BRITISH STANDARD

BS 6485:1999

PVC-covered conductors for overhead power lines

ICS 29.060.20; 29.240.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/2, Mains cables 1 kV and above, upon which the following bodies were represented:

Association of Consulting Engineers
British Approvals Service for Cables
British Cable Makers Confederation
British Plastics Federation
ERA Technology Ltd.
Electricity Association
London Underground Ltd.
UK Steel Association

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Contents

Foreword

This new edition of BS 6485 has been prepared by Subcommittee GEL/20/2 and supersedes BS 6485:1990 which is withdrawn.

This edition has updated references mainly due to the withdrawal of BS 125:1970 and BS 2755:1970 which have been replaced by BS 7884:1997.

This new edition incorporates technical changes. It does not represent a full review or revision of the standard, which will be undertaken in due course.

Annexes A and B are normative.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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 and ii, pages 1 to 7 and a back cover.

1 Scope

This British Standard specifies requirements for PVC-covered conductors for overhead power lines. Two types of PVC-covered conductor have been standardized by the designation of minimum thickness of covering as follows:

a) Type 8: 0.8 mm;

b) Type 16: 1.6 mm.

Type 8 is intended for use only where the operating voltage of the power lines does not exceed 650 V r.m.s. between any two conductors or 250 V r.m.s. between any conductor and earth. Under these operating conditions, it is suitable for:

a) crossings of telecommunication lines to guard against contact;

b) proximities to telecommunication lines to guard against contact;

c) lines (particularly service lines) accessible from buildings.

Type 16 is intended for use only where the operating voltage of the power line exceeds 650 V r.m.s between any two conductors or 250 V r.m.s. between any conductor and earth, but does not normally exceed 11 kV r.m.s. between conductors or 6.6 kV r.m.s. between any conductor and earth. The earthing of the neutral point of the system through an arc-suppression coil is not precluded, if arrangements exist for clearing earth faults without undue delay. Under these operating conditions, type 16 is suitable for crossings of telecommunication lines and proximities to them.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 215-1, *Specification for aluminium conductors and aluminium conductors, steel-reinforced for overhead power transmission — Part 1: Aluminium stranded conductors.*

BS 215-2, *Specification for aluminium conductors and aluminium conductors, steel-reinforced for overhead power transmission — Part 2: Aluminium conductors, steel-reinforced.*

BS 3242, *Specification for aluminium alloy stranded conductors for overhead power transmission.*

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

BS 5099, *Specification for spark testing of electric cables.*

BS 7655-3.1, *Specification for insulating and sheathing materials for cables — Part 3: PVC insulating compounds — Section 3.1: Harmonized types.*

BS 7884, *Specification for copper and copper-cadmium stranded conductors for overhead electric traction and power transmission systems.*

BS EN 60811-1-1:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1: General application — Section 1: Measurement of thickness and overall dimensions.*

3 Terms and definitions

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

3.1

nominal value

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.

3.2

approximate value

value which is only indicative

NOTE Usually, in this standard, values described as "approximate" do not constitute requirements to be checked by measurements.

3.3

routine tests

tests made by the manufacturer on each manufactured length of covered conductor to check that the whole of each length meets the specified requirements

3.4

sample tests

tests made by the manufacturer on samples of completed product or components taken from a completed product, at a specified frequency, so as to verify that the finished product meets the specified requirements

3.5

type tests

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

NOTE 1 These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the materials or design or manufacturing process which might change the performance characteristics.

NOTE 2 Tests classified as routine or sample may be required as part of any type approval schemes.

4 Conductor

The material, construction and physical properties of the conductor shall, after covering, conform to either BS 215, BS 3242, or BS 7884 for the bare conductor.

The conductor sizes are specified in annex B.

5 PVC covering

5.1 Material

The PVC covering shall conform to the type TI 1 compound requirements of BS 7655-3.1.

5.2 Colour

The colour of the covering shall be as follows:

a) Type 8: Black;

b) Type 16: Green.

NOTE The purchaser should consult the manufacturer when ordering green material for use in tropical countries.

5.3 Thickness of covering

When tested in accordance with **A.3** the thickness of the PVC covering at any point shall be not less than the appropriate value given below:

a) Type 8: 0.8 mm;

b) Type 16: 1.6 mm.

6 Schedule of tests

Testing shall be carried out in accordance with the schedule of tests given in Table 1.

Table 1 — Schedule of tests

Test	Clause reference
Routine tests	
Spark test	**8.2**
High voltage test (Type 16 only)	**8.3**
Conductor resistance	**8.4**
Insulation resistance test (Type 16 only)	**8.5**
Sample tests	
Thickness of PVC covering	**5.3**
Conductor examination and test	**9.2**
Type test	
PVC material	**5.1**

7 Test conditions

7.1 Ambient temperature

Tests shall be made at ambient temperature within the range 5 °C to 35 °C unless otherwise specified in the details of the particular test.

7.2 Frequency and waveform of power frequency test voltages

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

8 Routine tests

8.1 General

Routine tests shall be as given in Table 1.

8.2 Spark test

When the PVC covering is tested in accordance with BS 5099, applying the voltage given in Table 2, no breakdown shall occur.

Table 2 — Spark test voltage values

Designation	Test voltage kV	
	a.c. (r.m.s.)	d.c.
Type 8	6	9
Type 16	12	18

8.3 High voltage test (Type 16 only)

When tested in accordance with **A.1** no breakdown of the PVC covering shall occur.

8.4 Conductor resistance

The d.c. resistance of hard-drawn copper and hard-drawn copper-cadmium conductors shall be measured in accordance with BS 7884 and corrected to 20 °C in accordance with that standard. The results shall not exceed the appropriate maximum values given in Tables B.1 and B.2.

8.5 Insulation resistance test (Type 16 only)

When tested in accordance with **A.2** the insulation resistance shall be greater than 0.5 MΩ/km.

9 Sample tests

9.1 General

Sample tests shall be as given in Table 1.

9.2 Conductor examination and test

When examined and tested in accordance with the appropriate British Standard from those listed in clause **4**, the conductor shall conform to the requirements of that standard.

10 Type test

The type test shall be as given in Table 1.

Annex A (normative)
Test methods

A.1 High voltage test (type 16 only)

Cut a sample of PVC-covered conductor not less than 1 m long from each manufactured drum length. Immerse the sample in water for at least 24 h, and whilst it is still immersed apply 25 kV (r.m.s.) between the conductor and the water, the latter being earthed. Raise the voltage gradually and maintain at the full value for 5 min.

A.2 Insulation resistance test (type 16 only)

Cut a sample of PVC-covered conductor not less than 10 m long from each manufactured drum length. Immerse the sample in water at ambient temperature for at least 4 h. Measure the insulation resistance between the conductor and the water after steady electrification for 1 min using a voltage of between 80 V and 500 V d.c.

A.3 Thickness of PVC coating

Take a representative sample of the PVC-covered conductor, approximately 300 mm long, not less than 300 mm from the end of the selected drum lengths. At three different sections not less than 100 mm apart measure the thickness of the covering in accordance with BS EN 60811-1-1:1995, **8.1**.

Annex B (normative)
Particulars of PVC-covered conductors

NOTE Additional information may be obtained by direct reference to the British Standard designated in each table.

Table B.1 — PVC-covered stranded hard-drawn copper conductors (Based on BS 7884)

1	2	3	4	5	6	7	8	9
Nominal cross-sectional area	**Stranding and wire diameter**	**Approximate overall diameter of bare conductor**	**Maximum resistance per kilometre at 20 °C**	**Approximate breaking load**	**Approximate overall diameter of covered conductor**		**Approximate mass per kilometre of covered conductor**	
					Type 8	**Type 16**	**Type 8**	**Type 16**
mm^2	mm	mm	Ω	kN	mm	mm	kg	kg
14	7/1.60	4.80	1.303	5.744	6.8	8.4	160	190
16	3/2.65	5.70	1.106	6.590	7.7	9.3	180	220
32	3/3.75	8.06	0.5520	12.71	10.5	12.1	350	390
35	7/2.50	7.50	0.5337	14.097	9.9	11.5	360	400
70	7/3.55	10.65	0.2646	26.88	13.5	14.7	690	750
100	7/4.30	12.90	0.1810	37.64	15.7	16.9	990	1 060

Table B.2 — PVC-covered stranded hard-drawn copper alloy conductors (Based on BS 7884)

1	2	3	4	5	6	7
Nominal cross-sectional area	**Stranding and wire diameter**	**Approximate overall diameter of bare conductor**	**Maximum resistance per kilometre at 20 °C**	**Approximate breaking load**	**Approximate overall diameter of covered conductor**	**Approximate mass per kilometre of covered conductor**
					Type 16	**Type 16**
mm^2	mm	mm	Ω	kN	mm	kg
12	3/2.30	4.95	1.780	7.20	8.2	170
22	7/2.00	6.00	1.011	12.94	9.6	270
38	7/2.60	7.80	0.5983	21.69	11.8	430
75	7/3.70	11.10	0.2954	40.23	15.1	810
125	19/2.90	14.50	0.1784	68.75	18.5	1 310
150	19/3.20	16.00	0.1465	82.16	20.0	1 570

Table B.3 — PVC-covered aluminium stranded conductors (Based on BS 215-1)

1	2	3	4	5	6	7
Nominal cross-sectional area	**Stranding and wire diameter**	**Approximate overall diameter of bare conductor**	**Calculated resistance per kilometre at 20 °C**	**Approximate breaking load**	**Approximate overall diameter of covered conductor**	**Approximate mass per kilometre of covered conductor**
					Type 8	**Type 8**
mm^2	mm	mm	Ω	kN	mm	kg
22	7/2.06	6.18	1.227	3.99	8.2	100
50	7/3.10	9.30	0.5419	8.28	11.7	200
100	7/4.39	13.17	0.2702	16.00	16.0	360
200	19/3.78	18.90	0.1349	32.40	21.7	690

Table B.4 — PVC-covered aluminium conductors, steel reinforced (Based on BS 215-2)

1	2	3	4	5	6	7	8
Nominal cross-sectional area	**Stranding and wire diameter**		**Approximate overall diameter of bare conductor**	**Calculated resistance per kilometre at 20 °C**	**Approximate breaking load**	**Approximate overall diameter of covered conductor**	**Approximate mass per kilometre of covered conductor**
	Aluminium	**Steel**				**Type 16**	**Type 16**
mm^2	mm	mm	mm	Ω	kN	mm	kg
25	6/2.36	1/2.36	7.08	1.093	9.61	10.7	190
50	6/3.35	1/3.35	10.05	0.5426	18.35	14.1	330
100	6/4.72	7/1.57	14.15	0.2733	32.70	18.2	550
150	30/2.59	7/2.59	18.13	0.1828	69.20	22.2	920
150	18/3.35	1/3.35	16.75	0.1815	35.70	20.8	680
175	30/2.79	7/2.79	19.53	0.1576	79.80	23.6	1 050
175	18/3.61	1/3.61	18.05	0.1563	41.10	22.1	780
200	30/3.00	7/3.00	21.00	0.1363	92.25	25.0	1 190
200	18/3.86	1/3.86	19.30	0.1367	46.55	23.3	870

Table B.5 — PVC-covered aluminium alloy stranded conductors (Based on BS 3242)

1	2	3	4	5	6	7
Nominal cross-sectional area	**Stranding and wire diameter**	**Approximate overall diameter of bare conductor**	**Calculated resistance per kilometre at 20 °C**	**Approximate breaking load**	**Approximate overall diameter of covered conductor**	**Approximate mass per kilometre of covered conductor**
					Type 16	**Type 16**
mm^2	mm	mm	Ω	kN	mm	kg
25	7/2.34	7.02	1.094	8.44	10.6	170
50	7/3.30	9.90	0.5498	16.80	13.9	280
100	7/4.65	13.95	0.2769	33.30	18.0	470
150	19/3.48	17.40	0.1830	50.65	21.4	680
175	19/3.76	18.80	0.1568	59.10	22.8	780

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