

---

---

**Electrically propelled road vehicles —  
Safety specifications —**

**Part 3:  
Electrical safety**

*Véhicules routiers électriques — Spécifications de sécurité —  
Partie 3: Sécurité électrique*



This document is a preview generated by ERS



# **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>2</b>
<b>4 Voltage classes</b>	<b>6</b>
<b>5 General requirements</b>	<b>6</b>
5.1 Environmental and operational requirements	6
5.2 Marking	6
5.2.1 Marking of voltage class B electric components	6
5.2.2 Marking of voltage class B wiring	7
<b>6 Requirements for protection of persons against electric shock</b>	<b>7</b>
6.1 General requirements	7
6.1.1 General requirements for connected sections of a circuit	7
6.1.2 General requirements for voltage class B1	7
6.1.3 General requirements for voltage class B2	8
6.2 Basic protection	8
6.3 Fault protection and additional measures	8
6.3.1 Equipotential bonding	8
6.3.2 Isolation resistance	8
6.3.3 Provisions for capacitive coupling and capacitive discharge	10
6.3.4 De-energization	10
6.3.5 Alternative protection measures	11
6.4 General requirements for protective provisions	11
6.4.1 General	11
6.4.2 Requirements for insulation	11
6.4.3 Requirements for protective barriers and protective enclosures	11
6.4.4 Requirements for connectors	12
6.4.5 Insulation Coordination	12
6.5 Alternative approach for protection against electric shock	12
<b>7 Protection against thermal incidents</b>	<b>13</b>
7.1 Overload protection	13
7.2 Short-circuit protection	13
<b>8 Requirements for vehicle power supply circuit</b>	<b>13</b>
<b>9 Owner's manual</b>	<b>13</b>
<b>10 Test procedures</b>	<b>13</b>
10.1 General	13
10.2 Continuity test for equipotential bonding	13
10.3 Isolation resistance measurements for voltage class B2 electric circuits	14
10.3.1 Preconditioning and conditioning	14
10.3.2 Isolation resistance measurements of the balance of electric circuits	14
10.3.3 Isolation resistance measurement of the voltage class B2 electric power sources	15
10.3.4 Isolation resistance measurement of entire electric circuits	17
10.4 Test for isolation resistance monitoring system	17
10.5 Touch current	17
10.6 Withstand voltage test	18
10.6.1 General	18
10.6.2 Preconditioning and conditioning	18
10.6.3 Test procedure	19
10.6.4 Test criteria	19

<b>Bibliography</b> .....	<b>20</b>
---------------------------	-----------

This document is a preview generated by EVS

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. [www.iso.org/directives](http://www.iso.org/directives)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. [www.iso.org/patents](http://www.iso.org/patents)

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

This document was prepared by Technical Committee ISO/TC 22 *Road vehicles*, Subcommittee SC 37, *Electrically propelled vehicles*.

This third edition cancels and replaces the second edition (ISO 6469-3:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- extension of pure electric shock protection to all electric safety requirements including those against thermal incidents;
- introduction of definitions and requirements for new voltage classes B1 and B2;
- addition of specific requirements for capacitive discharge;
- new test specification for the isolation resistance monitoring system; and
- new requirements and test for touch current.



# Electrically propelled road vehicles — Safety specifications —

## Part 3: Electrical safety

**IMPORTANT** — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

### 1 Scope

This document specifies electrical safety requirements for voltage class B electric circuits of electric propulsion systems and conductively connected auxiliary electric systems of electrically propelled road vehicles.

It specifies electrical safety requirements for protection of persons against electric shock and thermal incidents.

It does not provide comprehensive safety information for manufacturing, maintenance and repair personnel.

NOTE 1 Electrical safety requirements for post-crash are described in ISO 6469-4.

NOTE 2 Electrical safety requirements for conductive connections of electrically propelled road vehicles to an external electric power supply are described in ISO 17409.

NOTE 3 Specific electrical safety requirements for magnetic field wireless power transfer between an external electric power supply and an electrically propelled vehicle are described in ISO PAS 19363.

NOTE 4 Electrical safety requirements for motorcycles and mopeds are described in ISO 13063.

### 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.

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 17409, *Electrically propelled road vehicles — Connection to an external electric power supply — Safety requirements*

ISO 20653, *Road vehicles — Degrees of protection (IP code) — Protection of electrical equipment against foreign objects, water and access*

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60950-1, *Information technology equipment — Safety — Part 1: General requirements*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*