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Road vehicles — Environmental conditions and testing for electrical and electronic equipment —

Part 4: Climatic loads

Véhicules routiers — Spécifications d'environnement et essais de l'équipement électrique et électronique —

Partie 4: Contraintes climatiques

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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 document 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).

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For an explanation of 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 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*.

This fourth edition cancels and replaces the third edition (ISO 16750-4:2010), which has been technically revised.

The main changes are as follows:

— integration and harmonization of contents from ISO 19453-4:2018 (e.g. addition of 5.8 and 5.12);

— subdivision of test methods in temperature cycle test for application to DUTs of "small and lightweight" or "large and heavy" size (5.3);

— addition of test methods for large and heavy DUTs in cold water shock test (5.4);

— addition of three salt spray corrosion tests (5.5.4, 5.5.5 and 5.5.6);

— addition of concrete test method and requirements in solar radiation test (5.10);

— addition of optional test method in dust test for DUT installed in passenger compartment or luggage/load compartment (5.11);

— addition of new tests and the selection of applied cycles in rapid change of temperature with specified transition duration (Clause 6, Table 10);

— subdivision of mounting location defining the corresponding severities (Annex A);

— error correction (Annex B, Figure B.1, B.2 and Table B.1 taken over from ISO 19453-4:2018);

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— clarification of technical background to determine number of cycles and severities according to the mounting location (Annex B, Clause B.4);

— subdivision of electric isolation test methods for voltage class A and voltage class B (Annex C).

A list of all parts in the ISO 16750 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Road vehicles — Environmental conditions and testing for electrical and electronic equipment —

Part 4: Climatic loads

1 Scope

This document applies to electric and electronic systems and components for vehicles including electric propulsion systems and components with maximum working voltages according to voltage class B. It describes the potential environmental stresses and specifies tests and requirements recommended for the specific mounting location on/in the vehicle.

This document describes climatic loads.

This document is not intended to apply to environmental requirements or testing for systems and components of motorcycles and mopeds.

Systems and their components released for production, or systems and their components already under development prior to the publication date of this document, can be exempted from fulfilling the changes in this edition compared to the previous one.

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

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 4892-4, *Plastics — Methods of exposure to laboratory light sources — Part 4: Open-flame carbon-arc lamps*

ISO 9227:2022, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 11997-3, *Paints and varnishes — Determination of resistance to cyclic corrosion conditions — Part 3: Testing of coating systems on materials and components in automotive construction*

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

ISO 16750-2, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads*

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

ISO 21498-1, *Electrically propelled road vehicles — Electrical specifications and tests for voltage class B systems and components — Part 1: Voltage sub-classes and characteristics*

ISO 21780, *Road vehicles — Supply voltage of 48 V — Electrical requirements and tests*

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

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IEC 60068-2-1:2007, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing — Part 2-2: Tests — Test B: Dry heat*

IEC 60068-2-11:2021, *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 60068-2-30:2005, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-38, *Environmental testing — Part 2-38: Tests — Test Z/AD: Composite temperature/humidity cyclic test*

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

IEC 60068-2-60:2015, *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 60664-1:2020, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests*

3 Terms and definitions

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

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

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

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

4 Operating temperature ranges

Choose the applicable temperature range from Table 1 to be presented in the specifications of the 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 5.3.1.

The paint repair temperature (T_{maxPR}) as defined in ISO 16750-1 can be set to a higher value than the operating temperature. Specify this temperature in the specifications of the DUT.

Table 1 — Operating temperature ranges

Code	Minimum operating temperature T_{min} [°C]	Maximum operating temperature T_{max} [°C]
A	–20	65
B	–30	65

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