

Environmental testing

Part 4. Information for specification writers

Test summaries

The European Standard EN 60068-4 : 1996 has the status of a British Standard

ICS 19.040

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/50, Environmental testing of electrotechnical products, upon which the following bodies were represented:

- Federation of the Electronics Industry
- GAMBICA (BEAMA Ltd.)
- Ministry of Defence
- Society of Motor Manufacturers and Traders Limited

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 December 1996

© BSI 1996

Amendments issued since publication

Amd. No.	Date	Text affected

The following BSI references relate to the work on this standard:
Committee reference GEL/50
Draft announced in BSI update August 1996

ISBN 0 580 26417 3

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60068-4	3

National foreword

This British Standard has been prepared by Technical Committee GEL/50 and is the English language version of EN 60068-4 : 1996 *Environmental testing, Part 4. Information for specification writers. Test summaries* published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 68-4 : 1987 including Amendment A1 : 1992 and Amendment A2 : 1994 published by the International Electrotechnical Commission (IEC). This British Standard supersedes BS 2011 : Part 4 : Section 4.4 : 1993, which is withdrawn.

Cross-references

This standard makes extensive references to other international standards. The corresponding British Standards can be found by referring to the International Standards Correspondence Index at the back of the **BSI Catalogue**.

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

ICS 19.040

Descriptors: Environmental testing, specification writers, test summaries, definitions, guidance documents

English version

Environmental testing
Part 4. Information for specification writers
Test summaries

(IEC 68-4 : 1987 + A1 : 1992 + A2 : 1994)

Essais d'environnement

Partie 4. Renseignements destinés aux rédacteurs
de spécifications

Résumés d'essais

(CEI 68-4:1987 + A1:1992 + A2:1994)

Umweltprüfungen

Teil 4. Informationen für den Verfasser von
Einzelbestimmungen

Zusammenfassungen zu den Prüfungen

(IEC 68-4:1987 + A1:1992 + A2:1994)

This European Standard was approved by CENELEC on 1995-11-28. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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

© 1996 Copyright reserved to CENELEC members

Ref. No. EN 60068-4 : 1996 E

 **Documents**
Document Sharing Hub

Foreword

The texts of the International Standard IEC 68-4:1987 and its amendments 1:1992 and 2:1994, prepared by TC 50, Environmental testing, were submitted to the formal vote and were approved by CENELEC as EN 60068-4 on 1995-11-28 without any modification.

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 by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

Contents

	Page
1 Object	3
2 General	3
3 Definitions	4
4 Lists of test summaries	6
5 Lists of guidance documents	10
6 Test summaries	Sheets A/B1 to Z-5

BASIC ENVIRONMENTAL TESTING PROCEDURES

Part 4: Information for specification writers - Test summaries

1. Object

To provide information in summarized form on the individual environmental tests in IEC Publication 68-2 to serve the purposes of specification writers and others when a knowledge of the detailed provisions of the complete standards is not required.

It should be particularly borne in mind by all concerned with laboratory testing that these summaries are not intended to be a substitute for the relevant complete standards.

2. General

The standards in Publication 68-2 for the individual environmental tests are based on the general considerations, including definitions and guidance, to be found in Publication 68-1. That standard gives an explanation of the method used to designate the various tests.

The uniform presentation of these summaries on a single page has resulted in varying degrees of 'reduction' of original texts which themselves vary widely in length and complexity. Although, in order to facilitate the use of the summaries in this publication, the presentation has been made as consistent as possible, it should be remembered that the original texts are of different dates and are the responsibility of IEC Technical Committee No. 50 or its Sub-Committees.

Tolerances have been omitted from these summaries; they can be found in Publication 68-2.

The information in Sub-clauses 2.1, 2.2 and 2.3, although not necessarily applicable to all the summaries, is of general application.

2.1 *Guidance*

Many of the standards in Publication 68-2 contain guidance on the application of the testing procedure and much of this is of particular value to specification writers and others who are not required to have a knowledge of the detailed provisions of a Test. In the case of these standards, the summaries will make no specific reference to guidance.

There are other cases, for example solar radiation testing (Publication 68-2-5), where guidance is to be found in another standard in the Publication 68-2 series (Publication 68-2-9 in the case of the example), or - and then described as 'background information' - in a standard in the Publication 68-3 series. In these cases, reference is made in the summary to the other standards concerned irrespective of their degree of relevance for specification writers in order that they can indicate fully in their specifications the sources of detailed information which laboratories will require. The standard will then be listed in Clause 5.

2.2 Storage

Guidance on the application of Tests in the Publication 68-2 series to simulate the effects of storage, from short-term to long-term, is given in Publication 68-2-48, to which reference should be made in appropriate cases.

2.3 Mounting

The mounting requirements for specimens to be subjected to certain of the vibration and shock tests covered by the summaries, namely shock and bump (Test Ea, Publication 68-2-27; Test Eb, Publication 68-2-29), sinusoidal and random vibration (Test Fc, Publication 68-2-6; Test Fd, Publications 68-2-34, 68-2-35, 68-2-36 and 68-2-37) and steady-state acceleration (Test Ga, Publication 68-2-7), are the subject of Publication 68-2-47, to which attention should be drawn in relevant specifications. This applies also, of course, when dealing with 'combined' or 'composite' tests, as defined in Clause 3, embodying one or more of the tests mentioned.

3. Definitions

The following list of generally-applicable definitions is based, with some editing, on those given in Publication 68-1.

For other definitions, refer to Publications 68-1 and 68-2.

3.1 Test

Complete series of operations implied by its title, normally comprising the following operations, when required:

- a) pre-conditioning;
- b) initial examination and measurements;
- c) conditioning;
- d) recovery;
- e) final examination and measurements.

Note. - Intermediate measurements may be required during conditioning and/or recovery.

3.1.1 *Pre-conditioning*

Treatment of a specimen with the object of removing or partly counteracting the effects of its previous history.

3.1.2 *Conditioning*

Exposure of a specimen to environmental conditions in order to determine the effect of such conditions on the specimen.

3.1.3 *Recovery*

Treatment of a specimen, after environmental conditioning, in order that the properties of the specimen may be stabilized before measurement.

3.2 *Specimen*

Product designated to be tested in accordance with the procedures of IEC 68.

Note. - The term "specimen" includes any auxiliary parts or systems that are integral functional features of the specimen, for example systems for cooling and heating.

3.2.1 *Heat-dissipating specimen*

Specimen with the hottest point on its surface, measured in free air conditions and under the air pressure specified in Sub-clause 5.3.1 of IEC 68-1, more than 5 °C above the ambient temperature of the surrounding atmosphere after temperature stability has been reached.

3.2.2 *Non-heat dissipating specimen*

Specimen other than as defined in Sub-clause 3.2.1.

3.3 *Relevant specification*

Set of requirements to be satisfied by a product, indicating the procedure(s) necessary to determine whether the requirements given are satisfied.

3.4 *Severity*

Set of parameters for the conditioning of the specimen.

3.5 *Combined test*

Test in which two or more test environments act upon the specimen simultaneously.

3.6 *Composite test*

Test in which the specimen is exposed to two or more test environments in close succession.

4. List of test summaries

To facilitate the finding of the required summary, the summaries are listed in numerical order in subclause 4.1 and in alphabetical order in subclause 4.2. The Sheets for the individual summaries are filed in alphabetical order.

Note. - A reference to a publication is to the edition of the standard identified by its date on the corresponding test summary sheet and to all similarly identified amendments.

4.1 *Numerical list*

<i>IEC Publication</i>	<i>Test designation and title</i>	<i>Sheet</i>
68-2-1	Tests A: Cold	A/B-1
68-2-2	Tests B: Dry Heat (including First Supplement 68-2-2A)	A/B-1
68-2-3	Test Ca: Damp Heat, Steady State	C-1
68-2-5	Test Sa: Simulated Solar Radiation at Ground Level	S-1
68-2-6	Test Fc and Guidance: Vibration (Sinusoidal)	F-1
68-2-7	Test Ga and Guidance: Acceleration, Steady State	G-1
68-2-10	Test J and Guidance: Mould Growth	J-1
68-2-11	Test Ka: Salt Mist	K-1
68-2-13	Test M: Low Air Pressure	M-1
68-2-14	Test N: Change of Temperature	N-1
68-2-17	Test Q: Sealing	Q-1 to Q-8
68-2-18	Test R and Guidance: Water	R-1 to R-4
68-2-20	Test T: Soldering	T-1, T-3, T-4, T-5
68-2-21	Test U: Robustness of Terminations and Integral Mounting Devices	U-1 to U-6
68-2-27	Test Ea and Guidance: Shock	E-1
68-2-29	Test Eb and Guidance: Bump	E-2
68-2-30	Test Db and Guidance: Damp heat, cyclic (12 + 12-hour Cycle)	D-1
68-2-31	Test Ec: Drop and Topple, primarily for Equipment-type Specimens	E-3
68-2-32	Test Ed: Free fall	E-4
68-2-34	Test Fd: Random Vibration Wide Band - General Requirements	F-2
68-2-35	Test Fd: Random Vibration Wide Band - Reproducibility High	F-2
68-2-36	Test Fd: Random Vibration Wide Band - Reproducibility Medium	F-2

<i>IEC Publication</i>	<i>Test designation and title</i>	<i>Sheet</i>
68-2-37	Test Fdc: Random Vibration Wide Band - Reproducibility Low	F-2
68-2-38	Test Z/AD: Composite Temperature/Humidity Cyclic Test	Z-1
68-2-39	Test Z/AMD: Composite Sequential Cold, Low Air pressure and Damp Heat Test	Z-4
68-2-40	Test Z/AM: Combined Cold/Low Air Pressure Tests	Z-3
68-2-41	Test Z/BM: Combined Dry Heat/Low Air Pressure Tests	Z-3
68-2-42	Test Kc: Sulphur Dioxide Test for Contacts and Connections	K-3
68-2-43	Test Kd: Hydrogen Sulphide Test for Contacts and Connections	K-3
68-2-45	Test XA and Guidance: Immersion in Cleaning Solvents	X-1
68-2-50	Test Z/AFc: Combined Cold/Vibration (sinusoidal) tests for both Heat-dissipating and Non-heat-dissipating Specimens	Z-2
68-2-51	Test Z/BFc: Combined Dry Heat/Vibration (Sinusoidal) tests for both Heat-dissipating and Non-heat-dissipating Specimens	Z-2
68-2-52	Test Kb: Salt Mist, Cyclic (Sodium Chloride Solution)	K-2
68-2-54	Test Ta: Soldering. Solderability Testing by the Wetting Balance Method	T-2
68-2-55	Test Ee and Guidance: Bounce	E-5
68-2-56	Test Cb: Damp Heat, Steady State (for equipment)	C-2
68-2-57	Test Ff: Vibration, Time-history method	F-4
68-2-58	Test Td: Solderability, resistance to dissolution of metallization and to soldering heat of Surface Mounting Devices (SMD)	T-5
68-2-59	Test Fe: Vibration. Sine-beat Method	F-3
68-2-61	Test Z/ABDM: Climatic Sequence	Z-5
68-2-62	Test Ef: Impact, Pendulum Hammer	E-6
68-2-63	Test Eg: Impact, Spring Hammer	E-7

4.2 Alphabetical list

<i>Test designation</i>	<i>IEC Publication</i>	<i>Title</i>	<i>Sheet</i>
A, Aa, Ab, Ad	68-2-1	Tests A: Cold	A/B-1
B, Ba, Bb Bc, Bd	68-2-2	Tests B: Dry Heat (including First Supplement 68-2-2A)	A/B-1
Ca	68-2-3	Test Ca: Damp Heat, Steady State	C-1
Cb	68-2-56	Test Cb: Damp Heat, Steady State primarily for equipment	C-2
Db	68-2-30	Test Db and Guidance: Damp Heat Cyclic (12 + 12-hour Cycle)	D-1
Ea	68-2-27	Test Ea and Guidance: Shock	E-1
Eb	68-2-29	Test Eb and Guidance: Bump	E-2
Ec	68-2-31	Test Ec: Drop and Topple, primarily for Equipment-type Specimens	E-3
Ed	68-2-32	Test Ed: Free Fall	E-4
Ee	68-2-55	Test Ee and Guidance: Bounce	E-5
Ef	68-2-62	Test Ef: Impact, Pendulum Hammer	E-6
Eg	68-2-63	Test Eg: Impact, Spring Hammer	E-7
Fc	68-2-6	Test Fc and Guidance: Vibration (sinusoidal)	F-1
Fd	68-2-34	Test Fd: Random Vibration Wide Band - General Requirements	F-2
Fda	68-2-35	Test Fda: Random Vibration Wide Band - Reproducibility High	F-2
Fdb	68-2-36	Test Fdb: Random Vibration Wide Band - Reproducibility Medium	F-2
Fdc	68-2-37	Test Fdc: Random Vibration Wide Band - Reproducibility Low	F-2
Fe	68-2-59	Test Fe: Vibration. Sine-beat Method	F-3
Ff	68-2-57	Test Ff: Vibration. Time-history Method	F-4
Ga	68-2-7	Test Ga and Guidance: Acceleration, Steady State	G-1
J	68-2-10	Test J: Mould Growth	J-1
Ka	68-2-11	Test Ka: Salt Mist	K-1

<i>Test designation</i>	<i>IEC Publication</i>	<i>Title</i>	<i>Sheet</i>
Kb	68-2-52	Test Kb: Salt Mist, Cyclic (Sodium Chloride Solution)	K-2
Kc	68-2-42	Test Kc: Sulphur Dioxide Test for Contacts and Connections	K-3
Kd	68-2-43	Test Kd: Hydrogen Sulphide Test for Contacts and Connections	K-3
M	68-2-13	Test M: Low Air Pressure	M-1
N, Na, Nb, Nc	68-2-14	Test N: Change of Temperature	N-1
Q	68-2-17	Test Q : Sealing	Q-1
Qa		Test Qa: Sealing of Bushes, Spindles and Gaskets	Q-2
Qc		Test Qc: Container Sealing, Gas Leakage	Q-3
Qd		Test Qd: Container Sealing, Seepage of Filling Liquid	Q-4
Qf		Test Qf: Immersion	Q-5
Qk		Test Qk: Sealing Tracer Gas Method with Mass Spectrometer	Q-6
Ql		Test Ql: Bomb Pressure Test	Q-7
Qm		Test Qm: Tracer Gas Sealing Test with internal pressurization	Q-8
R	68-2-18	Test R and Guidance	R-1
Ra		Falling drops	R-2
Rb		Impacting water	R-3
Rc		Immersion	R-4
Sa	68-2-5	Test Sa: Simulated Solar Radiation at Ground Level	S-1
T		Test T: Soldering	
Ta	68-2-20	Test Ta: Solderability of Wire and Tag Terminations	T-1
	68-2-54	Test Ta: Soldering - Solderability Testing by the Wetting Balance Method	T-2
Tb	68-2-20	Test Tb: Resistance of Components to Soldering Heat	T-3
Tc	68-2-20	Test Tc: Solderability of Printed Boards and Metal-clad Laminates	T-4
Td	68-2-58	Test Td: Solderability, Resistance to Dissolution of Metallization and to Soldering Heat of Surface Mounting Devices (SMD)	T-5

<i>Test designation</i>	<i>IEC Publication</i>	<i>Title</i>	<i>Sheet</i>
U	68-2-21	Test U: Robustness of Terminations and Integral Mounting Devices	
Ua ₁		Test Ua ₁ : Tensile	U-1
Ua ₂		Test Ua ₂ : Thrust	U-2
Ub		Test Ub: Bending	U-3
Uc		Test Uc: Torsion	U-4
Ud		Test Ud: Torque	U-5
Ue		Test Ue: Surface Mounting Devices (SMD) in the Mounted State (Applicable to SMD)	U-6
Xa	68-2-45	Test Xa and Guidance: Immersion in Cleaning Solvents	X-1
Z/ABDM	68-2-61	Test Z/ABDM: Climatic Sequence	Z-5
Z/AD	68-2-38	Test Z/AD: Composite Temperature/Humidity Cyclic Test	Z-1
Z/AFc	68-2-50	Tests Z/AFc: Combined Cold/Vibration (Sinusoidal) Tests for Both Heat-dissipating and Non-heat-dissipating Specimens	Z-2
Z/AM	68-2-40	Test Z/AM: Combined Cold/Low Air Pressure Tests	Z-3
Z/AMD	68-2-39	Test Z/AMD: Combined Sequential Cold, Low Air Pressure, and Damp Heat Test	Z-4
Z/BFc	68-2-51	Tests Z/BFc: Combined Dry Heat/Vibration (Sinusoidal) Tests for both Heat-dissipating and Non-Heat-dissipating Specimens	Z-2
Z/BM	68-2-41	Test Z/BM: Combined Dry Heat/Low Air Pressure Tests	Z-3

5. Lists of guidance documents

Many of the publications referred to in subclauses 4.1 and 4.2 contain guidance on the execution or application of the test procedure. In some cases, there is reference to other publications, containing guidance only, and these are listed in subclauses 5.1 and 5.2.

Note. - A reference to a publication is to the edition of the standard identified by its date on the corresponding test summary sheet and to all similarly identified amendments.

5.1 Numerical list

<i>IEC Publication</i>	<i>Test designation</i>	<i>Title</i>	<i>Sheet</i>
68-2-9	Sa	Guidance for Solar Radiation Testing	S-1
68-2-28	Ca, Db, Z/AD	Guidance for Damp Heat Tests	C-1, D-1, Z-1
68-2-33	N	Guidance on Change of Temperature Tests	N-1
68-2-44	T	Guidance on Test T: Soldering	T-1, T-3, T-4
68-2-46	Kd	Guidance to Test Kd: Hydrogen Sulphide Test for Contacts and Connections	K-3
68-2-49	Kc	Guidance to Test Kc: Sulphur Dioxide Test for Contacts and Connections	K-3
68-2-53	Z/AFc and Z/BFc	Guidance to Tests Z/AFc and Z/BFc: Combined Temperature (Cold and Dry Heat) and Vibration (Sinusoidal) tests	Z-2
68-3-1	A and B	Background Information: Section One - Cold and Dry Heat Tests	A/B-1
68-3-1A	A and B	First Supplement to Publication 68-3-1	A/B-1
68-3-2	Z/AM and Z/BM	Background Information: Section Two - Combined Temperature/Low Air Pressure Tests	Z-3
(260)	(Ca and Db)	Test Enclosures of Non-injection Type for Constant Relative Humidity	(C-1, D-1)
(355)	(Kb, Kc, Kd)	An Appraisal of the Problems of Accelerated Testing for Atmospheric Corrosion	(K-2, K-3)

5.2 *Alphabetical list*

<i>Test Designation</i>	<i>IEC Publication</i>	<i>Title</i>	<i>Sheet</i>
A and B	68-3-1	Background information: Section One - Cold and Dry Heat Tests	A/B-1
Ca	68-2-28	Guidance for Damp Heat Tests	C-1
(Ca)	(260)	Test enclosures of Non-injection Type for Constant Relative Humidity	(C-1)
Db	68-2-28	Guidance for Damp Heat Tests	D-1
(Db)	(260)	Test enclosures of Non-injection Type for Constant Relative Humidity	(D-1)
(Kb, Kc, Kd)	(355)	An Appraisal of the Problems of Accelerated Testing for Atmospheric Corrosion	(K-2, K-3)
Kc	68-2-49	Guidance for Test Kc: Sulphur Dioxide Tests for Contacts and Connections	K-3
Kd	68-2-46	Guidance for Test Kd: Hydrogen Sulphide Tests for Contacts and Connections	K-3
N	68-2-33	Guidance on Change of Temperature Tests	N-1
R	68-2-18	Test R and Guidance: Water	R-1
Sa	68-2-9	Guidance for Solar Radiation Testing	S-1
T	68-2-44	Guidance on Test T: Soldering	T-1, T-3, T-4
Z/AD	68-2-28	Guidance for Damp Heat Tests	Z-1
Z/AFc	68-2-53	Guidance to Tests Z/AFc and Z/BFc: Combined Temperature (Cold and Dry Heat) and Vibra- tion (Sinusoidal) Tests	Z-2
Z/AM	68-3-2	Background Information Section Two - Combined Tempera- ture/Low Air Pressure Tests	Z-3

<i>Test Designation</i>	<i>IEC Publication</i>		<i>Sheet</i>
Z/BFc	68-2-53	Guidance to Tests Z/AFc and Z/BFc: Combined Temperature (Cold and Dry Heat) and Vibration (Sinusoidal) Tests	Z-2
Z/BM	68-3-2	Background Information: Section Two - Combined Temperature/Low Air Pressure Tests	Z-3

6. Test summaries

The sheets for the individual summaries in this clause are identified by the letters identifying the test(s) considered and are filed in alphabetical order of the related sheet reference. Current sheets with their identifying date of issue are listed below in the order in which they are filed. This list, together with these introductory sentences in Clause 6, will be reissued every time that new individual summaries are added or existing ones are revised or withdrawn.

<i>Sheet</i>	<i>Issue date</i>	<i>Test designation(s)</i>	<i>IEC Publication(s)</i>
A/B-1	1991 1974	Tests A and Tests B	68-2-1 and 68-2-2
C-1	1991	Test Ca	68-2-3
C-2	1991	Test Cb	68-2-56
D-1	1991	Test Db	68-2-30
E-1	1987	Test Ea	68-2-27
E-2	1987	Test Eb	68-2-29
E-3	1969	Test Ec	68-2-31
E-4	1991	Test Ed	68-2-32
E-5	1987	Test Ee	68-2-55
E-6	1991	Test Ef	68-2-62
E-7	1991	Test Eg	68-2-63
F-1	1982	Test Fc	68-2-6
F-2	1973	Test Fd Test Fda Test Fdb Test Fdc	68-2-34, 68-2-35 68-2-36 68-2-37
F-3	1991	Test Fe	68-2-59
F-4	1991	Test Ff	68-2-57
G-1	1983	Test Ga	68-2-7
J-1	1991	Test J	68-2-10
K-1	1981	Test Ka	68-2-11
K-2	1984	Test Kb	68-2-52
K-3	1982, 1976	Test Kc and Test Kd	68-2-42 and 68-2-43

<i>Sheet</i>	<i>Issue date</i>	<i>Test designation(s)</i>	<i>IEC Publication(s)</i>
M-1	1983	Test M	68-2-13
N-1	1984	Test N	68-2-14
Q-1	1991	Test Q	68-2-17
Q-2	1978	Test Qa	68-2-17
Q-3	1978	Test Qc	68-2-17
Q-4	1978	Test Qd	68-2-17
Q-5	1978	Test Qf	68-2-17
Q-6	1991	Test Qk	68-2-17
Q-7	1978	Test Ql	68-2-17
Q-8	1991	Test Qm	68-2-17
R-1	1991	Test R	68-2-18
R-2	1989	Test Ra	68-2-18
R-3	1989	Test Rb	68-2-18
R-4	1989	Test Rc	68-2-18
S-1	1975	Test Sa	68-2-5
T-1	1979	Test Ta	68-2-20
T-2*	1985	Test Ta*	68-2-54
T-3	1979	Test Tb	68-2-20
T-4	1979	Test Tc	68-2-20
T-5	1989	Test Td	68-2-58
U-1	1983	Test Ua1	68-2-21
U-2	1983	Test Ua2	68-2-21
U-3	1983	Test Ub	68-2-21
U-4	1983	Test Uc	68-2-21
U-5	1983	Test Ud	68-2-21
U-6	1991	Test Ue	68-2-21
X-1	1980	Test XA	68-2-45
Z-1	1974	Test Z/AD	68-2-38
Z-2	1983	Tests Z/AFc and Tests Z/BFc	68-2-50 and 68-2-51
Z-3	1976	Test Z/AM and Test Z/BM	68-2-40 and 68-2-41
Z-4	1976	Test Z/AMD	68-2-39
Z-5	1991	Test Z/ABDM	68-2-61

* Sheet T-1 deals with Methods 1, 2 and 3 of Test Ta of IEC 68-2-20.

IEC 68-4: INFORMATION FOR SPECIFICATION WRITERS - TEST SUMMARIES

COLD: Tests A - IEC 68-2-1 (1990)

DRY HEAT: Tests B - IEC 68-2-2 (1974)* and 68-2-2A (1976)

See also: IEC 68-3-1: Background information. Section One - Cold and dry heat tests (1974) and 68-3-1A (1978).

A
B

1 INTRODUCTION

IEC 68-2 deals with cold and dry heat tests applicable both to heat-dissipating and non heat-dissipating specimens.

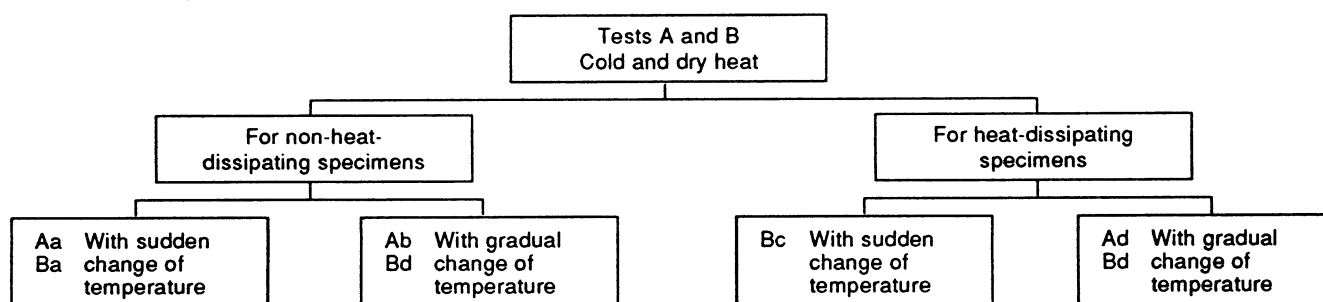
They are subdivided into tests with sudden and gradual change of temperature.

The object of these tests is to determine the ability of components, equipment or other articles to be used or stored at low or high temperature. They do not permit the assessment of the ability of specimens to withstand or operate during temperature variations, for which it is necessary to use Test N: Change of temperature.

The procedures given in these tests are normally intended for specimens which achieve temperature stability during the performance of the test.

Tests Aa, Ba and Bc shall be used only when it is known that the effects of a sudden change of temperature are not detrimental to the test specimen.

The cold and dry heat tests are subdivided as in the block diagram below:



2 GENERAL DESCRIPTION

The specimen is at the ambient temperature of the laboratory when introduced into the chamber. For tests with sudden change of temperature the chamber is at the temperature appropriate to the degree of severity as specified in the relevant specification; for the tests with gradual change of temperature it is at the temperature of the laboratory. In the latter case the temperature is then changed to the temperature appropriate to the degree of severity specified in the relevant specification.

After temperature stability of the specimen has been reached the specimen is exposed to the test conditions for the specified duration.

Non-heat-dissipating specimens under test are normally in non-operating conditions. Forced air circulation is normally used for this test. For heat-dissipating specimens the relevant specification defines the functioning of the specimens under test and testing with no forced air circulation is the preferred method. Forced air circulation may, however, be used when it is difficult or impossible to meet the conditions specified for testing without air circulation. Alternative methods for this situation are given in IEC 68-2.

3 SEVERITIES

Tests A: Cold			Tests B: Dry heat			
Temperature °C		Duration h	Temperature °C ¹⁾			Duration h
-65	-10	2	+200	+100	+40	2
-55	-5	16	+175	+85	+30	16
-40	+5	72	+155	+70		72
-25		96	+125	+55		96

¹⁾ In the absence of other considerations, temperatures above 200 °C and up to 1 000 °C should be chosen from the following values: 250 °C, 315 °C, 400 °C, 500 °C, 630 °C, 800 °C, 1 000 °C.

4 INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

The relevant specification shall identify the test to be used (including the following details) taking account of clause 1 of this summary.

- | | |
|--|---|
| a) Pre-conditioning. | f) Measurements and/or loading during conditioning. |
| b) Initial measurements. | g) Recovery if non-standard. |
| c) Details of mounting or supports. | h) Final measurements. |
| d) State of specimen including cooling system during conditioning. | i) Any deviation in procedure as agreed upon between customer and supplier. |
| e) Severity, temperature and duration of exposure. | |

* The 1987 reprint includes IEC 68-2-2A.

IEC 68-4: INFORMATION FOR SPECIFICATION WRITERS - TEST SUMMARIES

Ca

DAMP HEAT, STEADY STATE: Test Ca - IEC 68-2-3 (1969) and Amendment 1 (1984)

See also: IEC 68-2-28: Guidance for damp heat tests (1990) and IEC 260: Test enclosures of non-injection type for constant relative humidity (1968).

1 INTRODUCTION

The object of this test is to determine the suitability of components, equipment or other electrotechnical products for use and storage under conditions of high relative humidity.

This test is primarily intended to permit the observation of the effects of high humidity at constant temperature over a prescribed period.

2 GENERAL DESCRIPTION

Specimens are exposed to a damp heat environment which is maintained at a temperature of 40 °C and a relative humidity of 93 %.

3 SEVERITIES

The exposure time is chosen from the following:

- 4 days
- 10 days
- 21 days
- 56 days

4 INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

- a) Pre-conditioning procedure.
- b) Electrical and mechanical checks to be made prior to the test.
- c) State of the specimen as introduced into the chamber.
- d) Severity.
- e) Loading during conditioning.
- f) Electrical and mechanical checks to be made during conditioning and the period(s) after which they shall be performed.
- g) Special precautions to be taken regarding removal of surface moisture.
- h) Recovery conditions if other than standard.
- i) Electrical and mechanical checks to be made at the end of the test, the parameters to be measured first, and the maximum period allowed for the measurement of these parameters.

IEC 68-4: INFORMATION FOR SPECIFICATION WRITERS - TEST SUMMARIES

Cb

DAMP HEAT, STEADY STATE, PRIMARILY FOR EQUIPMENT: Test Cb - IEC 68-2-56 (1988)

1 INTRODUCTION

The object of this test is to determine the suitability of electrotechnical products, primarily for equipment, for use and storage under conditions of high humidity.

This test is primarily intended to permit the observation of the effect of high humidity at constant temperature without condensation of the specimen over a prescribed period.

The test is particularly applicable to large equipment or equipment having complex interconnections with test equipment external to the chamber, requiring a set-up time which prevents the use of pre-heating and the maintenance of specified conditions during the installation period.

2 GENERAL DESCRIPTION

Specimens are exposed to a damp heat environment.

3 SEVERITIES

Combinations of temperature and relative humidity shall be selected from the following:

30 ± 2 °C	93 ± 3 % H.R.
30 ± 2 °C	85 ± 3 % H.R.
40 ± 2 °C	93 ± 3 % H.R.
40 ± 2 °C	85 ± 3 % H.R.

Preferred test durations: 2, 4, 10, 21 days.

4 INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

- a) Specific mounting structures, if required.
- b) Test severity:
 - temperature,
 - relative humidity,
 - duration.
- c) Initial measurements.
- d) Conditioning.
- e) Intermediate measurements.
- f) Recovery conditions.
- g) Final measurements.

IEC 68-4: INFORMATION FOR SPECIFICATION WRITERS - TEST SUMMARIES

Db

DAMP HEAT, CYCLIC (12 + 12-HOUR CYCLE): Test Db - IEC 68-2-30 (1980) and Amendment 1 (1985)

See also: IEC 68-2-28: Guidance for damp heat tests (1990) and IEC 260: Test enclosures of non-injection type for constant relative humidity (1968).

1 INTRODUCTION

The object of this test is to determine the suitability of components, equipment or other electrotechnical products for use and storage under conditions of high humidity when combined with cyclic temperature changes and, in general, producing condensation on the surface of the specimen.

2 GENERAL DESCRIPTION

This test comprises one or more temperature cycles between 25 °C and the upper temperature of the cycle in which the relative humidity is maintained at a high level.

Two variants of the cycle are given; they are identical except for the temperature fall period. During this part of the cycle, variant 2 allows wider tolerances of relative humidity and rate of temperature fall.

3. SEVERITIES

The severity is chosen from the following:

- a) upper temperature: 40 °C,
number of cycles: 2, 6, 12, 21, 56;
- b) upper temperature: 55 °C,
number of cycles: 1, 2, 6.

4 INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

- a) Severity.
- b) Initial measurements.
- c) State of the specimen during conditioning.
- d) Details of mounting or supports.
- e) Variant 1 or 2.
- f) Intermediate measurements.
- g) Recovery conditions.
- h) Special precautions to be taken regarding the removal of surface moisture.
- i) Electrical and mechanical checks to be made at the end of the test, the parameters to be measured first, and the maximum period allowed for the measurement of these parameters (final measurements).

PUBLICATION 68-4: INFORMATION FOR SPECIFICATION WRITERS - TEST SUMMARIES

Ea

SHOCK: Test Ea - Publication 68-2-27 (1987).

1. INTRODUCTION

The object of this test is to reveal mechanical weakness and/or degradation in specified performance in specimens for applications in which they will be subjected to non-repetitive mechanical shocks. It may also be used to determine their structural integrity and as a means of quality control. It is intended as a means of producing in the specimen, the effects of relatively infrequent non-repetitive shocks likely to be encountered by equipments and components in service or during transportation.

2. GENERAL DESCRIPTION

For the purpose of this test the specimen is always fastened to the fixture or the table of the shock testing machine during conditioning and is subjected to a pulse (acceleration against time) whose shape can be either half-sine (most generally applicable), final-peak saw-tooth, or trapezoidal (not primarily intended for component type specimens) as prescribed in the relevant specification.

3. SEVERITIES

Peak acceleration		Corresponding duration of the nominal pulse
g_n	(Equivalent m/s^2)	
5	(50)	30
15	(150)	11
30	(300)	18
<u>30</u>	<u>(300)</u>	<u>11</u>
30	(300)	6
50	(500)	11
<u>50</u>	<u>(500)</u>	<u>3</u>
100	(1000)	11
<u>100</u>	<u>(1000)</u>	<u>6</u>
200	(2000)	6
200	(2000)	3
500	(5000)	1
<u>1000</u>	<u>(10000)</u>	<u>1</u>
1500	(15000)	0.5
<u>3000</u>	<u>(30000)</u>	<u>0.2</u>

In the above table the preferred combinations of peak acceleration and corresponding duration of the nominal pulse are underlined.

4. INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

- Pulse shape.
- Tolerances, special cases.
- Velocity change, special cases.
- Transverse motion, special cases.
- Method of mounting.
- Severity.
- Pre-conditioning.
- Initial measurements.
- Directions and number of shocks, in special cases only.
- Operating modes and functional monitoring.
- Acceptance and rejection criteria.
- Recovery.
- Final measurements.
- High frequency cut-off.