BS EN 60512-9-3:2011

BSI Standards Publication

Connectors for electronic equipment – Tests and measurements

Part 9-3: Endurance tests — Test 9c: Mechanical operation (engaging/separating) with electrical load

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National foreword

This British Standard is the UK implementation of EN 60512-9-3:2011. It is identical to IEC 60512-9-3:2011. It supersedes BS EN 60512-9-3:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/48, Electromechanical components and mechanical structures for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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English version

Connectors for electronic equipment - Tests and measurements - Part 9-3: Endurance tests - Test 9c: Mechanical operation (engaging/separating) with electrical load

(IEC 60512-9-3:2011)

Connecteurs pour équipements électroniques - Essais et mesures - Partie 9-3: Essais d'endurance - Essai 9c: Fonctionnement mécanique (d'accouplement et de désaccouplement) avec charge électrique (CEI 60512-9-3:2011)

Steckverbinder für elektronische Einrichtungen – Mess- und Prüfverfahren - Teil 9-3: Dauerprüfungen - Prüfung 9c: Mechanische Lebensdauer (Stecken und Ziehen) mit elektrischer Belastung (IEC 60512-9-3:2011)

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document (48B/2238/FDIS), future edition 2 of IEC 60512-9-3, prepared by SC 48B, Connectors, of IEC TC 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60512-9-3 on 2011-07-27.

This European Standard supersedes EN 60512-9-3:2006 + corr. Dec.2006.

The main technical changes with regard to EN 60512-9-3:2006 + corr. Dec.2006 are as follows:

– An additional requirement to 4.1 stating that if more than one electrical circuit is wired for testing, the wiring shall be carried out in a parallel electrical circuit.

– Subclauses 4.3 through 4.7 were removed and replaced by 4.2 through 4.4.

This standard is to be read in conjunction with EN 60512-1 and EN 60512-1-100, which explains the structure of the EN 60512 series.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-04-27
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-07-27

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60512-9-3:2011 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60068-1	-	Environmental testing - Part 1: General and guidance	EN 60068-1	-
IEC 60068-2-13	-	Environmental testing - Part 2: Tests - Test M: Low air pressure	EN 60068-2-13	-
IEC 60512-1	-	Connectors for electronic equipment - Tests and measurements - Part 1: General	EN 60512-1	-
IEC 60512-1-1	-	Connectors for electronic equipment - Tests and measurements - Part 1-1: General examination - Test 1a: Visual examination	EN 60512-1-1	-
IEC 60512-1-100	-	Connectors for electronic equipment - Tests and measurements - Part 1-100: General - Applicable publications	EN 60512-1-100	-
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	EN 60512-2-1	-
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	EN 60512-2-2	-
IEC 60512-3-1	-	Connectors for electronic equipment - Tests and measurements - Part 3-1: Insulation tests - Test 3a: Insulation resistance	EN 60512-3-1	-
IEC 60512-4-1	-	Connectors for electronic equipment - Tests and measurements - Part 4-1: Voltage stress tests - Test 4a: Voltage proof	EN 60512-4-1	-

CONTENTS

CONNECTORS FOR ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 9-3: Endurance tests – Test 9c: Mechanical operation (engaging and separating) with electrical load

1 Scope and object

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

The object of this standard is to define a standard test method to assess the mechanical and electrical operational endurance, i.e. engaging and separating cycles, of a connector in an operating mode which includes a specified electrical load.

2 Normative references

The following referenced documents are indispensable for the application 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 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-13, *Environmental testing – Part 2-13: Tests – Test M: Low air pressure*

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

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

IEC 60512-1-100, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

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 current method*

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 Preparation

3.1 Preparation of specimen

The specimen shall consist of a component with its terminations and cables according to Clause 5, a), unless otherwise specified in the detail specification. Any preconditioning given in the detail specification shall be applied.

3.2 Mounting

The specimen under test shall be mounted per the manufacturer's instructions or as described in the detail specification.

4 Test method

4.1 General

The specimen shall be subjected to any electrical load and mechanical operational endurance test in accordance with the requirements of the detail specification or other applicable specification.

The specimen shall be operated (engaged/separated) to make and break the current load as specified in the detail specification or other applicable specification.

In the case of specimen(s) having more than one circuit, the circuits shall be wired in parallel, with appropriate duplication of other circuit components.

A circuit diagram, typical of that which may be specified, is shown in Annex A.

4.2 Electrical load

The type of electrical load, current, d.c. or a.c. voltage and frequency shall be stated in the detail specification or other applicable specification.

An 'equivalent circuit' is intended to simulate a typical wiring installation including electrical load and cable.

The equivalent circuit is specified by a resistance R, a capacitance C and an inductance L.

A typical circuit diagram is shown in Annex A.

In the case of specimen(s) having more than one circuit, the circuits shall be wired in parallel, with appropriate duplication of other circuit components.

During the mating cycles, the current and open-circuit voltage tolerances shall be within $^{+5}_{0}$ % of the rated values specified in the detail specification.

4.3 Mechanical operation

The specimen shall be operated (engaged and separated) to make and break the current load as specified below.

Speed, duty cycles and number of operations shall be stated in the detail specification or other applicable specification. One engaging and one separating constitutes one operation.

Mechanical aids which simulate normal operation without introducing abnormal stresses may be used unless otherwise specified by the detail specification.

The engaging and separating speed shall be (50 ± 5) mm/s, if not otherwise specified in the detail specification or other applicable specification.

There will be a pause between operations of not less than 20 s if not otherwise specified, in the detail specification or other applicable specification.

4.4 Environmental test conditions

These shall be standard conditions according to IEC 60068-1, unless otherwise stated in the detail specification.

This test may be required at low air pressure. In this case, the atmospheric conditions shall be in accordance with test M: Low air pressure of IEC 60068-2-13. The severity shall be as specified in the detail specification or other applicable specification.

4.5 Measurements

4.5.1 Initial measurements

Before testing according to 4.1 above, the following tests shall be performed:

a) visual examination (IEC 60512-1-1);
b) contact resistance – Millivolt level method (IEC 60512-2-1) ;
c) insulation resistance (IEC 60512-3-1) ;
d) voltage proof (IEC 60512-4-1) ;
e) sealing (IEC 60068-2-13), if applicable.

4.5.2 Measurements during the test

Contact resistance may be monitored during the test according to Contact resistance – Specified current method (IEC 60512-2-2).

4.5.3 Final measurements

a) Visual examination (IEC 60512-1-1).
b) Contact resistance – Millivolt level method (IEC 60512-2-1).
c) Insulation resistance (IEC 60512-3-1).
d) Voltage proof (IEC 60512-4-1).
e) Sealing (IEC 60068-2-13), if applicable.

The values and requirements shall be in accordance with those details referenced in Clause 5 below.

5 Details to be specified

When this test is required by the detail specification, the following details shall be given:

a) Preparation of the specimen, type size and length of wire (cable) to be used.
b) Any mounting of the specimen.
c) Type of electrical load(s) e.g. resistance, capacitance and inductance.
d) Voltage, a.c. or d.c. value, waveform type e.g. harmonic content and crest factor, impedance etc., as appropriate.

e) Electrical current value.

f) Atmospheric pressure, if other than standard;

g) Number and duty cycle of engaging and separating cycles.

h) Requirements for final measurements and/or allowable change from initial measurements.

i) Any mechanical aids.

j) If any contact lubricant shall be used and, if so, its specification.

k) If low pressure testing is required.

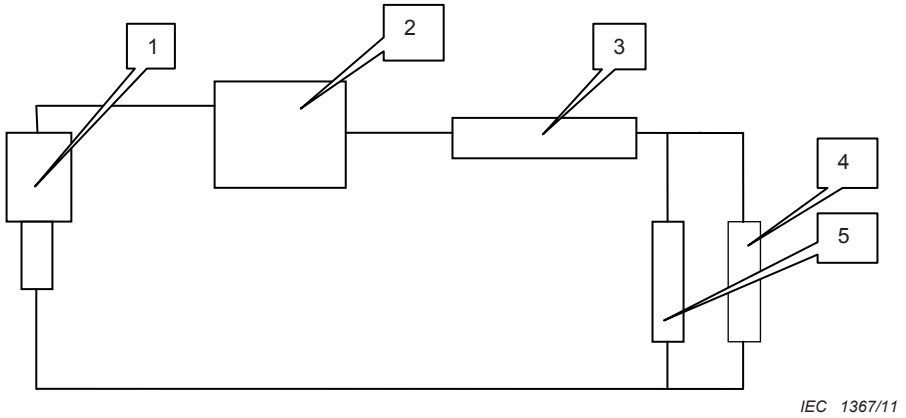
l) Any deviation from the standard test method.

Annex A
(informative)

Typical circuit diagram

A.1 Examples of electrical circuit

NOTE These diagrams (Figures A.1 and A.2) show a single circuit; in the case of an 'n' way connector, there will be 'n' instances of test load components. The power source may be multiple of singular, with appropriate cables/conductors.



Key
1 component under test
2 voltage source
3 inductor
4 resistor (variable)
5 capacitor

Figure A.1 – Example of circuit(s) – Diagrammatic

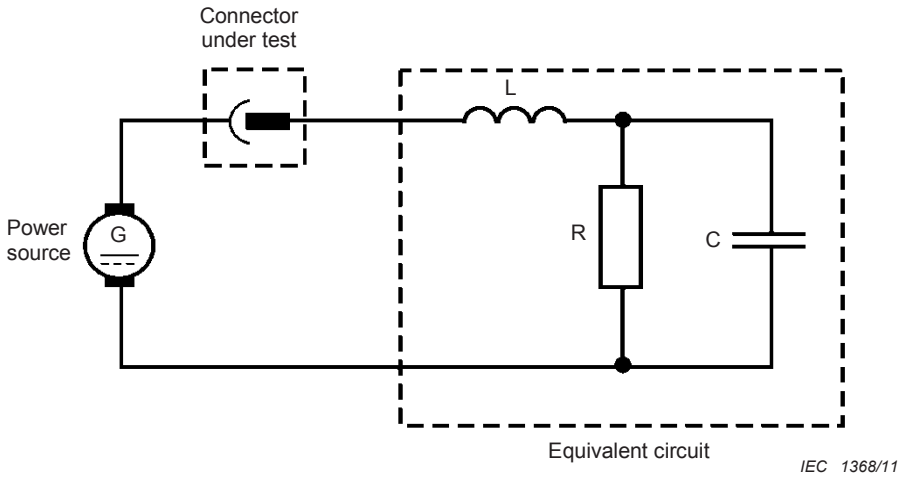


Figure A.2 – Example of circuit(s) – Circuit diagram

A.2 Over-voltage during switching

For switched electrical inductive and capacitive loads, the use of a protection circuit, for example surge diode, varistor or RC combination, may be considered to avoid high switch over-voltage/current.

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