

INTERNATIONAL STANDARD

Liquid crystal display devices –
Part 2: Liquid crystal display modules – Sectional specification

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL STANDARD

**Liquid crystal display devices –
Part 2: Liquid crystal display modules – Sectional specification**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIQUID CRYSTAL DISPLAY DEVICES –**Part 2: Liquid crystal display modules –
Sectional specification**

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International Standard IEC 61747-2 has been prepared by IEC technical committee 110: Electronic display devices.

This International Standard is to be used in conjunction with IEC 61747-1-1:2014.

This second edition cancels and replaces the first edition published in 1998. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) This version is applicable only for liquid crystal displays.
- b) All the references to IECQ and QC were removed in accordance with ISO/IEC Directives.
- c) The normative references were updated.

The text of this standard is based on the following documents:

CDV	Report on voting
110/531/CDV	110/602/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61747 series, published under the general title *Liquid crystal display devices*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 2: Liquid crystal display modules – Sectional specification

1 Scope

This part of IEC 61747 applies to liquid crystal display modules such as the following:

- static/segment type liquid crystal display modules;
- passive matrix monochrome liquid crystal display modules;
- passive matrix colour liquid crystal display modules;
- active matrix monochrome liquid crystal display modules;
- active matrix colour liquid crystal display modules.

It gives details of the quality assessment procedures, inspection requirements, screening sequences, sampling requirements, and test and measurement procedures required for the assessment of liquid crystal display modules.

2 Normative reference

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 61747-1-1:2014, *Liquid crystal display devices – Part 1-1: Generic – Generic specification*

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

IEC 61747-10-2, *Liquid crystal display devices – Part 10-2: Environmental, endurance and mechanical test methods – Environmental and endurance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

production line

single set of process operations including one or several of the following manufacturing phases:

- a) connection of external electronic circuit devices to cell;
- b) finishing and final electrical and optical measurements;
- c) screening (if applicable).

Note 1 to entry: Quality assessment procedures are not included in these phases.

3.2

production lot

devices of the same type, manufactured in the same production lines and passing through the same nominated process, normally within one month

4 Quality assessment procedure

4.1 Primary stage of manufacture

The quality assessment procedure is defined as outlined below.

For the purpose of this sectional specification, this stage is defined as the first process step that connects external electronic circuit devices (including separate printed circuit boards (PCB) and/or connection cables) to a liquid crystal display cell, thus converting it to a liquid crystal module.

4.2 Manufacturing process

4.2.1 General

The manufacturing process of liquid crystal display modules is classified as follows:

- a) connection of electronic circuit devices (including separate PCBs and/or connection cables): this process is the set of manufacturing process operations from the primary stage to the last step for electronic circuit device connections to the cell;
- b) finishing process and final electrical and optical measurements: this process is the final set of manufacturing process operations comprising the assembly of a bezel, external connectors/pins and integrated backlight system to the cell if required, as well as the marking for the completion as a liquid crystal display module;
- c) screening (if applicable): this phase may be part of the finishing operation(s).

4.2.2 Major changes in manufacturing process

Any change in the manufacturing process or in the technology which could affect the quality or performance of a product supplied according to an approved specification, or which could require a product to be transferred from one structural similarity group to another (see 4.4) represents a change considered as major. It is the responsibility of the designated management representative (DMR) to decide whether the change is major or not.

Any major change shall only be implemented with notification and demonstration by test evidence of quality.

Examples of major changes are:

- a) driver attachment: from two-bank to one-bank arrangement;
- b) integrated backlight system:
 - lamp position from horizontal to vertical or from top to bottom arrangement;
 - backlight-type change from electroluminescent to cold cathode fluorescent lamp;
 - light guide change from wedge to flat type;
- c) bezel material: from metal to plastic;
- d) connector change and/or pin assignment change: from type A to type B connector.

NOTE Equipment change without changing the technology is not considered as a major change.

4.3 Subcontracting

The approved manufacturer shall ensure that the subcontracted manufacturing process is either part of or a whole of the cell and/or module manufacturing process, unconditionally, including screening steps which are incorporated in them. Screening operations applied after the assembly process may also be independently subcontracted.

It shall be ensured that the DMR that is certifying the components

- has been provided with the full quality assessment and inspection documentation of any operation outside the specified geographical area. The documentation shall include the inspection records for each sample of the product which undergoes inspection;
- regularly verifies that the quality assessment and inspection is applied in accordance with the agreed requirements.

The DMR shall be provided and shall agree with the procedures for the transfer of the parts from the place of manufacture to the manufacturer within the specified geographical area which is certifying the component. Any changes in inspection requirements and manufacturing procedures shall be reported back to the DMR that is certifying the modules.

The approved manufacturer shall perform the acceptance tests prescribed by the detail specification for the components it is certifying. It can perform the acceptance tests in a facility outside the specified geographical area. Acceptance tests can be subcontracted to approved test laboratories within the specified geographical area.

4.4 Structural similarity procedures

4.4.1 General

Structural similarity procedures are intended to permit a reduction in the number of inspection lots for quality assessment that shall be tested. Therefore, in case of reassessment due to the extension of approval types or the change of the design, the testing data which was performed within the same grouping products may be used.

4.4.2 Structurally similar modules

Structurally similar modules are produced by one manufacturer, to the same design, with the same material, manufacturing process and methods. The crucial criterion for the grouping of types of modules as structurally similar is that the differences between the various types have no influence on the results of the test for which the group has been formed.

4.4.3 Test-dependent criteria for structural similarity

The test-dependent criteria for structural similarity applicable to group B (lot-by-lot inspections) and group C (periodic tests), are given in Table 1. Items a) to i) specify the interpretation of these criteria for structural similarity.

a) Cell

The material and basic design for the cell, for example passive matrix, active matrix, etc., shall be the same. The display area differences shall be within $\pm 50\%$. The pixel number differences shall be within $\pm 50\%$.

b) Electronic circuit devices including separate PCBs

The material and basic design, for example static driving, multiplex driving, direct addressing, matrix addressing, etc., shall be the same.

c) Backlight system

The material and basic design for the integrated backlight system shall be the same.

d) Bezel structure

The material and basic design for the bezel shall be the same.

e) External connection

The material and basic design for the external connection from the module shall be the same.

f) Process (common)

The basic process and process material shall be the same.

g) Production lines (common)

The modules shall be made along the same lines.

h) Marking

The same material shall be used for marking and the essential process condition of marking shall be the same.

i) Rating

The rating values which are specified in the detail specification shall be the same, exclusive of the items dependent on the display area and number of pixels. The power dissipation of associated types shall be less than 1,5 times that of the module which is tested.

4.5 Qualification approval procedure

Inspection requirements for the qualification approval test are as follows. Qualification approval shall normally be granted when satisfactory results have been achieved on completion of the test requirements (including testing items, condition, final sampling size, etc.). The inspection requirements to be used are specified in Table 2.

However, in case of fixed sampling sizes, the sampling requirements in accordance with those stated in Tables 7 and 8 may be used.

4.6 Quality conformance inspection

4.6.1 General

The quality conformance inspection is defined in IEC 61747-1-1:2014, 5.6.

4.6.2 Division into groups and subgroups

Division into groups and subgroups shall be in conformance with IEC 61747-1-1. In addition, the groups and subgroups shall satisfy the conditions outlined below.

- Groups A and B: one test lot contains devices produced within a period of one month or four weeks as indicated by the used date code(s).
- Group C: samples from a production submitted for periodic testing shall have been manufactured within a period of three months as indicated by three consecutive month date codes or by 13 consecutive week date codes.
- Group D: samples from a production submitted for periodic testing shall have been manufactured within a period of 12 months as indicated by 12 consecutive month date codes or by 52 consecutive week date codes.

4.6.3 Groups and categories

The groups shall be in accordance with Table 3.

4.6.4 Group A – Lot-by-lot inspections

These tests shall be prescribed in accordance with Table 4.

4.6.5 Group B – Lot-by-lot inspections

These tests shall be prescribed in accordance with Table 5.

4.6.6 Group C – Periodic tests

These tests shall be prescribed in accordance with Table 6.

4.6.7 Group D – Periodic tests

These tests shall be performed for qualification approval, and thereafter, annually, where required only. They shall be prescribed in the detail specification.

4.6.8 Dimensions to be checked

Dimensions to be checked as part of groups B and C shall be prescribed in the detail specification. Also, where applicable, optical related dimensions and the group in which they are tested shall be given in the detail specifications.

4.6.9 Sampling requirements (fixed sampling sizes)

Table 7 gives sampling requirements for group A tests and Table 8 gives requirements for group B and C tests, both for lot sizes between 501 and 1 200. The other sampling sizes shall be specified in the blank detail specification (BDS) for the different lot sizes.

4.7 Capability approval procedure

Under consideration.

4.8 Screening

When screening is specified in the detail specification or the order, it shall be applied to all devices in the production. Screening is normally performed before group A, B and C tests. When screening is performed after meeting the requirements of groups A and B on a lot-by-lot basis and groups C and D on a periodic basis, group A tests shall be repeated. Additional post-screening tests may be required as specified in the detail specification. The test shall be prescribed in accordance with Table 9.

4.9 Delayed deliveries

Before delivery of lots which have been in store for over a year, the lots or the quantities to be delivered shall undergo the specified group A test. Once this has been done for the complete lot, no further retesting is required for one year.

5 Test and measurement procedures

The testing and measuring methods of electrical and optical characteristics for liquid crystal display modules shall be in conformance with IEC 61747-1-1. These tests shall be referred to in the detail specification when required.

Table 1 – Test-dependent criteria for structural similarity

Test item	Cell Electronic circuit				Backlight Bezel structure External connection Finishing						Ratings			
	4.4.3 a) Cell	4.4.3 b) Electronic circuits	4.4.3 f) Process	4.4.3 g) Production line	4.4.3 c) Backlight system	4.4.3 d) Bezel structure	4.4.3 e) External connection	4.4.3 f) Process	4.4.3 g) Production lines	4.4.3 h) Marking	4.4.3 i) Damp, temperature characteristics	4.4.3 j) Electrical characteristics	4.4.3 k) Optical characteristics	4.4.3 l) Mechanical characteristics
External visual examination	X	X	X	X	X	X	X	X	X	X				X
Visual defects	X	X	X	X	X			X	X		X	X	X	
Contrast ratio	X	X									X	X	X	
Luminance	X				X						X	X	X	
Colour gamut ^a	X				X						X	X	X	
Supply current ^b	X	X									X	X	X	
Operating backlight current					X						X	X	X	
Viewing angle	X	X									X	X	X	
Dimensions	X				X	X	X							X
Response time	X	X									X	X	X	
Transmittance	X											X	X	
Reflectance	X											X	X	
Change of temperature		X	X	X	X	X	X	X	X		X			X
Shock	X	X	X	X	X	X	X	X	X					X
Vibration	X	X	X	X	X	X	X	X	X					X
Low air pressure	X				X									
Permanence of marking										X				
Electrical endurance		X			X	X	X					X		
Operation (at high temperature)	X	X	X	X	X		X	X	X		X	X	X	
Operation (at low temperature)	X	X	X	X	X		X	X	X		X	X	X	
Operation (damp heat)	X	X	X	X	X	X	X	X	X		X	X	X	
Storage (at high temperature)	X	X	X	X	X	X	X				X			
Storage (at low temperature)	X	X	X	X	X	X	X				X			
Storage (damp heat)	X	X	X	X	X	X	X				X			

^a This item is applicable only to colour LCD modules.

^b This item does not include the supply current from the backlight system.

NOTE Crosses (X) in the table denote a mandatory criterion for the corresponding test.

Table 2 – Inspection requirements for qualification approval test

Group	Sub-group	Examination or test	IEC publication	Details and conditions	Category I		Category II		Category III		
					<i>n</i>	<i>c</i>	<i>n</i>	<i>c</i>	<i>n</i>	<i>c</i>	
0	0-1	External visual examination	61747-1-1	To be specified in the detail specification	14	0	21	0	21	0	
	0-2	Visual defects									
	0-3	Contrast ratio		LSL in the detail specification							
	0-4	Luminance		LSL or USL in the detail specification							
	0-5	Colour gamut									
	0-6	Supply current		USL in the detail specification							
	0-7	Operating backlight current									
1	1-1	Dimensions	61747-1-1	LSL or USL in the detail specification	2	0	3	0	3	0	
		Storage (at high temperature)	61747-10-2	To be specified in the detail specification							
	1-2	Viewing angle	61747-1-1	LSL or USL in the detail specification	2	0	3	0	3	0	
		Response time		USL in the detail specification							
		Transmittance		LSL in the detail specification							
		Reflectance		LSL and USL in the detail specification							
		Change of temperature	61747-10-2	To be specified in the detail specification							
1-3	Bond strength for external pins	61747-10-1	To be specified in the detail specification								
2	2-1	Low air pressure	61747-10-2		2	0	3	0	3	0	
		Shock	61747-10-1								
	2-2	Permanence of marking	61747-10-2								
		Storage (at low temperature)									
		Vibration	61747-10-1								
2-3	Storage (damp heat)	61747-10-2									
3	3-1	Operation (at high temperature)			2	0	3	0	3	0	
	3-2	Operation (at low temperature)									
	3-3	Operation (damp heat)									
NOTE 1 <i>n</i> = sample size <i>c</i> = group criterion (permitted number of defectives per group or subgroup)											
NOTE 2 USL = upper specification limit LSL = lower specification limit											
NOTE 3 The supply current does not include the supply current from the backlight system.											

Table 3 – Groups and categories of assessed quality

Group	Category I	Category II	Category III
Screening			X
A	X	X	X
B	X ^a	X	X
C	X ^a	X	X

^a Annually, one lot meets the B and C group test requirements.

Table 4 – Group A – Lot-by-lot inspections

Subgroup	Examination or test	IEC publication	Details and conditions
A1	External visual examination	61747-1-1	To be specified in the detail specification
A2	Visual defects		
	Contrast ratio		
	Luminance		
A3	Supply current ^a		
	Operating backlight current		

^a This item does not include the supply current from the backlight system.

Those subgroups which are not specified in this specification shall be specified in the detail specification.

Table 5 – Group B – Lot-by-lot inspections

Subgroup	Examination or test	IEC publication	Details and conditions
B1	Dimensions (interchangeability)	61747-1-1	In accordance with the drawing given in the detail specification

Those subgroups which are not specified in this specification shall be specified in the detail specification.

NOTE In the case of category I, see 4.4 of the IEC 61747-1-1:2014.