INTERNATIONAL STANDARD

ISO 19453-4

First edition
2018-03

Road vehicles — Environmental conditions and testing for electrical and electronic equipment for drive system of electric propulsion vehicles —

Part 4: Climatic loads

Véhicules routiers — Spécifications d'environnement et essais de l'équipement électrique et électronique pour les véhicules à propulsion électrique —

Partie 4: Contraintes climatiques

Reference number
ISO 19453-4:2018(E)

© ISO 2018



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
Website: www.iso.org

Published in Switzerland

 © ISO 2018 – All rights reserved

Contents

Page

Foreword ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Operating temperature ranges **2**

5 Tests and requirements **4**

5.1 Tests at constant temperature 4
5.1.1 Low-temperature tests 4
5.1.2 High-temperature tests 4
5.2 Temperature cycling tests 5
5.2.1 Temperature cycle with specified change rate 5
5.2.2 Rapid change of temperature with specified transition duration 8
5.3 Cold water shock tests 8
5.3.1 Purpose 8
5.3.2 Splash water test 8
5.3.3 Submersion test 11
5.4 Salt spray tests 11
5.4.1 Corrosion test 11
5.4.2 Leakage and function test 12
5.4.3 Salt spray combined cycle test 13
5.5 Humid heat, cyclic test — Dewing test 17
5.5.1 Purpose 17
5.5.2 Test method 17
5.5.3 Requirements 19
5.6 Damp heat, steady state test 19
5.6.1 Purpose 19
5.6.2 Test method 19
5.6.3 Requirements 19
5.7 Condensation test 19
5.7.1 Purpose 19
5.7.2 Test method 19
5.7.3 Requirement 22
5.8 Corrosion test with flow of mixed gas 23
5.8.1 Purpose 23
5.8.2 Test method 23
5.8.3 Requirement 23
5.9 Solar radiation test 23
5.10 Dust test 23
5.10.1 Purpose 23
5.10.2 Test method 23
5.10.3 Requirement 24
5.11 Atmospheric pressure test 24
5.11.1 Purpose 24
5.11.2 Test method 24
5.11.3 Requirements 25

6 Code for climatic loads **26**

7 Protection against dust and water **26**

8 Documentation **26**

Annex A (informative) **Usual tests and requirements for equipment depending on the mounting location** **27**

© ISO 2018 – All rights reserved

Annex B (informative) **Background information to determine the number of cycles of the salt spray combined test** **29**
Annex C (informative) **Insulation tests** **33**
Annex D (informative) **The necessity of testing atmospheric pressure** **36**
Bibliography **40**

 © ISO 2018 – All rights reserved

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 (see 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 (see 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

A list of all parts in the ISO 19453 series can be found on the ISO website.

© ISO 2018 – All rights reserved

Road vehicles — Environmental conditions and testing for electrical and electronic equipment for drive system of electric propulsion vehicles —

Part 4:
Climatic loads

1 Scope

This document specifies requirements for the electric propulsion systems and components with maximum working voltages according to voltage class B. It does not apply to high voltage battery packs (e.g. for traction) and systems and components inside. It describes the potential environmental stresses and specifies tests and requirements recommended for different stress levels on/in the vehicle.

This document describes climatic loads.

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 16750-1, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 1: General*

ISO 19453-1, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment for drive system of electric propulsion vehicles — Part 1: General*

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

IEC 60068-1:2013, *Environmental testing — Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2, *Environmental testing — Part 2-2: Tests — Test B: Dry heat*

IEC 60068-2-11, *Basic environmental testing procedures — Part 2-11: Tests — Test Ka: Salt mist*

IEC 60068-2-14, *Environmental testing — Part 2-14: Tests — Test N: Change of temperature*

IEC 60068-2-30, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-52:2017, *Environmental testing — Part 2-52: Tests — Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-60, *Environmental testing — Part 2-60: Tests — Test Ke: Flowing mixed gas corrosion test*

IEC 60068-2-78, *Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state*

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

© ISO 2018 – All rights reserved

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16750-1 and ISO 19453-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Operating temperature ranges

Choose the applicable temperature range from Table 1 to be presented in the specifications of the device under test (DUT).

In the case of hot soak, choose from Table 2 the relative temperature increase ΔT_{HS} and add it to the maximum temperature T_{max} to have the absolute hot soak temperature (T_{maxHS}).

$$T_{max} + \Delta T_{HS} = T_{maxHS}$$

For further details, refer to 5.2.1.

The paint repair temperature (T_{maxPR}) can be set to a higher value than the operating temperature. Specify this temperature in the specifications of the DUT.

© ISO 2018 – All rights reserved