

---

**Železniške naprave - Kabli v železniških vozilih s posebno požarno odpornostjo - Tanka stena - 4. del: Večžilni in večparni oplaščeni kabli**

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

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

Applications ferroviaires - Câbles pour matériel roulant ferroviaire ayant des performances particulières de comportement au feu - Isolation mince - Partie 4: Câbles multiconducteurs et multipaires gainés

**Ta slovenski standard je istoveten z: prEN 50306-4:2018**

---

**ICS:**

13.220.40	Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju	Ignitability and burning behaviour of materials and products
29.060.20	Kabli	Cables
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

**oSIST prEN 50306-4:2019****en**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 50306-4**

November 2018

ICS

Will supersede EN 50306-4:2002

English Version

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

Applications ferroviaires - Câbles pour matériel roulant  
ferroviaire ayant des performances particulières de  
comportement au feu - Isolation mince - Partie 4: Câbles  
multiconducteurs et multipaires gainés

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

This draft European Standard is submitted to CENELEC members for enquiry.  
Deadline for CENELEC: 2019-02-08.

It has been drawn up by CLC/TC 20.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).  
A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## Contents

European foreword .....	4
Introduction .....	5
1 Scope .....	6
2 Normative references .....	6
3 Multicore cables - sheathed .....	7
3.1 General .....	7
3.2 Marking and code designation .....	7
3.2.1 Marking of cable .....	7
3.2.2 Code Designation .....	7
3.2.3 Marking on the insulation of cores .....	8
3.3 Rated voltage .....	8
3.4 Construction .....	8
3.4.1 Cores .....	8
3.4.2 Laying-up of cores .....	8
3.4.3 Sheath .....	8
4 Tests .....	10
4.1 Definitions relating to tests .....	10
4.2 Voltage test on cable .....	10
4.3 Tests at low temperature .....	10
4.4 Ozone resistance of sheath .....	11
4.5 Compatibility .....	11
4.6 Reaction to fire .....	11
5 Multicore cables - screened and sheathed .....	13
5.1 General .....	13
5.2 Designation, marking and coding .....	13
5.2.1 Marking of cable .....	13
5.2.2 Marking on the insulation of cores .....	13
5.3 Rated voltage .....	13
5.4 Construction .....	14
5.4.1 Cores .....	14
5.4.2 Laying-up of cores .....	14
5.4.3 Metallic braid screening .....	14
5.4.4 Sheath .....	14
6 Tests .....	16
6.1 Definitions relating to tests .....	16
6.2 Voltage test on cable .....	16
6.3 Spark test on the sheath .....	16
6.4 Tests at low temperature .....	16
6.5 Ozone resistance .....	17
6.6 Reaction to fire .....	17
7 Multipair cables - individually screened and sheathed and with an overall sheath .....	19
7.1 General .....	19
7.2 Designation, marking and coding .....	19

7.2.1	Marking of the cable .....	19
7.2.2	Marking on the insulation of cores .....	19
7.2.3	Marking on the sheath of the pair.....	19
7.3	Rated voltage .....	19
7.4	Construction .....	20
7.4.1	Pairs .....	20
7.4.2	Laying-up of pairs.....	20
7.4.3	Outer sheath of the cable .....	20
8	Tests.....	21
8.1	Definitions relating to tests .....	21
8.2	Voltage test - screen to screen.....	22
9	Multipair cables – general screened and sheathed .....	23
9.1	General .....	23
9.2	Designation, marking and coding .....	23
9.2.1	Marking of cable .....	23
9.2.2	Marking on the insulation of cores .....	24
9.3	Rated voltage .....	24
9.4	Construction .....	24
9.4.1	Pairs .....	24
9.4.2	Laying-up of pairs.....	24
9.4.3	Outer sheath of the cable .....	24
10	Tests.....	26
10.1	Definitions relating to tests .....	26
10.2	Voltage test - core to screen.....	26
Annex A (informative)	Guidance on selection of cables for type approval.....	28
Bibliography	.....	29

prEN 50306-4:2018 (E)

## European foreword

This document (prEN 50306-4:2018) has been 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.

This document is currently submitted to the Enquiry.

The following dates are proposed:

- |   |       |  |
|---|-------|--|
| • latest date by which the existence of this document has to be announced at national level   | (doa) | dor + 6 months   |
| • latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | dor + 12 months  |
| • latest date by which the national standards conflicting with this document have to be withdrawn   | (dow) | dor + 36 months<br>(to be confirmed or modified when voting) |

This document will supersede EN 50306-4:2002.

This edition includes the following significant technical changes with respect to the previous edition:

- a) The documents have been updated to reflect the changes in the test standard EN 50305 (revision starting in 2018);
- b) The range of the conductor cross sections has been extended.
- c) The reference to cited standards (e.g. 60811 series) has been updated.

## 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 screened and thin wall sheathed;
- Part 4: Multicore and multipair cables sheathed.

Special test methods referred to in EN 50306 are given in EN 50305. A guide to use is given in EN 50355 and rules for installation are given in EN 50343.

prEN 50306-1:2018, General requirements, contains a more extensive introduction to EN 50306 and has to be read in conjunction with this European Standard.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN 50306-4:2020

<https://standards.iteh.ai/catalog/standards/sist/89e865b5-038c-4313-89ee-dd7d7a1c5f48/sist-en-50306-4-2020>

prEN 50306-4:2018 (E)

## 1 Scope

This document specifies requirements for, and constructions and dimensions of, multicore and multipair cables rated voltage  $U_0/U$ : 300/500 V, of the following types:

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

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.

These cables are rated for occasional thermal stresses causing ageing equivalent to continuous operational life at a temperature of 90 °C. For standard cables this is determined by the acceptance test defined in EN 50305, using accelerated long-term (5000h) thermal ageing indicating a 110 °C/20 000 h temperature index. Should the customer require lifetime predictions this should be demonstrated based on the temperature index of the product as supplied by the manufacturer.

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

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 Level 3 of EN 45545-1 and EN 45545-2.

prEN 50306-4:2014 has to be used in conjunction with prEN 50306-1:2018, General requirements, prEN 50306-2:2018, Single core cables, and prEN 50306-3:2018, Single core and multicore cables.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 45545-1, *Railway applications - Fire protection on railway vehicles - Part 1: General*

EN 50264-1, *Railway applications - Railway rolling stock power and control cables having special fire performance - Part 1: General requirements*

EN 50305:2002, *Railway applications - Railway rolling stock cables having special fire performance - Test methods*

prEN 50306-1:2018, *Railway applications-Railway rolling stock cables having special fire performance - Thin wall - Part 1: General requirements*

prEN 50306-2:2018, *Railway applications - Railway rolling stock cables having special fire performance - Thin wall - Part 2: Single core cables*



prEN 50306-3:2018, *Railway applications - Railway rolling stock cables having special fire performance - Thin wall Part 3: Single core and multicore cables screened and thin wall sheathed*

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*

EN 60332-3-24, *Tests on electric and optical fibre cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C*

EN 61034-2, *Measurement of smoke density of cables burning under defined conditions - Part 2: Test procedure and requirements*

EN 60811 (all parts), *Common test methods for insulating and sheathing materials of electric cables*

### 3 Multicore cables - sheathed

#### 3.1 General

The completed cables shall conform to the applicable general requirements given in prEN 50306-1:2018 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 Marking and code designation

##### 3.2.1 Marking of cable

Cables shall be marked with the following:

- Manufacturer's name;
- EN reference;
- table number;
- cable class (P or E);
- Voltage rating ( $U_0$ );
- No. of cores and conductor size;
- A code designation according for use of the cable (see 3.2.2);
- Conductor temperature rating

For example:

XYZ EN 50306-4 1E 300 V 2x1,5 MM 90

The marking shall conform to the requirements of Clause 5 of prEN 50306-1:2018.

##### 3.2.2 Code Designation

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.

prEN 50306-4:2018 (E)

Hazard Level EN 45545-1 HL3

- low temperature / oil resistance C
- extra low temperature / oil resistance F
- low temperature / extra oil and fuel resistance J
- extra low temperature / extra oil and fuel resistance M

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

### 3.2.3 Marking on the insulation of cores

The cores shall be marked 1, 2, etc., in accordance with the requirements given in 3.3.1 of prEN 50306-2:2018.

However, the core number one may be marked as the relevant single core in accordance with the requirements of 3.3.1 of prEN 50306-2:2018.

### 3.3 Rated voltage

The rated voltage recognized for the purposes of this standard shall be  $U_o/U = 300V / 500V$

NOTE See EN 50355 and 50343 for further information.

### 3.4 Construction

#### 3.4.1 Cores

Each insulated single core shall conform to the requirements given in prEN 50306-2:2018.

#### 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 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 mm <sup>2</sup>	Cables class E			Cables class P		
	Average Minimum thickness of sheath  mm	Overall diameter		Minimum thickness of sheath at any point  mm	Overall diameter	
		min. mm	max. mm		min. mm	max. mm
2 × 0,5	1,0	4,90	5,90	0,42	3,5	4,5
3 × 0,5	1,0	5,10	6,10	0,42	3,8	4,8
4 × 0,5	1,0	5,5	6,5	0,42	4,1	5,3
7 × 0,5	1,0	6,3	7,3	0,42	4,9	6,1
13 × 0,5	1,0	8,3	9,3	0,56	7,3	8,5
19 × 0,5	1,0	9,0	10,2	0,56	8,1	9,3
37 × 0,5	1,0	12,3	13,5	0,56	10,8	12,2
2 × 0,75	1,0	5,30	6,30	0,42	4,0	5,0
3 × 0,75	1,0	5,50	6,50	0,42	4,2	5,2
4 × 0,75	1,0	6,0	7,0	0,42	4,6	5,8
7 × 0,75	1,0	6,9	7,9	0,42	5,5	6,6
13 × 0,75	1,0	9,1	10,3	0,56	8,2	9,4
19 × 0,75	1,0	10,0	11,2	0,56	9,	10,4
37 × 0,75	1,0	13,2	14,4	0,56	12,2	13,6
48 × 0,75	1,0	14,8	16,4	0,56	13,9	15,7
2 × 1,0	1,0	5,6	6,6	0,42	4,3	5,3
3 × 1,0	1,0	5,9	6,9	0,42	4,6	5,6
4 × 1,0	1,0	6,3	7,3	0,42	4,9	6,1
7 × 1,0	1,0	7,3	8,3	0,42	6,0	7,2
13 × 1,0	1,0	9,7	10,9	0,56	8,7	10,1
19 × 1,0	1,0	10,7	11,9	0,56	9,8	11,2
37 × 1,0	1,0	14,0	15,6	0,56	13,3	14,7
2 × 1,5	1,0	6,3	7,3	0,42	5,0	6,0
3 × 1,5	1,0	6,6	7,6	0,42	5,3	6,3
4 × 1,5	1,0	7,4	8,4	0,42	6,0	7,2
7 × 1,5	1,0	8,6	9,8	0,56	7,7	8,9
13 × 1,5	1,0	11,7	12,9	0,56	10,7	12,1
19 × 1,5	1,0	13,0	14,2	0,56	12,	13,4
37 × 1,5	1,0	17,2	18,8	0,56	16,2	18,
2 × 2,5	1,0	7,7	8,7	0,56	6,7	7,9
3 × 2,5	1,0	8,1	9,1	0,56	7,7	8,3
4 × 2,5	1,0	8,8	10,0	0,56	7,9	9,1

prEN 50306-4:2018 (E)

For other compositions (number of cores), insulation and sheath thicknesses shall follow in principle the value mentioned in the Table 1 or ask the manufacturer for adequate technical design depending on the application requirements. The cable marking shall keep the standard name as prEN 50306-4:2018.

## 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 prEN 50306-1:2018.

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 50305:2002, 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  $(20 \pm 5) ^\circ\text{C}$

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

### 4.3 Tests at low temperature

#### a) Bending

The test shall be carried out at  $(- 40 \pm 2) ^\circ\text{C}$  in accordance with EN 60811-504.

At the conclusion of the test there shall be no cracks in the sheath.

NOTE Where cables sheaths are not to be used at extra low temperature, the test may be carried out at  $(- 25 \pm 2) ^\circ\text{C}$ .

#### b) Elongation

The test shall be carried out at  $(- 40 \pm 2) ^\circ\text{C}$  in accordance with EN 60811-505.

The elongation of the sheath shall be not less than 30 %.

NOTE Where cables sheaths are not to be used at extra low temperatures, the test may be carried out at  $(- 25 \pm 2) ^\circ\text{C}$ .

#### c) Impact

The test shall be carried out at  $(- 25 \pm 2) ^\circ\text{C}$  in accordance with 5.1 of EN 50305:2002.

At the conclusion of the test there shall be no cracks in the inside or the outside of the sheath, nor on the outside of the insulation.