
Liquid crystal and solid-state display devices - Part 5: Environmental, endurance and mechanical test methods (IEC 61747-5:1998)

Liquid crystal and solid-state display devices -- Part 5: Environmental, endurance and mechanical test methods

Flüssigkristall- und Halbleiter-Anzeige-Bauelemente -- Teil 5: Umwelt-, Lebensdauer- und mechanische Prüfverfahren

Dispositifs d'affichage à cristaux liquides et à semiconducteurs -- Partie 5: Méthodes d'essais d'environnement, d'endurance et mécaniques

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Liquid crystal and solid-state display devices
Part 5: Environmental, endurance and mechanical test methods
(IEC 61747-5:1998)

Dispositifs d'affichage à cristaux
liquides et à semiconducteurs
Partie 5: Méthodes d'essais
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(CEI 61747-5:1998)

Flüssigkristall- und Halbleiter-
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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.

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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

Foreword

The text of document 47C/203/FDIS, future edition 1 of IEC 61747-5, prepared by SC 47C, Optoelectronic, display and imaging devices, of IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61747-5 on 1998-08-01.

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) 1999-05-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2001-05-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annex A is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61747-5:1998 was approved by CENELEC as a European Standard without any modification.

SIST EN 61747-5:2002

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Annex ZA (normative)**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1 ¹⁾	1994
IEC 60068-2-1	1990	Part 2: Tests - Tests A: Cold	EN 60068-2-1	1993
IEC 60068-2-2	1974	Part 2: Tests - Test B: Dry heat	EN 60068-2-2 ²⁾	1993
IEC 60068-2-3	1969	Part 2: Tests - Test Ca: Damp heat, steady state	HD 323.2.3 S2 ³⁾	1987
IEC 60068-2-5	1975	Part 2: Tests - Test Sa: Simulated solar radiation at ground level	HD 323.2.5 S1	1988
IEC 60068-2-6 + corr. March	1995 1995	Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	1995
IEC 60068-2-7	1983	Part 2: Tests - Test Ga and guidance: Acceleration, steady state	EN 60068-2-7 ⁴⁾	1993
IEC 60068-2-13	1983	Part 2: Tests - Test M: Low air pressure	HD 323.2.13 S1	1987
IEC 60068-2-14	1984	Part 2: Tests - Test N: Change of temperature	HD 323.2.14 S2 ⁵⁾	1987
IEC 60068-2-20	1979	Part 2: Tests - Test T: Soldering	HD 323.2.20 S3 ⁶⁾	1988
IEC 60068-2-21	1983	Part 2: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21 ⁷⁾	1997

1) EN 60068-1 includes the corrigendum October 1983 and A1:1992 to IEC 60068-1.

2) EN 60068-2-2 includes supplement A:1976 to IEC 60068-2-2.

3) HD 323.2.3 S2 includes A1:1984 to IEC 60068-2-3.

4) EN 60068-2-7 includes A1:1986 to IEC 60068-2-7.

5) HD 323.2.14 S2 includes A1:1986 to IEC 60068-2-14.

6) HD 323.2.20 S3 includes A2:1987 to IEC 60068-2-20.

7) EN 60068-2-21 includes the corrigendum November 1991 and A1:1985 to IEC 60068-2-21.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-27	1987	Part 2: Tests - Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 60068-2-30	1980	Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)	HD 323.2.30 S3 ⁸⁾	1988
IEC 60068-2-38	1974	Part 2: Tests - Test Z/AD: Composite temperature/humidity cyclic test	HD 323.2.38 S1	1988
IEC 60068-2-45	1980	Part 2: Tests - Test Xa and guidance: Immersion in cleaning solvents	EN 60068-2-45	1992
IEC 60747-1	1983	Semiconductor devices - Discrete devices Part 1: General	-	-
A1	1991		-	-
A2	1993		-	-
A3	1996		-	-
IEC 60747-5	1984	Part 5: Optoelectronic devices	-	-
A1	1994		-	-
A2	1995		-	-
IEC 60748-1	1984	Semiconductors devices - Integrated circuits Part 1: General	-	-
IEC 60749	1996	Semiconductor devices - Mechanical and climatic test methods	-	-
IEC 61747	series	Liquid crystal and solid-state display devices	-	-

8) HD 323.2.30 S3 includes A1:1985 to IEC 60068-2-30.

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Part 5: Environmental, endurance and mechanical test methods

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LIQUID CRYSTAL AND SOLID-STATE DISPLAY DEVICES –
Part 5: Environmental, endurance and mechanical test methods**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61747-5 has been prepared by subcommittee 47C: Optoelectronic, display and imaging devices, of IEC technical committee 47: Semiconductor devices.

The text of this standard is based on a part of amendments 1 and 2 to IEC 60747-5 and the following documents:

FDIS	Report on voting
47C/203/FDIS	47C/211/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annex A is for information only.

LIQUID CRYSTAL AND SOLID-STATE DISPLAY DEVICES – Part 5: Environmental, endurance and mechanical test methods

1 General

1.1 Scope and object

This part of IEC 61747 lists test methods applicable to liquid crystal display devices. It takes into account, wherever possible, the environmental test methods outlined in IEC 60068.

It also includes visual inspection for both liquid crystal display cells and modules.

NOTE 1 – This standard is established separately from IEC 60749, because the technology of liquid crystal display devices is completely different from that of semiconductor devices in such matters as

- shape and size;
- used materials and structure;
- function;
- measuring methods;
- operation principles.

NOTE 2 – Devices include cells and modules.

The object of this standard is to establish uniform preferred test methods with preferred values for stress levels for judging the environmental properties of liquid crystal display devices.

In case of contradiction between this standard and a relevant specification, the latter shall govern.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61747. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61747 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60068, *Environmental testing*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Test A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Test B: Dry heat*

IEC 60068-2-3:1969, *Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state*

IEC 60068-2-5:1975, *Environmental testing – Part 2: Tests – Test Sa: Simulated solar radiation at ground level*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-7:1983, *Environmental testing – Part 2: Tests – Test Ga: Acceleration, steady state*

IEC 60068-2-13:1983, *Environmental testing – Part 2: Tests – Test M: Low air pressure*

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*

IEC 60068-2-21:1983, *Environmental testing – Part 2: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*

IEC 60068-2-38:1974, *Environmental testing – Part 2: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

IEC 60068-2-45:1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*

IEC 60747, *Semiconductor devices*

IEC 60747-1:1983, *Semiconductor devices – Discrete devices – Part 1 – General*

Amendment 1 (1991)

Amendment 2 (1993)

Amendment 3 (1996)

IEC 60747-5:1984, *Semiconductor devices – Part 5: Optoelectronic devices*

Amendment 1 (1994)

Amendment 2 (1995)

IEC 60748-1:1984, *Semiconductor devices – Integrated circuits – Part 1: General*

IEC 60749:1996, *Semiconductor devices – Mechanical and climatic test methods*

IEC 61747:1998, *Liquid crystal and solid-state display devices*

1.3 Terms, definitions and letter symbols

For the purpose of this standard, the definitions and letter symbols of IEC 60068, IEC 60747, IEC 60748 and IEC 61747-1 apply.

1.4 Standard atmospheric conditions

The atmospheric conditions specified in IEC 60068-1 apply.

1.4.1 Standard reference atmosphere

Temperature: 25 °C

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar)

1.4.2 Standard atmosphere for referee measurements and tests

If the parameters of liquid crystal display devices to be measured depend on temperature, pressure, and humidity and the law of dependence is unknown, the atmospheres to be specified shall be selected from the following:

Temperature °C	Relative humidity % RH	Air pressure kPa
20 ± 1	45 to 75	86 to 106
25 ± 1	45 to 75	86 to 106
30 ± 1	45 to 75	86 to 106
35 ± 1	45 to 75	86 to 106
NOTE – Atmospheric conditions for initial and final measurements shall be the same.		

1.4.3 Standard atmospheric conditions for measurements and tests

Unless otherwise specified, all tests and measurements shall be carried out under standard atmospheric conditions for testing.

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 85 % RH, where appropriate

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar)

The absolute humidity of the atmosphere shall not exceed 22 g/m³.

1.4.4 Recovery conditions

After the conditioning period and before making the final measurements, the specimens should be allowed to stabilize at the ambient temperature, the temperature at which the measurements shall be made.

The “controlled recovery conditions” (see 1.4.4.1) shall be applied if the electrical parameters to be measured are affected by absorbed humidity or by the surface conditions of the specimens, and change rapidly, for example if the insulation resistance rises considerably within approximately 2 h after removal of the specimens from the humidity chamber.

If the electrical parameters of the specimens affected by absorbed humidity or surface conditions do not vary rapidly, recovery may be carried out in the conditions specified in 1.4.3.

1.4.4.1 Controlled recovery conditions

Unless otherwise specified, all recovery shall be carried out under controlled atmospheric conditions:

Temperature: actual laboratory temperature ±1 °C, provided that it is within the limits fixed in 1.4.3, that is between 15 °C to 35 °C.

Relative humidity: 73 % to 77 %, where appropriate

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar)

Before the measurements are made, the devices shall be stored until temperature equilibrium is reached. The ambient temperature during the measurements shall be stated in the test report.

During measurements, the devices shall not be exposed to draught, illumination or other influences likely to cause error. The environment shall be controlled to avoid error.

If recovery and measurements are performed in separate chambers, the combination of temperature and humidity conditions shall be such that condensation on the surface of the devices does not occur when the device is transferred to the measurement chamber.

1.4.4.2 Recovery procedure

The device shall be placed in the recovery chamber within 10 min of completing of conditioning. Where the relevant specification requires measurements to be made immediately after the recovery period, these measurements shall be completed within 30 min of the specimen being removed from the recovery chamber. Those characteristics which are expected to change most rapidly after the device is removed from the recovery chamber shall be measured first.

1.4.5 Standard atmospheric conditions for assisted drying

Where assisted drying is required before commencing a series of measurements, the conditions listed below shall be used on the specimen for 6 h, unless otherwise prescribed by the relevant specification.

Temperature: $(55 \pm 2) ^\circ\text{C}$

Relative humidity: not exceeding 20 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar)

When the specified temperature for the dry heat test is lower than $55 ^\circ\text{C}$, assisted drying shall be carried out at that lower temperature.

1.5 Visual examination and verification of dimensions

Clauses 5 and 6 are applicable.

1.5.1 Visual examination shall include

- a) the conformance and permanence of the marking;
- b) damage to the encapsulation, including terminals;
- c) workmanship of the encapsulation, including terminals.

1.5.2 Dimensions given in the relevant specification shall be verified.

1.5.3 Unless otherwise specified, visual inspection shall be performed under normal factory lighting and under normal visual conditions.

1.6 Electrical and optical measurements

1.6.1 For environmental testing, the characteristics to be checked shall be selected from the relevant part of IEC 61747.

1.6.2 Measurement conditions shall comply with the table "Conditions for the endurance tests" in the relevant part of IEC 61747.