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(JEITA)

**Environmental testing—Part 2-21:
Tests—Test U: Robustness of
terminations and integral mounting
devices**

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In the event of any doubts arising as to the contents,
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Contents

	Page
Introduction.....	1
1 Scope.....	1
2 Normative references	1
3 Test Ua ₁ : tensile (applicable to all types of terminations)	3
3.1 Object	3
3.2 General description	3
3.3 Preconditioning	3
3.4 Initial measurements	3
3.5 Test method.....	3
3.6 Final measurements.....	4
3.7 Information to be given in the relevant specification.....	5
4 Test Ua ₂ : thrust	5
4.1 Object	5
4.2 General description	5
4.3 Preconditioning	5
4.4 Initial measurements	5
4.5 Test method.....	5
4.6 Final measurements.....	6
4.7 Information to be given in the relevant specification.....	7
5 Test Ub: bending (applicable to pliable terminations only).....	7
5.1 Object	7
5.2 General description	7
5.3 Preconditioning	8
5.4 Initial measurements	8
5.5 Test method.....	8
5.6 Final measurements.....	11
5.7 Information to be given in the relevant specification.....	12
6 Test Uc: torsion	12
6.1 Object	12
6.2 Preconditioning	12
6.3 Initial measurements	12
6.4 Test method.....	12
6.5 Final measurements.....	14
6.6 Information to be given in the relevant specification.....	14
7 Test Ud: torque	14
7.1 Object	14

7.2	General description	14
7.3	Preconditioning	15
7.4	Initial measurements	15
7.5	Test method	15
7.6	Final measurements	16
7.7	Information to be given in the relevant specification	16
8	Test Ue: robustness of terminations for SMD in the mounted state	16
8.1	Object	16
8.2	General description	16
8.3	Mounting	18
8.4	Initial measurements	20
8.5	Test methods	20
8.6	Final measurements	24
8.7	Information to be given in the relevant specification	24

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Electronics and Information Technology Industries Association (JEITA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS C 60068-2-21 : 2002** is replaced with this Standard.

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Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Environmental testing—Part 2-21: Tests— Test U: Robustness of terminations and integral mounting devices

Introduction

This Japanese Industrial Standard has been prepared based on the sixth edition of **IEC 60068-2-21** published in 2006 without modifying the technical contents.

The portions with dotted underlines are the matters not given in corresponding International Standard.

1 Scope

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

Table 1 provides details of the applicable tests.

Table 1 Application

Test	Type	Component	Mounted/not mounted
Ua ₁	Tensile	Leaded devices	Not mounted
Ua ₂	Thrust	Leaded devices	Not mounted
Ub	Bending	Leaded devices or tag terminations	Not mounted
Uc	Torsion	Leaded devices	Not mounted
Ud	Torque	Threaded stud or screw termination	Not mounted
Ue ₁	Bending	Surface mounted devices	Mounted
Ue ₂	Pull/push	Surface mounted devices	Mounted
Ue ₃	Shear	Surface mounted devices	Mounted

NOTE : The International Standard corresponding to this Standard is as follows.

IEC 60068-2-21:2006 *Environmental testing—Part 2-21: Tests—Test U: Robustness of terminations and integral mounting devices* (IDT)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and any revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS B 1002:1985 *Dimensions of widths across flats*

NOTE : Corresponding International Standard: ISO 272:1982 *Fasteners—Hexagon products—Widths across flats*, ISO 2343:1972 *Hexagon socket set screws—Metric series* and ISO 4762:1977 *Hexagon socket head cap screws—Product grade A* (MOD)

JIS C 6484:2005 *Base materials for printed circuits—Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test)*

NOTE : Corresponding International Standard: IEC 61249-2-7:2002 *Materials for printed boards and other interconnecting structures—Part 2-7: Reinforced base materials clad and unclad—Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test)*, copper-clad and IEC 61249-2-8:2003 *Materials for printed boards and other interconnecting structures—Part 2-8: Reinforced base materials clad and unclad—Modified brominated epoxide woven fibreglass reinforced laminated sheets of defined flammability (vertical burning test)*, copper-clad (MOD)

JIS C 60068-1:1993 *Environmental testing Part 1: General and guidance*

NOTE : Corresponding International Standard: IEC 60068-1:1988 *Environmental testing. Part 1: General and guidance* and Amendment 1:1992 (IDT)

JIS C 60068-2-20:1996 *Basic environmental testing procedures Part 2: Tests. Test T: Soldering*

NOTE : Corresponding International Standard: IEC 60068-2-20:1979 *Environmental testing—Part 2-20: Tests—Test T: Soldering*, Amendment 1:1986 and Amendment 2:1987 (IDT)

JIS C 60068-2-58:2006 *Environmental testing—Part 2: Tests—Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

NOTE : Corresponding International Standard: IEC 60068-2-58:2004 *Environmental testing—Part 2-58: Tests—Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)* (MOD)

JIS C 60068-2-61:1996 *Environmental testing Part 2: Test methods Test Z/ABDM: Climatic sequence*

NOTE : Corresponding International Standard: IEC 60068-2-61:1991 *Environmental testing—Part 2: Test methods—Test Z/ABDM: Climatic sequence* (IDT)

JIS C 61191-2:2006 *Printed board assemblies—Part 2: Sectional specification—Requirements for surface mount soldered assemblies*

NOTE : Corresponding International Standard: IEC 61191-2:1998 *Printed board assemblies—Part 2: Sectional specification—Requirements for surface mount soldered assemblies* (IDT)

JIS Z 3282:2006 *Soft solders—Chemical compositions and forms*

NOTE : Corresponding International Standard: ISO 9453:2006 *Soft solder alloys—Chemical compositions and forms* (MOD)

IEC 61188-5 (all parts) *Printed boards and printed board assemblies—Design and use*

IEC 61190-1-2:2002 *Attachment materials for electronic assembly—Part 1-2: Requirements for solder pastes for high-quality interconnections in electronics assembly*

3 Test U_{a1} : tensile (applicable to all types of terminations)

3.1 Object

The purpose of this test is to verify 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.

3.2 General description

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 $10\text{ s} \pm 1\text{ s}$.

3.3 Preconditioning

The method of preconditioning shall be as prescribed in the relevant specification.

3.4 Initial measurements

The specimen shall be visually inspected and electrically and mechanically checked, when initial measurements are required by the relevant specification.

3.5 Test method

Unless otherwise specified in the relevant specification, the test method shall be as follows in addition to figure 1a.

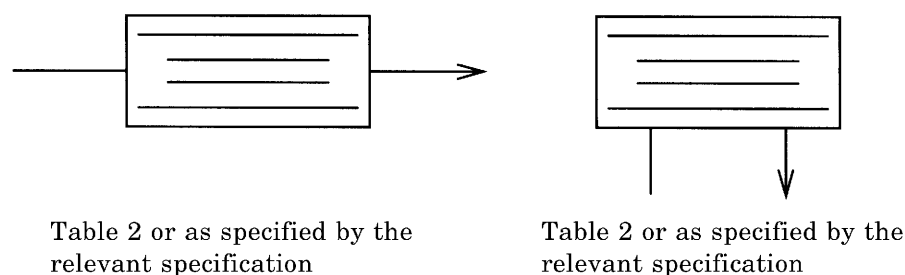


Figure 1a Test U_{a1} : tensile

3.5.1 Application

This test applies to all types of terminations. It shall be carried out on all the terminations, except where a component has more than three terminations, in which case 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 have an equal probability of being subjected to test.

3.5.2 Procedure

With the termination in its normal position and the component held by its body, a force with a value as stated in table 2 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 $10 \text{ s} \pm 1 \text{ s}$.

The types of terminations and the value of the applied force are as follows:

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

The value of the force applied shall be that indicated in table 2.

Table 2 Value of applied force for test U_{a1}

Nominal cross-sectional area (S) ^{a)} mm ²	Corresponding diameter (d) for circular-section wires mm	Force with tolerance of $\pm 10 \%$ N
$S \leq 0.05$	$d \leq 0.25$	1
$0.05 < S \leq 0.10$	$0.25 < d \leq 0.35$	2.5
$0.10 < S \leq 0.20$	$0.35 < d \leq 0.50$	5
$0.20 < S \leq 0.50$	$0.50 < d \leq 0.80$	10
$0.50 < S \leq 1.20$	$0.80 < d \leq 1.25$	20
$1.20 < S$	$1.25 < d$	40
Note ^{a)} 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 or stranded wires may give rise to difficulties during the stripping, joining or knotting operations and be liable to cause dispute for the test results, 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.

3.6 Final measurements

The specimen shall be visually inspected and electrically and mechanically checked, when final requirements are required by the relevant specification.

3.7 Information to be given in the relevant specification

Information	Subclause
a) Method of preconditioning	3.3
b) Initial measurements	3.4
c) Number of terminations to be tested, if more than three	3.5.1
d) Force (for oversized and other terminations)	3.5.2
e) Details of stripping, joining or knotting operations, if necessary	3.5.2
f) Final measurements	3.6

4 Test U_{a2}: thrust

4.1 Object

The purpose of this test is to verify that the terminations and attachment of the terminations to the body of the component will withstand such thrusts as are likely to be applied during normal assembly or handling operations. This test applies only to specimens of small dimensions and of low mass, to the exclusion of equipment and assemblies.

NOTE : This test does not apply to flexible terminations. The tests for flexible terminations are given in **a)** and **b)** of **5.1**.

4.2 General description

With the termination in its normal position and the component held by its body, thrust is applied to the termination as close as possible to the body of the component, but leaving a clear 2 mm of wire between the body of the component and the nearest point of the device applying the force. The force shall be applied progressively without any shock and then maintained for a period of $10 \text{ s} \pm 1 \text{ s}$.

4.3 Preconditioning

The method of preconditioning shall be as prescribed in the relevant specification.

4.4 Initial measurements

The specimen shall be visually inspected and electrically and mechanically checked, when initial measurements are required by the relevant specification.

4.5 Test method

The test method shall be as follows in addition to figure 1b.

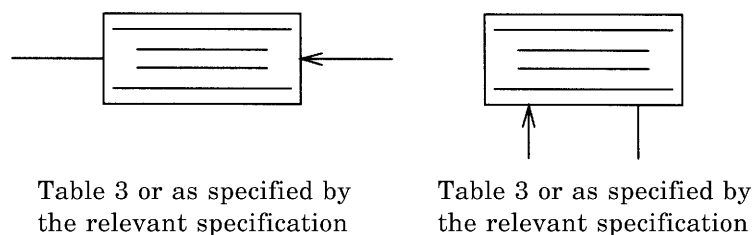


Figure 1b Test U_{a2}: thrust