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British Standard

# Instrumentation cables

Part 1. Specification for polyethylene insulated cables

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Câbles d'instrumentation

Partie 1. Câbles isolés au polyéthylène – Spécifications

Zuführungskabel und -leitungen für Instrumente

Teil 1. Isoliertekabel aus Polyethylen

## Foreword

BS 5308 has been prepared under the direction of the Electronic Components Standards Committee to cover the requirements for a range of instrument signal cables.

This Part of BS 5308 is a revision of BS 5308 : Part 1 : 1975, which is withdrawn, and updates the standard in line with current technology. Attention is drawn particularly to the increased operating voltage given in the scope and the new colour coding for the identification of pairs in appendix A.

These cables are not intended for use in coal mining (Group I) applications but may be suitable for Group II intrinsically safe systems (but see warning note).

This Part of BS 5308 covers polyethylene insulated cables used mainly by the petroleum industry. Part 2 covers PVC insulated cables, used mainly by the chemical and petrochemical industries.

Notes on the installation of thermoplastic cables are given in appendix B.

Further information relating to intrinsic safety may be obtained from the following British Standards:

- BS 5345 Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture)  
Part 1 : 1976 Basic requirements for all Parts of the code  
Part 2 : 1983 Classification of hazardous areas
- BS 5501 Electrical apparatus for potentially explosive atmospheres  
Part 1 : 1977 General requirements  
Part 7 : 1977 Intrinsic safety 'i'  
Part 9 : 1982 Specification for intrinsically safe electrical systems 'i'

**WARNING NOTE.** Cables used when installing an intrinsically safe system are required to conform to any relevant requirement in any certification documents, either for the system or for the intrinsically safe and associated apparatus forming parts of the system. Cables should also be suitable for the environment in which they are to be used (see, for example, 25.2.1 of BS 5345 : Part 1 : 1976). *This means that for some applications the cables specified in this British Standard may not be suitable.* The use in intrinsically safe systems of cables not covered by this standard is not precluded.

Amendment No. 1  
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Instrumentation cables  
Part 1. Specification for polyethylene insulated cables

Revised text

AMD 7617  
July 1993

Foreword

In line 6 of the last paragraph delete the text in brackets and substitute '(see for example, 19.3 of BS 5345 : Part 1 : 1989).'

AMD 7617  
July 1993

Clause 9 Pair screens

In line 1 of paragraph 3 delete '0.05 mm thick'.

AMD 7617  
July 1993

Clause 12.2 Cables other than one-pair cables

Delete the existing text entirely and substitute the following.

'A laminated screening tape shall be applied with a minimum overlap of 25 % and with the metallic side down in contact with a drain wire run longitudinally over the non-hygroscopic binder tape or tapes.'

AMD 7617  
July 1993

Clause 12.3.1 Cables where binder tape has been applied

In line 3, delete '(a) or shall not be applied'.

AMD 7617  
July 1993

Table 1. Details of conductors and insulation thickness

In the column headed 'Resistance at 20 °C maximum', delete '13.7' and substitute '39.7'.

AMD 7617  
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Table 8. Dimensions of 1.5 mm<sup>2</sup> class 2 conductor (7/0.53 mm) multipair polyethylene insulated cables without individual pair screens

In subcolumn '2' (Cable type) of column headed '20' (Number of pairs), delete '2.0' and substitute '1.6' (twice), delete '31.5' and substitute '30.7' and delete '35.5' and substitute '34.7'.



MD 7617  
ly 1993

Table 9. Dimensions of 1.5 mm<sup>2</sup> class 2 conductor (7/0.53 mm)  
multipair polyethylene insulated cables with individual pair screens

In subcolumns '2' and '3' (Cable type) of column headed '30' (Number of pairs), for  
'Thickness of oversheath (nominal)' delete '2.5' and substitute '2.4' and delete '2.4' and  
substitute '2.5' respectively.

MD 7617  
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Table 11. Maximum mutual capacitance values

In column headed '1.5 mm<sup>2</sup>' delete '115' and substitute '120'.

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y 1993

Appendix A. Identification of pairs

In line 1 of paragraph 1, after 'unscreened cables' insert 'and collectively screened cables'.



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## Section one. General

### 1 Scope

This Part of BS 5308 specifies requirements for and dimensions of polyethylene insulated cables in pairs with or without screens and optionally incorporating single wire armour or lead sheath with single wire armour.

The insulation of these instrumentation cables is suitable for operation at voltages up to and including 300 V r.m.s. core to earth and 500 V r.m.s. core to core and at a maximum temperature of 65 °C. However, instrumentation cables are not for direct connection to a low impedance source, e.g. the public mains electricity supply.

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

### 2 Definitions

For the purposes of this Part of BS 5308 the definitions given in BS 4727 apply.

### 3 Categories of cable

Cables are categorized into three types as follows.

Type 1: polyethylene insulated and PVC sheathed

NOTE. These cables are not recommended for underground burial.

Type 2: polyethylene insulated, polyethylene bedded, single wire armoured and PVC oversheathed.

Type 3: polyethylene insulated, PVC bedded, lead alloy sheathed, PVC bedded, single wire armoured and PVC oversheathed.



## Section two. Constructional requirements

### 4 Conductor material

Conductors shall be plain annealed copper wire in accordance with BS 6360 and table 1 of this standard.

The d.c. resistance of each copper conductor in the completed cable shall not exceed the values given in table 1.

### 5 Dimensions

The dimensions of polyethylene insulated cables shall be in accordance with tables 2 to 9 inclusive as appropriate.

### 6 Insulation

The insulation of polyethylene insulated cables shall be polyethylene type 03 as specified in BS 6234, of thickness as specified in table 1 of this standard.

### 7 Pairs

Two insulated conductors shall be uniformly twisted together to form a pair. The lengths of lay used shall be such that the two wires forming each pair are not dissociated by normal handling. Two-pair cables without individual pair screens shall have four cores laid in quad formation around a central dummy.

The length of lay of any pair shall not exceed 100 mm.

### 8 Pair identification

Unscreened pairs shall be identified by means of coloured insulation in the sequence specified in appendix A, starting at centre.

Screened pairs shall be identified either:

- (a) by means of coloured insulation in the sequence specified in appendix A, starting at centre; or
- (b) by a numbered polyester film which shall also serve as part of the screen insulation, in which case each pair in the cable shall have one black and one blue core.

### 9 Pair screens

When individual pair screening is required, each pair shall have a laminated screening tape applied with the metallic side down, in electrical contact with one or more tinned annealed copper wires (drain wire) of a total cross section of not less than  $0.5 \text{ mm}^2$ . The minimum overlap shall be 25 %.

The laminated tape shall be aluminium bonded to polyester having a minimum thickness of aluminium of 0.008 mm and a minimum thickness of polyester of 0.010 mm.

Over the screening tape, either two laps of 0.05 mm thick polyester tape shall be applied with a minimum overlap of 25 %, or one tape with a minimum overlap of 50 % shall be applied.

### 10 Cabling

The required number of pairs shall be assembled together using the reverse layer or reciprocating lay technique. The cable shall be so constructed that the pairs are in concentric layers.

NOTE 1. Non-hygroscopic fillers may be used to maintain a circular formation.

NOTE 2. The number of pairs should preferably be 1, 2, 5, 10, 15, 20, 30 or 50.

### 11 Binder tape

#### 11.1 General

Where specified in 11.2 and 11.3, binder tape shall be applied over the final layer of pairs.

NOTE. Open spiral interlayer tape may also be applied.

#### 11.2 Cables without a collective screen

A non-hygroscopic tape of minimum thickness 0.023 mm shall be applied with a minimum overlap of 25 %.

#### 11.3 Collectively screened cables

**11.3.1** *Collectively screened cables other than one-pair cables.* Either:

- (a) a non-hygroscopic tape of minimum thickness 0.023 mm shall be applied with an overlap of 50 %; or
- (b) two non-hygroscopic tapes each of minimum thickness 0.023 mm shall be applied each with a minimum overlap of 25 %.

**11.3.2** *Collectively screened one-pair cables.* Either:

- (a) binder tape or tapes shall be applied as specified in 11.3.1; or
- (b) no binder tape shall be applied (see 12.3.2).

### 12 Collective screen and drain wire

#### 12.1 General

Where specified in 12.2 and 12.3:

- (a) laminated screening tape shall comprise aluminium bonded to polyester, the tape having a minimum thickness of aluminium of 0.008 mm and a minimum thickness of polyester of 0.010 mm; and
- (b) a drain wire shall comprise one or more tinned annealed copper wires with a total cross section not less than  $0.5 \text{ mm}^2$ .

**12.2 Cables other than one-pair cables**

Either:

- (a) laminated screening tape shall be applied with a minimum overlap of 25 % and with the metallic side down in contact with a drain wire run longitudinally over a non-hygroscopic binder tape; or
- (b) no laminated screening tape shall be applied.

**12.3 One-pair cables****12.3.1 Cables where binder tape has been applied.**

Laminated screening tape shall be applied as specified in 12.2(a) or shall not be applied.

**12.3.2 Cables where in accordance with 11.3.2(b) no binder tape has been applied.** A laminated screening tape shall be applied with a minimum overlap of 25 % and with the metallic side down in electrical contact with a drain wire laid in one interstice.

**13 Outer protection****13.1 Type 1 cables**

An extruded sheath of type TM1 or type 6 PVC compound in accordance with BS 6746 shall be applied over the binder tape (see clause 11) or the collective screen (see clause 12) to the dimensions specified in tables 2 to 9. Compliance shall be verified by carrying out the appropriate tests listed in table 10.

NOTE. The sheath should be black unless the purchaser specifies that another colour is required.

**13.2 Type 2 cables**

**13.2.1** An extruded bedding of type 2C or type 03 black polyethylene compound in accordance with BS 6234 shall be applied over the binder tape (see clause 11) or the collective screen (see clause 12) to the dimensions specified in tables 2 to 9.

**13.2.2** A single layer of galvanized steel wire armour of the size indicated in the appropriate table shall be applied spirally over the polyethylene bedding. The galvanized steel wire shall comply with BS 1442.

**13.2.3** An extruded oversheath of type TM1 PVC compound in accordance with BS 6746 shall be applied over the galvanized steel wire armour to the dimensions given in tables 2 to 9. Compliance shall be verified by carrying out the appropriate tests listed in table 10.

NOTE. The sheath should be black unless the purchaser specifies that another colour is required.

**13.3 Type 3 cables**

**13.3.1** An extruded bedding of type TM1 or type 6 black PVC compound in accordance with BS 6746 shall be applied over the binder tape (see clause 11) or the collective screen (see clause 12) to the dimensions given in tables 2 to 9. Compliance shall be verified by carrying out the appropriate tests listed in table 10.

**13.3.2** An extruded sheath of lead alloy in accordance with BS 801 shall be applied over the PVC bedding to the dimensions given in tables 2 to 9.

**13.3.3** An extruded bedding of type TM1 black PVC compound in accordance with BS 6746 shall be applied over the lead sheath to the dimensions given in tables 2 to 9. Compliance shall be verified by carrying out the appropriate tests tested in table 10.

**13.3.4** A single layer of galvanized steel wire armour of the size indicated in the appropriate table shall be applied spirally over the extruded PVC bedding. The galvanized steel wire shall comply with BS 1422.

**13.3.5** An extruded oversheath of type TM1 PVC compound in accordance with BS 6746 shall be applied over the galvanized steel wire armour to the dimensions given in tables 2 to 9. Compliance shall be verified by carrying out the appropriate tests listed in table 10.

NOTE. The sheath should be black unless the purchaser specifies that another colour is required.

**13.4 Thickness of bedding**

The minimum thickness of extruded bedding measured in accordance with clause 19 of BS 6346 : 1969 shall not fall below the value given in the appropriate table by an amount more than (15 % +0.1 mm).

**13.5 Thickness of sheath**

**13.5.1 Type 1 cables.** The thickness of the PVC sheath, determined by taking the average of a number of measurements as described in clause 19 of BS 6346 : 1969, shall not fall below the nominal value given in the appropriate table by an amount more than (15 % +0.1 mm).

**13.5.2 Type 2 and type 3 cables.** The minimum thickness of the PVC oversheath, measured in accordance with clause 19 of BS 6346 : 1969, shall not fall below the nominal values given in the appropriate table by an amount more than (20 % +0.2 mm).

## Section three. Electrical requirements

### 14 Spark

#### 14.1 Cores

When tested at 4 kV a.c. (r.m.s.) minimum and otherwise in accordance with BS 5099, no failure of the insulation shall occur.

#### 14.2 Sheath

When tested in accordance with BS 5099, the outer PVC sheath on cables with lead sheath, screen and/or armour shall withstand the specified test voltage without failure.

### 15 Voltage

When tested in accordance with appendix C, there shall be no breakdown of the insulation.

### 16 Insulation resistance

#### 16.1 Individual conductor

When a steady voltage of 500 V d.c. is applied for 1 min, the insulation resistance of each conductor measured against the remaining bunched conductors/screens/lead/armour shall not be less than 5 G $\Omega$  for 1 km at 20 °C.

#### 16.2 Individual screens

For cables with individually screened pairs, when a steady voltage of 500 V d.c. is applied for 1 min, the insulation resistance measured between screens shall be not less than 1 M $\Omega$  for 1 km at 20  $\pm$  5 °C.

### 17 Conductor resistance

The d.c. resistance of each conductor in the completed cable at 20 °C shall not exceed the values given in table 1.

### 18 Capacitance

#### 18.1 Mutual capacitance

The mutual capacitance of the pairs or adjacent cores shall not exceed the values specified in table 11 at a frequency of 1 kHz.

#### 18.2 Capacitance unbalance

The maximum pair-to-pair capacitance unbalance values at a frequency of 1 kHz shall be 250 pF in lengths of 250 m.  
NOTE. For lengths other than 250 m (lengths less than 100 m being considered as 100 m), correct the measurements by multiplying by  $\frac{250}{l}$  where  $l$  is the length in metres of the cable under test.

### 19 L/R ratio

The L/R ratio for adjacent cores shall not exceed the following maximum values:

Conductor	Maximum L/R ratio
0.5 mm <sup>2</sup>	25 $\mu$ H/ $\Omega$
1.0 mm <sup>2</sup>	25 $\mu$ H/ $\Omega$
1.5 mm <sup>2</sup>	40 $\mu$ H/ $\Omega$

## Section four. Identification and sealing

### 20 Manufacturer identification

A means of identifying the manufacturer shall be provided throughout the length of all cables. If coloured threads are used, the colours shall be in accordance with PD 2379, the register maintained by the British Standards Institution.

In both cases the letters and figures shall be raised and shall consist of upright block characters. The maximum size of the characters shall be 13 mm and the minimum size shall be 15 % of the approximate overall diameter of the cable or 3 mm, whichever is the greater. The gap between the end of one set of embossed characters and the beginning of the next shall not be greater than 0.3 m.

### 21 Cable identification

#### 21.1 General

The cable shall be identified by one of the methods specified in 21.2 and 21.3.

#### 21.3 Printed tape

A printed tape bearing the number of this British Standard (i.e. BS 5308/1\*) at intervals of not more than 100 mm shall be applied immediately under the outer protection.

#### 21.2 Embossing of oversheath

The external surface of the oversheath shall be embossed with the number of this British Standard (i.e. BS 5308/1\*) as follows:

- (a) tabulated overall diameters above 15 mm: at least two lines of embossing approximately equally spaced around the circumference;
- (b) tabulated overall diameters 15 mm and smaller: at least one line of embossing.

### 22 End sealing

After completion of the electrical tests the ends of the cable shall be sealed to prevent the ingress of moisture.

**Table 1. Details of conductors and insulation thickness**

Conductor				Insulation thickness		Core diameter maximum
Nominal area	Conductor class (BS 6360)	Conductor details	Resistance at 20 °C maximum	Nominal	Minimum	
mm <sup>2</sup>		mm	Ω/km	mm	mm	mm
0.50	1	1/0.80	36.8	0.50	0.45	1.90
1.00	1	1/1.13	18.4	0.60	0.50	2.45
0.50	5	16/0.2	13.7	0.60	0.50	2.35
1.50	2	7/0.53	12.3	0.60	0.50	3.00

NOTE. As BS 6360 resistance values only allow for multicore cables, an additional 2 % of the maximum resistance has been allowed for cables of multipair construction.

\*Marking BS 5308/1 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturers responsibility. Enquiries as to the availability of third party certification should be addressed to the appropriate certification body.

**Table 2. Dimensions of 0.5 mm<sup>2</sup> class 1 conductor (1/0.8 mm) multipair polyethylene insulated cables without individual pair screens**

Number of pairs	1			2 (quad)			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	0.8	0.8	0.8	0.8	0.8	0.8	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5
Diameter over sheath/bedding	5.3	5.3	5.3	6.1	6.1	6.1	10.6	10.6	10.6	14.0	14.0	14.0	16.1	16.1	16.1	18.4	18.4	18.4	22.0	22.0	22.0	27.9	27.9	27.9
Thickness of lead sheath (nominal)			1.1			1.1			1.1			1.1			1.2			1.3			1.4			1.5
Diameter over lead sheath			7.5			8.3			12.8			16.2			18.5			21.0			24.8			30.9
Thickness of bedding (nominal)			0.8			0.8			0.8			1.0			1.0			1.0			1.0			1.2
Diameter over bedding			9.1			9.9			14.4			18.2			20.5			23.0			26.8			33.3
Size of armour wire		0.9	0.9		0.9	0.9		0.9	1.25		1.25	1.6		1.25	1.6		1.6	1.6		1.6	1.6		1.6	2.0
Diameter over armour		7.1	10.9		7.9	11.7		12.4	16.9		16.5	21.4		18.6	23.7		21.6	26.2		25.2	30.0		31.1	37.3
Thickness of oversheath (nominal)		1.3	1.4		1.3	1.4		1.4	1.6		1.6	1.7		1.6	1.8		1.7	1.8		1.8	1.9		2.0	2.1
Nominal overall diameter (for information only)	5.3	9.7	13.7	6.1	10.5	14.5	10.6	15.2	20.1	14.0	19.7	24.8	16.1	21.8	27.3	18.4	25.0	29.8	22.0	28.8	33.8	27.9	35.1	41.5

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

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Table 3. Dimensions of 0.5 mm <sup>2</sup> class 1 conductor (1/0.8 mm) multipair polyethylene insulated cables with individual pair screens																					
Number of pairs	2			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	0.9	0.9	0.9	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5	2.0	2.0	2.0
Diameter over sheath/bedding	9.3	9.3	9.3	12.5	12.5	12.5	17.3	17.3	17.3	20.1	20.1	20.1	22.5	22.5	22.5	26.9	26.9	26.9	35.1	35.1	35.1
Thickness of lead sheath (nominal)			1.1			1.1			1.2			1.3			1.4			1.5			1.8
Diameter over lead sheath			11.5			14.7			19.7			22.7			25.3			29.9			38.7
Thickness of bedding (nominal)			0.8			0.8			1.0			1.0			1.2			1.2			1.4
Diameter over bedding			13.1			16.3			21.7			24.7			27.7			32.3			41.5
Size of armour wire		0.9	1.25		1.25	1.25		1.25	1.6		1.6	1.6		1.6	2.0		1.6	2.0		2.0	2.5
Diameter over armour		11.1	15.6		15.0	18.8		19.8	24.9		23.3	27.9		25.7	31.7		30.1	36.3		39.1	46.5
Thickness of oversheath (nominal)		1.4	1.5		1.5	1.6		1.7	1.7		1.7	1.9		1.8	1.9		1.9	2.0		2.2	2.3
Nominal overall diameter (for information only)	9.3	13.9	18.6	12.5	18.0	22.0	17.3	23.2	28.3	20.1	26.7	31.7	22.5	29.3	35.5	26.9	33.9	40.3	35.1	43.5	51.1
NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.																					

**Table 4. Dimensions of 1.0 mm<sup>2</sup> class 1 conductor (1/1.13 mm) multipair polyethylene insulated cables without individual pair screens**

Number of pairs	1			2 (quad)			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	0.8	0.8	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0
Diameter over sheath/bedding	6.4	6.4	6.4	7.4	7.4	7.4	13.2	13.2	13.2	17.4	17.4	17.4	20.3	20.3	20.3	23.4	23.4	23.4	28.0	28.0	28.0	36.3	36.3	36.3
Thickness of lead sheath (nominal)			1.1			1.1			1.1			1.2			1.3			1.4			1.5			1.8
Diameter over lead sheath			8.6			9.6			15.4			19.8			22.9			26.2			31.0			39.9
Thickness of bedding (nominal)			0.8			0.8			1.0			1.0			1.0			1.2			1.2			1.4
Diameter over bedding			10.2			11.2			17.4			21.8			24.9			28.6			33.4			42.7
Size of armour wire		0.9	0.9		0.9	0.9		1.25	1.6		1.25	1.6		1.6	1.6		1.6	2.0		1.6	2.0		2.0	2.5
Diameter over armour		8.2	12.0		9.2	13.0		15.7	20.6		19.9	25.0		23.5	28.1		26.6	32.6		31.2	37.4		40.3	47.7
Thickness of oversheath (nominal)		1.3	1.4		1.4	1.5		1.5	1.7		1.7	1.8		1.8	1.9		1.8	2.0		2.0	2.1		2.2	2.4
Nominal overall diameter (for information only)	6.4	10.8	14.8	7.4	12.0	16.0	13.2	18.7	24.0	17.4	23.3	28.6	20.3	27.1	31.9	23.4	30.2	36.6	28.0	35.2	41.6	36.3	44.7	52.5

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

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Table 5. Dimensions of 1.0 mm <sup>2</sup> class 1 conductor (1/1.13 mm) multipair polyethylene insulated cables with individual pair screens																					
Number of pairs	2			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.5	1.5	1.7	1.7	1.7	2.0	2.0	2.0	2.2	2.2	2.2
Diameter over sheath/bedding	11.8	11.8	11.8	15.2	15.2	15.2	21.6	21.6	21.6	25.2	25.2	25.2	28.8	28.8	28.8	34.4	34.4	34.4	43.9	43.9	43.9
Thickness of lead sheath (nominal)			1.1			1.2			1.3			1.5			1.6			1.7			2.0
Diameter over lead sheath			14.0			17.6			24.2			28.2			32.0			37.8			47.9
Thickness of bedding (nominal)			0.8			1.0			1.0			1.2			1.2			1.4			1.6
Diameter over bedding			15.6			19.6			26.2			30.6			34.4			40.6			51.1
Size of armour wire		0.9	1.25		1.25	1.6		1.6	1.6		1.6	2.0		2.0	2.0		2.0	2.5		2.5	2.5
Diameter over armour		13.6	18.1		17.7	22.8		24.8	29.4		28.4	34.6		32.8	38.4		38.4	45.6		48.9	56.1
Thickness of oversheath (nominal)		1.5	1.6		1.6	1.7		1.8	1.9		1.9	2.1		2.0	2.2		2.2	2.4		2.5	2.7
Nominal overall diameter (for information only)	11.8	16.6	21.3	15.2	20.9	26.2	21.6	28.4	33.2	25.2	32.2	38.8	28.8	36.8	42.8	34.4	42.8	50.4	43.9	53.9	61.5
NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.																					



**Table 6. Dimensions of 0.5 mm<sup>2</sup> class 5 conductor (16/0.2 mm) multipair polyethylene insulated cables without individual pair screens**

Number of pairs	1			2 (quad)			5			10			15			20			30			50		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	0.8	0.8	0.8	0.8	0.8	0.8	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5	1.7	1.7	1.7
Diameter over sheath/bedding	6.0	6.0	6.0	6.9	6.9	6.9	12.1	12.1	12.1	16.2	16.2	16.2	18.8	18.8	18.8	21.3	21.3	21.3	25.9	25.9	25.9	32.9	32.9	32.9
Thickness of lead sheath (nominal)			1.1			1.1			1.1			1.2			1.3			1.3			1.5			1.7
Diameter over lead sheath			8.2			9.1			14.3			18.6			21.4			23.9			28.9			36.3
Thickness of bedding (nominal)			0.8			0.8			0.8			1.0			1.0			1.0			1.2			1.4
Diameter over bedding			9.8			10.7			15.9			20.6			23.4			25.9			31.3			39.1
Size of armour wire		0.9	0.9		0.9	0.9		0.9	1.25		1.25	1.6		1.6	1.6		1.6	1.6		1.6	2.0		2.0	2.5
Diameter over armour		7.8	11.6		8.7	12.5		13.9	18.4		18.7	23.8		22.0	26.6		24.5	29.1		29.1	35.3		36.9	44.1
Thickness of oversheath (nominal)		1.3	1.4		1.3	1.4		1.5	1.6		1.6	1.8		1.7	1.8		1.8	1.9		1.9	2.1		2.1	2.3
Nominal overall diameter (for information only)	6.0	10.4	14.4	6.9	11.3	15.3	12.1	16.9	21.6	16.2	21.9	27.4	18.8	25.4	30.2	21.3	28.1	32.9	25.9	32.9	39.5	32.9	41.1	48.7

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

**Table 7. Dimensions of 0.5 mm<sup>2</sup> class 5 conductor (16/0.2 mm) multipair polyethylene insulated cables with individual pair screens**

Number of pairs	2			5			10			15			20			30			50		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.7	1.7	1.7	2.2	2.2	2.2
Diameter over sheath/bedding	11.0	11.0	11.0	14.2	14.2	14.2	20.1	20.1	20.1	23.5	23.5	23.5	26.3	26.3	26.3	31.3	31.3	31.3	40.7	40.7	40.7
Thickness of lead sheath (nominal)			1.1			1.1			1.3			1.4			1.5			1.6			1.9
Diameter over lead sheath			13.2			16.4			22.7			26.3			29.3			34.5			44.5
Thickness of bedding (nominal)			0.8			1.0			1.0			1.2			1.2			1.2			1.4
Diameter over bedding			14.8			18.4			24.7			28.7			31.7			36.9			47.3
Size of armour wire		0.9	1.25		1.25	1.6		1.6	1.6		1.6	2.0		1.6	2.0		2.0	2.0		2.5	2.5
Diameter over armour		12.8	17.3		16.7	21.6		23.3	27.9		26.7	32.7		29.5	35.7		35.3	40.9		45.7	52.3
Thickness of oversheath (nominal)		1.5	1.6		1.6	1.7		1.8	1.9		1.8	2.0		1.9	2.1		2.1	2.2		2.4	2.6
Nominal overall diameter (for information only)	11.0	15.8	20.5	14.2	19.9	25.0	20.1	26.9	31.7	23.5	30.3	36.7	26.3	33.3	39.9	31.3	39.5	45.3	40.7	50.5	57.5

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

**Table 8. Dimensions of 1.5 mm<sup>2</sup> class 2 conductor (7/0.53 mm) multipair polyethylene insulated cables without individual pair screens**

Number of pairs	1			2 (quad)			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	0.8	0.8	0.8	0.9	0.9	0.9	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.7	1.7	1.7	2.0	2.0	2.0
Diameter over sheath/bedding	7.3	7.3	7.3	8.7	8.7	8.7	15.4	15.4	15.4	20.6	20.6	20.6	24.2	24.2	24.2	27.5	27.5	27.5	33.3	33.3	33.3	42.6	42.6	42.6
Thickness of lead sheath (nominal)			1.1			1.1			1.2			1.3			1.4			1.5			1.7			2.0
Diameter over lead sheath			9.5			10.9			17.8			23.2			27.0			30.5			36.7			46.6
Thickness of bedding (nominal)			0.8			0.8			1.0			1.0			1.2			1.2			1.4			1.6
Diameter over bedding			11.1			12.5			19.8			25.2			29.4			32.9			39.5			49.8
Size of armour wire		0.9	0.9		0.9	1.25		1.25	1.6		1.6	1.6		1.6	2.0		2.0	2.0		2.0	2.5		2.5	2.5
Diameter over armour		9.1	12.9		10.5	15.0		17.9	23.0		23.8	28.4		27.4	33.4		31.5	36.9		37.3	44.5		47.6	54.8
Thickness of oversheath (nominal)		1.4	1.5		1.4	1.5		1.6	1.7		1.8	1.9		1.9	2.0		2.0	2.1		2.1	2.3		2.4	2.6
Nominal overall diameter (for information only)	7.3	11.9	15.9	8.7	13.3	18.0	15.4	21.1	26.4	20.6	27.4	32.2	24.2	31.2	37.4	27.5	35.5	41.1	33.3	41.5	49.1	42.6	52.4	60.0

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

**Table 9. Dimensions of 1.5 mm<sup>2</sup> class 2 conductor (7/0.53 mm) multipair polyethylene insulated cables with individual pair screens**

Number of pairs	2			5			10			15			20			30			50		
Cable type	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Thickness of sheath/bedding (nominal)	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.5	1.5	1.7	1.7	1.7	1.7	1.7	1.7	2.0	2.0	2.0	2.2	2.2	2.2
Diameter over sheath/bedding	13.7	13.7	13.7	17.8	17.8	17.8	25.5	25.5	25.5	29.8	29.8	29.8	33.4	33.4	33.4	40.0	40.0	40.0	51.2	51.2	51.2
Thickness of lead sheath (nominal)			1.1			1.2			1.5			1.6			1.7			1.9			2.2
Diameter over lead sheath			15.9			20.2			28.5			33.0			36.8			43.8			55.6
Thickness of bedding (nominal)			1.0			1.0			1.2			1.2			1.4			1.4			1.6
Diameter over bedding			17.9			22.2			30.9			35.4			39.6			46.6			58.8
Size of armour wire		1.25	1.6		1.6	1.6		1.6	2.0		2.0	2.0		2.0	2.5		2.5	2.5		2.5	2.5
Diameter over armour		16.2	21.1		21.0	25.4		28.7	34.9		33.0	39.4		37.4	44.6		45.0	51.6		56.2	63.8
Thickness of oversheath (nominal)		1.6	1.7		1.7	1.8		1.9	2.1		2.0	2.2		2.1	2.3		2.5	2.4		2.7	2.9
Nominal overall diameter (for information only)	13.7	19.4	24.5	17.8	24.4	29.0	25.5	32.5	39.1	29.8	37.8	43.8	33.4	41.6	49.2	40.0	49.8	56.6	51.2	61.6	69.6

NOTE. To obtain the diameter of these cables with a collective screen add 1.0 mm to the diameter quoted.

<b>Table 10. List of tests applicable to PVC sheath</b>		
<b>Test (as prescribed in BS 6746)</b>	<b>Mechanical properties of sheath</b>	
	<b>Type TM1</b>	<b>Type 6</b>
Tensile strength	X	X
Elongation at break	X	X
Cold bend test	X	X
Cold elongation test	X	
Cold impact test	X	
Loss of mass	X	X
Hot pressure or hot deformation	X	X
Heat shock test	X	X

NOTE. X indicates that the test is applicable.

<b>Table 11. Maximum mutual capacitance values</b>			
	<b>Nominal dimension of cable</b>		
	<b>0.5 mm<sup>2</sup></b>	<b>1.0 mm<sup>2</sup></b>	<b>1.5 mm<sup>2</sup></b>
Cables without screens	pF/m 75	pF/m 75	pF/m 85
Cables with only collective screens (except one-pair and two-pair)	75	75	85
One-pair and two-pair cables collectively screened and all cables with individually screened pairs	115	115	115

## Appendices

### Appendix A. Identification of pairs

Two-pair unscreened cables shall be cabled in quad formation and colour coded in clockwise order of rotation: black, blue, green, brown.

All other cables up to 50 pairs shall conform to the coding in table 12.

Table 12. Identification of cable pairs other than two-pair unscreened cables					
Pair no.	a-wire	b-wire	Pair no.	a-wire	b-wire
1	Black	Blue	26	White	Yellow
2	Black	Green	27	Red	Yellow
3	Blue	Green	28	Orange	Yellow
4	Black	Brown	29	Black	Grey
5	Blue	Brown	30	Blue	Grey
6	Green	Brown	31	Green	Grey
7	Black	White	32	Brown	Grey
8	Blue	White	33	White	Grey
9	Green	White	34	Red	Grey
10	Brown	White	35	Orange	Grey
11	Black	Red	36	Yellow	Grey
12	Blue	Red	37	Black	Violet
13	Green	Red	38	Blue	Violet
14	Brown	Red	39	Green	Violet
15	White	Red	40	Brown	Violet
16	Black	Orange	41	White	Violet
17	Blue	Orange	42	Red	Violet
18	Green	Orange	43	Orange	Violet
19	Brown	Orange	44	Yellow	Violet
20	White	Orange	45	Grey	Violet
21	Red	Orange	46	Black	Turquoise
22	Black	Yellow	47	Blue	Turquoise
23	Blue	Yellow	48	Green	Turquoise
24	Green	Yellow	49	Brown	Turquoise
25	Brown	Yellow	50	White	Turquoise

### Appendix B. Handling and usage at various temperatures

Attention is drawn to the fact that as the temperature decreases PVC compounds become increasingly stiff and brittle, with the result that, if the cable is bent too quickly to too small a radius or is struck sharply at temperatures in the region of 0 °C or lower, there is a risk of shattering the PVC components.

To avoid the risk of damage during handling, therefore, it is desirable that the cables specified in this standard should be installed only when both the cable and the ambient temperatures are above 0 °C and have been so for the previous 24 h, or where special precautions have been taken to maintain the cable above this temperature. However, after installation, they will operate satisfactorily at temperatures between -40 °C and +65 °C providing that at temperatures below 0 °C they are not subject to movement and/or impact.

The manufacturer should be consulted for precise instructions if the cable is to be stored and/or used outside these temperature limits.

### Appendix C. Voltage test

The applied voltage is 1000 V approximately of sine-wave form having a frequency in the range 40 Hz to 62 Hz.

The voltage is applied to the completed cable at room temperature without immersion in water.

For cables without lead sheath, screen or armour, apply the voltage between conductors. For cables with lead sheath, screen or armour, apply the voltage between conductors, and between conductors and lead sheath, screen and armour which is earthed.

Increase the applied voltage gradually and maintain at full value for 1 min.

## Publications referred to

- BS 801 Specification for composition of lead and lead alloy sheaths of electric cables
- BS 1442 Galvanized mild steel wire for armouring cables
- BS 4727 Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms
- BS 5099 Spark testing of electric cables
- \*BS 5345 Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture)
- Part 1 Basic requirements for all Parts of the code
- Part 4 Installation and maintenance requirements for electrical apparatus with type of protection 'i'. Intrinsically safe electrical apparatus and systems
- \*BS 5501 Electrical apparatus for potentially explosive atmospheres
- Part 1 General requirements
- Part 7 Intrinsic safety 'i'
- Part 9 Specification for intrinsically safe electrical systems 'i'
- BS 6234 Polythene insulation and sheath of electric cables
- BS 6346 PVC-insulated cables for electricity supply
- BS 6360 Specification for 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

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\*Referred to in the foreword only.

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