

© Copyright SEK. Reproduction in any form without permission is prohibited.

Järnvägstillämpningar – Strömavtagare – Provning av slitskenor

*Railway applications –
Current collection systems –
Pantographs, testing methods for contact strips*

Som svensk standard gäller europastandarden EN 50405:2015. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50405:2015.

Nationellt förord

Tidigare fastställd svensk standard SS-EN 50405, utgåva 1, 2006, gäller ej fr o m 2018-11-16.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

**Railway applications - Current collection systems - Pantographs,
testing methods for contact strips**

Applications ferroviaires - Systèmes de captage de courant
- Méthodes d'essais des bandes de frottement des
pantographes

Bahnanwendungen - Stromabnahmesysteme -
Stromabnehmer für Oberleitungsfahrzeuge, Prüfverfahren
für Schleifstücke

This European Standard was approved by CENELEC on 2015-11-16. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Content	Page
European foreword.....	5
Introduction.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	7
3.1 General.....	7
3.2 Contact strip material.....	8
3.3 Contact strip construction.....	8
4 Symbols and abbreviations	9
5 Requirements for data sheets.....	10
5.1 Data sheet and design drawing.....	10
5.2 Contact strip material.....	10
5.3 Contact strip characteristics	10
6 Test categories and environmental conditions	11
6.1 General.....	11
6.2 Type tests	11
6.3 Routine tests	11
6.4 Environment.....	11
6.5 Ambient air temperature	11
6.6 Test sequence.....	12
7 Test procedures	16
7.1 Tests for the temperature characteristic of the contact strip under current loading.....	16
7.1.1 General.....	16
7.1.2 Test method – To determine the temperature characteristic of the contact strip under current loading	16
7.2 Test for deflection and extension of the carbon contact strip under extremes of temperature.....	17
7.2.1 General	17
7.2.2 Test method - High temperature test.....	17
7.2.3 Test method - Low temperature test.....	18
7.3 Test for flexural characteristic of the contact strip.....	18
7.3.1 General	18
7.3.2 Test method	18
7.3.3 Test acceptance criteria.....	19
7.4 Test for shear strength of the contact strip	19
7.4.1 General	19

7.4.2 Test method - Test at ambient temperature	20
7.4.3 Test method - Test at specified temperature	22
7.5 Test of auto-drop detection sensor integral with contact strips	22
7.5.1 General	22
7.5.2 Test method - Sealing integrity	22
7.5.3 Test method - Sealing integrity temperature test	23
7.5.4 Test method - Air flow continuity	24
7.5.5 Test method - Impact function of the auto-drop detection sensor	24
7.6 Test of mechanical fatigue resistance of the contact strip	26
7.6.1 General	26
7.6.2 Test method	26
7.7 Test of the electrical resistance of the contact strip	27
7.7.1 General	27
7.7.2 Test method	27
7.8 Test of the metal content for metal impregnated (metalized) contact strips	28
7.8.1 General	28
7.8.2 Method 1: Weighing a part before and after the impregnation	28
7.8.3 Method 2: Determination of the apparent density of the material before and after the impregnation	29
7.9 Test of the coefficient of friction	29
7.9.1 General	29
7.9.2 Test method	29
7.10 Optional test of the impact resistance of the Carbon material	30
7.10.1 General	30
7.10.2 Test method	30
7.11 Test of the thermal fatigue properties of the contact strip	30
7.11.1 General	30
7.11.2 Test method - Thermal fatigue test	30
Annex A (informative) Parameters to be specified by the customer and graphical representation of customer specified values for pantograph automatic dropping device operation	32
A.1 Parameters to be specified by the customer	32
A.2 Graphical representation of customer specified values for pantograph automatic dropping device operation	33
Annex B (normative) Current loading test apparatus	34
B.1 Current loading test apparatus – copper test electrode	34
B.2 Current loading test apparatus	35
Annex ZZ (informative) Correspondence between this European Standard and the Essential Requirements of EU Directive 2008/57/EC	36
Bibliography	37

Figures

Figure 1 — High temperature test apparatus	17
Figure 2 — Flexural characteristics test apparatus	19
Figure 3 — Shear test sample preparation	20
Figure 4 — Shear test fixture example	21
Figure 5 — Shear test apparatus example	21
Figure 6 — Impact test device example	25
Figure 7 — Air supply and monitoring apparatus example	26
Figure 8 — Electrical resistance test apparatus example	28
Figure A.1 — Graphical representation of customer specified values for pantograph automatic dropping device operation	33
Figure B.1 — Current loading test apparatus – copper test electrode	34
Figure B.2 — Current loading test apparatus	35

Tables

Table 1 — Schedule of tests	13
Table 2 — Sequence of tests	15
Table 3 — Test current	16

European foreword

This document (EN 50405:2015) has been prepared by CLC/SC 9XB "Electromechanical material on board of rolling stock".

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) 2016-11-16
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2018-11-16

This document supersedes EN 50405:2006.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Introduction

This European Standard defines testing methods for pantograph contact strips, but excludes wear tests, and tests using a particular pantograph.

In this issue of the standard, additional clauses have been included to address the European Rail Agency (ERA) request for standard (IU-RFS-024 of 3rd July 2009) which requested that this standard specifies the assessment methods for contact strips of different materials as specified in the High Speed and Conventional Rail Locomotives and Passenger rolling-stock technical specifications for interoperability (LOC and PAS TSIs). A method for determining the metal content for metal impregnated (metalized) contact strips (7.8) has been added in this issue of the standard. Tests for the coefficient of friction (7.9) and impact resistance of the carbon material (7.10) have also been included in this revision.

The Locomotives and Passenger rolling-stock technical specification for interoperability (COMMISSION REGULATION (EU) No 1302/2014 of 18 November 2014) (LOC and PAS TSI) chapter 4.2.8.2.9.4.2 states:

4.2.8.2.9.4.2 Contact strip material

- (1) Material used for the contact strips shall be mechanically and electrically compatible with the contact wire material (as specified in Clause 4.2.14 of the ENE TSI, in order to ensure proper current collection and to avoid excessive abrasion of the surface of the contact wires, thereby minimising wear of both contact wires and contact strips.
- (2) Plain carbon or impregnated carbon with additive material shall be permitted.

Where a metallic additive material is used, the metallic content of the carbon contact strips shall be copper or copper alloy and shall not exceed a content of 35 % by weight where used on AC lines and of 40 % where used on DC lines.

Pantographs assessed against this TSI shall be fitted with contact strips of a material mentioned above.

- (3) Additionally, contact strips of other material or higher percentage of metallic contents or impregnated carbon with clad copper are allowed (if permitted in the infrastructure register) provided that:
 - they are referenced in recognised standards, with mention of restrictions if any, or
 - they have been subject to a test of suitability for use (see 6.1.3.8).

Evidence from the UIC project “COSTRIM” testing of a sample of carbon contact strips has shown the difficulty of defining a cross-industry wear test. This could be the subject of a new requirement following further analysis of the COSTRIM results for a future revision of this standard. (These values were determined as a result of the tests undertaken under the COSTRIM project, and are the limit of the tests carried out, rather than an absolute limit.)

Although not currently applicable to contact strips for railway applications, it should be noted that certain materials listed in the EU Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment 2011/65/EU are prohibited from use in certain applications

1 Scope

This European Standard specifies testing methods to establish the basic characteristics of newly manufactured pantograph contact strips. Not all tests may be relevant to some designs of contact strips. This standard does not define tests for pure metallic contact strips.

This European Standard excludes wear tests, and tests using a particular pantograph. Additional supplementary tests, out of the scope of this standard, may be necessary to determine suitability for a particular application and are by prior agreement between customer and manufacturer.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 148-1:2010, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2009)*

EN ISO 179-1:2010, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test (ISO 179-1:2010)*

EN ISO 180:2000, *Plastics — Determination of Izod impact strength (ISO 180:2000)*

IEC 60413:1972, *Test procedures for determining physical properties of brush materials for electrical machines*

IEC 60773:1983, *Test methods and apparatus for measurement of the operational characteristics of brushes*