

INTERNATIONAL STANDARD

Liquid crystal display devices –
Part 20-2: Visual inspection – Monochrome matrix liquid crystal display modules
(excluding all active matrix liquid crystal display modules)

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(excluding all active matrix liquid crystal display modules)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIQUID CRYSTAL DISPLAY DEVICES –

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

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International Standard IEC 61747-20-2 has been prepared by IEC technical committee 110: Electronic display devices.

This first edition cancels and replaces Clause 5 of the first edition of IEC 61747-5 published in 1998. This edition constitutes a technical revision.

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

- a) editorial modification was done in accordance with the ISO/IEC Directives, Part 2;
- b) document number was changed to align with the new numbering structure of the IEC 61747 series.

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

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

| FDIS | Report on voting |
|--------------|------------------|
| 110/638/FDIS | 110/654/RVD |

Full information on the voting for the approval on 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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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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INTRODUCTION

This part of IEC 61747 facilitates the visual inspection of image defects of monochrome matrix LCD modules by the human eye subjectively. Visual inspection is performed at specified conditions and criteria. The objective measurement method of visual image defects with an instrument will be studied and standardized.

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LIQUID CRYSTAL DISPLAY DEVICES –

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

1 Scope

This part of IEC 61747 gives the details of the quality assessment procedures and provides general rules for the visual inspection of the non-active and active areas of monochrome matrix liquid crystal display modules by the human eye and, if necessary, through an optical microscope. Furthermore this standard includes the defect definitions and the method for visual defect inspection.

NOTE Restrictions on defect types, number, and sizes are specified in the quality contract (customer acceptance specification and incoming inspection specification) between the panel and set makers.

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 61747-1-2:2014, *Liquid crystal display devices – Part 2: Terminology and letter symbols*

IEC 61747-10-2:2014, *Liquid crystal display devices – Part 10-2: Environmental, endurance and mechanical test methods – Environmental and endurance*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms, definitions and letter symbols given in IEC 61747-1-2 and IEC 61747-10-2 apply.

3.2 Abbreviations

DUT Device under test

4 Visual inspection method and criteria

4.1 Standard inspection conditions and methods

4.1.1 Ambient conditions

4.1.1.1 Temperature

All visual inspection shall be carried out under specified temperature. Refer to IEC 61747-10-2:2014, 1.4.3.

4.1.1.2 Humidity

All visual inspection shall be carried out under specified humidity. Refer to IEC 61747-10-2:2014, 1.4.3.

4.1.1.3 Illuminance

All visual inspection shall be carried out under illumination levels as specified in the detail specification. The illumination level shall be adjusted in such a way that it allows for an accurate visual inspection.

4.1.2 Inspection equipment and liquid crystal display modules

The DUT will be installed on a rotatable fixture to enable changes in the horizontal and vertical viewing direction range. Alternatively, the inspector moves around and the DUT is fixed.

Turn on the direct current power supply and pattern generator and warm up for stabilization. Supply the driving voltage and pattern to the DUT. The warm-up time of the DUT shall be sufficiently long to obtain a stable signal, necessary for the visual inspection.

4.1.3 Inspector and limit sample for visual inspection

The inspector shall have a (corrected-to) normal vision, a normal colour vision and shall be periodically trained with specified limit samples in order to accurately carry out the visual examination.

4.1.4 Inspection and record of result

The inspector shall carry out the visual inspection based on the specified procedure and record the result on recording sheets with the specified inspection conditions.

4.2 Visual inspection of display

4.2.1 Display not activated

4.2.1.1 Test conditions

The test conditions of visual inspection shall be described for the following conditions:

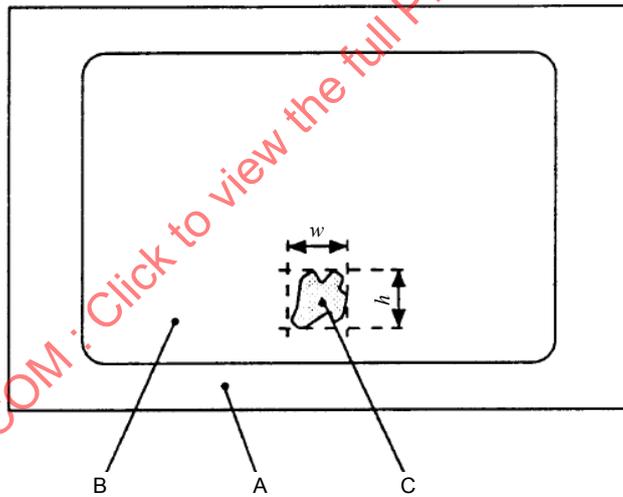
- viewing direction range;
- illumination from above or through the device (depending on the application);
- duration;
- viewing distance;
- ambient temperature.

4.2.1.2 Procedure

The devices shall be inspected for the following visual defects as described in Table 1.

Table 1 – Defects and criteria when display not activated

| Defects | Rejection criteria |
|---|---|
| Spots (see Figure 1), bubbles, foreign particles; light/dark stains on light background, light/dark stains on dark background | To be specified in the detail specification |
| Scratches on the liquid crystal cell and on the polarizer within the specified viewing direction range | To be specified in the detail specification |
| Mechanical damage outside of the viewing area | To be specified in the detail specification |
| Accumulation of the above-listed visible defects | To be specified in the detail specification |
| Visible structure of the electrodes within the viewing area | Reference samples |
| Non-uniformity of luminance and colours within the viewing area of the display and within the specified viewing direction range | Reference samples |
| Dirt on surface, e.g. finger prints, adhesive residue | Reference samples |



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- A = bezel
- B = viewing area
- C = defect
- h = height
- w = width

Figure 1 – Defects within the viewing area

4.2.2 Display activated

4.2.2.1 Overall geometrical aspect of the display (see Figures 2 and 3)

4.2.2.1.1 General

The defects of the geometrical aspect are shown in Figures 2 and 3.

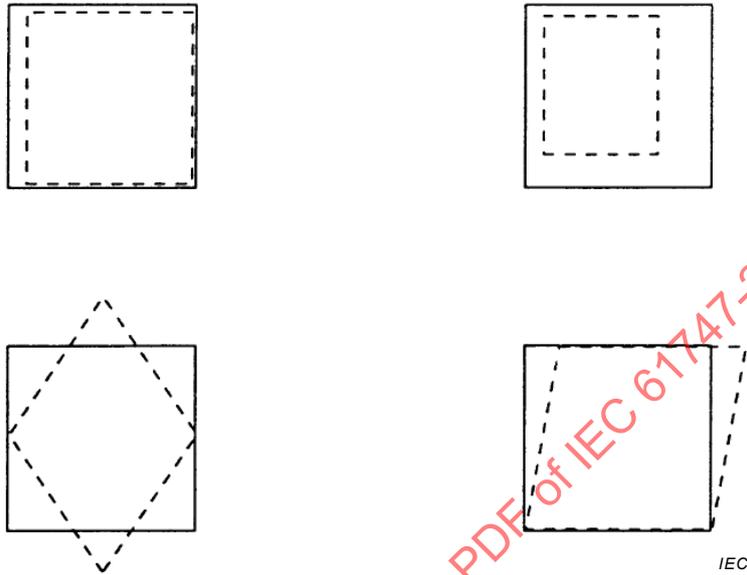


Figure 2 – Deviations and mis-shapes of a square picture element

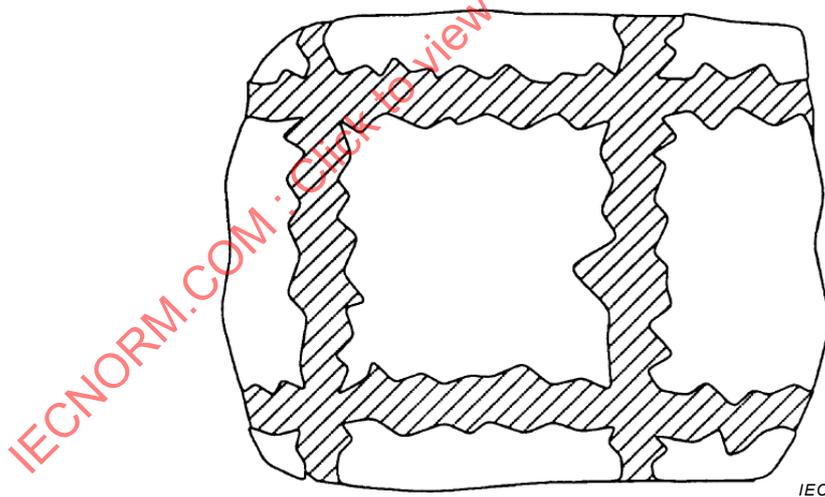


Figure 3 – Notched edges of picture elements

4.2.2.1.2 Test conditions

The test conditions of visual inspection for the display activated shall be described for the following conditions:

- electrical driving conditions;
- illumination;
- ambient temperature.

4.2.2.1.3 Procedure

Devices shall be inspected in conformity with the detail specification in Tables 2 and 3.

Table 2 – Properties and criteria when display activated

| Properties | Rejection criteria |
|-------------------------------|---|
| Dimension of picture elements | Not in conformity with the detail specification |
| Shape of picture elements | Not in conformity with the detail specification |

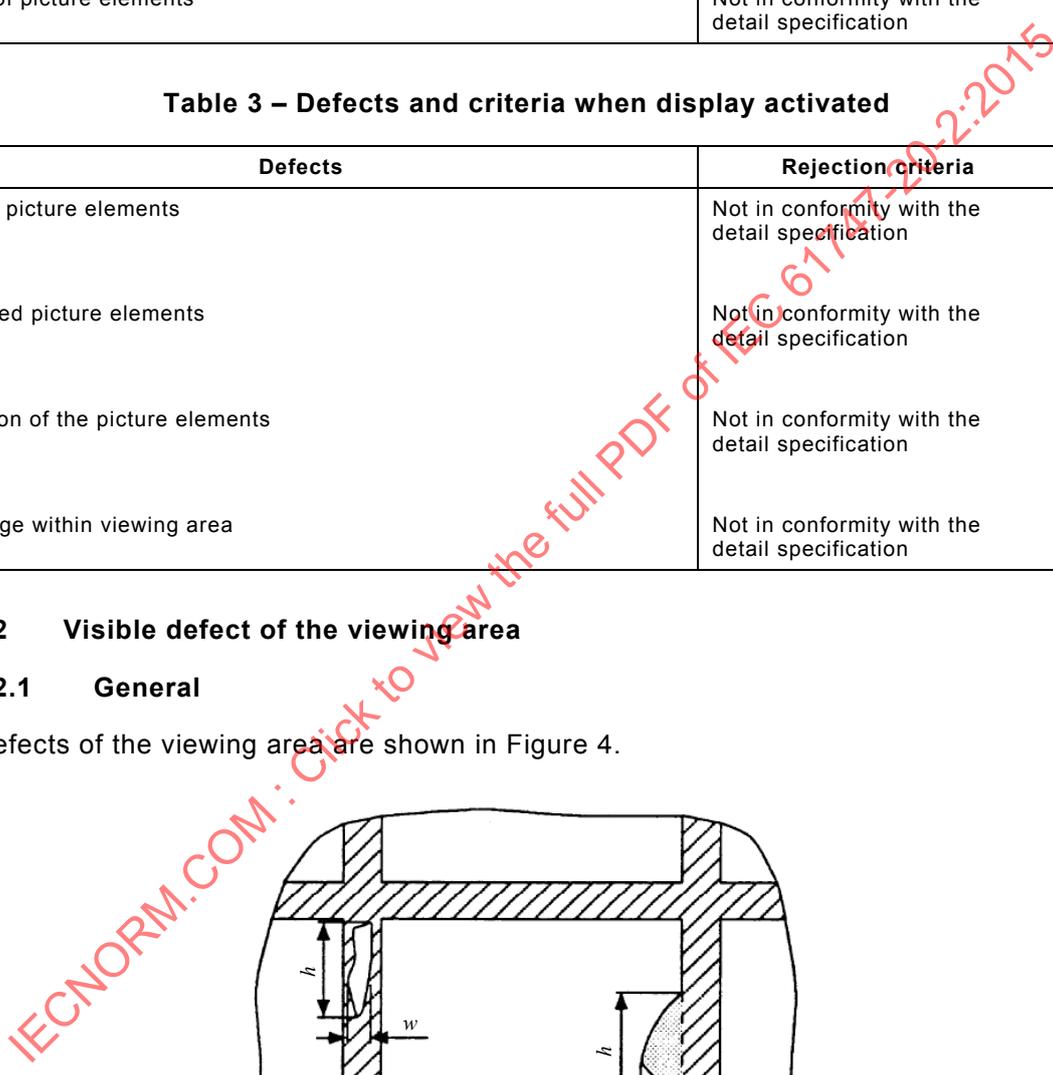
Table 3 – Defects and criteria when display activated

| Defects | Rejection criteria |
|------------------------------------|---|
| Missing picture elements | Not in conformity with the detail specification |
| Unwanted picture elements | Not in conformity with the detail specification |
| Activation of the picture elements | Not in conformity with the detail specification |
| Seal edge within viewing area | Not in conformity with the detail specification |

4.2.2.2 Visible defect of the viewing area

4.2.2.2.1 General

The defects of the viewing area are shown in Figure 4.



h = height

w = width

Figure 4 – Defects within the elements and their surroundings

4.2.2.2.2 Test conditions

The test condition of visual inspection shall be described for the following conditions:

- electrical driving conditions;
- viewing direction range;
- illumination from above or through the devices (depending on the application);
- duration;
- viewing distance;
- ambient temperature.

4.2.2.2.3 Procedure

Devices shall be inspected for the following visual defects in Table 4.

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Table 4 – Defect and criteria of viewing area

| Defects | Rejection criteria |
|--|---|
| A pin-hole within the picture element | To be specified in the detail specification |
| Accumulation of pin-holes whose size is smaller than specified above | Reference samples |
| Pin-holes within the non-activated surrounding area of the picture elements | To be specified in the detail specification |
| Difference of contrast ratio between different picture elements | To be specified in the detail specification |
| Uniformity of luminance within the viewing area | To be specified in the detail specification |
| Uniformity of contrast within the viewing area | To be specified in the detail specification |
| Non-uniformity of luminance and colours within the viewing area and within the specified viewing direction range | Reference samples |

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