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Edition 1.1

Any reference to SABS 1507-1 is deemed  
to be a reference to this standard  
(Government Notice No. 1373 of 8 November 2002)

## **SOUTH AFRICAN NATIONAL STANDARD**

### **Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V)**

#### **Part 1: General**

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**Table of changes**

<b>Change No.</b>	<b>Date</b>	<b>Scope</b>
Amdt 1	2007	Amended to change the designation of SABS standards to SANS standards and to update referenced standards, to modify the definition of type test, to update marking requirements to align with international standards, and to update the bibliography.

**Foreword**

This South African standard was approved by National Committee StanSA TC 66, *Electric cables*, in accordance with procedures of Standards South Africa, in compliance with annex 3 of the WTO/TBT agreement.

This document was published in December 2007.

This document supersedes SABS 1507-1:2002 (edition 1).

A vertical line in the margin shows where the text has been technically modified by amendment No. 1.

SANS 1507 consists of the following parts, under the general title *Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V)*:

*Part 1: General.*

*Part 2: Wiring cables.*

*Part 3: PVC Distribution cables.*

*Part 4: XLPE Distribution cables.*

*Part 5: Halogen-free distribution cables.*

*Part 6: Service cables.*

Annexes A, B and C are for information only.

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## Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V)

### Part 1: General

## 1 Scope

**1.1** This part of SANS 1507 covers the definitions, requirements for packing and marking, and informative annexes for single-core and multicore extruded solid dielectric insulated cables of rated operating voltage ( $U_0 / U$ ) in the range 300/500 V to 1 900/3 300 V, for use in fixed installations, as covered by SANS 1507-2 to SANS 1507-6.

**1.2** Specific requirements are given for a number of types of cables in common use. The types are as follows:

- a) single-core and multicore cables, armoured and unarmoured;
- b) multicore flat cables with and without an earth continuity conductor;
- c) multicore round cables with aluminium / PVC laminate and an earth continuity conductor;
- d) cables with concentric conductors;
- e) cables with split concentric neutral and earth conductors;
- f) panel/cubicle cables, excluding flexible cables and cords; and
- g) insulated earth conductors.

**1.3** This specification also covers cables that reduce the overall risk associated with fires.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of SANS 1507. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this part of SANS 1507 are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Standards South Africa.

SANS 1411-1, *Materials of insulated electric cables and flexible cords – Part 1: Conductors.*

SANS 1411-2, *Materials of insulated electric cables and flexible cords – Part 2: Polyvinyl chloride (PVC).*

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SANS 1411-3, *Materials of insulated electric cables and flexible cords – Part 3: Elastomers.*

SANS 1411-4, *Materials of insulated electric cables and flexible cords – Part 4: Cross-linked polyethylene (XLPE).*

SANS 1411-5, *Materials of insulated electric cables and flexible cords – Part 5: Halogen-free, flame-retardant materials.*

SANS 1411-6, *Materials of insulated electric cables and flexible cords – Part 6: Armour.*

SANS 1411-7, *Materials of insulated electric cables and flexible cords – Part 7: Polyethylene (PE).*

SANS 10005, *The preservative treatment of timber.*

### **3 Definitions**

For the purposes of this part of SANS 1507 the definitions (for terms not given below) given in SANS 1411-1 to SANS 1411-7 and the following definitions shall apply:

#### **3.1**

##### **acceptable**

acceptable to the authority administering this standard, or to the parties concluding the purchase contract, as relevant

#### **3.2**

##### **armour**

armouring

layer of wires applied to a cable to provide mechanical protection or earth continuity, or both

#### **3.3**

##### **bedding**

layer of extruded compound applied to a cable to form a circular base beneath the armour in order to prevent damage to the insulation by the armour or to form a base for the sheath

#### **3.4**

##### **cable**

length of one or more cores with or without an overall protective covering

#### **3.5**

##### **concentric conductor**

conductor in the form of a single layer of wires that are laid helically around one or more central cores

#### **3.6**

##### **core**

single insulated conductor without protective covering

#### **3.7**

##### **dielectric**

covering of a conductor that is intended to insulate the conductor electrically

#### **3.8**

##### **direction of lay**

lateral direction of inclination to the axis (either left hand or right hand) of the receding helix formed by a wire or a core in a cable

**3.9**

**filler**

material filling the interstices of the cores of a multicore cable

**3.10**

**fire retardant cable**

cable of such modified construction or composition (or both) that its properties are less affected by fire than the properties of a cable that has not been so modified

**3.11**

**flame propagation**

spreading of flame along a cable or cables under defined fire conditions

**3.12**

**halogen emission**

release of halogen gas from cable material under defined fire conditions

**3.13**

**lay ratio**

ratio of the axial length of a complete turn of the helix formed by an individual core in a multicore cable to the pitch circle diameter of the helix formed by the same core

**3.14**

**operating voltage**

relationship of  $U_0/U$ , where  $U_0$  is the power frequency rms voltage between phase and neutral or earth, and  $U$  is the power frequency rms voltage between phases

**3.15**

**routine test**

test conducted at the manufacturer's works on all cable lengths during manufacture or in the finished state, as appropriate

**3.16**

**sample test**

test conducted on a regular basis at the manufacturer's works or on representative samples taken by the manufacturer, or as requested by the purchaser at the time of enquiry or order

**3.17**

**sheath**

extruded protective covering applied to a cable

**3.18**

**turned core**

in a shaped conductor cable, a core that has, at any point along the length of the cable, deviated from its intended angular orientation

**3.19**

**type test**

test conducted before a type of cable covered by this standard is supplied on a general commercial basis, in order to demonstrate that the cable has the necessary performance characteristics for the intended application

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NOTE The test is of such a nature that, after it has been successfully completed, it need not be repeated unless changes are made in the cable materials or design that might change the performance characteristics of the cable.

Amdt 1

## **4 Packing and marking**

### **4.1 Packing**

Cables shall be packed on drums or reels or in coils.

#### **4.1.1 Drums and reels**

The moisture content of the wood of a wooden drum or reel shall not exceed 20 %. When wooden drums or reels are required to be resistant to biological attack, the wood shall have been impregnated (by pressure or in a hot/cold open tank) in accordance with SANS 10005 with a class C preservative or with chromated copper arsenate.

#### **4.1.2 Cable ends**

Each end of the cable shall, before being secured to the drum or reel, be sealed by an acceptable method. The outer end shall be secured to the drum or reel, and the inner end shall be protected in an acceptable manner against mechanical damage.

### **4.2 Marking**

#### **4.2.1 Marking of cables**

The external surface of each finished cable shall bear the information given in (a) to (d) below, in legible and indelible marking. The letters and numerals shall be upright characters of maximum height of 13 mm and minimum height of 3 mm. In the case of cables that have an overall diameter of less than 6 mm, the height area of the characters may be less than 3 mm provided that the legend is acceptably legible. The gap between the end of one legend and the beginning of the next shall not exceed 275 mm.

**Amdt 1**

- a) The manufacturer's name, trade name or trademark.
- b) The operating voltage ( $U$ ) for which the cable has been designed, given in volts or kilovolts (e.g. 500 V, 1 000 V or 3,3 kV), in two lines on opposite sides of the cable should the cable overall diameter exceed 15 mm.
- c) When applicable, identification of special properties in accordance with column 3 of the following table. (Optional additional marking can be done in accordance with column 2).

**Table 1 — Marking of cables**

1	2	3
Property	Marking	Colour of stripe
General purpose	-	No stripe
Reduced smoke emission	LS	No stripe
Reduced halogen emission	LH	No stripe
No halogen emission	NH	No stripe
Reduced flame propagation	FR	Red
Reduced halogen emission and reduced flame propagation	LHFR	Blue
No halogen, reduced smoke emission and reduced flame propagation	NHLSFR	White

- d) If so required, a marking that indicates the cross-sectional area and the number of cores.

#### **4.2.2 Marking of coils**

Each coil package shall bear the following information in legible and indelible marking:

- a) the manufacturer's trade name or trademark or both;
- b) the rated voltage, the cross-sectional area of phase conductor(s), and the number of cores; and
- c) the length of cable.

#### **4.2.3 Marking of drums or reels**

Each drum or reel shall bear the following information in legible and indelible marking:

- a) the information required in 4.2.2 above;
- b) a brief cable description;
- c) the gross mass;
- d) an identifying serial number;
- e) unless the manufacturer guarantees that the drum or reel may be laid flat without damage to the cable, the words "NOT TO BE LAID FLAT" (in capital letters), or a suitable pictogram;
- f) unless the manufacturer guarantees that the drum or reel may be rolled in either direction without damage to the cable, an arrow or the words "ROLL THIS WAY" (in capital letters, to indicate the direction in which the drum or reel is to be rolled in order to prevent the cable from unwinding); and
- g) if the wood of the drum or reel has been treated, a capital letter "T" of approximate height 50 mm surrounded by a circle of approximate outside diameter 65 mm.

**Annex A**  
(informative)

**Notes to purchasers**

**A.1** Before the purchaser orders cables produced to this specification, it is suggested that the following points be considered:

**A.1.1 Identification of cores**

The identification of cores, particularly in power cables, should preferably be done by colour coding. Identification by numbers is also acceptable. The neutral must always be black or carry the number -0-, or both. Particular care should be taken to select the correct colours when a three-core or four-core cable intended for use on single-phase circuits is being ordered.

**A.1.2 Current rating**

The current rating of the cable and the applicable derating factors for a particular installation should be ascertained from the cable manufacturer. This information is also given in SANS 10198-4 and SANS 10142-1.

**A.1.3 Type of cable**

Careful consideration should be given to the type of cable to be used for a particular installation. Alternatives such as copper or aluminium conductors; conventional PVC insulation and sheathing; flame-retardant, low smoke emission, halogen-free cables, armoured or unarmoured cables, etc., should be considered.

**A.2** It is recommended that the following requirements be specified in invitations to tender and in each order or contract:

- a) The maximum permissible operating voltage.
- b) The conditions of service of the cable.
- c) The conductor material (copper, tinned copper or aluminium) and the type of conductor.
- d) The type of insulation material.
- e) Colour coding or numbering of cores.
- f) The type of bedding material.
- g) Whether the cable is to be armoured.
- h) If the cable is to be armoured, the material of the armour wires.
- i) In the case of a cable with steel wire armour, whether an earth continuity conductor (ECC) is required.
- j) The type of material of the sheath.

- k) In the case of a cable with a metallic sheath, whether the metal is to be lead or lead alloy of type E (see annex B of EN 12548:1999).
- l) Whether fire retardant properties are required.
- m) In the case of cables packed on wooden drums, whether the wood of the drum is to be resistant to biological attack.
- n) Whether the number of cores and the cross-sectional area are to be indicated on the cable.

**A.3** The SANS 60332-3 series denotes four optional categories, namely A, B, C and D. Current research indicates that cables that satisfy the requirements for Category C, comply with the flame propagation requirements for steel wire armoured cables in accordance with both national and international standards.

**Amdt 1**

**Annex B**  
(informative)

**Quality verification of extruded solid dielectric insulated cables**

When a purchaser requires ongoing verification of the quality of extruded solid dielectric cables, it is suggested that, instead of concentrating solely on evaluation of the final product, he also directs his attention to the manufacturer's quality system. In this connection it should be noted that SANS 9001 covers the provision of an integrated quality system.

**Annex C**  
(informative)

**Installation of extruded solid dielectric insulated cables**

**C.1** Information on the installation of extruded solid dielectric insulated cables is given in SANS 10198-2 and SANS 10198-8.

**C.2 Minimum installation bending radii**

Although cables that comply with this specification are designed to have a certain flexibility, it is necessary that bending (and any subsequent straightening) be done slowly and carefully. The radii of bending given in table C.1 (measured on the inside of the bent cable) represent recommended minimum values and should be exceeded whenever possible.

**Table C.1 — Recommended minimum installation bending radii**

Construction of cable	Cable diameter <i>D</i> , mm		Minimum installation bending radius
	Exceeding	Not exceeding	
	1	2	
Insulated only	–	10	3 <i>D</i>
Insulated only	10	25	4 <i>D</i>
Insulated only	25	40	6 <i>D</i>
Insulated only	40	–	8 <i>D</i>
Sheathed only	–	–	8 <i>D</i>
Armoured	–	–	10 <i>D</i>
Lead sheathed	–	–	15 <i>D</i>

### C.3 Voltage test for cables after installation

After installation, the cable may, if so required, be subjected to the appropriate test voltage given in table C.2. The test voltage (either ac or dc) should be applied between conductors and between each conductor and the metallic protection or earthed surroundings of the cable, as appropriate; it should be increased to the full appropriate value, and maintained at this value for 15 min.

**Table C.2 — Test voltages after installation**

1 Cable operating voltage V	2 Where test voltage is to be applied	3 Test voltage V	
		ac (rms)	dc
300 / 500	Between conductors and conductors / earth	1 000	1 500
600 / 1 000	Between conductors and conductors / earth	2 000	3 000
1 900 / 3 300	Between conductors	6 000	9 000
	Between conductors / earth	3 500	5 000

## Bibliography

EN 12548, *Lead and lead alloys – Lead alloy ingots for electric cable sheathing and for sleeves.*

SANS 9001/ISO 9001, *Quality management systems – Requirements.*

SANS 10142-1, *The wiring of premises – Part 1: Low-voltage installations.*

SANS 10198-2, *The selection, handling and installation of electric power cables of rating not exceeding 33 kV – Part 2: Selection of cable type and methods of installation.*

SANS 10198-4, *The selection, handling and installation of electric power cables of rating not exceeding 33 kV – Part 4: Current ratings.*

SANS 10198-8, *The selection, handling and installation of electric power cables of rating not exceeding 33 kV – Part 8: Cable laying and installation.*

SANS 60332-3-10/IEC 60332-3-10, *Tests on electric cables under fire conditions – Part 3-10: Test for vertical flame spread of vertically-mounted bunched wires or cables – Apparatus. Amdt 1*

SANS 60332-3-21/IEC 60332-3-21, *Tests on electric cables under fire conditions – Part 3-21: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A F/R. Amdt 1*

SANS 60332-3-22/IEC 60332-3-22, *Tests on electric cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A. Amdt 1*

SANS 60332-3-23/IEC 60332-3-23, *Tests on electric cables under fire conditions – Part 3-23: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category B. Amdt 1*

SANS 60332-3-24/IEC 60332-3-24, *Tests on electric cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C. Amdt 1*

SANS 60332-3-25/IEC 60332-3-25, *Tests on electric cables under fire conditions – Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category D. Amdt 1*