



SLOVENSKI STANDARD

SIST EN 50206-2:2011

01-junij-2011

Nadomešča:
SIST EN 50206-2:1999

**Železniške naprave - Vozna sredstva - Odjemniki toka: karakteristike in preskusi -
2. del: Odjemniki toka za mestne železnice in lahka železniška vozila**

Railway applications - Rolling stock - Pantographs: Characteristics and tests - Part 2:
Pantographs for metros and light rail vehicles

Bahnanwendungen - Schienenfahrzeuge - Merkmale und Prüfungen von
Stromabnehmern - Teil 2: Dachstromabnehmer für Stadtbahnen und Straßenbahnen
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Applications ferroviaires - Matériel roulant - Pantographes: Caractéristiques et essais -
Partie 2: Pantographes pour métros et tramways
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Ta slovenski standard je istoveten z: EN 50206-2:2010

ICS:

45.060.01 Železniška vozila na splošno Railway rolling stock in
general

SIST EN 50206-2:2011

en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50206-2

May 2010

ICS 29.280

Supersedes EN 50206-2:1999

English version

**Railway applications - Rolling stock -
Pantographs: Characteristics and tests -
Part 2: Pantographs for metros and light rail vehicles**

Applications ferroviaires -
Matériel roulant -
Pantographes: Caractéristiques et essais
-
Partie 2: Pantographes pour métros
et tramways

Bahnanwendungen -
Schienenfahrzeuge -
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von Stromabnehmern -
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für Stadtbahnen und Straßenbahnen

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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.

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 Central Secretariat has the same status as the official versions.

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CENELEC

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

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Foreword

This European Standard was prepared by SC 9XB, Electromechanical material on board rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways. It was submitted to the CENELEC formal vote and was approved by CENELEC as EN 50206-2 on 2010-05-01.

This document supersedes EN 50206-2:1999.

The main changes brought by this revision are:

- simplification and standardisation of the tolerances for static contact force (Annexes A and B);
- adjustment of terms to TSI (static contact force instead of static force);
- deletion of Clause 10;
- update of normative references.

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

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) 2011-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-05-01

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Introduction

The electrical power supply of a tractive unit is achieved by the collection of current from the contact wire by means of one or more pantograph(s), installed on the traction unit or on the vehicle.

The contact strip of the pantograph which slides along the contact wire facilitates the transmission of power.

The pantograph and the overhead line equipment form two oscillating sub-systems which can be displaced. There exists a unilateral sliding linkage between them, which shall ensure continuous contact. Their design shall allow for minimum wear of both sub-systems when used.

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1 Scope

This European Standard defines the general assembly characteristics which are to be applied to pantographs, to enable current collection from the overhead line equipment. It also defines the tests the pantographs have to perform, excluding insulators.

This European Standard does not apply to pantograph dielectric tests, which are to be performed on the pantograph installed on the vehicle roof. If no other requirement is agreed between customer and supplier, insulation coordination according to EN 50124-1 may be used.

This European Standard does not apply to pantographs used on main line vehicles: these pantographs are considered in EN 50206-1.

This European Standard relates to conventional suspended overhead line equipment and accessories. The systems (or part of them) which are rigidly suspended will require special consideration between the customer and the supplier.

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 50125-1, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

EN 50126 series, *Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)*

EN 50163, *Railway applications – Supply voltages of traction systems*

EN 50317, *Railway applications – Current collection systems – Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line*

EN 60077-1, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules (IEC 60077-1)*

EN 60077-2, *Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules (IEC 60077-2)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373)*

3 Definitions

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

3.1 General

3.1.1

supplier

manufacturer of the pantograph

3.1.2

customer

either operating authority or vehicle manufacturer

3.1.3**pantograph** (see Figure 1)

apparatus that collects current on one or more contact wires. It consists of a base frame, an operating system, a frame and a collector head. It is of variable geometry. In the "operating" position, the apparatus is entirely or partly under voltage. It is electrically insulated only generally at its interfaces, on the vehicle roof. It enables current to be transmitted from the overhead line equipment to the vehicle electrical system

3.2 Design

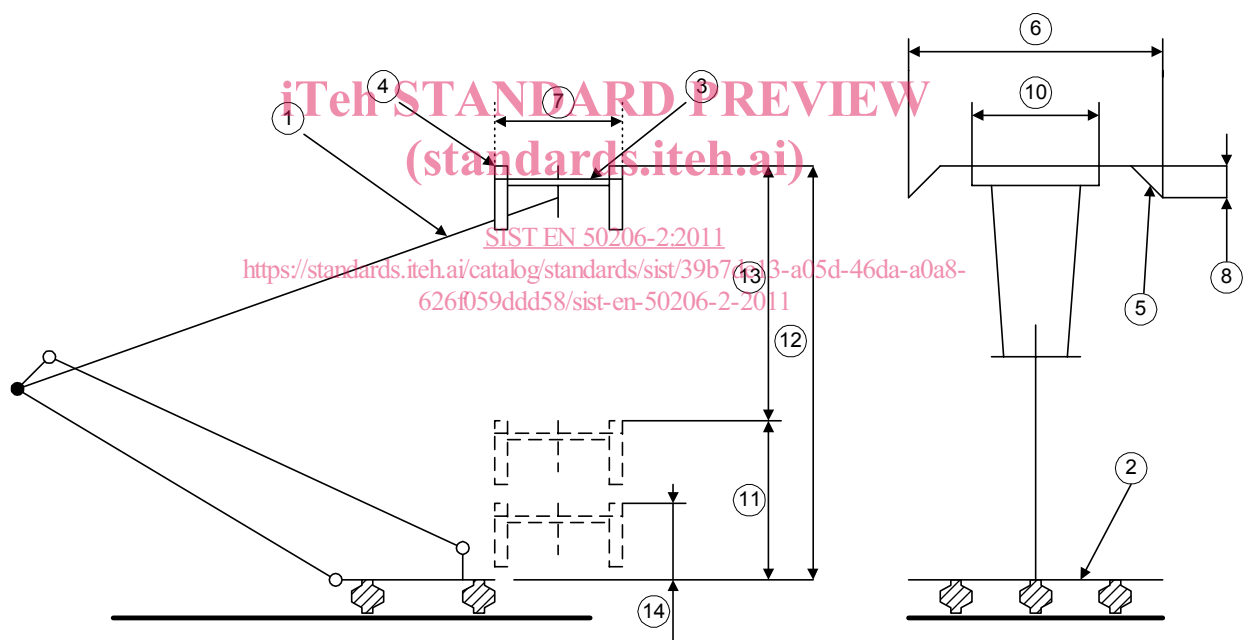
The definitions in Table 1 are related to Figure 1, except items 9, 15, 16, 17, 18.

Table 1 – Design definitions

Def. No.	Term	Item No.	Definition
3.2.1	frame	1	articulated structure which enables the collector head to move in a vertical direction with respect to the base frame of the pantograph
3.2.2	base frame	2	fixed part of the pantograph which supports the frame and is mounted on insulators fixed to the vehicle roof
3.2.3	collector head	3	part of the pantograph supported by the frame which includes contact strips, horns and may include a suspension
3.2.4	contact strip	4	replaceable wearing part of the collector head which interfaces with the overhead line equipment
3.2.5	horns	5	ends of the collector head which ensure smooth engagement with the contact wire
3.2.6	collector head length	6	dimension of collector head measured transversely in the horizontal plane in relation to the vehicle
3.2.7	collector head width	7	dimension of collector head measured longitudinally in relation to the vehicle
3.2.8	collector head height	8	vertical distance between the lowest point of the horns and the upper most point of the contact strips
3.2.9	collector head pivot	9	pitching axis of the collector head
3.2.10	length of contact strips	10	total length of wearable material intended for normal interaction measured transversely in relation to the vehicle
3.2.11	height at "lower operating position"	11	vertical distance between the pantograph mounting plane on the top of insulators and the upper surface of contact strips, the pantograph being raised to the lowest level at which it is designed to collect current
3.2.12	height at "upper operating position"	12	vertical distance between the pantograph mounting plane on the top of insulators and the upper surface of the contact strips, the pantograph being raised to the highest level at which it is designed to collect current
3.2.13	working range	13	difference between the "upper operating position" height and the "lower operating position" height

Table 1 – Design definitions (continued)

Def. No.	Term	Item No.	Definition
3.2.14	housed height	14	vertical distance between the pantograph mounting plane on the top of insulators and the upper surface of the contact strips or any other part of the pantograph structure if higher (pantograph being in the housed position)
3.2.15	pantograph "electrical thickness"	15	vertical distance between the highest live part and the lowest live part of the pantograph at housed position
3.2.16	operating system	16	device which provides a force to raise or to lower the pantograph
3.2.17	maximum extension	17	maximum extended height to mechanical stops (without any device which will limit the pantograph extension within the working range)
3.2.18	extension range	18	difference between height at upper operating position and housed height



The sketch in Figure 1 is an example only and does not exclude other types of pantographs (diamond type, for example).

Figure 1 – Pantograph terminology

3.3 General characteristics

All general characteristics are given in the customer specifications. Unless otherwise specified, environmental conditions are defined in EN 50125-1. The category of environment has to be specified by the customer.

3.3.1

rated voltage

voltage at which the pantograph is designed to function

3.3.2**rated current, vehicle at standstill**

average value of the current withstood for 30 min by the pantograph at standstill

3.3.3**maximum current, vehicle at standstill**

maximum value of the current withstood by the pantograph at standstill for a time given in the customer specification

3.3.4**rated current, vehicle running**

continuous current transfer capacity of the pantograph

3.3.5**static contact force**

vertical force exerted upward by the collector head on the overhead line equipment

3.3.6**nominal static contact force**

specified set point for the static contact force

3.3.7**mean static contact force**

average of the actual values of static contact forces evaluated as follows: the static contact forces are measured continually within the working range during raising (F_r) and lowering (F_l) operation. By convention, the mean static contact force at any point is equal to $\frac{F_r + F_l}{2}$

4 Technical requirements

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4.1 Gauge

The pantograph, at housed position and operating position, shall comply with the gauge specified in the customer specifications.

4.2 Extension of the pantographs

The customer specifications shall state the values in relationship with items 10 to 13 in Table 1. In the absence of specifications in the tender documents, when the pantograph is raising or lowering, the collector head trajectory over the working range shall be in accordance with Table 2.

Table 2 – Lateral deviation of the collector head

Extension range	Maximum lateral deviation to vertical line
E < 1 m	10 mm
1 m < E < 2 m	20 mm
E > 2 m	30 mm