SLOVENSKI STANDARD

SIST EN 50306-4:2003

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Railway applications - Railway rolling stock cables having special fire performance - Thin wall - Part 4: Multicore and multipair cables standard wall sheathed

Railway applications - Railway rolling stock cables having special fire performance - Thin wall -- Part 4: Multicore and multipair cables standard wall sheathed

Bahnanwendungen - Kabel und Leitungen für Schienenfahrzeuge mit verbessertem Verhalten im Brandfall - Reduzierte Isolierwanddicken -- Teil 4: Mehradrige und mehrpaarige Leitungen mit Standardmantelwanddicken

Applications ferroviaires - Câbles pour matériel roulant ferroviaire ayant des performances particulières de comportement au feu - Isolation mince -- Partie 4: Câbles multiconducteurs et multipaires avec gaine d'épaisseur normale

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EUROPEAN STANDARD **EN 50306-4**

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CENELEC
European Committee for Electrotechnical Standardization
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Foreword

This European Standard was prepared by Working Group 12, Railway cables, of Technical Committee CENELEC TC 20, Electric cables, as part of the overall programme of work in CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50306-4 on 2002-06-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-07-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2008-07-01

Annexes designated “informative” are given for information only.
In this standard, annexes A and B are informative.

Contents

Introduction

EN 50306 covers a range of sheathed and unsheathed cables with thin wall thickness insulation, based on halogen free materials, for use in railway rolling stock. It is divided into four parts:

Part 1: General requirements;
Part 2 : Single core cables;
Part 3: Single core and multicore cables (pairs, triples and quads) screened and thin wall sheathed;
Part 4: Multicore and multipair cables, standard wall sheathed.

Special test methods referred to in EN 50306 are given in EN 50305. A Guide to Use is given in EN 50355 [1)].

EN 50306-1, General requirements, contains a more extensive introduction to EN 50306, and should be read in conjunction with this European Standard.

1 Scope

EN 50306-4 specifies requirements for, and constructions and dimensions of, multicore and multipair cables rated 300 V to earth, of the following types:

- unscreened, sheathed for either exposed or protected wiring (0,5 mm^2 to 2,5 mm^2, number of cores from 2 to 48);
- screened, sheathed for either exposed or protected wiring (0,5 mm^2 to 2,5 mm^2, number of cores from 2 to 8);
- screened, sheathed for either exposed or protected wiring (0,5 mm^2 to 1,5 mm^2, number of pairs of cores from 2 to 7).

NOTE 1 Not all conductor sizes/number of cores are specified for every type.

All cables have stranded tinned copper conductors, halogen-free, thin wall thickness insulation and standard wall thickness sheath. Cable types are specified for use in exposed situations (Class E), and for protected situations (Class P). They are for use in railway rolling stock as fixed wiring, or wiring where limited flexing in operation is encountered. The requirements provide for a continuous operational life at temperatures of 90 °C or 105 °C dependent upon the sheath system type.

NOTE 2 In EN 50306-4 the higher temperature rating of 105 °C is only allowed where sheath type S2 is used, and where it has been specifically tested for the higher rating (i.e. by long-term thermal endurance testing to demonstrate a lifetime of at least 20 000 h at 125 °C).

The maximum temperature for short-circuit conditions of 160 °C is based on a duration of 5 s.

The cables specified in EN 50306-4 which have a sheath of type EM 101, EM 103 or S2 material are suitable for operation at temperatures as low as – 25 °C and those with sheath of type EM 102 or EM 104 material are suitable for operation at temperatures as low as - 40 °C.

NOTE 3 Where fuel oil is present sheath types EM 101 and EM 102 are not suitable.

NOTE 4 S2 material may also be suitable for operational temperatures as low as –40 °C, but if so must be tested accordingly to confirm this.

[1)] At draft stage.

Under fire conditions the cables exhibit special performance characteristics in respect of maximum permissible flame propagation (flame spread) and maximum permissible emission of smoke and toxic gases. These requirements are specified to permit the cables to satisfy Hazard Levels 2, 3 or 4 of EN 45545-1 [2)].

NOTE 5 Requirements for the emission of smoke and gases are not specified for cables used for Hazard Level 1 of EN 45545-1.

NOTE 6 EN 45545-1 is still under development and should be consulted.

EN 50306-4 should be used in conjunction with EN 50306-1, General requirements, EN 50306-2, Single core cables, and EN 50306-3, Single core and multicore cables.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 45545-1 [2)]	Railway applications - Fire protection of railway vehicles Part 1: General
EN 50265-2-1	Common test methods for cables under fire conditions - Test for resistance to vertical flame propagation for a single insulated conductor or cable - Part 2-1: Procedures - 1 kW pre-mixed flame
EN 50267-2-1	Common test methods for cables under fire conditions - Tests on gases evolved during combustion of materials from cables Part 2-1: Procedures - Determination of the amount of halogen acid gas
EN 50267-2-2	Common test methods for cables under fire conditions - Tests on gases evolved during combustion of materials from cables Part 2-2: Procedures - Determination of degree of acidity of gases for materials by measuring pH and conductivity
EN 50268-2	Common test methods for cables under fire conditions - Measurement of smoke density of cables burning under defined conditions Part 2: Procedure
EN 50305	Railway applications - Railway rolling stock cables having special fire performance - Test methods
EN 50306-1	Railway applications-Railway rolling stock cables having special fire performance - Thin wall - Part 1: General requirements
EN 50306-2	Railway applications-Railway rolling stock cables having special fire performance - Thin wall - Part 2: Single core cables
EN 60684-2	Flexible insulating sleeving - Part 2: Methods of test
EN 60811-1-1	Insulating and sheathing materials of electric and optical cables - Common test methods - Part 1-1: General application - Measurement of thickness and overall dimensions - Tests for determining the mechanical properties (IEC 60811-1-1)

2) At draft stage.

EN 60811-1-3 Insulating and sheathing materials of electric and optical cables - Common test methods - Part 1-3: General application - Methods for determining the density - Water absorption tests - Shrinkage test (IEC 60811-1-3)

EN 60811-1-4 Insulating and sheathing materials of electric and optical cables - Common test methods - Part 1-4: General application - Test at low temperature (IEC 60811-1-4)

EN 60811-2-1 Insulating and sheathing materials of electric and optical cables - Common test methods - Part 2-1: Methods specific to elastomeric compounds - Ozone resistance, hot set and mineral oil immersion tests (IEC 60811-2-1)

3 Multicore cables - sheathed

3.1 General

The completed cables shall conform to the applicable general requirements given in EN 50306-1 and to the specific requirements of clause 3 and clause 4.

Conformity with the requirements shall be checked by inspection and by the tests given in Table 2.

3.2 Designation, marking and coding

3.2.1 Code designation

For the purpose of supplying cables to this clause of the standard, the following code designation shall be used:

- EN reference;
- table number;
- cable class (P or E);
- number of cores and conductor size;
- identifier for the particular Hazard Level (see 3.2.2);
- temperature rating.

For example:

EN 50306-4 1P 4x2,5 CC 90

3.2.2 Code identities for cables suitable for use in particular hazard levels

The following letters shall be used as a code to identify the suitability of a particular cable for use under one of the Hazard Levels of EN 45545-1, and to indicate performance levels relating to low temperature and to oil and fuel resistance:

NOTE For sheathed cables two letters are required, one for the insulation and one for the sheath.

Hazard Level EN 45545-1	**1**	**2 or 3**	**4**
- low temperature / oil resistance	A	B	C
- extra low temperature / oil resistance	D	E	F
- low temperature / extra oil and fuel resistance	G	H	J
- extra low temperature / extra oil and fuel resistance	K	L	M

3.2.3 Marking on the insulation of cores

The cores shall be marked 1, 2, etc., in accordance with the requirements given in 3.3.2 of EN 50306-2.

However, the core number one may be marked as the relevant single core in accordance with the requirements of 3.3.1 of EN 50306-2.

3.2.4 Marking of the cable

The cables shall be marked with the following:

- manufacturer's name;
- EN reference;
- table number ;
- cable class (P or E);
- voltage rating;
- number of cores and conductor size;
- identifier for the particular Hazard Level (see 3.2.2);
- temperature rating.

For example:

XYZ EN 50306-4 1P 300 V 4x2,5 CC 90

The marking shall conform to the requirements of clause 5 of EN 50306-1.

3.3 Rated voltage

The rated voltage recognised for the purposes of this standard shall be 300 V to earth.

NOTE See EN 50355 for further information.

3.4 Construction

3.4.1 Cores

Each insulated single core shall conform to the requirements given in EN 50306-2.

3.4.2 Laying-up of cores

The cores shall be twisted together.

The pitch of lay for the cores shall not be greater than 20 times the diameter of the laid up cores in the cable.

3.4.3 Sheath

The sheath shall be either a compound of type S2, or a compound of type EM 101 to EM 104, and shall be applied by extrusion. Compounds type EM 101 to EM 104 together with their requirements are defined in EN 50264-1.

The sheath shall be smooth and uniformly applied; the application shall ensure that cables with a class E sheath are substantially circular. The thickness of sheath shall conform to the specified value given in Table 1 according to the class.

The sheath colour shall be black, unless otherwise specified.

Table 1 - Requirements for construction of multicore cables - sheathed

1	2	3	4	5	6	7
Number of cores and nominal cross-section of the conductor	**Cables class E**			**Cables class P**		
	Minimum thickness of sheath	**Overall diameter**		**Minimum thickness of sheath**	**Overall diameter**	
		min.	max.		min.	max.
mm^2	mm	mm	mm	mm	mm	mm
4 x 0,5	1,0	5,5	6,5	0,42	4,1	5,1
7 x 0,5	1,0	6,3	7,3	0,42	4,9	5,9
13 x 0,5	1,0	8,3	9,3	0,56	7,3	8,3
19 x 0,5	1,0	9,0	10,2	0,56	8,1	9,1
37 x 0,5	1,0	12,3	13,5	0,56	10,8	12,0
4 x 0,75	1,0	6,0	7,0	0,42	4,6	5,6
7 x 0,75	1,0	6,9	7,9	0,42	5,5	6,5
13 x 0,75	1,0	9,1	10,3	0,56	8,2	9,2
19 x 0,75	1,0	10,0	11,2	0,56	9,0	10,2
37 x 0,75	1,0	13,2	14,4	0,56	12,2	13,4
48 x 0,75	1,0	14,8	16,4	0,56	13,9	15,5
4 x 1,0	1,0	6,3	7,3	0,42	4,9	5,9
7 x 1,0	1,0	7,3	8,3	0,42	6,0	7,0
13 x 1,0	1,0	9,7	10,9	0,56	8,7	9,9
19 x 1,0	1,0	10,7	11,9	0,56	9,8	11,0
37 x 1,0	1,0	14,0	15,6	0,56	13,3	14,5
4 x 1,5	1,0	7,4	8,4	0,42	6,0	7,0
7 x 1,5	1,0	8,6	9,8	0,56	7,7	8,7
13 x 1,5	1,0	11,7	12,9	0,56	10,7	11,9
19 x 1,5	1,0	13,0	14,2	0,56	12,0	13,2
37 x 1,5	1,0	17,2	18,8	0,56	16,2	17,8
2 x 2,5	1,0	7,7	8,7	0,56	6,7	7,7
3 x 2,5	1,0	8,1	9,1	0,56	7,7	8,1
4 x 2,5	1,0	8,8	10,0	0,56	7,9	8,9

4 Tests

4.1 Definitions relating to tests

The definition of Type (T), Sample (S) and Routine (R) tests is as given in clause 3 of EN 50306-1.

NOTE 1 Tests classified as Sample (S) or Routine (R) may be required as part of any approval schemes.

NOTE 2 Annex A gives guidance on the selection of cables for type approval.

4.2 Voltage test on cable

The test shall be carried out in accordance with 6.2.1 of EN 50305, using an a.c. or d.c. voltage and the following conditions:

- sample length 20 m
- voltage (a.c.) 2 kV
- voltage (d.c.) 4,8 kV
- duration of application 5 min
- test temperature (20 ± 5) °C

At the conclusion of the test there shall be no breakdown of the insulation.

4.3 Long term ageing - Thermal endurance

NOTE This test is only applicable to cables sheathed with S2 material rated at 105 °C.

The test shall be carried out in accordance with 7.3 of EN 50305.

The time to reach the end-point of the test shall be not less than 20 000 hours, when determined by extrapolation to a temperature of 125 °C.

4.4 Hot set test on sheath

The test shall be carried out in accordance with clause 9 of EN 60811-2-1, using the following conditions:

- temperature (200 ± 3) °C
- time under load 15 min
- mechanical stress 20 N/cm2

The maximum elongation shall be

100 % - under load,
25 % - after unloading.