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**Železniške naprave - Sistemi zajema toka - Odjemniki toka, preskusne metode  
za ogljene kontaktne drsnike**

**(istoveten EN 50405:2006)**

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

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EUROPEAN STANDARD

**EN 50405**

NORME EUROPÉENNE

EUROPÄISCHE NORM

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

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

Bahnanwendungen -  
Stromabnahmesysteme -  
Stromabnehmer für  
Oberleitungsfahrzeuge, Prüfverfahren  
für Kohleschleifstücke

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

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**CENELEC**

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

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## Foreword

This European Standard was prepared by SC 9XB, Electromechanical material on board of rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways. The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50405 on 2006-03-01.

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) 2007-03-01
  - latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-03-01
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## 1 Scope

This European Standard gives rules for testing methods for carbon contact strips. The purpose of this standard is to demonstrate that the carbon strip construction is fit for purpose. Not all tests may be relevant to some designs.

## 2 Normative references

The following referenced documents are indispensable for the application 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 ISO 9001	Quality management systems – Requirements (ISO 9001)
EN 50206-1	Railway applications – Rolling stock – Pantographs: Characteristics and tests – Part 1: Pantographs for main line vehicles
EN 50206-2	Railway applications – Rolling stock – Pantographs: Characteristics and tests – Part 2 : Pantographs for metros and light rail vehicles
EN 50367	Railway applications – Current collection systems – Technical criteria for the interaction between pantograph and overhead line (to achieve free access)
IEC 60413	Test procedures for determining physical properties of brush materials for electrical machines

## 3 Definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **carbon contact strip**

strip of carbon material, permanently attached to an integral supporting structure (carrier) but excluding bolted assemblies

### 3.2

#### **shear strength**

stress at failure of the adhesion between carbon and the support structure

### 3.3

#### **autodrop detection (ADD) sensor**

mechanism incorporated in the carbon contact strip to provide the indication for the pantograph automatic dropping device

### 3.4

#### **flow continuity**

uninterrupted flow of air or other fluid

### 3.5

#### **rated current loading**

current value defined by the manufacturer that the carbon strip is designed to sustain without degradation under the specified operating conditions

## 4 Symbols and abbreviations

<b>A</b>	designed area of adhesion (mm <sup>2</sup> )
<b>F<sub>s</sub></b>	shear force (N)
<b>R</b>	resistance (Ω)
<b>T<sub>s</sub></b>	shear strength (N/mm <sup>2</sup> )

## 5 Tests

### 5.1 General

There are two categories of tests:

- type tests,
- routine tests.

The above tests are described in 5.1.1 to 5.1.2.

Supplementary tests may be required if they have been specified in the customer specification and after agreement with the supplier.

Annex A summarises the tests which shall be performed.

#### 5.1.1 Type tests

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Type tests shall be performed on a single piece of product of a given design.

Equipment in current manufacture shall be considered to have satisfied the type tests; if the manufacturer can provide certified reports of type tests already conducted on identical components, the type tests shall be considered to be complied with.

#### 5.1.2 Routine tests

Routine tests shall be carried out to verify that the properties of a product correspond to those measured during the type test. Routine tests shall be performed by the supplier on each equipment.

### 5.2 Test procedures

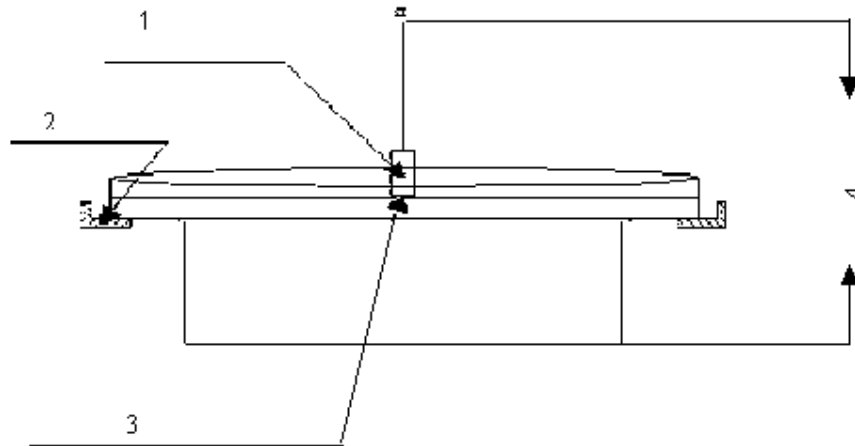
#### 5.2.1 Tests for the temperature characteristic of the carbon contact strip under rated current loading

##### 5.2.1.1 General

The test aims to determine the temperature characteristic to stability of the carbon contact strip at the maximum designed current loading.

### 5.2.1.2 Test method

The carbon contact strip shall be fixed at one end and freely supported at the other end (see Figure 1). The current supply connection shall be made by clamping suitable interfaces to the vertical faces of the carbon, but not in contact with the carrier material (see Figure 2). The current take off shall be made at the normal design interface(s).



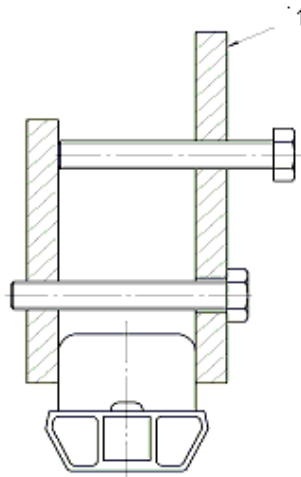
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### Key

- 1 parallel clamp (steel)
- 2 carbon contact strip fixed end
- 3 temperature sensor 2 mm above carbon carrier interface
- 4 power supply

Figure 1 – Arrangement of test device for testing temperature characteristic





**Key**

- 1 current supply connection (steel, copper)

**Figure 2 – Example of current supply connection**

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The temperature shall be monitored adjacent to the current supply connection at a point 2 mm above the carbon / carrier interface. The maximum rated current loading shall be applied to the carbon contact strip until the monitored temperature remains constant and then for a further 30 minutes. The temperature shall be continuously recorded during the test as a temperature – time characteristic.

*Test acceptance criteria:* The carbon contact strip shall remain fit for purpose. The contact strip shall remain in accordance with drawing at room temperature.

**5.2.2 Test for deflection and extension of the carbon contact strip under extremes of temperature**

**5.2.2.1 General**

The test aims to determine the vertical displacement and change in length of the carbon contact strip under extremes of temperature.

**5.2.2.2 Test method**

**5.2.2.2.1 High temperature test**

This test may be carried out concurrently with the test described in 5.2.1. Under the steady state heated conditions of 5.2.1.2, the change of length of the carrier ( $\Delta l$ ) and vertical displacement of the strip ( $\Delta h$ ) from the room temperature condition shall be recorded (see Figure 3).