BRITISH STANDARD

BS EN 60512-5-2:2002

Connectors for electronic equipment —

Part 5-2: Current-carrying capacity tests — Test 5b: Current-temperature derating

The European Standard EN 60512-5-2:2002 has the status of a British Standard

ICS 31.220.10

National foreword

This British Standard is the official English language version of EN 60512-5-2:2002. It is identical with IEC 60512-5-2:2002.

The UK participation in its preparation was entrusted by Technical Committee EPL/48, Electromechanical components and mechanical structures for electronic equipment, to Subcommittee EPL/48/2, Connectors for electronic equipment, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 6 June 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 7, and a back cover.

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EUROPEAN STANDARD **EN 60512-5-2**

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English version

Connectors for electronic equipment - Tests and measurements Part 5-2: Current-carrying capacity tests - Test 5b: Current-temperature derating

(IEC 60512-5-2:2002)

Connecteurs pour équipements électroniques -
Essais et mesures
Partie 5-2: Essais de courant limite -
Essai 5b: Taux de réduction de l'intensité en fonction de la température
(CEI 60512-5-2:2002)

Steckverbinder für elektronische Einrichtungen -
Mess- und Prüfverfahren
Teil 5-2: Prüfungen der Strombelastbarkeit -
Prüfung 5b: Strombelastbarkeit (Derating-Kurve)
(IEC 60512-5-2:2002)

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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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) 2003-01-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow) 2005-04-01

Endorsement notice

The text of the International Standard IEC 60512-5-2:2002 was approved by CENELEC as a European Standard without any modification.

CONNECTORS FOR ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 5-2: Current-carrying capacity tests – Test 5b: Current-temperature derating

1 Scope and object

This part of IEC 60512, when required by the detail specification, is used for testing electromechanical components 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 test is to detail a standard test method to assess the current-carrying capacity of electromechanical components at elevated ambient temperature.

2 General conditions

2.1 Determining the current-carrying capacity curve

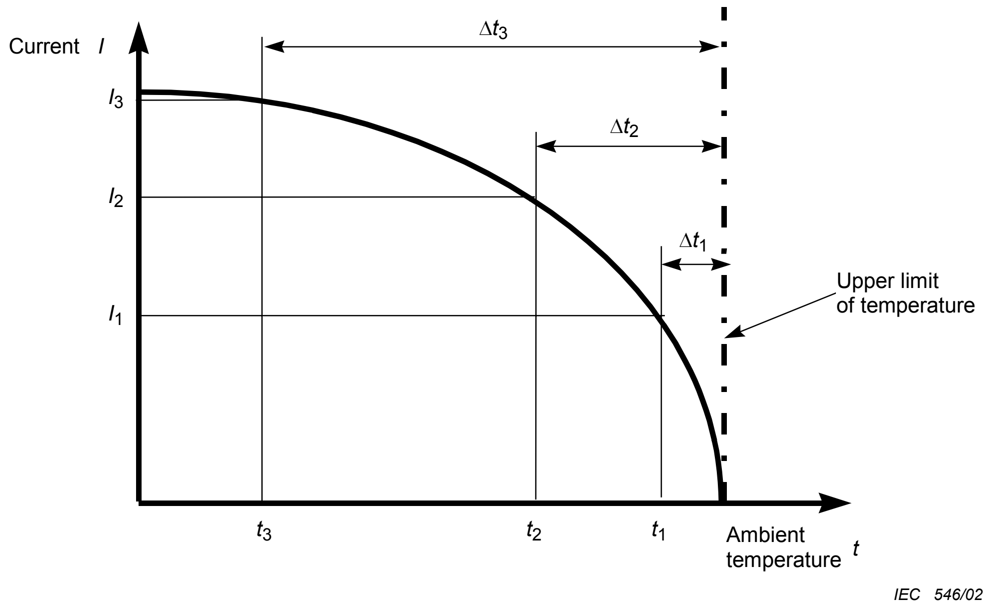
The current-carrying capacity is limited by the thermal properties of the materials which are used for the contacts, terminals as well as the insulating materials of housing. Therefore, it is a function of the self-generated heat and the ambient temperature at which a device operates.

Using the measuring conditions given in 3.2, the temperature t_b of a measuring point (approximately the hottest spot) of the component and the temperature t_u in the immediate environment of the component are measured at various currents. The difference between the two temperatures is the self-heating or rise created by the current flow. This may be expressed as:

$$t_b - t_u = \Delta t \text{ (K)}$$

The relation between the current, the temperature rise and the ambient temperature of the component is represented by a curve as shown in figure 1. Unless otherwise specified in the detail specification, the temperature rise is based upon the mean current of three specimens. The mean value derived from the measured values of these three specimens serves as the basic curve. At least three points of the basic curve shall be established.

The permissible upper-limit temperature of the materials employed is plotted as a vertical line on the graphs shown in figures 1 and 2, with current I as the ordinate and temperature t as the abscissa. The temperature rise Δt (mean value of three specimens), determined at current I_n, is deducted. From this, the maximum permissible ambient temperature t_u for the load current I_n is obtained, since the sum of the ambient temperature t_u and the temperature rise Δt shall not exceed the upper temperature limit of the materials.



NOTE An upper temperature limit, which may be imposed by e.g. material considerations, may truncate the curve.

Figure 1 – Construction of the basic current-carrying curve

2.2 Derating curve

A derating curve, see figure 2, derived from the basic curve, see figure 1, determined in accordance with 2.1, shall be specified in the relevant detail specification. This curve takes into account variations in specimens as well as errors in temperature measurements in the measuring equipment.

The derating factor is justified because the current-carrying capacity may be further limited by external factors, for example the size of the wire and unequal distribution of the loaded circuits. If these factors result in a current-carrying capacity other than that which may be expected due to thermal limitations, then a revised value shall apply.

2.3 Application of the current-carrying capacity curve

The derating curve determined in accordance with 2.2 represents the official current-carrying capacity curve as defined by this standard. Since it gives the maximum permissible current as a function of the ambient temperature, it is truly a derating curve. The cross-hatched area shown in figure 2 indicates the permissible operating range.

This derating curve is obtained by applying a reduction factor of 0,8 on the current value of the basic current-carrying curve, unless otherwise clearly specified on the derating curve.

NOTE If the detail specification specifies current-carrying capacity data, then the current-carrying capacity curve given in this standard must be cited. If values in tabular form are preferred, they should coincide with the current-carrying capacity curve.

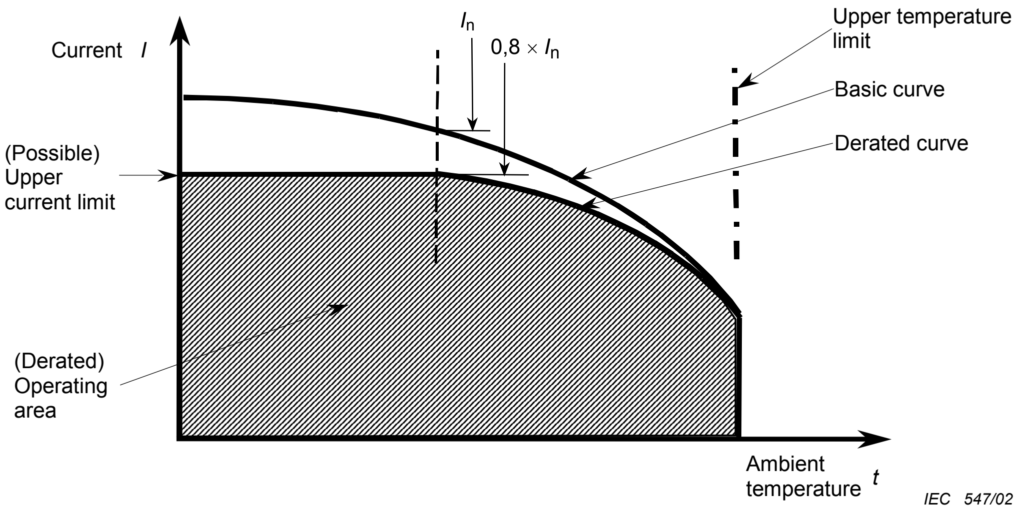


Figure 2 – Derating curve derived from the basic curve

3 Conditions of the test

3.1 Test set-up

Enclosure – The measurement shall be carried out in air as undisturbed as possible. Therefore, the specimen shall be mounted in an enclosure which protects the immediate environment from external movements of air. The enclosure should be made of a non-heat-reflective material.

The sides of the enclosure may be movable to accommodate different specimen sizes. The sides shall not be closer than 200 mm from the edges of the specimen. The enclosure may have a lid, any such lid shall be provided with ventilation apertures to minimize any rise in ambient temperature caused by the heating effect of the specimen under test.

Mounting – The specimen is to be arranged in the enclosure in a horizontal plane, 50 mm above the bottom of the enclosure and at least 150 mm below the top and equidistant from the sides. As far as possible, the specimen shall be in free suspension. If this is not possible, a thermal insulating material with a thermal conductivity ≤2 W/mK may be used, provided that not more than 20 % of the surface of the specimen is in contact with the insulating material.

Wiring – The specimen shall be connected with wires of suitable cross-section for the maximum current to be expected or according to the size of the termination. In order to reduce external heat dissipation to a minimum, at least the length of the connecting wires given in table 1 shall be within the measuring enclosure. In the case of multipole specimens, all contacts shall be wired in series with wire the same size as the connecting wires. These links shall be at least twice the minimum length specified in table 1.

The manufacturer's recommended, or industry standards, wiring method and tooling shall be used, unless otherwise stated in the detail specification.

NOTE In the case of specimens with moving contacts, care must be taken that the contacts are not disturbed by the connecting wires.

A mated connector set is considered to be a single specimen.

Table 1 – Minimum wire length for each specimen

Wire size mm^2	**Minimum length** mm
<0,5	200
0,5 to 5	500
>5	1 400

NOTE This table is based on heat conduction criteria, and is designed to ensure that the wires are long compared with their cross-section.

If the specimens require the use of printed circuits, the characteristics of these should be given in the detail specification.

3.2 Conditions of temperature measurement

If temperatures are measured with temperature probes, the probe leads shall pass through the insulation walls of the enclosure. Other methods of temperature measurement are permissible.

The measuring point for measuring the ambient temperature shall be located in a horizontal plane passing through the axis of the specimen. It shall be located 50 mm from the mid-point of the edge of the longest side of the specimen. Care shall be taken to protect the probe against radiant heat.

The point for measuring the temperature of the specimen shall be as near as practicable to the hottest part of each specimen.

NOTE The temperature probes may be thin thermocouples, e.g. nichrome/nickel wire with a diameter ≤0,3 mm. If thermocouples with the same type of calibration curve are used for both temperature probes, they may be connected in opposition in the measuring circuit. In this case, the temperature rise Δt is measured directly. However, t_b should be monitored to ensure that it does not exceed the upper temperature limit of the materials.

4 Method of measurement

The specimen shall be arranged in the enclosure as described in 3.1 and its terminals are connected to a regulated power supply through an ammeter, see figure 3.

The loading current may be a.c. or d.c. When a.c. current is used, the r.m.s. value applies.

If d.c. current is used, avoid voltage bias influence on the thermocouple by executing the test with reverse current.

The current shall be maintained for a period of approximately 1 h after thermal stability is achieved at each of the selected current levels. This is defined as when three consecutive values of temperature rise, taken at 5 min intervals, do not differ by more than 2 K of each other.

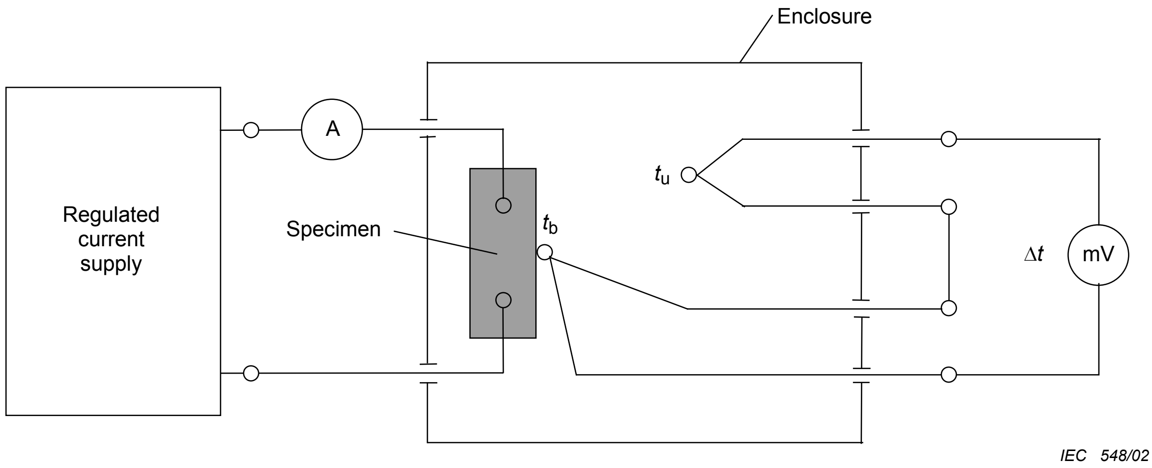


Figure 3 – Typical arrangement of the measuring apparatus

5 Details to be specified

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

a) mounting of specimen;
b) wire size and type;
c) upper temperature limit;
d) any deviation from the standard test method.

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