

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

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



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 45.060

ISBN 978-2-8322-3207-1

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions	10
4 Technical information (electrical ratings)	17
5 Classification.....	17
5.1 General.....	17
5.2 Severity of service conditions on different rolling stock technologies	17
5.3 Intended use of rolling stock.....	17
5.4 Location of connector on board rolling stock	17
6 Requirements.....	20
6.1 General.....	20
6.2 Marking and identification.....	20
6.2.1 Identification	20
6.2.2 Marking	20
6.2.3 Marking of position for contacts.....	21
6.3 Provision against incorrect mating (non-interchangeable)	21
6.4 Protection against electric shock	21
6.5 Provisions for earthing	21
6.6 Terminations and connection methods.....	21
6.7 Resistance to ageing.....	22
6.8 General design.....	22
6.8.1 Polarization.....	22
6.8.2 Fixing of live parts	23
6.8.3 Connection of conductors.....	23
6.9 Design of a free connector	23
6.10 Interlock.....	23
6.11 IP degree of protection	23
6.12 Dielectric strength	23
6.13 Mechanical and electrical durability	23
6.14 Cable strain relief.....	24
6.15 Mechanical strength	24
6.16 Vibration and shock.....	24
6.17 Insulation coordination	25
6.18 Temperature classes.....	25
6.19 Temperature rise.....	25
6.20 Protection against corrosion	25
6.21 Electromagnetic compatibility (EMC) requirements.....	26
6.22 Fire behaviour of materials and components	26
6.23 Resistance to chemically active substances and to contaminating fluids	26
6.24 Resistance to ozone.....	26
6.25 Resistance to UV	26
7 Tests.....	27
7.1 Overview.....	27

7.1.1	General	27
7.1.2	Preconditioning and preparation	27
7.1.3	Test conditions	27
7.2	Test schedule	29
7.3	Tests on raw materials	36
7.4	Visual examination	36
7.5	Durability of marking	37
7.6	Interlock.....	37
7.7	Protection against electric shock	37
7.8	Temperature rise.....	37
7.9	Mechanical operation	38
7.10	Vibration and shock.....	38
7.11	Measurement of clearances and creepage distances.....	39
7.12	Dielectric strength	39
7.13	Resistance between accessible metal parts and the protective earthing contact.....	39
7.14	Corrosion test	40
7.15	Ozone resistance (ISO 1431-1)	40
7.16	Resistance to UV (ISO 4892-2:2013)	40
7.17	Resistance to fluids (IEC 60512-19-3:1997)	40
Annex A (informative) Additional characteristics to be agreed by the manufacturer and the user		41
A.1	Additional information to be provided upon request of the user.....	41
A.1.1	General	41
A.1.2	Geometrical characteristics	41
A.1.3	Electrical characteristics	41
A.1.4	Environmental characteristics	42
A.1.5	Mechanical characteristics	42
A.2	Information for testing additional to that mentioned above	42
Annex B (normative) Severity of the service conditions in different rolling stock locations (mandatory)		43
Annex C (informative) Severity of the service conditions in different rolling stock locations (optional)		44
Bibliography		45
Figure 1 – Typical examples of connections		11
Figure 2 – Multiple connectors		12
Figure 3 – Typical connector locations on board rolling stock.....		18
Figure 4 – Test sample for temperature rise test.....		38
Table 1 – Example of typical connector locations on board rolling stock		19
Table 2 – Preferred number of operating cycles.....		24
Table 3 – Preferred test temperatures		25
Table 4 – Plan of specimens required for tests		27
Table 5 – Mechanical test group A		29
Table 6 – Service life test group B.....		30
Table 7 – Thermal test group C.....		30

Table 8 – Climatic test group D	31
Table 9 – Degree of protection test group E.....	33
Table 10 – Vibration and shock test group F.....	34
Table 11 – Resistance to fluids test group G.....	35
Table 12 – Shielding effectiveness test group H	36
Table 13 – Tests on raw materials.....	36
Table 14 – Test voltages.....	39
Table B.1 – Minimum severity of service conditions in different rolling stock locations	43
Table C.1 – Minimum severity of service conditions in different rolling stock locations	44

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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, 2.1, 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*