
British Standard

Basic environmental testing procedures

Part 2.1 Tests

Test U. Robustness of terminations and integral mounting devices

Essais fondamentaux climatiques et de robustesse mécanique

Partie 2.1 Essais

Essais U. Robustesse des sorties et des dispositifs de fixation

Grundsätzliche Umweltprüfverfahren

Teil 2.1 Prüfungen

Prüfung U. Mechanische Widerstandsfähigkeit der Anschlüsse und festmontierter Befestigungseinrichtungen

(This Part should be read in conjunction with Part 1.1 General and guidance)

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National foreword

This revision of this British Standard has been prepared under the direction of the General Electrotechnical Engineering Standards Committee. It is identical with IEC Publication 68-2-21 : 1983 'Basic environmental testing procedures, Part 2 : Tests — Test U : Robustness of terminations and integral mounting devices', published by the International Electrotechnical Commission (IEC). With certain exceptions (e.g. IEC 68-2-42 and IEC 68-2-43), all Parts of IEC Publication 68 are endorsed by CENELEC Harmonization Document (HD) 323.

This revision supersedes BS 2011 : Part 2.1U : 1977, which is withdrawn. The 1983 edition of IEC Publication 68-2-21 was produced in order to incorporate Amendments No. 1 (1979) and No. 2 (1980) to the 1975 edition and other changes. As this latest edition of IEC Publication 68-2-21 is subject to harmonization under CENELEC HD 323, it has been considered necessary to produce a new edition of BS 2011 : Part 2.1U, in view of the introduction of a scope clause and the re-numbering of the other clauses. General descriptions for the five tests have been introduced in 2.2, 3.2, 4.2, 5.2 and 6.2. The technical requirements of the tests have not been altered.

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards. The comma has been used as a decimal marker in figure 3. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Cross-references

International standard*	Corresponding British Standard
ISO 31/III-1978	BS 5775 Specification for quantities, units and symbols Part 3 : 1979 Mechanics (Identical)

There is no corresponding British Standard for ISO 272, referred to in 6.5.2.1, but, since the reference constitutes informative matter only, the validity of this British Standard is not affected. Related British Standards to ISO 272 are BS 3692 : 1967 'ISO metric precision hexagon bolts, screws and nuts' and BS 4190 : 1967 'ISO metric black hexagon bolts, screws and nuts'.

Additional information. The notes below table I and table II, marked with an asterisk, are intended to explain how to calculate the nominal cross-sectional areas of terminations whether they are circular sections or strips (non-circular) or pins by using the nominal dimensions given in the relevant specification.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

*Undated in the text.



Amendment No. 1
published and effective from 30 November 1990
to BS 2011 : Part 2.1U : 1984 (IEC 68-2-21 : 1983)

Basic environmental testing procedures

Part 2.1 Tests

**Test U. Robustness of terminations and integral
mounting devices**

NOTE. This amendment has been issued to implement Amendment No. 1 to IEC Publication 68-2-21 : 1983.

The opportunity has also been taken to make additions to the national foreword as a consequence of implementing this amendment.

Revised text

AMD 6106
November 1990

National foreword

Insert at the end of the second sentence in paragraph 1, 'and Amendment No. 1 published in 1985'.

AMD 6106
November 1990

Table I

Replace the second and third lines by the following:

$0.05 < S \leq 0.1$	$0.25 < d \leq 0.35$	2.5
$0.1 < S \leq 0.2$	$0.35 < d \leq 0.5$	5'

AMD 6106
November 1990

Table II

Replace the second and third lines by the following:

$0.05 < S \leq 0.1$	$0.25 < d \leq 0.35$	0.5
$0.1 < S \leq 0.2$	$0.35 < d \leq 0.5$	1'

AMD 6106
November 1990

Table III

Replace the second and third lines by the following:

$1.5 \times 10^{-3} < Z_x \leq 4.2 \times 10^{-3}$	$0.25 < d \leq 0.35$	1.25
$4.2 \times 10^{-3} < Z_x \leq 1.2 \times 10^{-2}$	$0.35 < d \leq 0.5$	2.5'

1. Scope

This standard is applicable to all electrical and electronic components of which the terminations or integral mounting devices are liable to be submitted to stresses during normal assembly or handling operations.

2. Test U_{a1} : Tensile (applicable to all types of terminations)

2.1 Object

To determine that the terminations and attachment of the terminations to the body of the component will withstand such axial stresses as are likely to be applied during normal assembly or handling operations.

2.2 General description of Test U_{a1}

With the termination in its normal position and the component held by its body, a force is applied to the termination in the direction of its axis and acting in a direction away from the body of the component.

The force shall be applied progressively (without any shock) and then maintained for a period of 10 ± 1 s.

2.3 Pre-conditioning

The method of pre-conditioning shall be as prescribed in the relevant specification.

2.4 Initial measurements

The specimen shall be visually inspected and electrically and mechanically checked, as required by the relevant specification.

2.5 Test method (see Figure 1a)

2.5.1 Application

This test applies to all types of terminations. It shall be carried out on all the terminations, except that where a component has more than three terminations, the specification shall state the number of terminations per component to be tested. The test shall be carried out in such a manner that all the terminations of the component shall have an equal probability of being subjected to the test.

2.5.2 Procedure

With the termination in its normal position and the component held by its body, a force giving a value as stated in Table I shall be applied to the termination in the direction of its axis and acting in a direction away from the body of the component.

The force shall be applied progressively (without any shock) and then maintained for a period of 10 ± 1 s.

Value of applied force:

a) Wire terminations (circular section or strip) or pins

The value of the force applied shall be as given in Table I.

Note. — For components with oversized wire terminations, the appropriate force should be given in the relevant specification.

TABLE I

Nominal cross-sectional area* (mm ²)	Corresponding diameter for circular-section wires (mm)	Force (N)
$S \leq 0.05$	$d \leq 0.25$	1
$0.05 < S \leq 0.07$	$0.25 < d \leq 0.3$	2.5
$0.07 < S \leq 0.2$	$0.3 < d \leq 0.5$	5
$0.2 < S \leq 0.5$	$0.5 < d \leq 0.8$	10
$0.5 < S \leq 1.2$	$0.8 < d \leq 1.25$	20
$S > 1.2$	$d > 1.25$	40

* For circular-section wires, strips or pins: the nominal cross-sectional area is equal to the value calculated from the nominal dimension(s) given in the relevant specification.

For stranded wires: the nominal cross-sectional area is obtained by taking the sum of the cross-sectional areas of the individual strands of the conductor specified in the relevant specification.

Insulated wires shall be stripped of the insulation at the point at which the load is applied.

Stranded wires shall be united mechanically at the point of application of the load (such as by soldering or knotting), prior to the application of the load.

Where the technical features of insulated wires or stranded wires may give rise to difficulties during the stripping, joining or knotting operations, liable to cause dispute as to the results of the test, such operations shall be in accordance with the relevant specification or, where necessary, with the instructions of the component manufacturer.

b) Other terminations (tag terminations, threaded studs, screws, terminals, etc.)

The value of the force to be applied shall be given in the relevant specification.

2.6 Final measurements

The specimen shall be visually inspected and electrically and mechanically checked, as required by the relevant specification.

2.7 Information to be given in the relevant specification

- a) Method of pre-conditioning** (Sub-clause 2.3)
- b) Initial measurements** (Sub-clause 2.4)
- c) Number of terminations to be tested, if there are more than three** (Sub-clause 2.5.1)
- d) Force (for oversized and other terminations)** (Sub-clause 2.5.2)
- e) Details of stripping, joining or knotting operations, if necessary** (Sub-clause 2.5.2)
- f) Final measurements** (Sub-clause 2.6)