

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Connectors for electrical and electronic equipment – Tests and measurements –
Part 9-5: Endurance tests – Test 9e: Current loading, cyclic**

**Connecteurs pour équipements électriques et électroniques –
Essais et mesures –
Partie 9-5: Essais d'endurance – Essai 9e: Charge en courant, essai cyclique**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –
TESTS AND MEASUREMENTS –****Part 9-5: Endurance tests – Test 9e: Current loading, cyclic**

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 60512-9-5 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- added method B and renamed the former test method as method A, to provide an alternative with more adjustable time “ON” and “OFF” for products with larger thermal mass;
- added introduction to provide background of this revision;

The text of this International Standard is based on the following documents:

FDIS	Report on voting
48B/2803/FDIS	48B/2819/RVD

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

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

A list of all parts in the IEC 60512 series, published under the general title *Connectors for electrical and electronic equipment – Tests and measurements*, can be found on the IEC website.

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

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- withdrawn,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

INTRODUCTION

The object of this document is to detail a standard method for subjecting solderless connections to a thermal stress conditioning by cyclic current loading, in order to verify the right combination of conductor material, termination material and tool application – if any is required, in view of any possible creep phenomena that might lead to a reduction of performance of the solderless connection.

Although requiring electric power to apply the specified current loading, this test is an endurance test by thermal conditioning, whose aim is to submit specimens of connectors using solderless connections or of solderless connections to a repeated cycling between ambient temperature (normal laboratory conditions) and the upper limiting temperature (ULT) specified for the connector or solderless connection, either by the detail product specification or the manufacturer specification, or by the default values provided in the relevant part of IEC 60352 series.

The way the solderless connection under test acts is affected both by the solderless termination design and material and the attached conductor size and material, as well as by any tool applied to produce the connection, with all relevant settings and accessories as specified for the particular combination of termination and conductor.

Time “ON” represents the “heating” interval necessary to reach the ULT from ambient temperature, time “OFF” represents the “cooling” interval, necessary to cool down the specimen to ambient temperature. The sum of these intervals represents a cycle. Due to the various nature of a solderless connection in terms of size and thermal inertia of the termination and of the attached conductor, the traditional method with fixed duty cycle duration it is not always suitable.

For this reason, two methods are now provided to perform this test:

- method A is the traditional one, with time “ON” of 45 min and time “OFF” of 15 min, that has proven suitable for small-sized solderless connections, e.g. connections employing conductors with cross-sectional area less than or equal to 10 mm². However, even in such cases, depending on the thermal mass of the termination or the conductor (e.g. for a crimped connection), method B may be preferable;
- method B is with time “ON” or time “OFF” to be determined experimentally by the first test cycle. Moreover, heating time by current load may be even abbreviated by increasing and controlling the current load, whereas cooling may be accelerated too, by forced air cooling. Because the number of repeated cycles is the primary factor affecting the severity of this test, long duration times at ULT (highest temperature) and ambient temperature (lowest temperature) may not be necessary for the purpose of this test. This method is suitable for large-sized solderless connections, e.g. connections employing conductors with cross-sectional area larger than 10 mm².

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 9-5: Endurance tests – Test 9e: Current loading, cyclic

1 Scope

This part of IEC 60512, when required by the detail product specification, is used for testing connectors or solderless connections within the scope of technical committee 48. It may also be used for similar devices when specified in a detail product specification.

The object of this document is to detail a standard method for subjecting solderless connections to thermal stress conditioning by cyclic current loading.

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.

IEC 60352 (all parts), *Solderless connections*

IEC 60512-1:2018, *Connectors for electrical and electronic equipment – Tests and measurements – Part 1: Generic specification*

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

IEC 60512-2-1, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-2-2, *Connectors for electronic equipment – Tests and measurements – Part 2-2: Electrical continuity and contact resistance tests – Test 2b: Contact resistance – Specified test current method*

IEC 60512-2-6, *Connectors for electronic equipment – Tests and measurements – Part 2-6: Electrical continuity and contact resistance tests – Test 2f: Housing (shell) electrical continuity*

IEC 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: Insulation resistance*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60512-1 apply.

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