SLOVENSKI STANDARD
SIST EN 50305:2020

01-junij-2020

Nadomešča:
SIST EN 50305:2002

Železniške naprave - Kabli v železniških vozilih s posebno požarno odpornostjo - Preskusne metode

Railway applications - Railway rolling stock cables having special fire performance - Test methods

Bahnanwendungen - Kabel und Leitungen für Schienenfahrzeuge mit verbessertem Verhalten im Brandfall - Prüfverfahren

Applications ferroviaires - Câbles pour matériel roulant ferroviaire ayant des performances particulières de comportement au feu - Méthodes d'essais

Ta slovenski standard je istoveten z: **EN 50305:2020**

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

SIST EN 50305:2020 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50305

March 2020

ICS 29.060.20; 45.060.01

Supersedes EN 50305:2002 and all of its amendments and corrigenda (if any)

English Version

Railway applications - Railway rolling stock cables having special fire performance - Test methods

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

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European foreword

This document (EN 50305:2020) has been prepared by CLC/TC 20, “Electric cables”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2020-12-30
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2022-12-30

This document supersedes EN 50305:2002 and all of its amendments and corrigenda (if any).

EN 50305:2020 includes the following significant technical changes with respect to EN 50305:2002:

— a new cable standard EN 50382 series has been added to EN 50305;

— the long term ageing test part is improved and adapted to the whole range of products;

— the requirements are now clearly described and give more information for the test laboratories;

— the definition of “halogen free” in Annex F and the determination of halogens element test in Annex G are moved from the product standard (EN 50306 series) to EN 50305.

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

Introduction

The railway industry is generally concerned with the movement of people as well as goods. It is therefore essential that a high level of safety is achieved, even when failures occur which could involve fire, howsoever caused, affecting railway rolling stock.

Hence, it is necessary to provide cables for use in railway environments which minimize the hazard to people when a fire may damage the cable, irrespective of whether the fire is caused by an external source or from within the electrical system.

European Standard series EN 50264, EN 50306 and EN 50382 specify cables, which, in the event of fire, will limit risk to people and improve the safety on railways in general. They cover cables based on halogen free materials, for use in railway rolling stock.

A separate European Standard, the EN 50264 series covers cables for similar applications up to 3,6/6 kV rating with a conductor temperature at 90 °C, but with standard wall and medium wall thicknesses of both insulation and sheath, and provides for a maximum conductor size of 400 mm^2.

A separate European Standard, the EN 50382 series covers cables for similar applications up to 3,6/6 kV rating with a conductor temperature at 120°C and 150°C, and provides for a maximum conductor size of 400 mm^2.

The EN 50306 series covers a range of sheathed and unsheathed cables with thin wall insulation, and is restricted to a rating of 300 V to earth and a maximum conductor size of 2,5 mm^2.

This document gives particular test methods applicable to the cables at present covered by the EN 50264 series, EN 50306 series and EN 50382 series.

1 Scope

This document specifies special test methods applicable to cables, and their constituent insulating and sheathing materials, for use in railway rolling stock. Such cables are specified in the various parts of the EN 50264 series, EN 50306 series and EN 50382 series.

Other test methods required for railway rolling stock cables and their insulating and sheathing materials are listed in Annex A.

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

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

EN 50382-1, *Railway applications - Railway rolling stock high temperature power cables having special fire performance - Part 1: General requirements*

EN 60216-1, *Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results*

EN 60228, *Conductors of insulated cables*

EN 60332-3-25, *Tests on electric and optical fibre cables under fire conditions - Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D*

EN 60754-1, *Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content*

EN 60754-2:2014, *Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity*

EN 60811 (all parts), *Electric and optical fibre cables - Test methods for non-metallic materials*

EN 62230, *Electric cables - Spark-test method*

ISO 6349:1979, *Gas analysis - Preparation of calibration gas mixtures - Permeation method*

ISO 8458-2, *Steel wire for mechanical springs — Part 2: Patented cold-drawn non-alloy steel wire*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50264-1, EN 50306-1 and EN 50382-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Applicability, sampling, test-piece preparation and test conditions

4.1 Applicable tests

Tests applicable to each type of cable are given in the particular cable standard.

4.2 Classification of tests

The classification of tests is given in the general requirements of the relevant cable standard.

4.3 Sampling

The size and number of samples for each particular test is given either in this document or the relevant cable standard.

4.4 Test-piece preparation

The preparation of test pieces shall be as described in the particular test method or in the cable standard.

NOTE Attention is drawn to the fact that some insulation systems used for railway cables are composites (multilayer). In such cases special preparation techniques and requirements are given in the particular cable standard.

4.5 Test conditions

4.5.1 Ambient temperature

Tests shall be made at an ambient temperature within the range 5 °C to 35 °C, unless otherwise specified in the details for the particular test.

4.5.2 Tolerance on temperature values

The tolerances which shall apply to the temperature values are given in Table 1.

Table 1 — Tolerances for temperature values

Specified temperature (T) °C	Tolerance °C
−40 ≤ T ≤ 0	±2
0 < T ≤ 50	According to relevant clause
50 < T ≤ 150	±2
T > 150	±3

4.5.3 Frequency and waveform of power frequency test voltages

Unless otherwise specified, the test voltage shall be a.c. 49 Hz to 61 Hz of approximately sine-wave form; the ratio peak value/r.m.s. value being equal to √2 with a tolerance of ± 7 %.

The values quoted are r.m.s. values.

4.5.4 Pre-conditioning

Unless otherwise stated the tests shall be carried out not less than 16 h after the extrusion or cross-linking, if any, of the insulating or sheathing compounds.

5 Mechanical tests

5.1 Impact test at low temperature

The impact test in accordance with EN 60811-506:2012, 8.5 shall be used except that the mass of hammer, intermediate test piece and height of drop shall be as given in Table 2.

Table 2 — Parameters for impact test at low temperature

Cable diameter (D)	Mass of hammer	Mass of intermediate test piece	Height of drop
mm	g	g	mm
D ≤ 15	1 000	200	100
15 < D ≤ 25	1 500	200	150
D > 25	2 000	200	200

The inside and outside of the sheath and the insulation of unsheathed cables shall then be examined with normal or corrected vision, without magnification. The insulation of sheathed cables shall be examined on the outside only.

5.2 Abrasion resistance

The test shall be carried out at a temperature of (20 ± 5) °C, using a machine similar to that shown in Figure 1.

The cutting edge shall be either a polished steel spring wire needle of (0,45 ± 0,01) mm diameter of material according to ISO 8458-2, held in a suitable support (Figure 1 b)), or a rectangular shaped steel blade (Figure 1 a)) mounted at 90° to the axis of the cable. The setting shall be arranged so as to wear the surface of the core or cable lengthwise over a distance of 10 mm to 20 mm, with a frequency of (55 ± 5) cycles per minute. The machine shall be fitted with a counter which shall stop automatically when the cutting edge touches the conductor or electrical screen.

For cables of diameter less than or equal to 6 mm the needle shall be used, and for cables with diameter greater than 6 mm the steel blade shall be used, unless otherwise specified in the particular cable standard.

The load on the cutting edge shall be defined in the cable standard.

The test specimen shall consist of a single 0,75 m sample of core or cable.

The test specimen shall be held securely on the plate by 2 cable clamps.

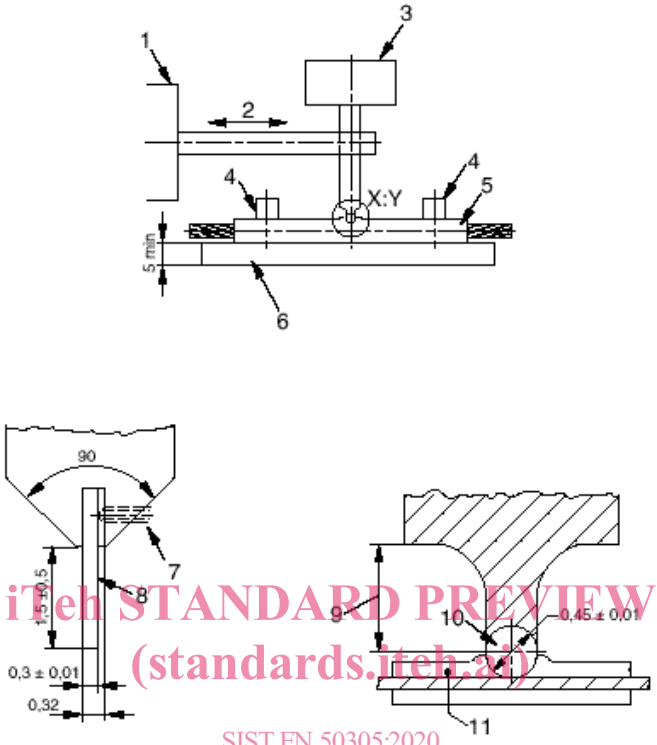
Each test specimen shall undergo four tests. After each single test it shall be moved approximately 100 mm and turned by a 90° angle, clockwise.

In the case of 2 core cables, 3 core cable or those cables not substantially circular, the cutting edge should be applied to the highest points on the circumference of the cable.

Each test is finished when the cutting edge touches the conductor or electrical screen.

The measure of abrasion resistance shall be the average value of the number of cycles in the four tests.

Dimensions in millimetres



a) Detail X **b) Detail Y**

(edges not rounded; free of burr)

Key

1	Stroke generator	7	Fastening screw
2	Stroke	8	Blade reamer
3	Loading weight	9	Shoulder of sufficient depth to clear insulation
4	Clamp		
5	Test specimen	10	Cutting edge - needle
6	Supporting plate	11	Cable under test

Figure 1 — Test arrangement for abrasion of insulation and sheath

5.3 Notch propagation

Three samples of the cable shall be notched, to a depth of 0,05 mm of the insulation or sheathing, at four points equally spaced with respect to one another around the circumference and 25 mm apart along the length, and in a plane mutually perpendicular to the conductor.

In the case of 2 core cable, 3 core cable or those cables not substantially circular, the notches should be made at the highest points on the circumference of the cable.

One of the samples shall be conditioned at −15 °C, one at ambient temperature and one at 85 °C, in all cases for 3 h, after which time they shall be wound on to a mandrel, (3 ± 0,3) times the minimum specified diameter of the cable, whilst at the conditioning temperature. The notched sample shall be wrapped around the mandrel such that at least one notch is on the outside of the wrapped cable.

The sample shall be allowed to return to ambient temperature and then subjected to the voltage test given in 6.2 but at half the rated voltage U_0.

5.4 Pliability (only applicable for cable in according to EN 50306 series)

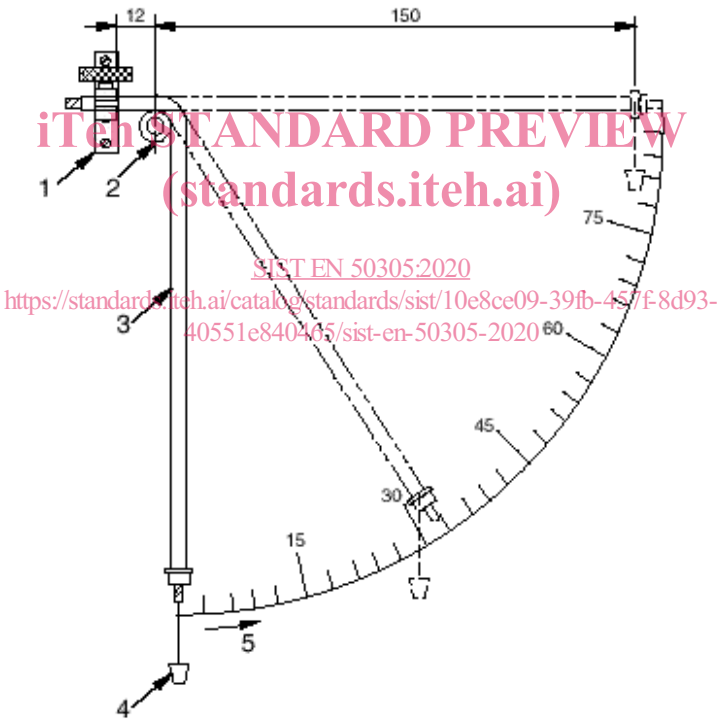
From a single coil of cable cut consecutive test specimen lengths, each of approximately 200 mm.

Suspend each specimen vertically for 24 h in an oven with a mass attached to its free end. The applied mass and oven temperature shall be as stated in the cable specification. Immediately after removal from the oven, store the specimens at the temperature, relative humidity and period of time specified in the cable specification.

Test each specimen using the test rig shown in Figure 2; the diameter of the mandrel in the test rig shall be as the minimum bend diameter unless specified in the cable specification. Gradually apply a mass to the cable, at the position shown in Figure 2, sufficient to bend the cable downwards through (90 ± 1)°.

Ensure that the specimen remains in this position for 5 min and record the mass. After this time, remove the mass and allow the specimen to recoil towards its original position. At a time 5 min after removal of the mass, record the recoil angle.

Dimensions in millimetres / scale in degrees



Key

1 Clamp
2 Mandrel
3 Test specimen
4 Mass container
5 Recoil angle

Figure 2 — Pliability test rig

5.5 Strippability and adhesion of insulation (only applicable for cable in according to EN 50306 series)

5.5.1 Strippability

Stripping of 5 mm of insulation from each end of a 50 mm sample shall be easily carried out with normal stripping pliers.

5.5.2 Adhesion

Three test specimens, each of 50 mm length, shall be cut at regular intervals from a test sample of 3 m of core or cable.

On each specimen the insulation shall be cut 5 mm and 30 mm from one end. The insulation shall be stripped from the cuts to each end, so that insulation is left intact in-between the two cuts. The conductor shall then be passed through a calibrated hole the diameter of which is that of the conductor + 0,05 mm (see Figure 3).

Using a pulling speed of (100 ± 10) mm/min a force shall be applied to the conductor until it slips inside the insulation. The force (F) required to produce the slippage shall be recorded.

Dimensions in millimetres

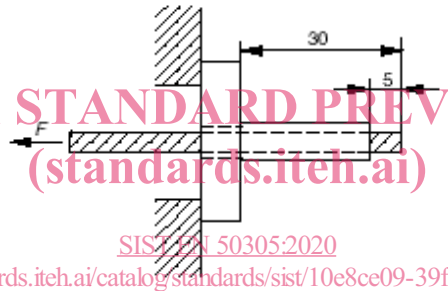


Figure 3 — Assembly for adhesion test

5.6 Dynamic cut-through (only applicable for cable in according to EN 50306 series)

A tensile tester (or equivalent apparatus) shall be operated in a compression mode and shall be equipped with a means to record the force necessary to drive the needle cutting edge (see Figure 1 b)) through the insulation or sheath of a finished sample of cable. A low voltage detection circuit, designed to stop the tester when the edge cuts through the cable insulation or sheath and contacts the conductor or electrical screen, shall be attached.

Carry out the test at the temperature specified in the individual cable specification. The force on the cutting edge driving it through the insulation or sheath shall be increased at the constant rate as specified in the product standard until contact with the conductor or metallic screen occurs. Perform four tests on each test sample, and record the force measured at electrical contact. Move the sample forward a minimum of 25 mm and rotate 90° clockwise between each test.

In the case of 2 core cables, 3 core cable or those cables not substantially circular, the cutting edge should be applied to the highest points on the circumference of the cable.

The average of the four results shall not be less than the specified minimum.