

SLOVENSKI STANDARD SIST EN 50119:2009

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Railway applications - Fixed installations - Electric traction overhead contact lines

Bahnanwendungen - Ortsfeste Anlagen - Oberleitungen für den elektrischen Zugbetrieb

Applications ferroviaires - Installations fixes - Lignes aériennes de contact pour la traction électrique

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ICS:

29.280 Ò|^\dã} æ [/] |-{ æ Electric traction equipment

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EUROPEAN STANDARD

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English version

Railway applications Fixed installations Electric traction overhead contact lines

Applications ferroviaires -Installations fixes -Lignes aériennes de contact pour la traction électrique Bahnanwendungen -Ortsfeste Anlagen -Oberleitungen für den elektrischen Zugbetrieb

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This European Standard was approved by CENELEC on 2009-04-01. 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.9:2009

https://standards.iteh.ai/catalog/standards/sist/68b66628-bd64-4b87-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.

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

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations), 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 50119 on 2009-04-01.

This European Standard supersedes EN 50119:2001.

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) 2010-04-01

 latest date by which the national standards conflicting with the EN have to be withdrawn

(dow) -

References to definitions in IEC 60050-811 in Clause 3 are included for user reference and in some cases may update or modify the current definition.

National Standards implementing EN 50119:

The National Standards implementing EN 50119 will comprise the full text of the Eurocode (including any annexes), as published by CENELEC, which may be preceded by a national title page and national foreword, and may be followed by a National Annex:

A National Annex, if included, may contain information on those parameters or statements in EN 50119 which are not normative, e.g. https://standards.iteh.ai/catalog/standards/sist/68b66628-bd64-4b87-

- values where alternative values or informative values only are given in the standard,
- country specific data (e.g. geographical, climatic, etc.), e.g. ice loads or temperature limits,
- the procedure to be used where alternative procedures are given in the standard.

It may also contain

- decisions on the use of informative annexes, and
- references to non-contradictory complementary information to assist the user to apply the standard.

The National Annex shall not alter any provisions of the European Standard.

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1 Scope

This European Standard applies to electric traction overhead contact line systems in heavy railways, light railways, trolley busses and industrial railways of public and private operators.

It applies to new installations of overhead contact line systems and for the complete reconstruction of existing overhead contact line systems.

This standard contains the requirements and tests for the design of overhead contact lines, requirements for structures and their structural calculations and verifications as well as the requirements and tests for the design of assemblies and individual parts.

This standard does not provide requirements for conductor rail systems where the conductor rails are located adjacent to the running rails.

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 206-1, Concrete - Part 1: Specification, performance, production and conformity

EN 485-1, Aluminium and aluminium alloys Sheet, strip and plate Part 1: Technical conditions for inspection and delivery (standards.iteh.ai)

EN 755-1, Aluminium and aluminium alloys- Extruded rod/bar, tube and profiles – Part 1: Technical conditions for inspection and delivery SIST EN 50119:2009

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EN 755-2, Aluminium and aluminium alloys **Extruded rod/bar, tube and profiles – Part 2: Mechanical properties

EN 1536, Execution of special geotechnical work – Bored piles

EN 1537, Execution of special geotechnical work – Ground anchors

EN 1991-1-4:2005, Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions

ENV 1991-2-4:1995, Eurocode 1: Basis of design and actions on structures – Part 2-4: Actions on structures – Wind actions

EN 1992 (all parts), Eurocode 2 – Design of concrete structures

EN 1993 (all parts), Eurocode 3: Design of steel structures

EN 1993-1-1:2005, Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings

EN 1995 (all parts), Eurocode 5: Design of timber structures

EN 1997-1:2004, Eurocode 7: Geotechnical design – Part 1: General rules

EN 1997-2:2007, Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing

EN 1998 (all parts), Eurocode 8: Design of structures for earthquake resistance

EN 1999 (all parts), Eurocode 9: Design of aluminium structures

EN 10025 (all parts), Hot rolled products of structural steels

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EN 10149 (all parts), Hot-rolled flat products made of high yield strength steels for cold forming

EN 10164, Steel products with improved deformation properties perpendicular to the surface of the product – Technical delivery conditions

EN 10210 (all parts), Hot finished structural hollow sections of non-alloy and fine grain steels

EN 12510, Wood poles for overhead lines – Strength grading criteria

EN 12699, Execution of special geotechnical work – Displacement piles

EN 12843, Precast concrete products – Masts and poles

EN 20898-2, Mechanical properties of fasteners – Part 2: Nuts with specified proof load values – Coarse thread (ISO 898-2)

EN 50121-2, Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world

EN 50122 (all parts) 1), Railway applications – Fixed installations – Electrical safety, earthing and bonding

EN 50123 (all parts), Railway applications – Fixed installations – D.C. switchgear

EN 50124 (all parts), Railway applications – Insulation coordination

EN 50125-2, Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations

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EN 50149, Railway applications – Fixed installations – Electric traction – Copper and copper alloy grooved contact wires

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EN 50151, Railway applications — Fixed installations — Electric traction — Special requirements for composite insulators

EN 50152-2, Railway applications – Fixed installations – Particular requirements for a.c. switchgear – Part 2: Single-phase disconnectors, earthing switches and switches with U_n above 1 kV

EN 50163, Railway applications – Supply voltages of traction systems

EN 50182, Conductors for overhead lines - Round wire concentric lay stranded conductors

EN 50183, Conductors for overhead lines - Aluminium-magnesium-silicon alloy wires

EN 50189, Conductors for overhead lines - Zinc coated steel wires

EN 50206-1:1998, Railway applications – Rolling stock – Pantographs: Characteristics and tests – Part 1: Pantographs for main line vehicles

EN 50206-2:1999, Railway applications – Rolling stock – Pantographs: Characteristics and tests – Part 2: Pantographs for metros and light rail vehicles

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

EN 50318, Railway applications – Current collection systems – Validation of simulation of the dynamic interaction between pantograph and overhead contact line

¹⁾ At draft stage.

EN 50326, Conductors for overhead lines – Characteristics of greases

EN 50341-1:2001, Overhead electrical lines exceeding AC 45 kV – Part 1: General requirements – Common specifications

EN 50345, Railway applications – Fixed installations – Electric traction – Insulating synthetic rope assemblies for support of overhead contact lines

EN 50367:2006, Railway applications – Current collection systems – Technical criteria for the interaction between pantograph and overhead line (to achieve free access)

EN 60071 (all parts), Insulation co-ordination (IEC 60071, all parts)

EN 60099 (all parts), Surge arresters (IEC 60099, all parts, mod.)

EN 60168, Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 kV (IEC 60168)

EN 60265-1, High-voltage switches – Part 1: Switches for rated voltages above 1 kV and less than 52 kV (IEC 60265-1)

EN 60305, Insulators for overhead lines with a nominal voltage above 1 kV – Ceramic or glass insulator units for a.c. systems – Characteristics of insulator units of the cap and pin type (IEC 60305)

EN 60383 (all parts), Insulators for overhead lines with a nominal voltage above 1 kV (IEC 60383, all parts)

EN 60433, Insulators for overhead lines with a nominal voltage above 1 kV – Ceramic insulators for a.c. systems – Characteristics of insulator units of the long rod type (IEC 60433)

EN 60529, Degrees of protection provided by enclosures (IP Code) (IEC 60529)

EN 60660, Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV (IEC 60660)

EN 60672 (all parts), Ceramic and glass insulating materials (IEC 60672, all parts)

EN 60889, Hard-drawn aluminium wire for overhead line conductors (IEC 60889)

EN 60947-1, Low-voltage switchgear and controlgear – Part 1: General rules (IEC 60947-1)

EN 61109, Insulators for overhead lines - Composite suspension and tension insulators for a.c. systems with a nominal voltage > 1 000 V - Definitions, test methods and acceptance criteria (IEC 61109)

EN 61232, Aluminium-clad steel wires for electrical purposes (IEC 61232, mod.)

EN 61284:1997, Overhead lines – Requirements and tests for fittings (IEC 61284:1997)

EN 61325, Insulators for overhead lines with a nominal voltage above 1 kV – Ceramic or glass insulator units for d.c. systems – Definitions, test methods and acceptance criteria (IEC 61325)

EN 61773, Overhead lines – Testing of foundations for structures (IEC 61773)

EN 61952, Insulators for overhead lines - Composite line post insulators for A.C. systems with a nominal voltage > 1 000 V - Definitions, test methods and acceptance criteria (IEC 61952)

EN 62271-102:2002, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches* (IEC 62271-102:2001 + corrigendum April 2002 + corrigendum May 2003)

EN ISO 898-1:1999, Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs (ISO 898-1:1999)

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EN ISO 1461:1999, Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods (ISO 1461:1999)

HD 578, Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 kV (IEC 60273)

IEC 60050-811, International Electrotechnical Vocabulary (IEV) – Chapter 811: Electric traction

IEC/TR 61245, Artificial pollution tests on high-voltage insulators to be used on d.c. systems

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 60050-811 and the following apply.

3.1 Systems

3.1.1

contact line system

support network for supplying electrical energy from substations to electrically powered traction units, which covers overhead contact line systems and conductor rail systems; the electrical limits of the system are the feeding point and the contact point to the current collector

NOTE The mechanical system may comprise

- the contact line iTeh STANDARD PREVIEW

structures and foundations,
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supports and any components supporting or registering the conductors,

— head and cross spans,
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tensioning devices,
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- along-track feeders, reinforcing feeders, and other lines like earth wires and return conductors as far as they are supported from contact line system structures,
- any other equipment necessary for operating the contact line,
- conductors connected permanently to the contact line for supply of other electrical equipment such as lights, signal operation, point control and point heating.

3.1.2

contact line

conductor system for supplying traction units with electrical energy via current-collection equipment

NOTE This includes all current-collecting conductors and conducting rails or bars, including the following:

- reinforcing feeders;
- cross-track feeders;
- disconnectors;
- section insulators;
- over-voltage protection devices;
- supports that are not insulated from the conductors;
- insulators connected to live parts;

but excluding other conductors, such as the following:

- along-track feeders;
- earth wires and return conductors.

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3.1.3

overhead contact line system

contact line system using an overhead contact line to supply current for use by traction units

overhead contact line

contact line placed above or beside the upper limit of the vehicle gauge, supplying traction units with electrical energy via roof-mounted current collection equipment

3.1.5

conductor rail system

contact line system using a conductor rail for current collection

3.1.6

overhead conductor rail

rigid overhead contact line, of simple or composite section, mounted above or beside the upper limit of the vehicle gauge, supplying traction units with electrical energy via roof-mounted current collection equipment

3.1.7

conductor rail

contact line made of a rigid metallic section or rail, mounted on insulators located near the running rails

3.1.8

supporting assembly

assembly of components attached to the main support structure that supports and registers the overhead contact line iTeh STANDARD PREVIEW

3.1.9

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static load gauge

maximum cross-sectional profile of the vehicles using the railway line

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3.1.10 kinematic load gauge

b13c-180af7b4ec6a/sist-en-50119-2009 static load gauge enlarged to allow for dynamic movements of the vehicle, e.g. suspension travel and bounce

3.1.11

kinematic envelope

kinematic load gauge further enlarged to allow for possible tolerances in the position of the track

3.1.12

swept envelope

kinematic envelope enlarged to allow for centre and end throw of the vehicles on horizontal and vertical curves

3.1.13

tensioning device

device to maintain the tension of conductors within the system design parameters

3.1.14

urban mass transportation system

light rail, trolleybus and tramway system, operating in urban areas, excluding heavy rail systems

3.2 **Conductors**

3.2.1

along-track feeder

overhead conductor mounted on the same structure as the overhead contact line to supply successive feeding points

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3.2.2

reinforcing feeder

overhead conductor mounted adjacent to the overhead contact line, and directly connected to it at frequent intervals, in order to increase the effective cross sectional area of the overhead contact line

3.3 Electrical

3.3.1

nominal voltage

voltage by which an installation or part of an installation is designated

NOTE The voltage of the contact line may differ from the nominal voltage by a quantity within permitted tolerances given in EN 50163.

3.3.2

feeding section

electrical section of the route fed by individual track feeder circuit breakers within the area supplied by the substation

3.3.3

fault current

maximum current passed through the overhead contact line system under fault conditions between live equipment and earth, within a short defined time period

3.3.4

short-circuit

accidental or intentional conductive path between two or more points in a circuit forcing the voltages between these points to be relatively low. Any such conductive path whether between conductors or between conductor and earth is regarded as a short-circuit and such as a short-ci

3.3.5 <u>SIST EN 50119:2009</u>

short-circuit current https://standards.iteh.ai/catalog/standards/sist/68b66628-bd64-4b87-electric current flowing through the short-circuit/7b4ec6a/sist-en-50119-2009

3.3.6

continuous current rating

permanent rated current carrying capacity of the overhead contact line within the system operating parameters

3.3.7

feeding point

point at which the feeding system is connected to the contact line

3.3.8

isolation

disconnection of a section of overhead contact line from the source of electrical energy, either in an emergency or to facilitate maintenance

3.4 Geometrical

3.4.1

tension length

length of overhead contact line between two terminating points

3.4.2

gradient

ratio of the difference in height of the overhead contact line above top of rail (or road surface for overhead contact line system for trolleybus applications) at two successive supports to the length of the span

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3.4.3

contact wire height

distance from the top of the rail (or road surface for overhead contact line system for trolleybus applications) to the lower face of the contact wire, measured perpendicular to the track

3.4.4

minimum contact wire height

minimum value of the contact wire height in the span in order to avoid the arcing between one or more contact wires and the vehicles in all conditions

3.4.5

minimum design contact wire height

theoretical contact wire height including tolerances, designed to ensure that the minimum contact wire height is always achieved

3.4.6

nominal contact wire height

nominal value of the contact wire height at a support in the normal conditions

3.4.7

maximum contact wire height

maximum possible contact wire height which the pantograph is required to reach, in all conditions

3.4.8

maximum design contact wire height

theoretical contact wire height taking account of tolerances, movements etc, designed to ensure the maximum contact wire height is not exceeded

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3.4.9

contact wire uplift

vertical upward movement of the contact wire due to the force produced from the pantograph

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3.5 Foundations

3.5.1

gravity foundation

shallow foundation installed by excavation and backfilling

3.5.2

pile foundation

foundation which is flexible enough to show both rotation and deformations in the pile element itself subjected to horizontal loading or overturning moments. The cross section may be circular or non-circular and it is installed by boring and/or ramming

3.5.3

sidebearing foundation

relatively short, rigid foundation installed by excavation or boring which is subjected to horizontal loading or overturning moments. The cross section may be circular or rectangular

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3.6 Symbols and abbreviated terms

projected area of an insulator A_{ins}

characteristic value of accidental actions A_{K}

effective area of the elements of a lattice structure A_{lat}

projected area of a structure A_{str}

AACSR Aluminium alloy conductor steel reinforced

ACSR Aluminium conductor steel reinforced

alternating current a.c.

Ccompression amplitude for dropper test

 C_{C} drag factor of a conductor drag factor for insulators C_{ins}

 C_{lat} drag factor for lattice structures

 C_{str} drag factor of a structure

d.c. direct current

total design value of actions E_{d} EMI electromagnetic interference

EMC electromagnetic compatibility ANDARD PREVIEW

minimum breaking load of stranded conductors and ropes F_{Bmin} standards.iteh.ai)

design value of an action F_{d}

characteristic value of an action SISTEN 50119:2009 F_{K}

internal force for dropper test teh.ai/catalog/standards/sist/68b66628-bd64-4b87- F_{L}

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maximum or failure force for test specimens F_{max}

nominal force F_{nom}

permissible operating force $F_{\mathsf{perm.op.}}$

 F_{w} permissible tensile loading of stranded conductors & ropes

structural response factor for conductors G_{C} G_{ins} structural resonance factor for insulator sets G_{K} characteristic value of permanent actions

structural resonance factor for lattice structures G_{lat}

 G_{q} gust response factor

structural resonance factor for a structure G_{str}

 G_{t} terrain factor

characteristic ice loads g_{lK} $M_{\text{dyy}}, M_{\text{dzz}}$ design bending moments

internal axial force of an element $N_{\sf dax}$

safety factor for calculating the permissible loading in wires n

OCS overhead contact line system

OCL overhead contact line P_{prim} externally applied heat

conductor tensile forces depending on the temperatures and climate related loads Q_{CK}