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# INTERNATIONAL STANDARD



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**Railway applications – Fixed installations – Electric traction overhead contact  
lines systems**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – FIXED INSTALLATIONS –  
ELECTRIC TRACTION OVERHEAD CONTACT LINE SYSTEMS**

## FOREWORD

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**This commented version (CMV) of the official standard IEC 60913:2024 edition 3.0 allows the user to identify the changes made to the previous IEC 60913:2013 edition 2.0. Furthermore, comments from IEC TC 9 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

IEC 60913 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

The European standard EN 50119 has served as a basis for the elaboration of this document.

This edition includes the following significant technical changes with respect to the previous edition:

- a) title modified;
- b) requirements for urban rail systems are included;
- c) requirements for rigid overhead contact line (ROCL) are included;
- d) additional definitions for new terms are included (Clause 3);
- e) clearances and geometry of overhead contact line are improved (Clause 5);
- f) urban aspects are added, for example wall anchors (Clause 6);
- g) requirements for monitoring devices, automatic earthing and short-circuiting equipment are included (Clause 7);
- h) requirements for overhead contact line for electric vehicles with pantograph on electrified roads are added (Annex E)
- i) improvements on the basis of EN 50119:2020 and the questionnaire 9/2619A/Q

The text of this International Standard is based on the following documents:

Draft	Report on voting
9/3031/FDIS	9/3052/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

The reader's attention is drawn to the fact that Annex H lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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# RAILWAY APPLICATIONS – FIXED INSTALLATIONS – ELECTRIC TRACTION OVERHEAD CONTACT LINE SYSTEMS

## 1 Scope

~~This International 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 document specifies the requirements and tests for the design of overhead contact line systems, 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.~~

This document is applicable to electric traction overhead contact line systems in heavy railways, light railways, for trolley bus lines, electric road systems **1** (Annex E) and industrial railways of public and private operators. This document is applicable to new installations of overhead contact line systems and for the complete renewal of existing overhead contact line systems.

This document does not apply to ground level conductor rail systems (see Figure 1).

NOTE Ground level conductor rail means conductor rails located adjacent to the running rail, e.g. the third rail or a conductor rail in the ground.

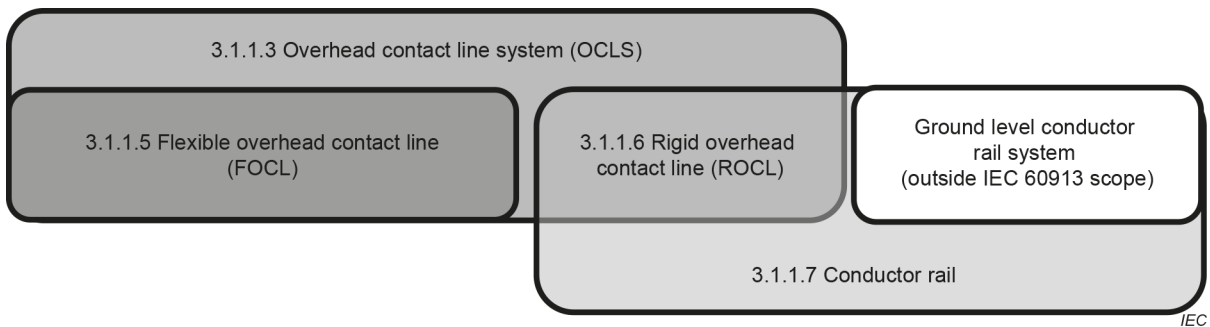


Figure 1 – Scope of contact line systems **2**

## 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.

~~NOTE Normative references are made to ISO and IEC standards. For some necessary references, ISO and IEC standards do not exist. In these cases, references are made to European Standards which are normative for Europe according to EN 50110. For non-European countries these references are only informative and listed in the bibliography.~~

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

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

~~IEC 60099 (all parts), Surge arresters~~

~~IEC 60099-1, Surge arresters – Part 1: Non-linear resistor type gapped surge arresters for a.c. systems~~

IEC 60099-4, Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems

IEC 60168, Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V

IEC 60273, Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 000 V

IEC 60305, Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic or glass insulator units for AC systems – Characteristics of insulator units of the cap and pin type

IEC 60383 (all parts), Insulators for overhead lines with nominal voltage above 1 000 V

IEC 60433, Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic insulators for AC systems – Characteristics of insulator units of the long rod type

~~IEC 60494 (all parts), Railway applications – Rolling stock – Pantographs – Characteristics and tests~~

IEC 60494-1, Railway applications – Rolling stock – Pantographs – Characteristics and tests – Part 1: Pantographs for main line vehicles

IEC 60494-2, Railway applications – Rolling stock – Pantographs – Characteristics and tests – Part 2: Pantographs for metros and light rail vehicles

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

IEC 60660, Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 000 V up to but not including 300 kV

IEC 60672-1, Ceramic and glass insulating materials – Part 1: Definitions and classification

IEC 60672-2, Ceramic and glass insulating materials – Part 2: Methods of test

IEC 60672-3, Ceramic and glass-insulating materials – Part 3: Specifications for individual materials

IEC 60850, Railway applications – Supply voltages of traction systems

~~IEC 60889, Hard-drawn aluminium wire for overhead line conductors~~

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

IEC 61089, Round wire concentric lay overhead electrical stranded conductors

~~IEC 61109, Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria~~

~~IEC 61232, Aluminium-clad steel wires for electrical purposes~~

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

IEC 61325, Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic or glass insulator units for d.c. systems – Definitions, test methods and acceptance criteria

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

IEC 61773, Overhead lines – Testing of foundations for structures

~~IEC 61952, Insulators for overhead lines – Composite line post insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria~~

~~IEC 61992 (all parts), Railway applications – Fixed installations – DC switchgear~~

IEC 61992-1, Railway applications – Fixed installations – DC switchgear – Part 1: General

IEC 61992-4, Railway applications – Fixed installations – DC switchgear – Part 4: Outdoor d.c. disconnectors, switch-disconnectors and earthing switches

~~IEC 61992-5, Railway applications – Fixed installations – DC switchgear – Part 5: Surge arresters and low-voltage limiters for specific use in d.c. systems~~

IEC 62128 (all parts), Railway applications – Fixed installations – Electrical safety, earthing and the return circuit

~~IEC 62128-1:2003, Railway applications – Fixed installations – Part 1: Protective provisions relating to electrical safety and earthing~~

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<sup>1</sup> Under preparation. Stage at the time of publication: IEC/AFDIS 63438:2023.

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~~ISO 22476-3, *Geotechnical investigation and testing – Field testing – Part 3: Standard penetration test*~~

~~ISO 23469:2005, *Bases for design of structures – Seismic actions for designing geotechnical works*~~



# INTERNATIONAL STANDARD



**Railway applications – Fixed installations – Electric traction overhead contact lines systems**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**RAILWAY APPLICATIONS – FIXED INSTALLATIONS –  
ELECTRIC TRACTION OVERHEAD CONTACT LINE SYSTEMS****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 60913 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

The European standard EN 50119 has served as a basis for the elaboration of this document.

This edition includes the following significant technical changes with respect to the previous edition:

- a) title modified;
- b) requirements for urban rail systems are included;
- c) requirements for rigid overhead contact line (ROCL) are included;
- d) additional definitions for new terms are included (Clause 3);

- e) clearances and geometry of overhead contact line are improved (Clause 5);
- f) urban aspects are added, for example wall anchors (Clause 6);
- g) requirements for monitoring devices, automatic earthing and short-circuiting equipment are included (Clause 7);
- h) requirements for overhead contact line for electric vehicles with pantograph on electrified roads are added (Annex E)
- i) improvements on the basis of EN 50119:2020 and the questionnaire 9/2619A/Q

The text of this International Standard is based on the following documents:

Draft	Report on voting
9/3031/FDIS	9/3052/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

The reader's attention is drawn to the fact that Annex H lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## RAILWAY APPLICATIONS – FIXED INSTALLATIONS – ELECTRIC TRACTION OVERHEAD CONTACT LINE SYSTEMS

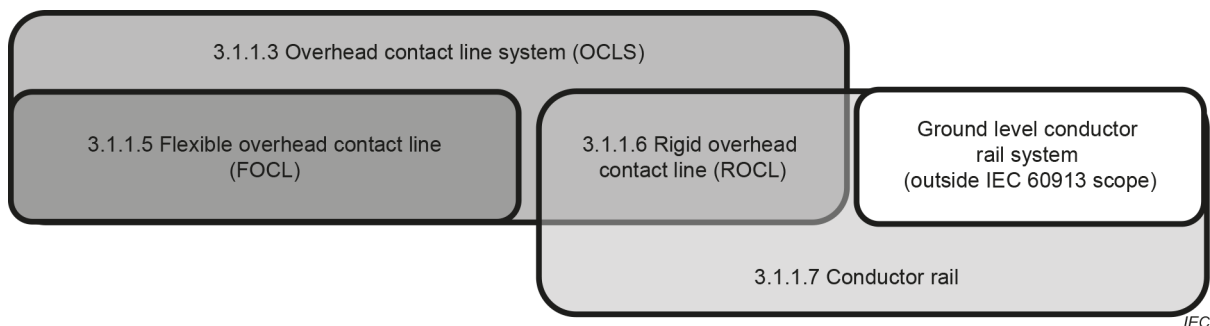
### 1 Scope

This document specifies the requirements and tests for the design of overhead contact line systems, 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 document is applicable to electric traction overhead contact line systems in heavy railways, light railways, for trolley bus lines, electric road systems (Annex E) and industrial railways of public and private operators. This document is applicable to new installations of overhead contact line systems and for the complete renewal of existing overhead contact line systems.

This document does not apply to ground level conductor rail systems (see Figure 1).

NOTE Ground level conductor rail means conductor rails located adjacent to the running rail, e.g. the third rail or a conductor rail in the ground.



**Figure 1 – Scope of contact line systems**

### 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.

IEC 60099-4, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems*

IEC 60168, *Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V*

IEC 60273, *Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 000 V*

IEC 60305, *Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic or glass insulator units for AC systems – Characteristics of insulator units of the cap and pin type*

IEC 60383 (all parts), *Insulators for overhead lines with nominal voltage above 1 000 V*

IEC 60433, *Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic insulators for AC systems – Characteristics of insulator units of the long rod type*

IEC 60494-1, *Railway applications – Rolling stock – Pantographs – Characteristics and tests – Part 1: Pantographs for main line vehicles*

IEC 60494-2, *Railway applications – Rolling stock – Pantographs – Characteristics and tests – Part 2: Pantographs for metros and light rail vehicles*

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

IEC 60660, *Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 000 V up to but not including 300 kV*

IEC 60672-1, *Ceramic and glass insulating materials – Part 1: Definitions and classification*

IEC 60672-2, *Ceramic and glass insulating materials – Part 2: Methods of test*

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<sup>1</sup> Under preparation. Stage at the time of publication: IEC/AFDIS 63438:2023.

<sup>2</sup> Under preparation. Stage at the time of publication: IEC/CCDV 63453:2023.

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