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INTERNATIONAL STANDARD

Liquid crystal display devices – Part 4-1: Matrix colour LCD modules – Essential ratings and characteristics

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LIQUID CRYSTAL DISPLAY DEVICES –

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FOREWORD

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International Standard IEC 61747-4-1 has been prepared by IEC technical committee 110: Electronic display devices.

This second edition cancels and replaces the first edition published in 2004. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: Adding the contents of the IEC 61747 series, adding the TFT technical kinds, revising the electrical and optical characteristics in Table 1 and correcting some editorial errors.

This standard is to be read in conjunction with IEC 61747-1-1.

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

FDIS	Report on voting
110/589/FDIS	110/611/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.

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

A list of all 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- withdrawn,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.

The National Committees are requested to note that for this publication the stability date is 2020.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

IEC 61747 consists of the following parts, under the general title “Liquid crystal display devices”:

Part 1-1: Generic – Generic specification;

Part 1-2: Generic – Terminology and letter symbols;

Part 2: Liquid crystal display modules – Sectional specification[1];

Part 2-1: Passive matrix monochrome LCD modules – Blank detail specification;

Part 2-2: Matrix colour LCD modules – Blank detail specification;

Part 3: Liquid crystal display (LCD) cells – Sectional specification[2];

Part 3-1: Liquid crystal display (LCD) cells – Blank detail specification[3];

Part 4: Liquid crystal display modules and cells – Essential ratings and characteristics;

Part 4-1: Matrix colour LCD modules – Essential ratings and characteristics;

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

Part 10-2: Environmental, endurance and mechanical test methods – Environmental and endurance;

Part 20-1: Visual inspection – Monochrome liquid crystal display cells (excluding all active matrix liquid crystal display cells);

Part 20-2: Visual inspection – Monochrome matrix liquid crystal display modules (excluding all active matrix liquid crystal display modules)[4];

Part 20-3: Visual inspection – Active matrix colour liquid crystal display modules[5];

Part 30-1: Functional measurement methods for liquid crystal display modules – Transmissive type;

Part 30-4: Measuring methods of LCD modules with dynamic backlight units[6];

Part 40-1: Mechanical testing guidelines for display cover glass for mobile devices;

Part 40-2: Mechanical testing of display cover glass for mobile devices – Uni-axial flexural strength (4-point bend)[7];

Part 40-3: Mechanical testing of display cover glass for mobile devices – Biaxial flexural energy-to-failure (ball drop)[8];

Part 40-4: Mechanical testing of display cover glass for mobile devices – Biaxial flexural strength (ring-on-ring)[9];

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1 To be published.

2 To be published.

3 To be published.

4 To be published.

5 Under consideration.

6 Under consideration.

7 To be published.

8 To be published.

9 To be published.

LIQUID CRYSTAL DISPLAY DEVICES –

Part 4-1: Matrix colour LCD modules – Essential ratings and characteristics

1 Scope

This part of IEC 61747 describes the essential ratings and characteristics of matrix colour liquid crystal display (LCD) modules.

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

3 Matrix colour liquid crystal display modules

3.1 Principles and material used

Example: a thin film transistor (TFT) (amorphous silicon, polycrystalline silicon, oxide, organic) active matrix display cell with electronic circuits and connector pins.

Where appropriate, a type of integrated light source.

3.2 Modes of operation

3.2.1 Addressing mode of operation

Example: passive matrix, active matrix, TFT mode, thin film diode (TFD) mode, etc.

3.2.2 Optical mode of operation

– Illumination mode: for example reflective, transmissive, transflective.
– Number of colours.
– Number of grey levels.

Normally white, normally black.

3.3 Details of outline

3.3.1 Material, mechanical description

– Examples: glass, plastic, metal, etc.
– Construction: for example integrated light source, bezel structure.

3.3.2 Method of connection

Connectors, flex cable or connection pins, etc.

3.3.3 Outline drawing and dimensions

– Overall dimensions.

– Viewing area and display centre.

3.3.4 Pin layout and/or assignment

Type of connectors.

3.3.5 Preferred or designed viewing direction

3.4 Limiting values (absolute maximum rating system) over the operating temperature range, unless otherwise stated

3.4.1 Minimum and maximum ambient operating temperature (T_{op})

3.4.2 Minimum and maximum storage temperature (T_{stg})

3.4.3 Minimum and maximum value of supply voltages for logic and LCD drive or supply voltage(s) for module

3.4.4 Minimum and maximum value of input signal voltage (V_{IN})

3.4.5 Where appropriate, minimum and maximum value of integrated light source voltage (V_{LS})

3.4.6 Where appropriate, maximum soldering temperature (T_{sld})

The maximum soldering time and minimum distance to module package should be specified.

3.5 Electrical and optical characteristics

The following characteristics should be specified in Table 1.

Table 1 – Electrical and optical characteristics of matrix colour LCD modules

Reference	Characteristics	Condition at T_{op} = 25 unless otherwise specified	Symbol	Requirements	
3.5.1	Supply voltages				
	Supply voltage for logic drive		$V_{DD} - V_{SS}$	Min.	Max.
	Supply voltage for LCD drive		$V_{DD} - V_{EE}$ or $V_{EE} - V_{SS}$ or $V_{DD} - V_{O}$ or $V_{O} - V_{SS}$	Min.	Max.
	Supply voltage(s) for module		V_{MDL}	Min.	Max.
3.5.2	Input signal voltages		V_{IN}	Min.	Max.
	High level input signal voltage		V_{INH}	Min.	Max.
	Low level input signal voltage		V_{INL}	Min.	Max.
	Input analogue video signals (where appropriate)		V_{VID}	Min.	Max.
3.5.3	Operating backlight voltage (where appropriate)		V_{BL}	Min.	Max.
	Discharge ignition voltage of backlight (where appropriate)		V_{BLIG}	Min.	

Reference	Characteristics	Condition at T_{op} = 25 unless otherwise specified	Symbol	Requirements	
3.5.4	Operating frequency (where appropriate) Frame frequency Oscillator frequency		f_{op} f_{FRM} f_{OSC}	 Min. Min.	 Max. Max.
3.5.5	Supply currents (without backlight)	Conditions chosen to achieve maximum supply current, e.g. operating supply voltage, display pattern, etc., as appropriate.	I_{DD}		Max.
3.5.6	High level input signal current (where appropriate)		I_{INH}		Max.
3.5.7	Low level input signal current (where appropriate)		I_{INL}		Max.
3.5.8	Operating backlight current (where appropriate)		I_{BL}	Min.	Max.
3.5.9	Contrast ratio	When the module has a light source system, this system shall be used at a specified level during the contrast ratio measurements	CR	Min.	
3.5.10	Luminance (where appropriate) Luminance uniformity or Luminance long-range non-uniformity (where appropriate)	Specified measuring method and conditions	L L_{uni} or L_{NU}	Min. Min.	 Max
3.5.11	Viewing angle range	Specified definition of viewing Direction and specified contrast ratio	θ_H and θ_V	Min.	
3.5.12	Rise time	Specified temperature	t_r		Max.
3.5.13	Fall time	Specified temperature	t_f		Max.
3.5.14	Transmittance (regular and/or diffuse) (where appropriate)	Specified measuring method and conditions	T_r and/or T_d	Min.	
3.5.15	Reflectance (regular and/or diffuse) (where appropriate)	Specified measuring method and conditions	ρ_r and/or ρ_d	Min.	Max.

Reference	Characteristics	Condition at T_{op} = 25 unless otherwise specified	Symbol	Requirements	
3.5.16	Chromaticity of white (x, y) (where appropriate)	Specified measuring method and conditions	x_W, y_W	[a]	[a]
	Chromaticity of red (x, y) (where appropriate)		x_R, y_R	[a]	[a]
	Chromaticity of blue (x, y) (where appropriate)		x_B, y_B	[a]	[a]
	Chromaticity of green (x, y) (where appropriate)		x_G, y_G	[a]	[a]
[a] The items of value (i.e., minimum, maximum, typical or average) are determined in a detail specification.					

3.6 Supplementary information

3.6.1 Timing characteristics, timing of logic voltages and data/format interface specification

3.6.2 Supply voltages sequence condition, where appropriate

3.6.3 Operating voltage range, if appropriate, as a function of temperature at specified contrast ratio

3.6.4 Handling and operating information

3.6.5 Precautions with respect to electrostatic discharges

3.6.6 Precautions of installation, mechanical and/or electrical

3.6.7 Safety information

3.6.8 Characterization of diffused and regular reflectance and transmittance