to BS 6500 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature		
		BS 6500:2000, Table 11 221- [a]	BS 6500:2000, Table 12 318-[a]	BS 6500:2000, Table 14 380-P[a]
Constructional details				
Nominal voltage rating	V	300/300	300/500	300/500
Conductor class[b]		5	5	5
Number of cores		2 to 3	2 and 3	2 to 4
Cross-sectional area size range	mm^2	0.5 to 1.5	1.25 only	0.75 to 2.5
Duty[c]				
Extra light		+	+	+
Light		+	+	+
Ordinary		+	+	+
Heavy		—	—	—
Presence of water				
Condition AD1		+	+	+
Condition AD2		—	+	+
Condition AD6		—	—	—
Condition AD7		—	—	—
Condition AD8		—	—	—

Table 4A — Cables with cross-linked insulation conforming to BS 6500 — Constructional details, method of installation and temperature (*continued*)

Parameter	Unit	Constructional details, method of installation and temperature		
		BS 6500:2000, Table 11 221-[a]	BS 6500:2000, Table 12 318-[a]	BS 6500:2000, Table 14 380-P[a]
Corrosive or polluting substances condition AF3		—	—	+
Impact condition AG2		—	—	—
Vibrations condition AH3		—	—	—
Flora condition AK2		—	—	—
Fauna condition AL2		—	—	—
Solar radiation condition AN2		—	—	—
Outdoor use[d]				
Intermittent and temporary periods of short duration[e]		—	+	+
Permanent[e]		—	—[f]	—
Flexing and torsion				
Frequent flexing		+	+	+
Frequent torsion		+	+	+
Temperature				
Maximum continuous conductor operating	°C	60	60	60
Maximum conductor short circuit[g, h]	°C	200	200	200
Maximum cable surface	°C	50	50	50
Maximum storage[i]	°C	40	40	40
Minimum installation and handling	°C	–25	–25	–25

"+" = Acceptable
"—" = Not suitable

[a] CMA code designation.
[b] Conductor class designation 5 = flexible.
[c] See BS 7540-1:2005, Annex D.
[d] Only relevant classification given for duty.
[e] See BS 7540-1:2005, Annex C.
[f] Permanent outdoor usage is permitted, but only for the relevant duty applications defined in BS 7540-1:2005, Annex D, where a black sheath is used and has been shown to conform to the requirements for carbon black specified in BS 6500, or where the manufacturer has demonstrated suitable alternative protection.
[g] Maximum allowable time 5 s.
[h] Values in excess of 160 °C are reduced under certain conditions (see BS 7540-1:2005, **5.3.4**).
[i] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 4B — Cables with cross-linked insulation conforming to BS 6500 — Guide to use

Cable type	Standard reference BS 6500:2000	Recommendations for use	Comments
Twisted twin and 3 core braided UDF cord with flexible conductor	Table 11	The cables are **suitable** for: — use in domestic premises, kitchens, offices and for supplying hand appliances where the cables are subjected to low mechanical stresses. The cables are **not suitable** for: — use outdoors; — use in industrial[a] or agricultural workshops; — supplying non-domestic tools.	—
Tough ordinary EPR insulated and EPR sheathed cord with flexible conductor	Table 12	The cables are **suitable** for: — general use in domestic premises, kitchens, offices and for supplying appliances where the cables are subjected to low mechanical stresses (e.g. vacuum cleaners, cooking appliances, soldering irons, toasters). The cables are **not suitable** for: — permanent use outdoors; — use in agriculture; — use in industrial[a] or agricultural workshops; — supplying non-domestic tools.	The conductor size for these cables is 1.25 mm^2. The cables are for applications with 13 A plugs conforming to BS 1363-1.
Screened rubber sheathed cords with flexible conductor	Table 14	The cables are **suitable** for: — temporary use on building sites; — portable hand-lamps; — use in flameproof installations[b]. The cables are **not suitable** for: — permanent use outdoors.	—

[a] Admissible, however, in tailors' workshops and similar premises.
[b] In some countries, usage in explosive atmospheres is precluded. Refer to BS EN 60079-14 when considering using this cable.

Table 5A — Cables with thermoplastic insulation conforming to BS 6500 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature
		BS 6500:2000, Table 27 318-Y[a]
Constructional details		
Nominal voltage rating	V	300/500
Conductor class[b]		5
Number of cores		2 and 3
Cross-sectional area size range	mm^2	1.25 only
Duty[c]		
Extra light		+
Light		+
Ordinary		+
Heavy		—
Presence of water		
Condition AD1		+
Condition AD2		+
Condition AD6		—
Condition AD7		—
Condition AD8		—
Corrosive or polluting substances condition AF3		+
Impact condition AG2		—
Vibrations condition AH3		—
Flora condition AK2		—
Fauna condition AL2		—
Solar radiation condition AN2		—
Outdoor use[d]		
Intermittent and temporary periods of short duration[e]		+
Permanent[e]		—

Table 5A — Cables with thermoplastic insulation conforming to BS 6500 — Constructional details, method of installation and temperature (*continued*)

Parameter	Unit	Constructional details, method of installation and temperature
		BS 6500:2000, Table 27 318-Y[a]
Flexing and torsion		
Frequent flexing		+
Frequent torsion		+
Temperature		
Maximum continuous conductor operating	°C	60
Maximum conductor short circuit[f]	°C	150
Maximum cable surface	°C	50
Maximum storage[g]	°C	40
Minimum installation and handling	°C	5

"+" = Acceptable
"—" = Not suitable

[a] CMA code designation.
[b] Conductor class designation 5 = flexible.
[c] See BS 7540-1:2005, Annex D.
[d] Only relevant classification given for duty.
[e] See BS 7540-1:2005, Annex C.
[f] Maximum allowable time 5 s.
[g] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 5B — Cables with thermoplastic insulation conforming to BS 6500 — Guide to use

Cable type	Standard reference BS 6500:2000	Recommendations for use	Comments
Ordinary PVC sheathed cord with flexible conductors	Table 27	The cables are **suitable** for: — use in domestic premises, kitchens, offices; — household appliances, including in damp premises; — medium duties (e.g. washing machines, spin dryers, and refrigerators). The cables are **not suitable** for: — outdoor use, in industrial[a] or agricultural buildings; — non-domestic portable tools.	Providing that there is no risk of contact with hot parts and the cables are not subjected to radiation, they may be used for cooking and heating appliances, but the use, in these cases, of cables conforming to BS 6500:2000, Table 29 is preferred. The conductor size for these cables is 1.25 mm^2, which are for applications with 13 A plugs conforming to BS 1363-1.

[a] Admissible, however, in tailors' workshops and similar premises.

Table 6A — Cables conforming to BS 7211 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature					
		BS 7211:1998, Table 5	BS 7211:1998, Table 5	BS 7211:1998, Table 6	BS 7211:1998, Table 6	BS 7211:1998, Table 7	BS 7211:1998, Table 7
Constructional details							
Nominal voltage rating	V	450/750	450/750	450/750	450/750	450/750	450/750
Conductor class[a]		1	2	1	2	1	2
Number of cores		1	1	2 to 5	2 to 5	1 to 3	2 and 3
Cross-sectional area size range	mm^2	1.0 to 6	1.0 to 35	1.0 to 10	1.0 to 35	1.0 to 2.5	1.0 to 16
Method of installation[b]							
In conduit		+	+	+	+	+	+
In cable trunking		+	+	+	+	+	+
In cable ducting		+	+	+	+	+	+
In cable wiring of electric appliances and equipment		+	+	+	+	+	+
Clipped direct		+	+	+	+	+	+
On cable tray		+	+	+	+	+	+
Embedded		+	+	+	+	+	+
Temperature							
Maximum continuous conductor operating[c]	°C	90	90	90	90	90	90
Maximum conductor short circuit[d, e]	°C	250	250	250	250	250	250
Maximum cable surface[f]	°C	90	90	90	90	90	90
Maximum storage[g]	°C	40	40	40	40	40	40
Minimum installation and handling	°C	5	5	5	5	5	5

"+" = Acceptable
"—" = Not suitable

[a] Conductor class designations:
1 = solid wire;
2 = stranded.
[b] The presence of water in contact with the cable is not acceptable.
[c] The maximum conductor temperature at which the particular cable should operate depends upon the limiting temperature of the other cables and accessories with which it is in contact.
[d] Values in excess of 160 °C are reduced under certain conditions (see BS 7540-1:2005, **5.3.4**).
[e] Maximum allowable time 5 s.
[f] See BS 7540-1:2005, **5.4.3**.
[g] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 6B — Cables conforming to BS 7211 — Guide to use

Cable type	Standard reference BS 7211:1998	Recommendations for use	Comments
Single core sheathed cables for fixed wiring having low emission of smoke and corrosive gases with rigid (solid or stranded) conductor	Table 5	The cables are **suitable** for: — fixed installation in dry or damp premises, particularly for situations in which low emission of smoke and corrosive gases is required in the case of burning; — installation in walls, on boards and in channels or embedded in plaster. The cables are **not suitable** for: — the provision of circuit integrity in case of fire.	The maximum conductor temperature in normal use is 90 °C. Skin contact should be avoided when operating at high temperature. The defined tests for smoke and corrosive gases relate only to the cables. Meeting the requirements of BS EN 60332-1-2 does not imply a similar performance from bunched cables.
Sheathed cables for fixed wiring having low emission of smoke and corrosive gases with rigid (solid or stranded) conductor	Table 6	As BS 7211:1998, Table 5.	As BS 7211:1998, Table 5.
Single core, flat twin and 3 core, sheathed having low emission of smoke and corrosive gases with protective conductor with rigid (solid and stranded) conductors	Table 7	As BS 7211:1998, Table 5.	As BS 7211:1998, Table 5.

Table 7A — Cables conforming to BS 7919 — Constructional details, method of installation and temperature

Parameter	Unit	Constructional details, method of installation and temperature
		BS 7919:2001, Table 44 318-A[a]
Constructional details		
Nominal voltage rating	V	300/500
Conductor class[b]		5
Number of cores		2 to 5
Cross-sectional area size range	mm^2	0.5 to 4
Duty[c]		
Extra light		+
Light		+
Ordinary		+
Heavy		—
Presence of water		
Condition AD1		+
Condition AD2		+
Condition AD6		—
Condition AD7		—
Condition AD8		—
Corrosive or polluting substances condition AF3		—
Impact condition AG2		—
Vibrations condition AH3		—
Flora condition AK2		—
Fauna condition AL2		—
Solar radiation condition AN2		—
Outdoor use[d]		
Intermittent and temporary periods of short duration[e]		+
Permanent[e]		—

Table 7A — Cables conforming to BS 7919 — Constructional details, method of installation and temperature (*continued*)

Parameter	Unit	Constructional details, method of installation and temperature
		BS 7919:2001, Table 44 318-A[a]
Flexing and torsion		
Frequent flexing		+
Frequent torsion		+
Temperature		
Maximum continuous conductor operating	°C	60
Maximum conductor short circuit[f]	°C	160
Maximum cable surface	°C	50
Maximum storage[g]	°C	40
Minimum installation and handling	°C	–25

"+" = Acceptable
"—" = Not suitable

[a] CMA code designation.
[b] Conductor class designation 5 = flexible.
[c] See BS 7540-1:2005, Annex D.
[d] Only relevant classification given for duty.
[e] See BS 7540-1:2005, Annex C.
[f] Maximum allowable time 5 s.
[g] In direct sunlight the storage temperature of the cable may exceed the value given but subject to a maximum of 60 °C.

Table 7B — Cables conforming to BS 7919 — Guide to use

Cable type	Standard reference BS 7919:2000	Recommendations for use	Comments
Ordinary duty low temperature PVC sheathed cord circular	Table 44	The cables are **suitable** for: — use on ELV systems (110 V centre tapped) on building sites in the UK; — use with temporary traffic light systems when suitably protected. The cables are **not suitable** for: — outdoor use at standard voltages — in industrial[a] or agricultural buildings.	Usage on UK building sites, with ELV (110 V centre tapped) may include hand-held tools.

[a] Admissible, however, in tailors' workshops and similar premises.

Annex A (informative)
Relationship between cable product standards and this part of BS 7540

Table A.1 identifies, for each cable product standard covered by BS 7540, the location of specific guidance for national standard cables.

NOTE The location of specific guidance for harmonized cables is identified in BS 7540-2:2005, Table A.1. A generic table giving the locations for all cables, including examples of how to use the table, is given in BS 7540-1:2005, Annex A.

Table A.1 — Cross-reference table

Cable standard	Table no. in cable standard	Table no. in BS 7540-3:2005
BS 638-4:1996	1, 2, 3, 6, 7	1
BS 6004:2000	4a, 4b	—
	5, 7, 8, 9	2
	10a, 10b, 11a, 11b	—
	12	2
	13	—
BS 6007:2000	3, 4, 5, 6, 7	—
	8	3
	9, 10	—
BS 6500:2000	11, 12	4
	13	—
	14	4
	15, 16, 24, 26	—
	27	5
	28, 29	—
BS 7211:1998	3a, 3b, 4a, 4b	—
	5, 6, 7	6
BS 7919:2001	10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 40, 41, 42, 43	—
	44	7

Annex B (normative)
Duty cycles, current ratings and voltage drop for arc welding cables (aluminium conductors)

NOTE Current ratings and voltage drop for arc welding cables with copper conductors are given in BS 7540-2.

B.1 Current ratings

The current ratings given in this annex are for arc welding cables (aluminium conductors), according to BS 638-4, are calculated for sustained currents, 100 % duty cycles, using the methods given in BS 7769-1, for cables in free air at an ambient temperature of 25 °C unless otherwise specified, and a conductor temperature of 85 °C. Where the ambient temperature differs from 25 °C, the rating should be corrected by multiplying it by the appropriate factor shown in Table B.1.

Table B.1 — Ambient temperature correction factors

Ambient temperature °C	Factor
30	0.96
35	0.91
40	0.87
45	0.82

The current ratings are given in three forms as follows:

a) Table B.2 gives current ratings for single cycle operation over a maximum period of 5 min;

b) Table B.3 gives current ratings for repeat cycle operation based on a 5 min repeat period;

c) Table B.4 gives current ratings for repeat cycle operation based on a 10 min repeat period.

The method of operation, together with the current rating, is a determining factor in the choice of conductor size. The three methods used in Table B.2, Table B.3 and Table B.4 are defined as follows.

1) Single cycle operation as used in Table B.2 is a single on-load period not exceeding 5 min. The on-load time period is expressed as a percentage of 5 min, and is called the percentage duty cycle. For percentage duty cycles not stated in Table B.2, the next higher percentage duty cycle rating should be used or the cable manufacturer consulted.

2) Repeat cycle operation as used in Table B.3 and Table B.4 is a periodically switched constant load with an on-load period followed by an off-load period, which is repeated. The repeat periods are 5 min for Table B.3 and 10 min for Table B.4. The on-load time period is expressed as a percentage of the repeat period, and is called the percentage duty cycle. For percentage duty cycles not stated in the tables, the next higher percentage duty cycle rating should be used or the cable manufacturer consulted.

Where long cable runs are involved, it can be necessary to choose the cable size on the basis of voltage drop. The values given in Table B.2, Table B.3 and Table B.4 are for 10 m of cable carrying 100 A. For longer cable lengths and higher currents the values should be increased pro rata. The values in the table apply to direct current circuits only. In alternating current circuits the values are higher; the amount depends on the spacing between the two cables forming the welding circuit. To minimize the effects of alternating current on voltage drop, the two cables forming the welding circuit should be kept as close together as possible. When in use, welding cables should not be coiled.

Table B.2 — Current rating for single cycle operation over a maximum period of 5 min

Nominal cross-sectional area (mm^2)	Current rating (A)			
	100 % duty cycle	85 % duty cycle	60 % duty cycle	35 % duty cycle
25	140	150	180	240
35	175	190	225	295
50	225	245	290	380
70	275	300	355	465
95	335	365	430	570
120	390	425	500	660
150	455	495	590	770
240	600	650	775	1 015

Table B.3 — Current rating for repeat cycle operation based on a 5 min repeat period

Nominal cross-sectional area (mm^2)	Current rating (A)						
	100 % duty cycle	85 % duty cycle	80 % duty cycle	60 % duty cycle	35 % duty cycle	20 % duty cycle	8 % duty cycle
25	140	143	145	153	178	218	323
35	175	180	183	196	233	289	433
50	225	234	237	257	310	389	589
70	275	288	293	322	395	502	767
95	335	353	360	399	495	633	975
120	390	412	421	469	587	755	1 166
150	455	482	493	552	694	896	1 388
240	600	640	656	742	944	1 228	1 915

Table B.4 — Current rating for repeat cycle operation based on a 10 min repeat period

Nominal cross-sectional area (mm^2)	Current rating (A)						
	100 % duty cycle	85 % duty cycle	80 % duty cycle	60 % duty cycle	35 % duty cycle	20 % duty cycle	8 % duty cycle
25	140	141	141	144	155	179	250
35	175	177	177	183	203	239	341
50	225	228	230	240	272	326	474
70	275	282	284	302	351	430	637
95	335	345	350	376	446	553	830
120	390	404	410	444	534	669	1 011
150	455	474	482	525	637	803	1 220
240	600	632	645	714	886	1 134	1 744

B.2 Voltage drop

The voltage drops associated with the current ratings given in Table B.2, Table B.3 and Table B.4 are given in Table B.5. The values given in Table B.5 are for 10 m of cable carrying 100 A.

Table B.5 — Voltage drop at normal and elevated temperatures

Nominal cross-sectional area (mm^2)	D.C. Voltage drop (V)		
	At 20 °C	At 60 °C	At 85 °C
25	1.248	1.45	1.58
35	0.886	1.03	1.12
50	0.616	0.715	0.778
70	0.440	0.511	0.555
95	0.326	0.379	0.411
120	0.254	0.295	0.321
150	0.208	0.242	0.263
240	0.126	0.146	0.159

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Standards publications

BS 1363-1:1995, *13 A plugs, socket-outlets and adaptors — Part 1: Specification for rewirable and non-rewirable 13 A fused plugs.*

BS 7540-2:2005, *Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V — Harmonized cable types from HD 21 and HD 22.*

BS 7769-1 (all sections), IEC 60287-1 (all sections), *Electric cables — Calculation of the current rating — current rating equations (100% load factor) and calculation of losses.*

BS EN 60079-14:2003, *Electrical apparatus for explosive gas atmospheres — electrical installations in hazardous area (other than mines).*

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

HD 21 (all parts), *Cables of rated voltages up to and including 450/750 V and having thermoplastic insulation.*

HD 22 (all parts), *Cables of rated voltages up to and including 450/750 V and having cross-linked insulation.*

Other publications

[1] GREAT BRITAIN. Electrical Equipment (Safety) Regulations 1994. London: HMSO.

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