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Railway applications - Rolling stock - Electrical connectors - Requirements and test methods

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This standard includes the English version of the European Standard.

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Applications ferroviaires - Matériel roulant - Connecteurs électriques - Exigences et méthodes d'essai (IEC 62847:2016)

Bahnanwendungen - Fahrzeuge - Elektrische Steckverbinder - Anforderungen und Prüfverfahren (IEC 62847:2016)

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

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European foreword

This document (EN IEC 62847:2023) consists of the text of document IEC 62847:2016, prepared by IEC/TC 9 "Electrical equipment and systems for railways".

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) 2024-02-24
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-02-24

This document supersedes EN 50467:2011 and all of its amendments and corrigenda (if any).

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Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62847:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60068-2-31:2008	NOTE	Approved as EN 60068-2-31:2008 (not modified)
IEC 60068-2-78:2012	NOTE	Approved as EN 60068-2-78:2013 (not modified)
IEC 60077-1	NOTE	Approved as EN 60077-1
IEC 60352-1:1997	NOTE	Approved as EN 60352-1:1997 (not modified)
IEC 60512-1-2:2002	NOTE	Approved as EN 60512-1-2:2002 (not modified)
IEC 60512-1-4:1997	NOTE	Approved as EN 60512-1-4:1997 (not modified)
IEC 60512-2-1	NOTE	Approved as EN 60512-2-1
IEC 60512-2-2:2003	NOTE	Approved as EN 60512-2-2:2003 (not modified)
IEC 60512-2-5:2003	NOTE	Approved as EN 60512-2-5:2003 (not modified)
IEC 60512-3-1:2002	NOTE	Approved as EN 60512-3-1:2002 (not modified)
IEC 60512-5-2:2002	NOTE	Approved as EN 60512-5-2:2002 (not modified)
IEC 60512-11-2:2002	NOTE	Approved as EN 60512-11-2:2002 (not modified)
IEC 60512-11-3:2002	NOTE	Approved as EN 60512-11-3:2002 (not modified)

IEC 60512-11-4:2002	NOTE	Approved as EN 60512-11-4:2002 (not modified)
IEC 60512-11-9:2002	NOTE	Approved as EN 60512-11-9:2002 (not modified)
IEC 60512-11-10:2002	NOTE	Approved as EN 60512-11-10:2002 (not modified)
IEC 60512-13-1:2006	NOTE	Approved as EN 60512-13-1:2006 (not modified)
IEC 60512-15-1	NOTE	Approved as EN 60512-15-1
IEC 60512-15-2	NOTE	Approved as EN IEC 60512-15-2
IEC 60512-15-3	NOTE	Approved as EN 60512-15-3
IEC 60512-23-7	NOTE	Approved as EN 60512-23-7

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050-581	-	International Electrotechnical Vocabulary - Part 581: Electromechanical components for electronic equipment	-	-
IEC 60060-1	2010	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60068-1	-	Environmental testing - Part 1: General and guidance	EN 60068-1	-
IEC 60068-2-70	1995	Environmental testing - Part 2-70: Tests - Test Xb: Abrasion of markings and letterings caused by rubbing of fingers and hands	EN 60068-2-70	1996
IEC 60309-1	1999	Plugs, socket-outlets and couplers for industrial purposes - Part 1: General requirements	EN 60309-1	1999
IEC 60352-2	2006	Solderless connections - Part 2: Crimped connections - General requirements, test methods and practical guidance	EN 60352-2	2006
IEC 60352-3	-	Solderless connections - Part 3: Accessible insulation displacement (ID) connections - General requirements, test methods and practical guidance	EN IEC 60352-3	-
IEC 60352-4	-	Solderless connections - Part 4: Non-accessible insulation displacement (ID) connections - General requirements, test methods and practical guidance	EN IEC 60352-4	-
IEC 60352-5	-	Solderless connections - Part 5: Press-in connections - General requirements, test methods and practical guidance	EN IEC 60352-5	-
IEC 60352-6	-	Solderless connections - Part 6: Insulation piercing connections - General requirements, test methods and practical guidance	EN 60352-6	-

Publication	Year	Title	EN/HD	Year
IEC 60352-7	-	Solderless connections - Part 7: Spring clamp connections - General requirements, test methods and practical guidance	EN IEC 60352-7	-
IEC 60417	-	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.	-	-
IEC 60512-1	2001	Connectors for electronic equipment - Tests and measurements - Part 1: General	-	-
IEC 60512-1-1	2002	Connectors for electronic equipment - Tests and measurements - Part 1-1: General examination - Test 1a: Visual examination	EN 60512-1-1	2002
IEC 60512-4-1	2003	Connectors for electronic equipment - Tests and measurements - Part 4-1: Voltage stress tests - Test 4a: Voltage proof	EN 60512-4-1	2003
IEC 60512-5-1	2002	Connectors for electronic equipment - Tests and measurements - Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise	EN 60512-5-1	2002
IEC 60512-11-6	2002	Connectors for electronic equipment - Tests and measurements - Part 11-6: Climatic tests - Test 11f: Corrosion, salt mist	EN 60512-11-6	2002
IEC 60512-11-7	2003	Connectors for electronic equipment - Tests and measurements - Part 11-7: Climatic tests - Test 11g: Flowing mixed gas corrosion test	EN 60512-11-7	2003
IEC 60512-13-5	-	Connectors for electronic equipment - Tests and measurements - Part 13-5: Mechanical operation tests - Test 13e: Polarizing and keying method	EN 60512-13-5	-
IEC 60512-19-3	1997	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods - Part 19: Chemical resistance tests - Section 3: Test 19c - Fluid resistance	EN 60512-19-3	1997
IEC 60512-23-3	2000	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods - Part 23-3: Test 23c: Shielding effectiveness of connectors and accessories	EN IEC 60512-23-3	2019
IEC 60512-23-4	2001	Connectors for electronic equipment - Tests and measurements - Part 23-4: Screening and filtering tests - Test 23d: Transmission line reflections in the time domain	EN 60512-23-4	2001

FprEN IEC 60335-2-40:2020 (E)

Publication	Year	Title	EN/HD	Year
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corrigendum May	1993
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	2013
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60999-1	1999	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm2 up to 35 mm2 (included)	EN 60999-1	2000
IEC 60999-2	2003	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors above 35 mm2 up to 300 mm2 (included)	EN 60999-2	2003
IEC 61210	-	Connecting devices - Flat quick-connect terminations for electrical copper conductors - Safety requirements	EN 61210	-
IEC 61373	2010	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	2010
IEC 61984	2008	Connectors - Safety requirements and tests	EN 61984	2009
IEC 61991	-	Railway applications - Rolling stock - Protective provisions against electrical hazards	EN 50153	-
IEC 62497-1	2010	Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment	EN 50124-1	2017
			+ A1	—[1]
ISO 1431-1	2012	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Part 1: Static and dynamic strain testing	-	-
ISO 4892-2	2013	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2	2013

[1] Under preparation. Stage at the time of publication: EN 50124-1:2017/prA1:2023.

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INTERNATIONAL STANDARD

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Railway applications – Rolling stock – Electrical connectors – Requirements and test methods

Applications ferroviaires – Matériel roulant – Connecteurs électriques – Exigences et méthodes d'essai

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INTERNATIONAL STANDARD

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RAILWAY APPLICATIONS – ROLLING STOCK – ELECTRICAL CONNECTORS – REQUIREMENTS AND TEST METHODS

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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International Standard IEC 62847 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

EN 50467:2011 has served as a basis for the elaboration of this standard.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/2110/FDIS	9/2139/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

INTRODUCTION

This International Standard provides performance requirements and tests for low-voltage electrical connectors intended to be installed on board rolling stock, either inside or outside. Safety requirements and tests for electrical connectors are already covered in general by IEC 61984:2008. The additional requirements and testing of specific characteristics demanded by rolling stock applications are set out in this International Standard. One goal of this International Standard is to avoid retesting of electrical connectors already in compliance with IEC 61984:2008 for those characteristics that have been assessed suitable also for use on board rolling stock.

Among the additional requirements for use on board rolling stock, those that can be verified by documentation of tests on the raw materials are distinguished from those to be assessed by tests on the component.

Due to the wide spectrum of existing and future specific rolling stock applications of electrical connectors, this International Standard does not select any particular geometric configuration of connectors, nor establish any particular values for electrical ratings such as voltage and current, or for any other characteristic. All such details should be selected and agreed between the parties involved (e.g. manufacturer and user) depending on the electrical, mechanical and environmental conditions expected in the intended use. Annexes A and C of this International Standard provide guidance.

Upon agreement between the parties involved, this International Standard may be used in conjunction with existing connector detail specifications for interchangeability purposes.

Specific standards based on this generic International Standard may be developed in the future to address particular connector requirements and designs, for instance, to fix dimensions for interchangeability and to set additional requirements for specific applications that, due to complexity and variety, are left here to agreement between parties involved.

RAILWAY APPLICATIONS – ROLLING STOCK – ELECTRICAL CONNECTORS – REQUIREMENTS AND TEST METHODS

1 Scope

This International Standard retains IEC 61984:2008 as the minimum performance requirements for railway rolling stock electrical connectors.

It identifies additional terms, test methods and performance requirements for single-pole and multipole connectors with rated voltages up to 1 000 V, rated currents up to 125 A per contact and frequencies below 3 MHz used for indoor and outdoor applications in railway rolling stock.

This International Standard does not cover:

- connectors with breaking capacity (CBCs) as defined in IEC 61984:2008, 3.2, because on board rolling stock connectors are not intended to be operated (i.e. mated and unmated) under load or when live, either by means of procedures or by the presence of interlocks, as required by IEC 61991;
- non-rewirable connectors as defined in IEC 61984:2008, 3.5;
- automatic couplers, due to their additional mechanical complexity and the need for more specific requirements and testing;
- inter-vehicle jumpers, as they are connector and cable assemblies whose characteristics depend on those of both elements. Inter-vehicle connectors within the limits set in the scope of this International Standard are therefore covered by the agreed choice of suitable mechanical and environmental characteristics as defined by Annex B, and suggested by Annex C.

This International Standard identifies the application levels for electrical connectors based on

a) the severity of the service conditions in different rolling stock technologies,

b) the intended use of the rolling stock,

c) the location of the connector in the rolling stock system.

This International Standard is not applicable to internal connections of electronic devices such as connectors for printed boards and rack-and-panel connectors.

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.

IEC 60050-581, *International Electrotechnical Vocabulary – Part 581: Electromechanical components for electronic equipment* (available at: http://www.electropedia.org)

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-70:1995, *Environmental testing – Part 2-70: Tests – Test Xb: Abrasion of markings and letterings caused by rubbing of fingers and hands*

IEC 60309-1:1999, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60352-2:2006, *Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance*
IEC 60352-2:2006/AMD1:2013

IEC 60352-3, *Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-4, *Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-5, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60352-6, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance*

IEC 60352-7, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance*

IEC 60417, *Graphical symbols for use on equipment* (available at: http://www.graphical-symbols.info/equipment)

IEC 60512-1:2001, *Connectors for electronic equipment – Tests and measurements – Part 1: General*

IEC 60512-1-1:2002, *Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination*

IEC 60512-4-1:2003, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof*

IEC 60512-5-1:2002, *Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-carrying capacity tests –Test 5a: Temperature rise*

IEC 60512-11-6:2002, *Connectors for electronic equipment – Tests and measurements – Part 11-6: Climatic tests – Test 11f: Corrosion, salt mist*

IEC 60512-11-7:2003, *Connectors for electronic equipment – Tests and measurements – Part 11- 7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

IEC 60512-13-5, *Connectors for electronic equipment – Tests and measurements – Part 13-5: Mechanical operation tests – Test 13e: Polarizing and keying method*

IEC 60512-19-3:1997, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 19: Chemical resistance tests – Section 3: Test 19c – Fluid resistance*

IEC 60512-23-3:2000, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 23-3: Test 23c: Shielding effectiveness of connectors and accessories*

IEC 60512-23-4:2001, *Connectors for electronic equipment – Tests and measurements – Part 23-4: Screening and filtering tests – Test 23d: Transmission line reflections in the time domain*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included)*

IEC 60999-2:2003, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm^2 up to 300 mm^2 (included)*

IEC 61210, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61373:2010, *Railway applications – Rolling stock equipment – Shock and vibration tests*

IEC 61984:2008, *Connectors – Safety requirements and tests*

IEC 61991, *Railway applications – Rolling stock – Protective provisions against electrical hazards*

IEC 62497-1:2010, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

ISO 1431-1:2012, *Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 1: Static and dynamic strain testing*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*