BRITISH STANDARD 6862 : Part 1 : 1971

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METRIC UNITS

CONFIRMED JUNE 1981

SPECIFICATION FOR

CABLES FOR VEHICLES

Part 1. Cables with copper conductors

BRITISH STANDARDS INSTITUTION

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BS 6862 : Part 1 : 1971

Incorporating amendments issued June 1976 (AMD 2046)
and December 1979 (AMD 3109)

CONFIRMED JUNE 1981

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THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Executive Board on 31 March, 1971.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards and Special Issue:

BS 805. Toluenes.

BS 2011. Methods for the environmental testing of electronic components and electronic equipment. Part 2J. Mould growth.

BS 2869. Petroleum fuels for oil engines and burners.

BS 4109. Copper for electrical purposes (wire for general electrical purposes and for insulated cables and flexible cords).

BS 6360. Copper conductors in insulated cables and cords.

BS 6746. PVC-insulation and sheath of electric cables.

PD 2379. Register of colours of manufacturers' identification threads for electric cables and cords.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard: Committee reference ELE/3 and ELE/3/9 Draft for comment 69/6904

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CO-OPERATING ORGANIZATIONS

The Electrical Industry Standards Committee under whose supervision this British Standard was prepared consists of representatives from the following Government departments and scientific and industrial organizations:

*Association of Consulting Engineers
Association of Manufacturers of Domestic Electrical Appliances
Association of Mining Electrical and Mechanical Engineers
Associated Offices' Technical Committee
*Association of Supervisory and Executive Engineers
*British Electrical and Allied Manufacturers' Association
British Radio Equipment Manufacturers' Association
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The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committee entrusted with the preparation of this British Standard:

Aluminium Federation
British Plastics Federation
British Railways Board
Institute of Iron and Steel Wire Manufacturers
London Transport Executive
National Coal Board
Society of Motor Manufacturers and Traders

BRITISH STANDARD SPECIFICATION FOR

CABLES FOR VEHICLES

Part 1. Cables with copper conductors

FOREWORD

This revision in metric units of BS 1862: 1959 reflects the present trend in demand and covers PVC- and rubber-insulated ignition cables, PVC-insulated general wiring cables and copper earthing braids, for use in road vehicles. Resistive ignition cables will be included in Part 2 which will be published later.

NOTE. Attention is drawn to certification facilities offered by BSI; see the back cover of this standard.

SPECIFICATION

1. GENERAL

1.1 SCOPE

Section 2 of this British Standard applies to ignition cables for general use in road vehicles and specifies dimensions and requirements for the following ozone-resisting types of cable:

Rubber-insulated, without further covering.
PVC-insulated, without further covering.

Section 3 of this British Standard applies to general wiring cables for use in road vehicles at voltages not exceeding 100 V. Dimensions and requirements are specified for the following types of cable:

Single-core PVC-insulated, without further covering.
Single-core PVC-insulated, braided and lacquered.
Flat twin PVC-insulated and PVC-sheathed.
Circular twin and three-core PVC-insulated and PVC-sheathed.
Seven-core PVC-insulated and PVC-sheathed trailer cables.

Section 4 of this British Standard applies to copper earthing braids and specifies dimensions and requirements for the following types:

Round and flat tinned copper braids without further covering.

1.2 DEFINITIONS

As amended Dec., 1979

For the purposes of this British Standard the definitions relating to electric cables given in BS 4727 * apply.

* BS 4727, 'Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms'.

2. IGNITION CABLES

2.1 GENERAL REQUIREMENTS

The dimensions of ignition cables shall be in accordance with Table 1.

The cable shall be subjected to the routine tests specified in 2.5 and shall be capable of passing the type tests specified in 2.6 or 2.7.

2.2 CONDUCTOR

The conductor shall comply with BS 6360*. The conductor shall be circular and may be bunched or stranded.

2.2.1 Rubber-insulated cables. The conductor of rubber-insulated ignition cables shall be formed of 19 tinned copper wires each of 0·3 mm nominal diameter.

2.2.2 PVC-insulated cables. The conductor of PVC-insulated ignition cables shall be formed of 19 plain annealed copper wires, or, when specified by the purchaser, of 19 tinned annealed copper wires, each of 0·3 mm nominal diameter.

2.3 INSULATION

2.3.1 Rubber-insulated cables. For rubber-insulated cables, the insulation shall consist of vulcanized rubber or rubber-like composition compounded and processed in one or more layers to meet the requirements of this standard. The conductor shall be centred accurately in the insulation and it shall be possible to remove the insulation cleanly and without difficulty.

2.3.2 PVC-insulated cables. For PVC-insulated cables, the insulation shall consist of:

(1) polyvinyl chloride, or

(2) suitable co-polymers, of which the major constitutent shall be vinyl chloride, or

(3) mixtures of (1) and (2),

suitably compounded and processed in one or more layers to meet the requirements of this standard. The conductor shall be centred accurately in the insulation and it shall be possible to remove the insulation cleanly and without difficulty.

2.4 MANUFACTURER'S IDENTIFICATION

When specified by the purchaser, coloured identification threads shall be laid with the conductor to identify the manufacturer. The colours shall be in conformity with the Register† maintained by the British Standards Institution, where applicable.

* BS 6360, ' Copper conductors in insulated cables and cords '.

† PD 2379, ' Register of colours of manufacturers' identification threads for electric cables and cords '. Copies may be obtained from BSI Sales Office, 101 Pentonville Road, London N1 9ND.

2.5 ROUTINE TESTS

2.5.1 Conductor resistance test. The resistance of the conductor shall be measured and, when corrected to 20 °C, shall not exceed the appropriate maximum value given in Table 1.

2.5.2 Voltage test. Every length of cable shall be immersed in water with each end projecting above the surface of the water. The following test shall be applied not less than 12 hours after immersion, while the core is still immersed.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument connected on the lower voltage side.

The voltage shall be applied gradually between the conductor and the water, which shall be earthed, and shall be maintained for 15 minutes. Electrical breakdown shall not occur.

The r.m.s. value of the test voltage shall be 10 kV.

2.6 TYPE TESTS FOR RUBBER-INSULATED CABLES

2.6.1 Ozone-resistance test. A sample of the finished rubber-insulated cable shall be wound on a 3 mm diameter brass rod, with six turns per 750 mm length of rod, and the whole inserted in a glass tube of 19 mm internal diameter as shown in Fig. 1. The assembled but open tube shall be placed in a current of air at room temperature and a relative humidity of 60 $\pm$ 2 % for 3 minutes, and then the ends shall be tightly plugged. The cable shall be subjected to 20 kV r.m.s. at any frequency from 40 Hz to 62 Hz inclusive, applied between the conductor and the brass rod. Electrical breakdown shall not occur in less than 20 minutes.

2.6.2 Effect of heat on flexibility. 300 mm of the finished rubber-insulated cable shall be heated in an oven at 100 $\pm$ 2 °C for 5 hours. After cooling to room temperature for 24 hours, the cable shall be wound in close turns round a 25 mm diameter mandrel, and after 2 minutes in that position the insulation shall show no sign of splitting.

2.6.3 Effect of cooling on flexibility. 300 mm of the finished rubber-insulated cable shall be kept in an atmosphere having a temperature of $-$ 25 $\pm$ 3 °C for a period of half an hour. At the end of this period the cable shall be immediately wound in three close turns round a similarly cooled mandrel. The diameter of the mandrel shall be 25 mm. After 2 minutes the insulation shall show no sign of splitting.

2.6.4 Effect of oil. A 450 mm length of the finished rubber-insulated cable shall be carefully measured for outside diameter and then wound ten times alternately

in opposite directions, on a 25 mm diameter mandrel. The cable shall next be bent in the form of a U-loop, with straight sides of at least 100 mm and immersed to within 25 mm of the ends in lubricating oil at room temperature. The oil shall be of the grade defined in Appendix A. The temperature of the oil shall then be raised to 100 ± 2°C and maintained for 5 hours. On removal from the oil, the cable shall be wiped and allowed to cool to room temperature. The straight portions shall not have increased in average diameter by more than 4 %, shall not be sticky or appreciably softened and shall be free from blisters and other defects.

2.6.5 High-voltage test. A sample of the rubber-insulated cable, not less than 1 m in length, shall be immersed in water with the ends projecting above the surface of the water. The following test shall be applied not less than 12 hours after immersion, while the sample is still immersed.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument on the lower voltage side.

The voltage shall be applied gradually between the conductor and the water, which shall be earthed, and shall be maintained for 5 minutes. Electrical breakdown shall not occur.

The r.m.s. value of the test voltage shall be 20 kV.

2.7 TYPE TESTS FOR PVC-INSULATED CABLES

2.7.1 Capacitance test. A suitable length of finished PVC-insulated cable shall be dried in an air oven at a temperature of 80 ± 2°C for 18 hours. The sample shall be allowed to cool to room temperature and then be placed in a bath of water. The capacitance shall be measured between the conductor and the water by means of an accurate capacitance bridge at a frequency of approximately 1000 Hz. The capacitance shall be not more than 80 pF/300 mm.

2.7.2 Ozone-resistance test. A sample of the finished PVC-insulated cable shall be wound on a 3 mm diameter brass rod, with six turns per 750 mm length of rod and the whole inserted in a glass tube of 19 mm internal diameter, as shown in Fig. 1. The assembled but open tube shall be placed in a current of air at room temperature and a relative humidity of 60 ± 2 % for 3 minutes, and then the ends shall be tightly plugged. The cable shall be subjected to 20 kV r.m.s. at any frequency from 40 Hz to 62 Hz inclusive, applied between the conductor and the brass rod. Electrical breakdown shall not occur in less than 20 minutes.

2.7.3 Effect of heat on flexibility. A sample of the finished PVC-insulated cable about 750 mm long shall be put in an oven and kept at a temperature of 90 ± 2°C

for 72 hours. After cooling for 24 hours the sample shall be wound round a cylindrical mandrel as follows:

Diameter of mandrel	25 mm
Number of turns	5
Spacing between turns	19 mm
Speed of winding	1 turn per second
Load applied during winding	45 N

The sample shall be removed from the mandrel, formed into a coil not less than 75 mm in diameter and immersed in water. The following voltage test shall then be applied.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument connected on the lower voltage side.

The test voltage shall be applied gradually between the conductor and the water, which shall be earthed. The voltage shall be raised to 20 kV r.m.s. and held at this value for 5 minutes. There shall be no breakdown of the insulation.

2.7.4 Effect of cooling on flexibility. 300 mm of the finished PVC-insulated cable shall be kept in an atmosphere having a temperature of -25 ± 3 °C for a period of half an hour. At the end of this period the cable shall be immediately wound in three close turns round a similarly cooled 25 mm diameter mandrel. After 2 minutes the insulation shall show no sign of splitting.

2.7.5 Effect of oil. A sample of the finished PVC-insulated cable about 750 mm long shall be wound round a cylindrical metal mandrel, as follows:

Diameter of mandrel	25 mm
Number of turns	5
Spacing between turns	19 mm
Speed of winding	1 turn per second
Load applied during winding	45 N

The mandrel and cable shall then be immersed in a tank of lubricating oil, with not less than 75 mm of the cable protruding above the surface of the oil at each end. The oil shall be of the grade defined in Appendix A. The temperature of the oil shall be maintained at 90 ± 2 °C for 48 hours. At the end of this period the sample shall be removed from the mandrel, the oil shall be wiped off and the sample shall be allowed to cool to room temperature. It shall next be formed into a coil not less than 75 mm diameter and immersed in water. The following voltage test shall then be applied.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument connected on the lower side.

The test voltage shall be applied gradually between the conductor and the water, which shall be earthed. The voltage shall be raised to 20 kV r.m.s. and held at this value for 5 minutes. There shall be no breakdown of the insulation.

2.7.6 High voltage test. A sample of the finished PVC-insulated cable, not less than 1 m in length, shall be immersed in water with the ends projecting above the surface of the water. The following test shall be applied not less than 12 hours after immersion, while the sample is still immersed.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument connected on the lower voltage side.

The test voltage shall be applied gradually between the conductor and the water, which shall be earthed. The voltage shall be raised to 20 kV r.m.s. and held at this value for 5 minutes. Electrical breakdown shall not occur.

TABLE 1. IGNITION CABLES

1	2	3	4	5	6	7
		Conductor				
Designation	Insulation	Number and nominal diameter of wires	Approximate diameter of conductor	Maximum resistance per 1000 m at 20 °C	Radial thickness of insulation	Overall diameter
		mm	mm	Ω	mm	mm
7 mm	Rubber	19/0·30	1·50	14·28	2·75 ± 0·25	7·0 ± 0·25
7 mm	PVC	19/0·30	1·50	13·88*	2·75 ± 0·25	7·0 ± 0·25

* 14·28 Ω for tinned conductor.

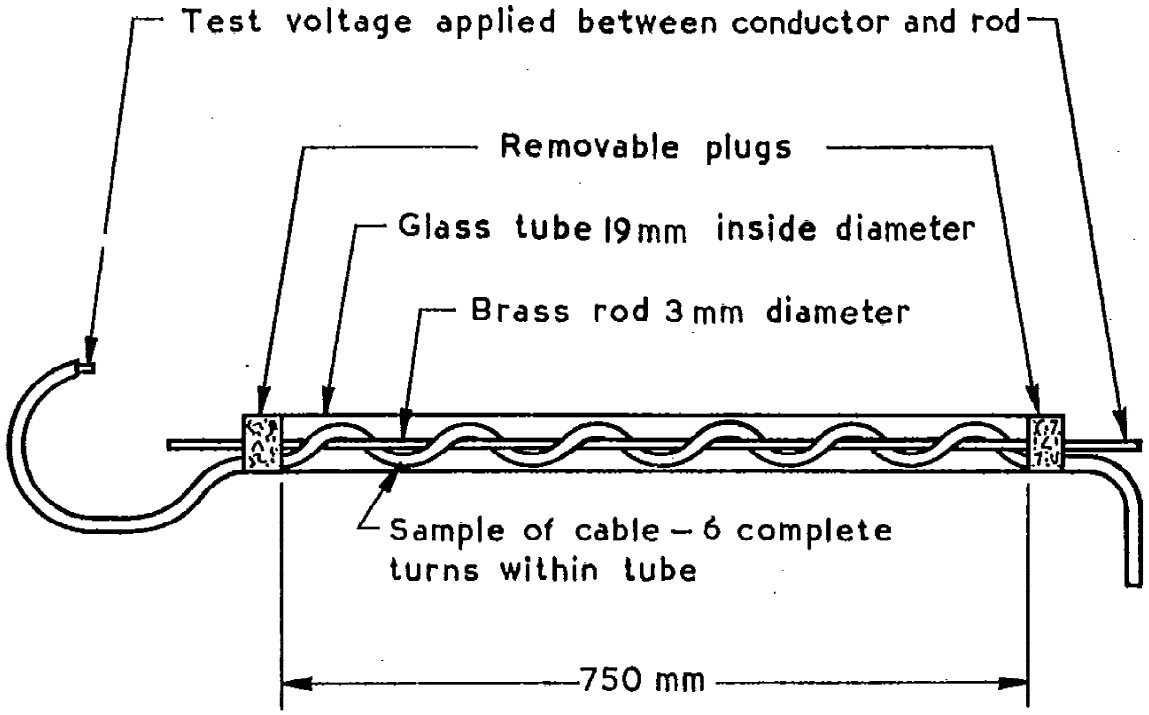

Fig. 1. Ozone test apparatus for ignition cables

3. GENERAL WIRING CABLES

3.1 GENERAL REQUIREMENTS

The dimensions of general wiring cables shall be in accordance with Tables 5, 6, 7 and 8.

The conductor, core and finished cable shall be subjected to the relevant routine tests specified in 3.11. The finished cable shall be capable of passing the appropriate type test specified in 3.12.

3.2 CONDUCTOR

All conductors shall be circular, plain annealed copper conductors or, when specified by the purchaser, tinned annealed copper conductors, and shall comply with Table 4 of this British Standard and the requirements of BS 6360* as far as applicable.

For non-flexible conductors the number and nominal diameter of wires in the conductor shall be as specified in the appropriate tables.

For flexible conductors the diameter of the individual wires in the conductor shall not be greater than that specified in the appropriate tables. The number and nominal diameter of the wires in flexible conductors are given in the appropriate tables.

The conductor shall be stranded if the number of wires is 37 or 61, otherwise it shall be bunched for nominal areas up to and including 4·5 mm² and multiple stranded for larger sizes.

* BS 6360, ' Copper conductors in insulated cables and cords '.

3.3 PVC INSULATION

The PVC insulation shall be general purpose insulation in accordance with BS 6746* for Type TI1 compound and shall be such that the finished cable will meet the requirements specified in 3.12.1. *As amended June 1976*

3.4 BRAID AND LACQUER

The braid shall consist of suitable fibrous material so treated with a lacquer that the finished cable is capable of passing the relevant tests.

3.5 PVC SHEATH

The PVC sheath shall be general purpose sheath in accordance with BS 6746* for TYPE 6 compound and shall be such that the finished cable will meet the requirements specified in 3.12.1.

3.6 MANUFACTURER'S IDENTIFICATION

When specified by the purchaser, coloured identification threads shall be laid with the conductor or under the braid or sheath, if any, to identify the manufacturer. The colours shall be in conformity with the Register† maintained by the British Standards Institution, where applicable. Alternatively, identification may be provided by means of a tape enclosed in the cable and printed repeatedly with the manufacturer's name.

3.7 THICKNESS OF INSULATION AND SHEATH

3.7.1 Insulation. The thickness of the insulation, determined by taking the average of a number of measurements, shall be not less than the standard value given in the appropriate table, and the smallest of the measured values shall not fall below the standard value by more than the following:

Up to and including	1·2 mm	5 % + 0·1 mm
Above	1·2 mm	10 % + 0·1 mm

3.7.2 Sheath. The thickness of the sheath, determined by taking the average of a number of measurements, shall be not less than the standard value given in the appropriate table, and the smallest of the measured values shall not fall below the standard value by more than 5 % + 0·1 mm.

In twin and multicore cables where the sheath fills the interstices between the cores, the standard thickness applies at the points where the thickness of the sheath is at its minimum.

* BS 6746, ' PVC insulation and sheath of electric cables '.

† PD 2379, ' Register of colours of manufacturers' identification threads for electric cables and cords'. Copies may be obtained from BSI Sales Office, 101 Pentonville Road, London N1 9ND.

3.7.3 Method of measurement. The thickness of insulation and sheath shall be measured on a representative sample of the cable about 300 mm long, taken not less than 300 mm from the end of a factory length of cable.

The measurements shall be made at a number of equidistant points around the periphery of the core or cable at a number of points along the length of the sample.

3.8 OVERALL DIMENSIONS

Overall dimensions of the cable shall be in accordance with the appropriate table.

3.9 COLOURS

3.9.1 Insulation. The following are regarded as standard colours for the insulation.

(1) *PVC insulation with further covering*

Single-core cables:	Black
Twin cables:	Red and Black
Three-core cables:	Red, Black and Green
Seven-core cables:	As shown in Fig. 2.

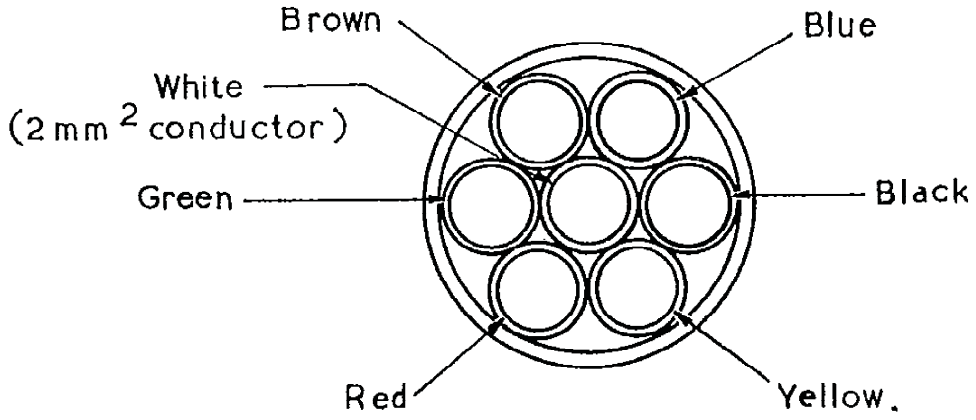

Fig. 2. Insulation colours for seven-core cables

(2) *PVC insulation without further covering*

Single-core cables: Black unless otherwise specified.

3.9.2 Finished cable. The overall colour of braided and lacquered cables and of PVC-sheathed cables shall be black unless otherwise specified.

3.10 CONSTRUCTION

3.10.1 Single-core PVC-insulated cables without further covering (Table 5). Single-core PVC-insulated cables without further covering shall consist of an insulated conductor in accordance with 3.2 and 3.3.

3.10.2 Single-core PVC-insulated cables, braided and lacquered (Table 6). Single-core PVC-insulated cables, braided and lacquered, shall consist of an insulated

conductor in accordance with 3.2 and 3.3, braided and lacquered in accordance with 3.4.

3.10.3 Flat twin, circular twin and three-core PVC-insulated and PVC-sheathed cables (Table 7). Flat twin, circular twin and three-core PVC-insulated and PVC-sheathed cables shall consist of insulated conductors in accordance with 3.2, 3.3 and 3.9.1 covered with a PVC sheath in accordance with 3.5.

3.10.4 Seven-core PVC-insulated and PVC-sheathed trailer cable (Table 8). Seven-core PVC-insulated and PVC-sheathed trailer cable shall consist of seven insulated conductors in accordance with 3.2, 3.3 and 3.9.1, which shall be cabled with a lay of about 6 times the pitch diameter and covered with a PVC sheath in accordance with 3.5 to make a reasonably circular cable.

3.11 ROUTINE TESTS

3.11.1 Conductor resistance test. The resistance of the conductor shall be measured and shall comply with the requirements given in Table 4.

3.11.2 Spark test. The core shall be spark tested as described in Appendix B, and shall withstand the appropriate voltage given in Table 2.

TABLE 2. SPARK TEST VOLTAGES

Radial thickness of insulation	Test voltage (r.m.s.)
mm	V
0·5, 0·6, 0·7	1 500
0·8, 1·0	6 000
1·2, 1·3	8 000
1·5, 1·6	10 000
1·7	12 000

3.11.3 Voltage test. The following voltage test shall be applied, in the dry state, to multicore cables after completion.

The test shall be made at room temperature with alternating current approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz. The test voltage shall be measured either on the higher voltage side of the test transformer or by a suitably calibrated instrument connected on the lower voltage side.

The voltage shall be applied gradually between conductors and shall be maintained at 1500 V for 2 minutes. Electrical breakdown shall not occur.

3.12 TYPE TESTS

3.12.1 Effect of lubricating oil, fuel oil and petrol. Three samples of the finished PVC-sheathed cable or PVC-insulated cable without further covering, or of the core of other PVC-insulated cables, each approximately 450 mm long, shall be carefully measured for outside diameter. Each sample shall then be bent in the form of a U-loop, with straight sides of at least 100 mm.

The samples shall be immersed to within 25 mm of the ends, one in each of the hydrocarbon liquids defined in Appendix A, the temperature being adjusted and maintained as shown in Table 3.

TABLE 3. IMMERSION TIMES IN HYDROCARBON LIQUID

Liquid	Immersion time	Temperature
Lubricating oil	72 hours	70 ± 1°C
Fuel oil	7 days	70 ± 1°C
Petrol	24 hours	20 ± 1°C

Each sample shall be removed from the fluid after the appropriate period of immersion shown above and shall be wiped and allowed to come to room temperature. The outside diameter shall again be carefully measured. The increase in average diameter shall not exceed 4 %.

The sample shall then be wrapped around a mandrel of diameter equal to twice the specified diameter of the cable or core (minor axis diameter for a flat cable). No cracking shall occur.

3.12.2 Bending test (for braided cables). A sample of the finished braided cable shall be wound at room temperature round a mandrel of a diameter equal to twice the specified diameter of the cable. There shall be no cracking or rupture of the braid.

3.12.3 Test for flame retardance (for braided cables). A piece of the PVC-insulated braided and lacquered cable, approximately 225 mm in length, shall be supported horizontally and subjected to a luminous 'batswing' flame. The flame shall be 25 mm wide across the tips and shall be applied, so that the flame is longitudinal with the cable, for a period of 5 s.

Should the cable become ignited, it shall not continue to burn for more than 60 s after the flame has been removed, and the burning shall not extend more than 25 mm on each side of the portion of the cable which has been subjected to the flame.

3.12.4 Test for mould growth (for braided cables). A piece of the PVC-insulated braided and lacquered cable shall be capable of withstanding the test given in BS 2011, Part 2J*, so that when three specimens are exposed for 28 days and visually examined, the fungus growth of any one shall be not greater than scale 2, i.e. ' growth plainly visible to the naked eye, but covers less than 25% of the test surface '.

* BS 2011, ' Methods for the environmental testing of electronic components and electronic equipment ', Part 2J, ' Mould growth '.

TABLE 4. CONDUCTORS FOR GENERAL WIRING CABLES

As amended Dec., 1979

1	2	3	4	5
Nominal area	Number and nominal diameter of wires in conductor	Maximum diameter of wires in conductor	Maximum resistance per km of conductor at 20 °C	
			Plain copper	Tinned copper
mm^2	mm	mm	Ω	Ω
0·5	16/0·20	0·21	37·1	38·2
0·65	9/0·30	0·31	29·35	30·23
1·0	14/0·30	0·31	18·84	19·38
1·5	21/0·30	0·31	12·57	12·95
2·0	28/0·30	0·31	9·42	9·69
2·5	35/0·30	0·31	7·54	7·75
3·0	44/0·30	0·31	6·00	6·17
4·5	65/0·30	0·31	4·06	4·18
6	84/0·30	0·31	3·14	3·23
7	97/0·30	0·31	2·72	2·80
8	120/0·30	0·31	2·20	2·26
10	80/0·40	0·41	1·82	1·85
16	37/0·75	—	1·10	1·12
16	126/0·40	0·41	1·16	1·18
20	266/0·30	0·31	0·99	1·02
25	37/0·90	—	0·762	0·777
40	61/0·90	—	0·462	0·471
60	61/1·13	—	0·293	0·296

TABLE 5. SINGLE-CORE PVC-INSULATED CABLES

1	2	3	4	5
Conductor			Radial thickness of insulation	Overall diameter
Nominal area	Number and nominal diameter of wires	Approximate diameter		Maximum
mm^2	mm	mm	mm	mm
0·5	16/0·20	1·0	0·5	2·2
0·65	9/0·30	1·1	0·6	2·5
1·0	14/0·30	1·3	0·6	2·7
1·5	21/0·30	1·6	0·6	3·1
2·0	28/0·30	1·9	0·6	3·4
2·5	35/0·30	2·1	0·7	3·8
3·0	44/0·30	2·3	0·8	4·2
4·5	65/0·30	2·8	1·0	5·1
6	84/0·30	3·6	1·0	5·9
7	97/0·30	3·9	1·0	6·2
8	120/0·30	4·3	1·2	7·0
10	80/0·40	4·6	1·3	7·5
16	37/0·75	5·3	1·3	8·3
16	126/0·40	5·7	1·3	8·7
20	266/0·30	6·5	1·3	9·5
25	37/0·90	6·3	1·5	9·7
40	61/0·90	8·1	1·6	11·8
60	61/1·13	10·2	1·7	14·1

As amended Dec., 1979

TABLE 6. SINGLE-CORE PVC-INSULATED CABLES, BRAIDED AND LACQUERED

1	2	3	4	5
Conductor			Radial thickness of insulation	Overall diameter
Nominal area	Number and nominal diameter of wires	Approximate diameter		Maximum
mm²	mm	mm	mm	mm
0·5	16/0·20	1·0	0·5	3·2
0·65	9/0·30	1·1	0·6	3·5
1·0	14/0·30	1·3	0·6	3·7
1·5	21/0·30	1·6	0·6	4·1
2·0	28/0·30	1·9	0·6	4·4
2·5	35/0·30	2·1	0·7	4·8
3·0	44/0·30	2·3	0·8	5·2
4·5	65/0·30	2·8	1·0	6·1
6	84/0·30	3·6	1·0	6·9
7	97/0·30	3·9	1·0	7·2
8	120/0·30	4·3	1·2	8·0

As amended Dec., 1979

TABLE 7. FLAT TWIN, CIRCULAR TWIN AND CIRCULAR THREE-CORE PVC-INSULATED AND PVC-SHEATHED CABLES

1	2	3	4	5	6	7	8	9	10	11	12
Conductor			Radial thickness of insulation	Radial thickness of sheath		Overall dimensions		Overall diameter			
Nominal area	Number and nominal diameter of wires	Approximate diameter		Twin flat	Circular twin and three-core	Flat twin		Circular twin		Circular three-core	
						Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
mm^2	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0·65	9/0·30	1·1	0·6	0·6	0·8	5·8 × 3·5	6·1 × 3·8	6·2	6·5	6·5	7·0
1·0	14/0·30	1·3	0·6	0·6	0·8	6·2 × 3·7	6·5 × 4·0	6·6	7·1	7·0	7·5
2·0	28/0·30	1·9	0·6	0·6	0·8	7·4 × 4·3	7·9 × 4·8	7·8	8·3	8·2	8·7

As amended Dec., 1979

TABLE 8. SEVEN-CORE PVC-INSULATED AND PVC-SHEATHED TRAILER CABLE

1	2	3	4	5	6	7	8
Number of cores	Conductor			Radial thickness of insulation	Radial thickness of sheath	Overall diameter	
	Nominal area	Number and nominal diameter of wires	Approximate diameter			Min.	Max.
	mm^2	mm	mm	mm	mm	mm	mm
6	1·0	14/0·30	1·3	0·6	0·8	9·7	10·2
1	2·0	28/0·30	1·9	0·6			

4. EARTHING BRAIDS

4·1 GENERAL REQUIREMENTS

The dimensions of earthing braids shall be in accordance with Table 9.

4·2 FORMULATION

Earthing braids shall be formed of tinned annealed copper wires complying with BS 4109*. The wires shall be formed into a braid of approximately circular cross section, the number of spindles, the number of ends per spindle and the braiding lay being as indicated in Table 9. For a flat braid the circular braid shall be flattened to the dimensions given in Table 9. Brazed silver-soldered or electrically welded joints may be made in individual wires but no joints shall be made in the finished braid.

* BS 4109, 'Copper for electrical purposes (wire for general electrical purposes and for insulated cables and flexible cords)'.

TABLE 9. EARTHING BRAIDS

1	2	3	4	5	6
Type	Nominal area	Make-up of braid		Approximate overall dimensions	Approximate braiding lay
		Number of spindles	Number and size of wires per spindle		
	mm²	mm	mm	mm	mm
Round	19	16	16/0·30	7·1	80
Round	28	16	24/0·30	10·0	100
Round	37	16	32/0·30	11·0	90
Flat	21	48	14/0·20	24 × 2·5	150
Flat	21	24	28/0·20	24 × 2·5	150

APPENDIX A

TEST FLUIDS

A.1 Lubricating oil. The oil consists of pure refined petroleum products in which small quantities of additives may be blended to meet the following requirements.

(1) Viscosity at 99°C	$18{\cdot}80 \times 10^{-6}$ m²/s minimum*, $21{\cdot}15 \times 10^{-6}$ m²/s maximum*
(2) Viscosity index	95 minimum
(3) Pour point	− 12°C maximum
(4) Carbon residue (Ramsbottom)	0·95 maximum
(5) Flash point, (open)	240°C minimum
(6) Total acidity (mg-KOH/g of oil)	0·1 maximum
(7) Mineral acidity	Nil
(8) Ash content	0·01 % maximum
(9) Saponification number (20 g sample)	0·5 maximum.

A.2 Fuel oil. The oil is Class A engine fuel as defined in BS 2869†.

A.3 Petrol. The test fluid is a mixture containing 30 % by volume of pure toluole to BS 805‡ and 70% by volume of alkylate iso-octane (reference fuel quality).

APPENDIX B

SPARK TEST

B.1 Test electrode. The electrode, consisting preferably of a fine-link mesh, is arranged to make intimate contact with the surface of the core.

B.2 Running speed. The speed at which the core passes through the electrode is such that every point is in the electrode for not less than 0·1 s.

B.3 Test voltage. The supply to the electrode shall be alternating current having a frequency in the range 40 Hz to 62 Hz. The conductor of the core is earthed and the voltage between the electrode and the conductor is as specified in 3.11.2.

B.4 Fault detector. The detector is arranged so as to maintain its indication even after the fault has passed out of the electrode.

B.5 Sensitivity. The minimum sensitivity of the spark-testing apparatus is such that the detector will operate when an artificial fault device, consisting of a spark gap in series with a capacitor, is connected between the electrode and earth. The electrode potential is 6000 V r.m.s. and the capacitance is 350 pF. The spark gap consists of a metal plate moving past a needle point in 0·02 s and the distance between them during this time shall be 5·0 mm.

* Values in centistokes are 10^6 times those quoted.
† BS 2869, ' Petroleum fuels for oil engines and burners '.
‡ BS 805, ' Toluenes '.