

# INTERNATIONAL STANDARD



3D display devices – **STANDARD PREVIEW**  
Part 13-1: Visual inspection methods for stereoscopic displays using glasses –  
Ghost image  
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# INTERNATIONAL STANDARD



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**3D display devices – Part 13-1: Visual inspection methods for stereoscopic displays using glasses – Ghost image**

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INTERNATIONAL  
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**3D DISPLAY DEVICES –**

**Part 13-1: Visual inspection methods for stereoscopic displays using glasses – Ghost image**

FOREWORD

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International Standard IEC 62629-13-1 has been prepared by IEC technical committee 110: Electronic display devices.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
110/896/FDIS	110/912/RVD

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

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

A list of all parts in the IEC 62629 series, published under the general title *3D display devices*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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## 3D DISPLAY DEVICES –

### Part 13-1: Visual inspection methods for stereoscopic displays using glasses – Ghost image

#### 1 Scope

This part of IEC 62629 specifies the visual inspection methods of ghost image. This document is applicable to stereoscopic displays using glasses.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61747-30-1:2012, *Liquid crystal display devices – Part 30-1: Measuring methods for liquid crystal displays modules – Transmissive type*

IEC 61988-2-1:2012, *Plasma display panels – Part 2-1: Measuring methods – Optical and optoelectrical*

IEC 62341-6-3:2012, *Organic light emitting diode (OLED) displays – Part 6-3: Measuring methods of image quality*

IEC 62629-1-2, *3D display devices – Part 1-2: Terminology and letter symbols*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62629-1-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1

##### **ghost image**

image artefact that the observer perceives due to the incomplete separation of the left and the right images occurring in the stereoscopic display using glasses

#### 4 Standard visual inspection conditions

##### 4.1 Environmental conditions

Visual inspection shall be carried out under the standard environmental conditions as follows:

- temperature: 25 °C ± 5 °C,



- relative humidity: 45 % to 75 %,
- pressure: 86 kPa to 106kPa.

When different environmental conditions are used, these shall be noted in the report.

## 4.2 Setup conditions

### 4.2.1 Standard visual inspection distance and standard observing point

The standard visual inspection distance shall be defined in the relevant specification by the manufacturer. The standard observing point shall be at the standard visual inspection distance from the screen on the centre line which is perpendicular to the screen and through the screen centre (see Figure 1). The standard observing point shall not change when the inspector carries out inspection for the various positions of the screen.

If the standard visual inspection distance is not available, the distance of  $3V$  shall be used or the distance used shall be reported.

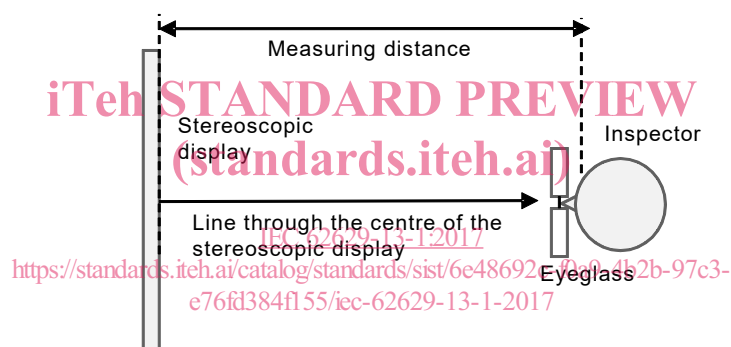


Figure 1 – Top view of standard visual inspection layout

### 4.2.2 Setup conditions of stereoscopic display

The 2D-3D mode selection of the stereoscopic display, if it exists, shall be set to stereo mode, 3D mode or related mode. When detailed mode settings are defined in the relevant specification, the mode settings shall be applied. Display setup such as gamma curve setting shall not be changed during the experiment.

### 4.2.3 Warm-up conditions of display modules and glasses

The display module and glasses for the visual inspection shall be warmed up to stabilize their characteristics. The warm-up conditions for the inspected display module shall comply with the conditions defined in each relevant specification of each display module, i.e. LCD, PDP, OLED, etc. (see IEC 61747-30-1:2012, 6.12, IEC 61988-2-1:2012, Clause 5 and IEC 62341-6-3:2012, Clause 5). The warm-up conditions of the glasses shall be defined in the relevant specification, if warm-up is needed.

## 4.3 Lighting conditions

Dark-room conditions shall be used as lighting conditions.

Illuminance shall be measured on nine positions of the screen of the stereoscopic display as shown in Figure 2. Illuminance shall be less than 1 lx.

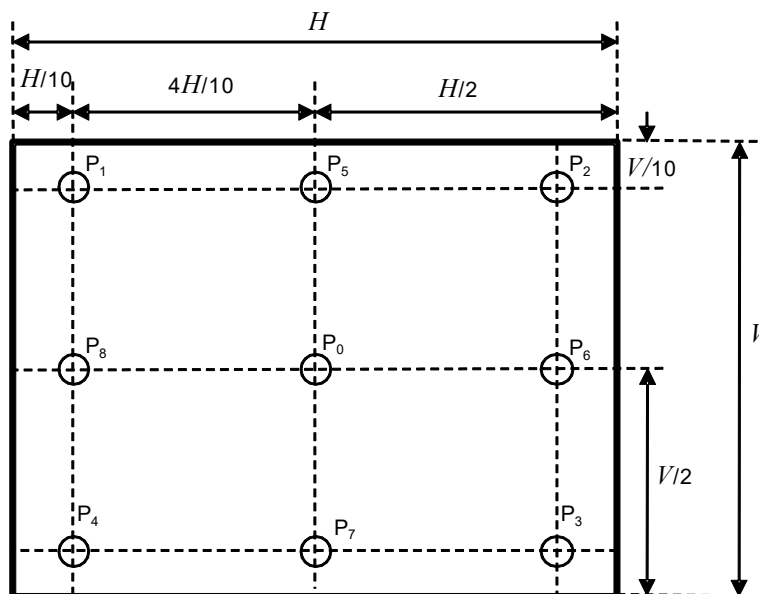


Figure 2 – Nine positions for the box patterns

**4.4 Inspector conditions** (standards.iteh.ai)

The inspector shall have normal colour vision, visual acuity (optically corrected to)  $\geq 1,0$  in decimal notation and normal stereopsis as determined by a qualified eye care professional or physician using methods consistent with those defined by the International Council on Ophthalmology. For colour vision, the Ishihara test is recommended, and for visual acuity the Snellen test or Landolt C test is recommended. Relevant literature on these tests can be found in the Bibliography, see [1]<sup>1</sup>.

**4.5 Input signals**

**4.5.1 Signal format and field frequency of input video signal**

The signal format and the field frequency of applied input video signal shall be matched to the stereoscopic displays for the visual inspection. The applied signal format and its field frequency shall be noted in the report.

NOTE Some examples of signal formats are shown in Annex B.

**4.5.2 Input signal pattern**

An input signal pattern shall be used for the visual inspection at the grey levels of  $G_2$  and  $G_1$ .

For the visual inspection at the grey levels of  $G_2$  and  $G_1$ , the box pattern of Figure 3 consists of a part of an input signal pattern.  $H$  and  $V$  represent the horizontal width and the vertical height of the active area of the 3D display.

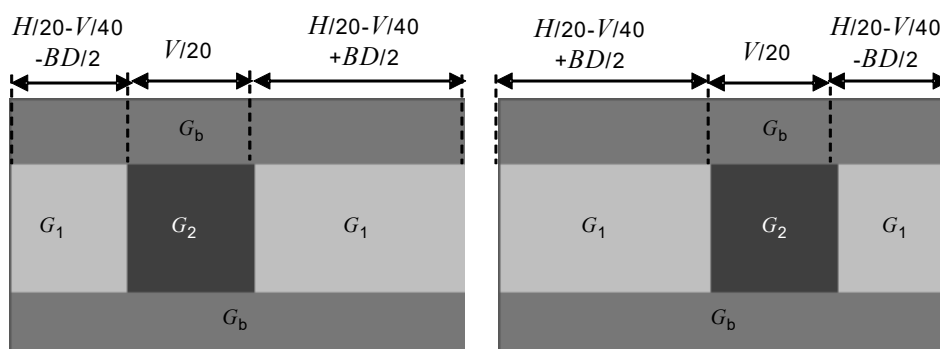
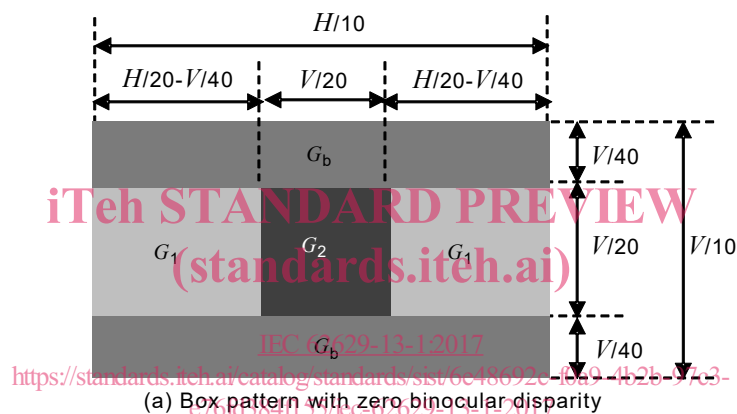
- a) In the box pattern of Figure 3, grey bars of grey level  $G_b$  and height  $V/40$  are located at the upper and lower side of the box pattern. The area of  $G_b$  is used for the visual inspection of ghost.

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

- b) A square of size  $V/20$  and of  $G_2$  grey level is located beside the area of  $G_1$  grey level.
- c) For a 2D image, the position of this square of  $G_2$  is located at the centre of the box pattern (see Figure 3(a)).
- d) For a 3D image, the square box of  $G_2$  grey level for the left view is horizontally shifted to the left side by (distance  $BD$ )/2 from the centre of the box pattern. Similarly, the square box of  $G_2$  grey level for the right view is horizontally shifted to the right side by (distance  $BD$ )/2 (see Figure 3(b)).

The distance  $BD$  represents the amount of binocular disparity of this square of  $G_2$  between the left and right input signal. Due to the distance  $BD$ , the inspector will perceive the depth of this square differently from that of the active screen. The distance  $BD$  of the input signal can be different, depending on the size of the active area of the display. The distance  $BD$  should be  $2/3$  arc degree.

NOTE 1  $BD$  in  $2/3$  arc degree can be changed to length by the following formula:  $BD$  in length = visual inspection distance  $\times \tan [2/3 \text{ degree}]$ . For example, at the visual inspection distance of 2 m, a  $BD$  of  $2/3$  arc degree is equivalent to 2,4 cm. If  $BD$  is too large, the inspector will not observe the stereoscopically fused image, but the double image.



**Figure 3 – Example of box pattern at  $G_1$  and  $G_2$**

The input signal pattern of Figure 4 shall be used for the visual inspection of ghost at the grey levels of  $G_2$  and  $G_1$ . The values of  $G_1$  and  $G_2$  are selected from nine, five, three or two values, which are equally divided levels including 0 and maximum grey levels. For an 8-bit grey scale display, the grey levels for nine values are 0, 31, 63, 95, 127, 159, 191, 223 and 255 (see Table 1). The grey levels for five values are 0, 63, 127, 191 and 255. The grey levels for three values are 0, 127 and 255. The grey levels for two values are 0 and 225. The same grey levels for  $G_1$  and  $G_2$  shall not be used.