



BSI Standards Publication

# Electric cables — Low voltage energy cables of rated voltages up to and including 450/750 V ( $U_0/U$ )

Part 2-83: Cables for general applications — Multicore cables with crosslinked silicone rubber insulation

### National foreword

This British Standard is the UK implementation of EN 50525-2-83:2011.

In the UK, the BS EN 50525 series of standards contain complex supersession details. The table below best summarizes the relationship between these standards:

Part 1 together with	Supersedes
2-81	BS 638-4:1996
2-41, 2-42	BS 6007: 2006
2-11 (in part), 2-12, 2-21 (in part), 2-71	BS 6500:2000
2-11 (in part), 2-21 (in part), 2-51 (in part), 2-83, 3-21	BS 7919:2001
2-31, 2-51 (in part)	<b>BS 6004:2000</b>
3-41	<b>BS 7211:1998</b>
2-22, 2-72, 2-82, 3-11, 3-31	None

*NOTE All British Standards will remain current until they are withdrawn on 31 December 2012. British Standards in bold are only partially superseded, and new editions of BS 6004 and BS 7211 will be introduced on 1 January 2013.*

National Annex NA (informative) gives information on the origins and identification of particular cable types.

The UK participation in its preparation was entrusted to Technical Committee GEL/20/17, Electric Cables - Low voltage.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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### Amendments issued since publication

Date	Text affected
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English version

**Electric cables -  
 Low voltage energy cables of rated voltages up to and including 450/750 V  
 ( $U_0/U$ ) -  
 Part 2-83: Cables for general applications -  
 Multicore cables with crosslinked silicone rubber insulation**

Câbles électriques -  
 Câbles d'énergie basse tension de tension  
 assignée au plus égale à 450/750 V  
 ( $U_0/U$ ) -  
 Partie 2-83: Câbles pour applications  
 générales -  
 Câbles multiconducteurs isolés au silicone  
 réticulé

Kabel und Leitungen -  
 Starkstromleitungen mit Nennspannungen  
 bis 450/750 V ( $U_0/U$ ) -  
 Teil 2-83: Starkstromleitungen für  
 allgemeine Anwendungen -  
 Mehradrige Leitungen mit vernetzter  
 Silikon-Isolierung

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 Comité Européen de Normalisation Electrotechnique  
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## Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 20, Electric cables.

The text of the draft was submitted to the formal vote and was accepted by CENELEC as EN 50525-2-83 on 2011-01-17.

This document, which is one of a multipart series, supersedes HD 22.15 S2:2007.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates are proposed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2012-01-17
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2014-01-17

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## 1 Scope

This European Standard applies to multicore cables insulated and sheathed with heat resistant crosslinked silicone rubber. Types with or without an overall textile braid, and with or without a strain-bearing element, are included.

The cables are of rated voltages  $U_0/U$  300/500 V.

The cables are intended for use within high temperature zones, either:

- in fixed installations with mechanical protection (cables to 4.1); or
- for flexible use under low mechanical stress (cables to 4.2).

The maximum conductor operating temperature for each of the cables in this standard is 180 °C.

NOTE HD 516 contains extensive guidance on the safe use of cables in this standard.

This EN 50525-2-83 should be read in conjunction with EN 50525-1, which specifies general requirements.

## 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.

NOTE One or more references to the standards below are in respect of a specific sub-division of that standard, for instance a clause, a table, a class or a type. Cross-references to these standards are undated and, at all times, the latest version applies.

EN 50363-1	Insulating, sheathing and covering materials for low voltage energy cables – Part 1: Cross-linked elastomeric insulating compounds
EN 50363-2-1	Insulating, sheathing and covering materials for low voltage energy cables – Part 2-1: Cross-linked elastomeric sheathing compounds
EN 50395	Electrical test methods for low voltage energy cables
EN 50396	Non electrical test methods for low voltage energy cables
EN 50525-1	Electric cables – Low voltage energy cables of rated voltages up to and including 450/750 V ( $U_0/U$ ) – Part 1: General requirements
EN 60228	Conductors of insulated cables (IEC 60228)
EN 60332-1-2	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 (IEC 60332-1-2)
EN 60811-1-2	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-2: General application – Thermal ageing methods (IEC 60811-1-2)
EN 60811-1-4	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-4: General application – Tests at low temperature (IEC 60811-1-4)
EN ISO 6892-1 2009	Metallic materials – Tensile testing – Part 1: Method of test at room temperature (ISO 6892-1:2009)

### 3 Terms and definitions

For the purposes of this document the terms and definitions given in Clause 3 of EN 50525-1 apply.

### 4 Heat resistant cables (180 °C)

#### 4.1 Cables H05SS-F and braided cables H05SST-F

##### 4.1.1 Construction

###### 4.1.1.1 Conductor

The conductor shall be class 5, according to EN 60228.

###### 4.1.1.2 Sizes of cable

The sizes of cable shall be:

Number of cores: 2, 3, 4 or 5

Nominal cross section: 0,75 mm<sup>2</sup> up to 2,5 mm<sup>2</sup> for 2 and 5 cores

0,75 mm<sup>2</sup> up to 6 mm<sup>2</sup> for 3 and 4 cores

###### 4.1.1.3 Insulation

The insulation shall be a cross-linked elastomeric compound of Type EI 2 to EN 50363-1 applied around each conductor.

###### 4.1.1.4 Assembly of cores

The cores shall be twisted together.

###### 4.1.1.5 Sheath

The core assembly shall be covered with a sheath.

The sheath shall be a cross-linked compound of Type EM 9 to EN 50363-2-1 applied around the cores.

The sheath shall fill the spaces between the cores and fillers, if any.

###### 4.1.1.6 Braid

For cable type H05SST-F the sheath shall be provided with a braid of suitable material. The braid shall have a uniform texture, without knots or gaps.

###### 4.1.1.7 Marking

The cable shall be marked with the CENELEC code H05SS-F for cables without braid, or H05SST-F for cables with braid. The marking shall comply with Clause 6 of EN 50525-1.

#### 4.1.2 Requirements

Each cable shall comply with the appropriate requirements given in EN 50525-1, and the particular requirements of this Part.

Testing shall be in accordance with Annex A, and the relevant tests indicated in column 6.

The dimensions of the cables shall conform to Table B.1 for the relevant size.

The requirements to be met for the compatibility test shall be as given in Annex C.

## **4.2 Cables H05SSD3-K and braided cables H05SSD3T-K, with strain-bearing element**

### **4.2.1 Construction**

#### **4.2.1.1 Conductor**

The conductor shall be class 5, according to EN 60228.

#### **4.2.1.2 Sizes of cable**

The sizes of cable shall be:

- Number of cores: 2, 3, 4 or 5;
- Nominal cross section: 0,75 mm<sup>2</sup> or 1 mm<sup>2</sup>.

#### **4.2.1.3 Insulation**

The insulation shall be a cross-linked elastomeric compound of Type EI 2 to EN 50363-1 applied around each conductor.

#### **4.2.1.4 Strain-bearing element**

The strain-bearing element shall be of non-metallic material. The strain-bearing element can be constructed as a single strain-bearing element or divided in two or more elements.

#### **4.2.1.5 Assembly of cores**

The cores shall be twisted together.

The strain-bearing element(s) shall be twisted together with the cores, and for the 3, 4 and 5 core cables the strain-bearing element shall be in the centre of the cable.

#### **4.2.1.6 Sheath**

The core assembly shall be covered with a sheath.

The sheath shall be a cross-linked compound of Type EM 9 to EN 50363-2-1 applied around the cores.

The sheath shall fill the spaces between the cores and fillers, if any.

#### **4.2.1.7 Braid**

For cable type H05SSD3T-K the sheath shall be provided with a braid of suitable material. The braid shall have a uniform texture, without knots or gaps.

#### **4.2.1.8 Marking**

The cable shall be marked with the CENELEC code H05SSD3-K for cables without braid, or H05SSD3T-K for cables with braid. The marking shall comply with Clause 6 of EN 50525-1.



#### **4.2.2 Requirements**

Each cable shall comply with the appropriate requirements given in EN 50525-1, and the particular requirements of this Part.

Testing shall be in accordance with Annex A, and the relevant tests indicated in column 7.

The dimensions of the cables shall conform to Table B.1 for the relevant size.

The requirements to be met for the compatibility test shall be as given in Annex C.

The strain-bearing element shall have in total a minimum load at break of 300 N, before and after ageing on complete cable at a temperature of  $(200 \pm 3) ^\circ\text{C}$  for 240 h.

The strain-bearing element shall have a limited elongation compatible with cores in order to avoid excessive stresses on them.

**Annex A**  
(normative)

**Tests for cables to EN 50525-2-83**

**Table A.1**

1	2	3	4	5	6	7
Ref. No.	Tests <sup>a</sup>	Category of test	Test method described in		Applicability of test – Subclause	
			EN	(Sub)clause	4.1	4.2
					H05SS	H05SSD3
<b>1</b>	<b>Electrical tests <sup>b</sup></b>					
1.1	Resistance of conductors	T, S	50395	5	X	X
1.2	Voltage test on completed cable at 2 000 V	T, S	50395	6	X	X
1.3	Voltage test on cores according to the specified insulation thickness	T, S	50395	7		
1.3.1	- at 1 500 V up to and including 0,6 mm				X	X
1.3.2	- at 2 000 V above 0,6 mm				X	-
1.4	Absence of faults in insulation	R	50395	10	X	X
1.5	Surface resistance of sheath	T	50395	11	X	X
<b>2</b>	<b>Constructional and dimensional tests</b>					
2.1	Checking of compliance with constructional provisions	T, S	50525-1	Inspection and manual tests	X	X
2.2	Measurement of thickness of insulation	T, S	50396	4.1	X	X
2.3	Measurement of thickness of sheath	T, S	50396	4.2	X	X
2.4	Measurement of overall diameter					
2.4.1	- mean value	T, S	50396	4.4	X	X
2.4.2	- ovality	T, S	50396	4.4	X	X
2.5	Solderability test (plain conductors)	T	50396	8.2	X	X
<b>3</b>	<b>Insulation material tests</b>	T	50363-1 <sup>c</sup>	-	X	X
<b>4</b>	<b>Sheath material tests</b>	T	50363-2-1 <sup>c</sup>	-	X	X
<b>5</b>	<b>Compatibility test</b>	T	60811-1-2	8.1.4	X	X
<b>6</b>	<b>Impact test at - 25 °C</b>	T	60811-1-4	8.5	X	X
<b>7</b>	<b>Mechanical strength of completed cable <sup>d</sup></b>					
7.1	Flexing test followed, after immersion in water, by a voltage test	T	50396	6.2	X	-
	- at 2 000 V for two core cables	T	50395	7	X	-
	- at 1 500 V for cables having more than two cores	T	50395	7	X	-

**Table A.1 (concluded)**

1	2	3	4	5	6	7
Ref. No.	Tests <sup>a</sup>	Category of test	Test method described in		Applicability of test – Subclause	
			EN	(Sub)clause	4.1	4.2
					H05SS	H05SSD3
<b>8</b>	<b>Mechanical strength of strain-bearing element</b>					
8.1	Load at break before ageing	T	EN ISO 6892-1 <sup>e</sup>		-	X
8.2	Ageing at (200 ± 3) °C for 240 h	T	60811-1-2	8.1.4	-	X
8.3	Load at break after ageing	T	EN ISO 6892-1 <sup>e</sup>		-	X
<b>9</b>	<b>Test under fire conditions <sup>f</sup></b>	T	60332-1-2	-	X	X

<sup>a</sup> The order given does not imply a sequence of testing.

<sup>b</sup> Particular test conditions and requirements are given in Table 1 of EN 50525-1.

<sup>c</sup> This EN includes all the test methods and requirements for the material. Material to be tested is taken from the finished cable.

<sup>d</sup> Not applicable to cables having conductors greater than 4 mm<sup>2</sup>.

<sup>e</sup> The test shall be carried out with a tensile strength machine at an elongation speed of (50 ± 10) mm/min.

<sup>f</sup> Not applicable to cables having a polyester braid overall (see HD 516).

## Annex B (normative)

### General data

NOTE 1 The following table gives data for braided and non braided cables. For braided cables see the table footnote b.

NOTE 2 The overall dimensions of cables have been calculated in accordance with EN 60719.

**Table B.1**

1	2	3	4	5
Nominal cross sectional area of conductors <sup>a</sup>	Thickness of insulation Specified value	Thickness of sheath Specified value	Mean overall diameter for non-braided types <sup>b</sup>	
			Lower limit	Upper limit
mm <sup>2</sup>	mm	mm	mm	mm
2 x 0,75	0,6	0,8	5,7	7,4
2 x 1	0,6	0,9	6,1	8,0
2 x 1,5	0,8	1,0	7,6	9,8
2 x 2,5	0,9	1,1	9,0	11,6
3 x 0,75	0,6	0,9	6,2	8,1
3 x 1	0,6	0,9	6,5	8,5
3 x 1,5	0,8	1,0	8,0	10,4
3 x 2,5	0,9	1,1	9,6	12,4
3 x 4	1,0	1,2	11,3	14,5
3 x 6	1,0	1,4	12,8	16,3
4 x 0,75	0,6	0,9	6,8	8,8
4 x 1	0,6	0,9	7,1	9,3
4 x 1,5	0,8	1,1	9,0	11,6
4 x 2,5	0,9	1,2	10,7	13,8
4 x 4	1,0	1,3	12,7	16,2
4 x 6	1,0	1,5	14,2	18,1
5 x 0,75	0,6	1,0	7,6	9,9
5 x 1	0,6	1,0	8,0	10,3
5 x 1,5	0,8	1,1	9,8	12,7
5 x 2,5	0,9	1,3	11,9	15,3

<sup>a</sup> Not all cable types are specified in all the sizes given here. See the specific clause of the standard, and also Clause 1 of EN 50525-1.

<sup>b</sup> For braided types H05SST-F and H05SSD3T-K, the lower and upper limits for the overall diameter are increased by 1,0 mm.

## Annex C (normative)

### Requirements for compatibility test

#### C.1 Test conditions

The sample shall be aged for ten days at  $(200 \pm 3)$  °C in accordance with the designated test method.

#### C.2 Requirements

At the conclusion of the ageing period the insulation and sheath shall meet the requirements given in Table C.1 below.

**Table C.1 — Requirements**

Parameter	Units	Insulation EI 2	Sheath EM 9
Tensile strength	- median, min.	4,0	4,0
	- variation <sup>a</sup> , max.	-	-
Elongation at break	- median, min.	120	120
	- variation <sup>a</sup> , max.	-	-
<sup>a</sup> The variation is the difference between the respective values obtained prior to and after heat treatment, expressed as a percentage of the former.			

## Bibliography

- |          |  |
|----------|--|
| EN 60719 | Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V (IEC 60719) |
| HD 516   | Guide to use of low voltage harmonized cables  |

**National Annex (informative) Origins and identification of the particular cable types**

As an aid to users, the table below shows, in respect of BS EN 50525-2-83:

- the identification of the particular cable types from BS 7919 that are now included in BS EN 50525-2-83;
- the location of the cables within BS EN 50525-2-83;
- any applicable United Kingdom and CENELEC cable codings (see also National Informative Annex B to BS EN 50525-1).

Pre-existing BS		Clause in BS EN 50525-2-83	Cable type – Coding	
Number	Table		United Kingdom (if applicable)	CENELEC
BS 7919	22	4.1	– –	H05SS-F H05SST-F







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