

BS EN 61747-10-1:2013



BSI Standards Publication

Liquid crystal display devices

Part 10-1: Environmental, endurance and mechanical test methods —
Mechanical

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National foreword

This British Standard is the UK implementation of EN 61747-10-1:2013. It is identical to IEC 61747-10-1:2013. It partially supersedes BS EN 61747-5:1998.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English version

**Liquid crystal display devices -
 Part 10-1: Environmental, endurance and mechanical test methods -
 Mechanical
 (IEC 61747-10-1:2013)**

Dispositifs d'affichage à cristaux liquides -
 Partie 10-1: Méthodes d'essais
 d'environnement, d'endurance et
 mécaniques -
 Essais mécaniques
 (CEI 61747-10-1:2013)

Flüssigkristall-Anzeige-Bauelemente -
 Teil 10-1: Umwelt-, Lebensdauer- und
 mechanische Prüfverfahren -
 Mechanisch
 (IEC 61747-10-1:2013)

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Foreword

The text of document 110/395/CDV, future edition 1 of IEC 61747-10-1, prepared by IEC TC 110, "Electronic display devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61747-10-1:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2014-05-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-08-14

This document partially supersedes EN 61747-5:1998.

EN 61747-10-1:2013 supersedes Clauses 1 and 2 of EN 61747-5:1998.

NOTE It is intended that the other clauses of EN 61747-5:1998 will be replaced by new parts in the EN 61747 series. The details of the intended changes are given in Annex D of EN 61747-30-1:2012.

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-1	NOTE Harmonised as EN 60068-1.
IEC 61747 series	NOTE Harmonised in EN 61747 series.
IEC 61747-5-3	NOTE Harmonised as EN 61747-5-3.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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	Series	Environmental testing	EN 60068	Series
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-7	-	Environmental testing - Part 2: Tests. Test Ga: Acceleration, steady state	EN 60068-2-7	-
IEC 60068-2-20	-	Environmental testing - Part 2-20: Tests - Test T: Test methods for solderability and resistance to soldering heat of devices with leads	EN 60068-2-20	-
IEC 60068-2-21	-	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21	-
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 60747	Series	Semiconductor devices	-	-
IEC 60748	Series	Semiconductor devices - Integrated circuits	-	-
IEC 60749-14	-	Semiconductor devices - Mechanical and climatic test methods - Part 14: Robustness of terminations (lead integrity)	EN 60749-14	-
IEC 61747-1	-	Liquid crystal and solid-state display devices - Part 1: Generic specification	EN 61747-1	-

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 10-1: Environmental, endurance and mechanical test methods – Mechanical

1 Scope

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

NOTE 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 mechanical properties of liquid crystal display devices.

In case of contradiction between this standard and a relevant specification, it is the latter that should govern.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068 (all parts), *Environmental testing*

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

IEC 60068-2-7, *Basic environmental testing procedures – Part 2-7: Tests – Test Ga and guidance: Acceleration, steady state*

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

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

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

IEC 60747 (all parts), *Semiconductor devices*

IEC 60748 (all parts), *Semiconductor devices – Integrated circuits*

IEC 60749-14, *Semiconductor devices – Mechanical and climatic test methods – Part 14: Robustness of terminations (lead integrity)*

IEC 61747-1, *Liquid crystal and solid-state display devices – Part 1: Generic specification*

3 Terms, definitions and letter symbols

For the purposes of this document, the terms, definitions and letter symbols given in IEC 60068, IEC 60747, IEC 60748 and IEC 61747-1 apply.

4 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.

5 Test methods

5.1 General

Choice of the appropriate tests depends on the type of devices. The relevant specification shall state which tests are applicable.

5.2 Robustness of terminations

5.2.1 Wire terminations, pins or connectors with pins

5.2.1.1 Test U

Test U, specified in IEC 60068-2-21, is applicable.

5.2.1.2 Tensile

This test shall be in accordance with test Ua1 of IEC 60068-2-21, with the following specific requirements.

After the test, examine under 3× to 10× magnification.

The device shall be rejected if there is breakage, loosening or relative motion between the lead or termination and the device body.

5.2.1.3 Bending

This test shall be in accordance with test Ub of IEC 60068-2-21.

5.2.1.4 Torsion

See IEC 60749-14.

Applied only for cells with pin.

5.2.1.5 Torque

See IEC 60749-14.

Applied only for cells with pin.

5.2.2 Flexible terminations

Under consideration.

5.3 Soldering

Test T, specified in IEC 60068-2-20, is applicable.

This test shall be in accordance with test Ta (methods 1, 2) (only methods 1 and 2 are referenced, these methods are solder bath and soldering iron).

5.4 Vibration (sinusoidal)

5.4.1 Test Fc

Test Fc, specified in IEC 60068-2-6, is applicable, with the following specific requirements.

5.4.2 Transverse motion

The maximum vibration amplitude at the check points in any perpendicular to the specified axis shall not exceed 25 %.

5.4.3 Distortion

Not exceeding 25 %.

5.4.4 Vibration amplitude tolerance

Reference point: ± 15 %

Check point: ± 25 %

5.4.5 Severities

The frequency range shall be given in the relevant specification by selecting a lower frequency from Table 1 and an upper frequency from Table 2.

Table 1 – Frequency range – Lower end

Lower frequency f_1 Hz
1
5
10
55

Table 2 – Frequency range – Upper end

Upper frequency f_2 Hz
55
100
150
300
500

The recommended ranges are shown in Table 3.

Table 3 – Recommended frequency ranges

Recommended frequency ranges, from f_1 to f_2 Hz
1 to 55
10 to 55
10 to 300
10 to 500
55 to 500

5.4.6 Vibration amplitude

The recommended vibration amplitudes with cross-over frequency are shown in Table 4.

Table 4 – Recommended vibration amplitudes

Displacement amplitude below the cross-over frequency	Acceleration amplitude above the cross-over frequency	
	m/s ²	g_n
mm		
0,035	4,9	0,5
0,075	9,8	1,0
0,15	19,6	2,0
0,35	49,0	5,0
0,75	98,0	10,0

NOTE The values listed apply in Table 4 for cross-over frequencies between 57 Hz and 62 Hz.

5.4.7 Duration of endurance

5.4.7.1 Endurance by sweeping

The duration of the endurance in each axis shall be given as a number of sweep cycles given preference by the relevant specification from the list given below:

1, 2, 5, 10, 20.

5.4.7.2 Endurance at critical frequencies

The duration of the endurance in each appropriate axis at each critical frequency found during the vibration response investigation shall be given preference in the relevant specification from the list given below:

10 min ± 0,5 min

30 min ± 1 min

90 min ± 1 min

10 h ± 5 min

The body of the device shall be securely clamped during the test. If the device has a specified method of installation, it shall be used to clamp the device.

5.5 Shock

Test Ea, specified in IEC 60068-2-27, is applicable, with the following specific requirements.

The conditions shall be selected from Table 5, taking into consideration the mass of the device and its internal construction.

Table 5 – Conditions for shock test

Peak amplitude A	Corresponding duration D of the nominal pulse	Corresponding velocity change ΔV	
		Half-sine	Final-peak saw-tooth
m/s ² (g_n)	ms	m/s	m/s
50 (5)	30	1,0	–
150 (15)	11	1,0	0,8
150 (15)	6	0,6	0,4
<u>300 (30)</u>	<u>18</u>	<u>3,4</u>	<u>2,6</u>
300 (30)	11	2,1	1,6
300 (30)	6	1,1	0,9
500 (50)	20	6,2	4,9
<u>500 (50)</u>	<u>11</u>	<u>3,4</u>	<u>2,7</u>
500 (50)	3	0,9	0,7
700 (70)	11	4,8	3,8
1 000 (100)	11	6,9	5,4
<u>1 000 (100)</u>	<u>6</u>	<u>3,7</u>	<u>2,9</u>
2 000 (200)	6	7,5	5,9
2 000 (200)	3	3,7	2,9

NOTE The preferred values are underlined.

The relevant specification shall state the wave form utilized.

The device shall be subjected to three successive shocks, in both directions of three mutually-perpendicular axes chosen so that faults are most likely to be revealed, i.e. a total of 18 shocks (see IEC 60068-2-27.) The preferred combinations are underlined.

The body of the device shall be securely clamped during the test. If the device has a specified method of installation, it shall be used to clamp the device.

5.6 Acceleration, steady state

Test Ga, specified in IEC 60068-2-7, is applicable, with the following specific requirements.

The acceleration conditions shall be selected from Table 6.

Table 6 – Acceleration conditions

Acceleration m/s ²
30
50
100
200
500
1 000
2 000

Procedure:

The acceleration shall be applied for at least 1 min, in both directions of the three major axes, unless otherwise specified.

The body of the device shall be securely clamped during the test. If the device has a specified method of installation, it shall be used to clamp the device.

5.7 Bond strength test

5.7.1 General

The purpose of this test is to measure bond strength or to determine compliance with specified bond strength requirements. This test is intended to show the bond strength on devices of flexible flat cables.

5.7.2 General description of the test

The flexible flat cable is pulled as shown in Figure 1, with the substrate rigidly fixed.

5.7.3 Preconditioning

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

5.7.4 Initial measurements

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

5.7.5 Test method (see Figure 1)

5.7.5.1 Application

This test shall apply to the bond strength measurement of flexible flat cables.

5.7.5.2 Procedure

The substrate of the bonded device shall be rigidly fixed. The flexible flat cable shall be pulled as shown in Figure 1 until it is completely removed from the device. The bond strength is equal to the minimum value indicated by the gauge.

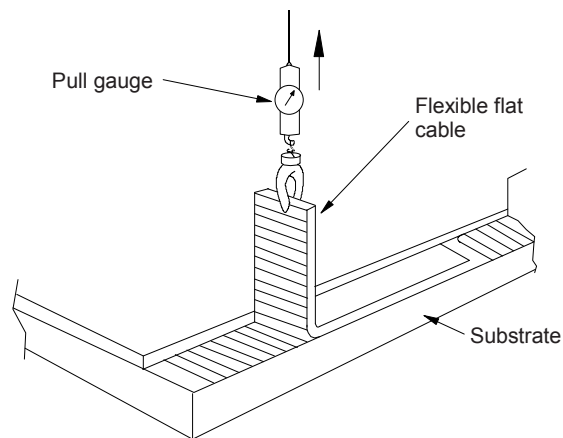
Be aware that pull speed should be sufficiently low.

The failure mode may be dependent on the pull speed.

5.7.6 Information required in the relevant specification

The following details shall be given as far as they are applicable:

- a) description of the clamp attachment and preparation of the flexible flat cable;
- b) preconditioning;
- c) conditions of test:
 - speed of pull;
 - maximum value of pull force;
 - method of data recording;
- d) test results:
 - minimum value of pull force;
 - category of separation.



IEC 1542/13

Figure 1 – Example of bond strength

Bibliography

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

IEC 61747 (all parts), *Liquid crystal display devices*

IEC 61747-5-3, *Liquid crystal display devices – Part 5-3: Environmental, endurance and mechanical test methods – Glass strength and reliability*

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