

INTERNATIONAL STANDARD

Liquid crystal display devices –
Part 1-2: Generic – Terminology and letter symbols

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IEC 61747-1-2

Edition 1.0 2014-08

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

T

ICS 31.120

ISBN 978-2-8322-1806-8

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 1-2: Generic – Terminology and letter symbols

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International Standard IEC 61747-1-2 has been prepared by IEC technical committee 110: Electronic display devices.

This first edition cancels and replaces the first edition of IEC 61747-1 published in 1998 and Amendment 1:2003. This edition constitutes a technical revision.

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

- a) The former IEC 61747-1, *Generic specification* was divided into IEC 61747-1-1, *Liquid crystal display devices – Part 1-1: Generic – Generic specification* and IEC 61747-1-2, *Liquid crystal display devices – Part 1-2: Generic – Terminology and letter symbols*.
- b) In this part of IEC 61747, new terms have been added and some of the terms and the definitions have been updated.

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

CDV	Report on voting
110/526/CDV	110/562/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, under the general title *Liquid crystal display devices*, can be found on the IEC website.

NOTE The structure of IEC 61747 series and the changes in the numbering are shown in Annex D of IEC 61747-30-1:2012.

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- withdrawn,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.

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 1-2: Generic – Terminology and letter symbols

1 Scope

This part of IEC 61747 gives the preferred terms, their definitions and symbols for liquid crystal devices, with the object of using the same terminology when publications are prepared in different countries.

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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

IEC 60617, *Graphical symbols for diagrams*

ISO 80000-1, *Quantities and units – Part 1: General*

3 Terms and definitions

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

3.1 Physical concepts

3.1.1

alignment layer

thin layer deposited over the patterned electrodes that determines the direction of the director at the surface

Note 1 to entry: The alignment layer produces the desired ordering. Alignment such as homeotropic alignment or planar alignment is achieved by the co-operative ordering of the liquid crystal molecules locally affected by the surface forces. The alignment layer generates the pretilt angle.

3.1.2

anti-ferroelectric liquid crystal

AFLC

type of smectic liquid crystal having no macroscopic electric polarization at zero external field

Note 1 to entry: An anti-ferroelectric liquid crystal has a paraelectric state with layers of alternating polarity of permanent dipoles without an external electric field, and it transfers to a ferroelectric state of parallel alignment when an electric field is applied.

3.1.3

cell gap

thickness of the liquid crystal layer between the two support plates

3.1.4**cholesteric phase**

liquid crystal phase that exhibits planar nematic ordering in which the directors form a helix that has its axis perpendicular to the plane

3.1.5**chiral pitch
helical pitch**

periodic distance needed for directors to rotate by 360° in a helically structured liquid crystal

3.1.6**chiral nematic phase**

liquid crystal phase that exhibits planar nematic ordering in which the directors form a helix that has its axis perpendicular to the plane

3.1.7**clearing point**

phase transition temperature of a liquid crystal for transition toward the isotropic phase

3.1.8**dichroic liquid crystal**

liquid crystal exhibiting dichroism, i.e. the property of anisotropic absorption of light

3.1.9**direct addressing**

method of addressing by applying a signal to a terminal that corresponds to a single pixel

Note 1 to entry: Hence, all pixels can be addressed individually, in groups or simultaneously

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3.1.10**director**

axial unit vector describing the local axis of symmetry for the orientational distribution function of any chosen molecular axis of a liquid crystal

Note 1 to entry: The director co-ordinates define the local alignment of the liquid crystal.

3.1.11**disclination**

localized alignment defect (appearing generally in the form of closed or open lines) forming the boundary between areas exhibiting different alignment states

3.1.12**discotic mesophase**

liquid crystal phase of disc-like shaped molecules exhibiting a long range ordering with respect to the short molecular axis

3.1.13**domain**

region having a well-defined boundary in which liquid crystal molecules have the same director orientation

3.1.14**dynamic scattering**

electro-optical effect showing a light scattering caused by turbulent motion in a liquid crystal layer induced by an electro-hydrodynamic effect

3.1.15**electrically controlled birefringence**

electro-optical effect caused by the birefringence of a liquid crystal layer which can be modulated (varied) by an electric field

Note 1 to entry: It is also called “tunable birefringence”.

3.1.16**electrode layer**

electrically conductive layer, usually transparent, covering the support plates and patterned to establish the display and electric contact configuration

Note 1 to entry: The electrode layer may be made, for example, of indium tin oxide (ITO).

3.1.17**ferroelectric liquid crystal**

liquid crystal phase exhibiting a spontaneous electric polarization

Note 1 to entry: The ferroelectric liquid crystal effect is commonly exhibited in chiral smectic liquid crystal.

3.1.18**film compensated super twisted nematic liquid crystal****FSTN**

liquid crystal which changes the background colour of an STN-LCD to black-and-white, by adding a special layer of compensation film

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3.1.19**guest-host effect**

anisotropic optical absorption effect occurring in a dichroic liquid crystal layer containing a dissolved dye

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3.1.20**highly twisted nematic liquid crystal cell**

nematic liquid crystal which has a twisted angle structure of 90° to 180° between two substrates

3.1.21**homeotropic alignment**

alignment state of a liquid crystal layer for which the director is at all points nominally perpendicular to a support plate surface

3.1.22**liquid crystal**

material that exhibits a mesophase consisting of elongated (rod-like) or disc-like (discotic) molecules and that possesses at least one long range orientational ordering with respect to one molecular axis

3.1.23**mesophase****mesomorphic phase**

ordered state of matter between the crystalline and isotropic liquid phases, exhibiting some of the properties of the neighbouring phases, for example in respect of fluidity and birefringence

3.1.24**nematic phase**

liquid crystal phase in which the molecules possess a long-range orientational ordering of one molecular axis (uniaxial nematic liquid crystal) or two molecular axes (biaxial nematic liquid crystal)

3.1.25**phase transition**

phenomenon in which liquid crystal changes from one phase to another

EXAMPLE From the smectic to the nematic phase, the solid to the smectic phase, or the nematic to the isotropic liquid phase

3.1.26**planar alignment**

alignment state of a liquid crystal layer for which the director is everywhere nominally parallel to a support plate surface

Note 1 to entry: This alignment is also referred to as homogeneous alignment.

3.1.27**polymer dispersed liquid crystal**

liquid crystal polymer composites within which there exists at least two different phases

3.1.28**pretilt angle**

angle between the plane of a support plate and the adjacent liquid crystal director

3.1.29**rubbing axis****rubbing direction**

direction or axis of rubbing of the alignment layer in order to align liquid crystal molecules

3.1.30**smectic phase**

liquid crystalline phase characterized by at least one one-dimensional long range transitional ordering of the molecules and a long range orientational ordering for one molecular axis

3.1.31**spacer**

material (e.g. calibrated spheres or cylinders) incorporated into a liquid crystal cell to ensure a constant distance between the support plates

3.1.32**storage capacitor**

capacitor, parallel to a liquid crystal element, holding a signal voltage applied to each pixel or subpixel in an active matrix display

3.1.33**storage effect**

property of a picture element in which the visual information is retained after the activation has been removed

3.1.34**super twisted nematic liquid crystal****STN**

nematic liquid crystal which possesses a twisted structure from 180° to 270° between the support plates

3.1.35**thermotropic liquid crystal**

material whose liquid crystalline phase changes as the temperature changes in a certain range

3.1.36**thin film transistor liquid crystal display
TFT-LCD**

active matrix liquid crystal display with thin film transistors, in which every pixel is controlled by one or more thin film transistor switches

3.1.37**twist angle**

oriented angle between the projections of the respective surface directors at the support plates on to one of the support plates of a twisted nematic cell

3.1.38**twisted nematic liquid crystal
TN**

nematic liquid crystal which possesses a twisted structure of around 90° between the support plates

3.1.39**twisted nematic structure**

nematic liquid crystal state characterized by a twisted structure

3.1.40**voltage holding ratio**

ratio of the holding voltage to the signal voltage initially applied at opposed electrodes in a liquid crystal cell

3.2 General terms

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3.2.1**achromatic display**

display that generates an image which is devoid of hue

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3.2.2**active area**

part of a display screen area delimited by picture elements

3.2.3**active matrix display**

matrix-addressed display device in which each picture element has at least one switching element (e.g. diode or transistor)

3.2.4**addressing**

selection of the pixels in space and/or time for activation or deactivation

3.2.5**alphanumeric display**

display that is able to show a limited set of characters comprising at least letters and Arabic numerals

3.2.6**backlight**

light source system that illuminates light uniformly onto a liquid crystal display cell from behind