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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MEASURING METHODS OF MULTI-SCREEN LCD DISPLAY SYSTEM
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XXX	Report on voting
100/XXX/XXX	100/XXX/XXX

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

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The National Committees are requested to note that for this publication the stability date is 2018.

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MEASURING METHODS OF MULTI-SCREEN LCD DISPLAY SYSTEM

1 Scope

This International Standard specifies the standard measurement conditions and measuring methods for multi-screen LCD display system.

2 Normative references

None

3 Terms, definitions, symbols and units

Refer to conceptual model of multi-screen LCD display system.

4 Measuring conditions

4.1 Standard measuring environmental conditions

Measurements shall be carried out under the standard environmental conditions:

- Temperature: 25 °C ± 3 °C,
- Relative humidity: 25 %RH to 85 % RH,
- Atmospheric pressure: 86 kPa to 106 kPa.

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

4.2 Optical measuring distance

The optical test distance of multi-screen LCD display system should be as 1.5 times the multi-screen system height.

5 Measuring methods of multi-screen LCD display system structure test

5.1 Physical gap

5.1.1 General

The purpose of this test is to measure the gap between two adjacent screen sides in multi-screen LCD display system.

5.1.2 Test method

Using feeler gauge measure all the adjacent screen sides of the multi-screen LCD display system, choose the largest data recorded as physical gap. (refer to figure 1)

5.2 Optical gap

5.2.1 General

The purpose of this test is to measure the gap between two adjacent image sides in multi-screen LCD display system

5.2.2 Test method

- 1) Input a full white signal to multi-screen LCD display system, set multi system all units to standard states.

- 2) Using calliper measure all the distance between each two adjacent images in multi-screen LCD display system, choose the largest data and record as optical gap. (refer to figure 1)

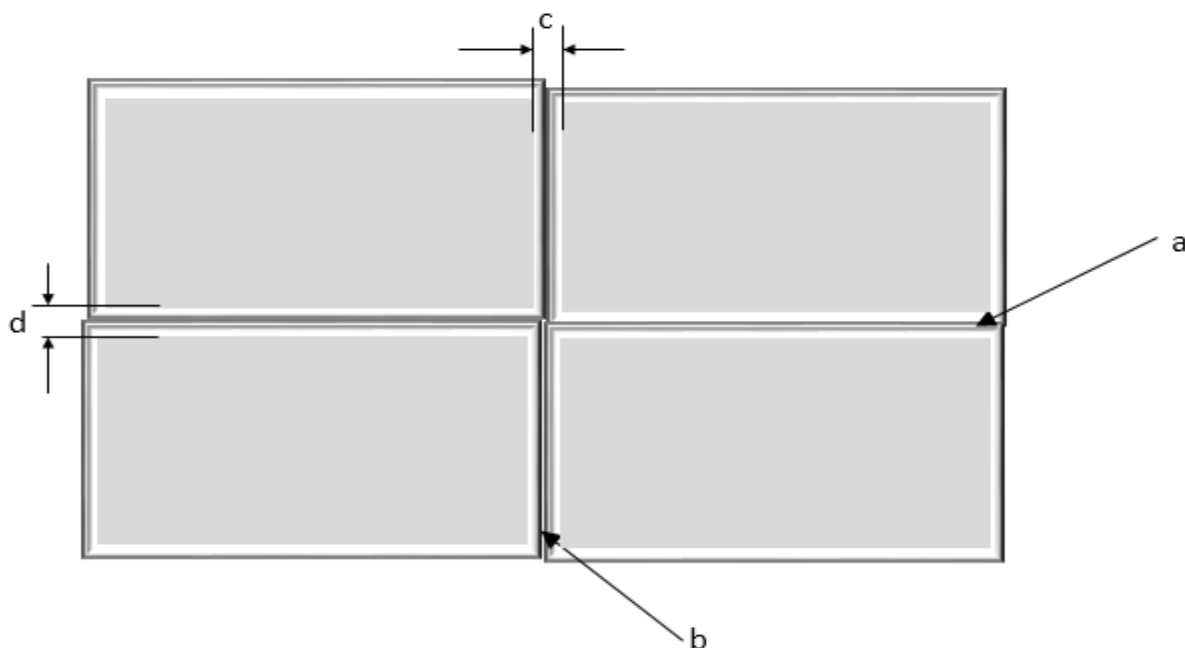


Figure 1

Comment : a, b represent the physical gap c, d represent the optical gap

5.3 Image distortion

5.3.1 General

The purpose of this test is measure the image distortion in multi-screen LCD display system.

5.3.2 Test method

- 1) Set multi system all units to standard states.
- 2) Input a cross hatch & circle signal to multi-screen LCD display system
- 3) Check the image distortion at the side of the adjacent units, record the distortion pixels. (refer to figure 2)

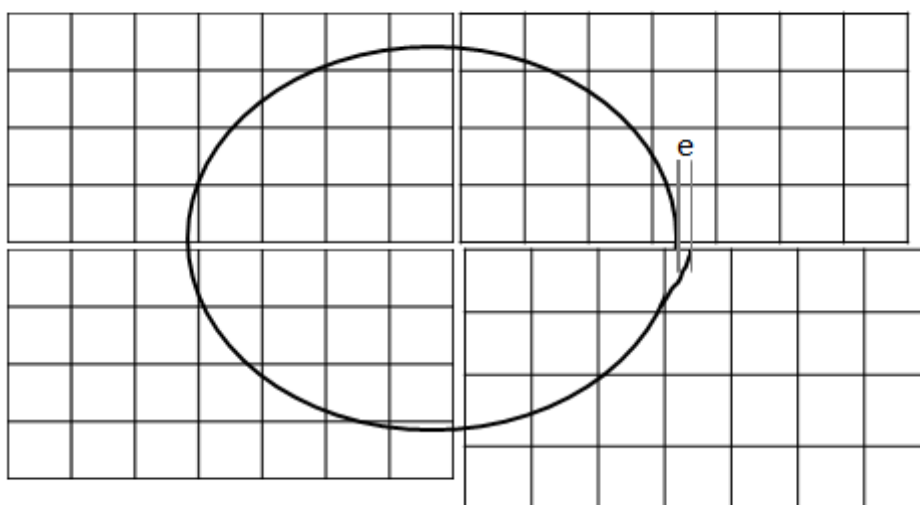


Figure 2

Comment: e represent the image distortion

5.4 Multi-screen LCD display system installation tolerances

5.4.1 General

The purpose of this test is verify the flatness and installation tolerances of multi-screen LCD display system, Include diagonal tolerance, edge horizontal flatness, adjacent units flatness, vertical installation tolerance.

5.4.2 Test method

- 1) Define the multi-screen LCD display system four corner as A,B,C,D (refer to figure 3)
- 2) Measure the length of AC and recorded as L1,measure the length of BD and recorded as L2, diagonal tolerance $\Delta L = L2 - L1$.
- 3) Measure the horizontal position of A、B point , calculate the tolerance as edge horizontal flatness.
- 4) Measure the surface flatness deviation between adjacent units surface, calculate the tolerance as flatness.
- 5) Hanging a vertical plumb from B point, measure and calculate $\angle EBC$ degree as multi-screen LCD display system vertical installation tolerance.(refer to figure 4)

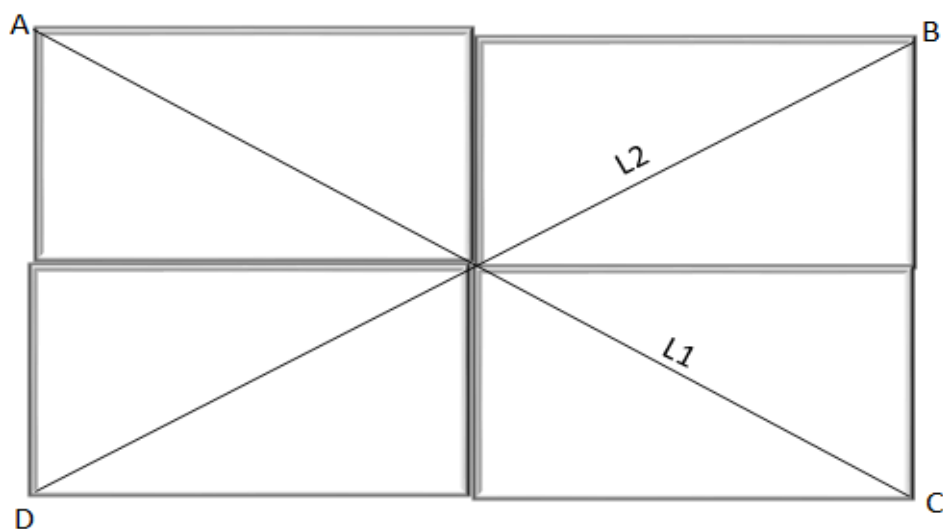


Figure 3

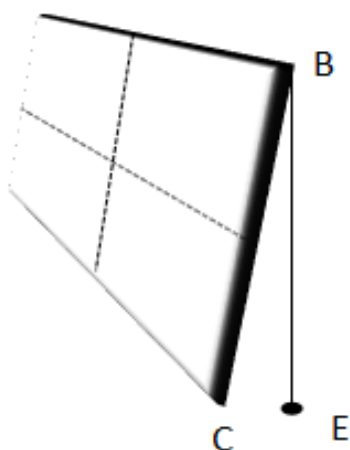


Figure 4

6 Measuring methods of multi-screen LCD display system brightness - uniformity

6.1 Multi-screen Brightness uniformity

6.1.1 General

The purpose of this test is verify the brightness tolerance in each unit of multi-screen LCD display system.

6.1.2 Test method

- 1) Input a full white signal to multi-screen LCD display system, set multi system all units to standard states.
- 2) Using luminance meter measure the centre point brightness in all units and recorded as L01、L02、L03、L04 ……L0n (refer to figure 5)

- 3) Calculate the average brightness of the multi-screen LCD display system using the formula as below:

$$L_0 = \frac{(L_{01} + L_{02} + L_{03} + \dots + L_{0n})}{n} \dots\dots\dots (1)$$

L_0 ——Multi-screen LCD display system average brightness

n ——The number of multi-screen LCD display system units

i ——1,2,3..... n

Calculate brightness uniformity using the formula below and expressed as a percentage.

$$\Delta L = L_{0i} / L_0 \dots\dots\dots (2)$$

P01 Unit 1	P02 Unit 2	P03 Unit 3
P04 Unit 4	P05 Unit 5	P06 Unit 6
P07 Unit 7	P08 Unit 8	P0n Unit n

Figure 5

6.2 Adjacent unit brightness uniformity

6.2.1 General

The purpose of this test is to verify the adjacent unit brightness uniformity in the multi-screen LCD display system.

6.2.2 Test method

- 1) Multi-screen LCD display system display a full white signal, all units are set to standard states.
- 2) Using luminance meter measure the brightness of L_{i2} 、 L_{i4} 、 L_{i5} 、 L_{i7} in all adjacent units edge center points, refer as Figure 6 $i=1, 2, 3, \dots, n$
- 3) In each unit, comparing brightness in each unit edge centre point and its adjacent unit edge- centre point, record and calculate adjacent unit brightness uniformity as below table 1.

L_{up} 、 L_{down} 、 L_{left} 、 L_{right} represent up, down, left and right 4 adjacent units edge centre brightness

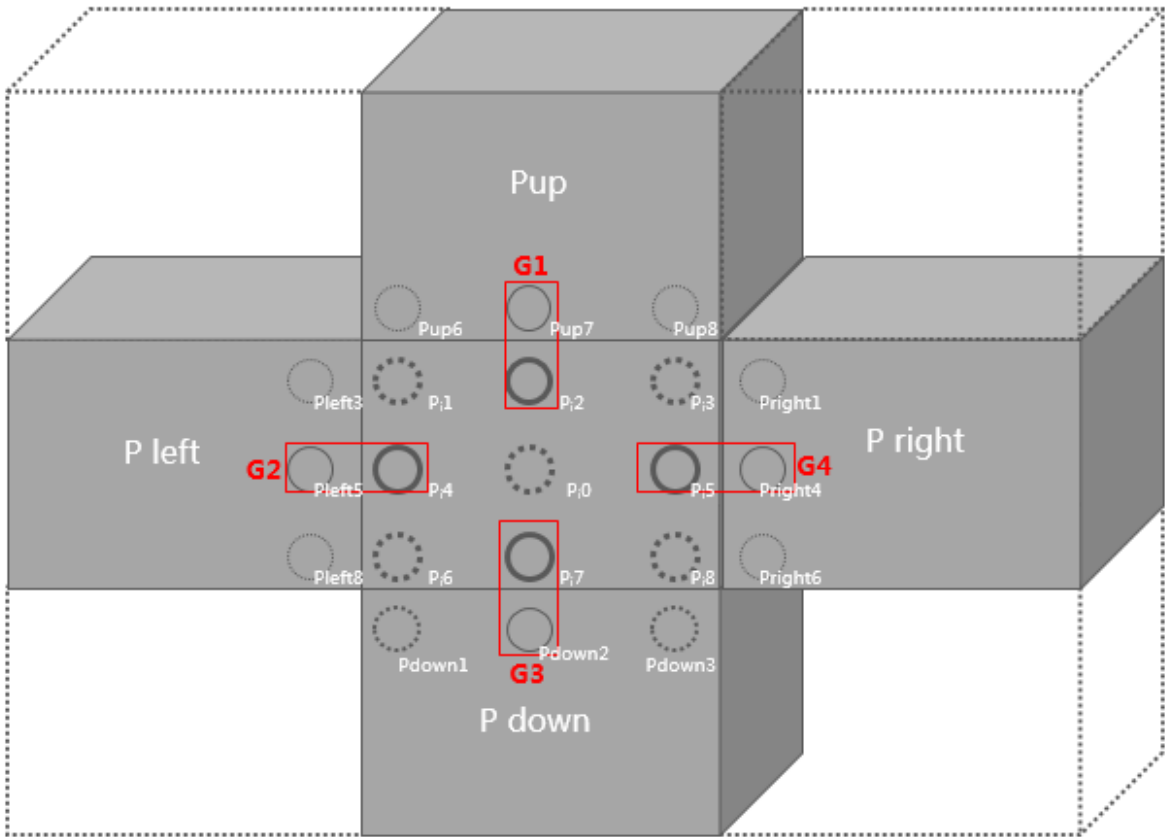


Figure 6

	L_{i2}/ L_{up7}		L_{i7}/ L_{down2}		L_{i4}/ L_{left5}		L_{i5}/ L_{right4}	
	L_{i2}	L_{up7}	L_{i7}	L_{down2}	L_{i4}	L_{left5}	L_{i5}	L_{right4}
Data								
Record L_{max} as	a		b		c		d	
$\bar{L}_=$	$\frac{L_{i2} + L_{up7}}{2}$		$\frac{L_{i7} + L_{down2}}{2}$		$\frac{L_{i4} + L_{left5}}{2}$		$\frac{L_{i5} + L_{right4}}{2}$	
$U_P =$								

Table 1

7 Measuring methods of multi-screen LCD display system colour uniformity

7.1 Multi- screen colour uniformity

7.1.1 General

The purpose of this test is to verify the colour tolerance in each unit centre of multi-screen LCD display system.

7.1.2 Test method

- 1) Set multi system all units to standard states.
- 2) Input a full white signal to multi-screen LCD display system, Using Chroma meter measure the Color coordinate u'_i 、 v'_i in all units center point refer figure 5. $i=1, 2, 3...n$
- 3) Calculating the multi-screen colour uniformity of the multi-screen LCD display system as

Formula below:

$$\mu'_0 = \frac{\mu'_1 + \mu'_2 + \dots + \mu'_n}{n} \dots\dots\dots (3)$$

$$v'_0 = \frac{v'_1 + v'_2 + \dots + v'_n}{n} \dots\dots\dots (4)$$

$$\Delta u'v' = \sqrt{(u'_i - \mu'_0)^2 + (v'_i - v'_0)^2} \dots\dots\dots (5)$$

u'_i 、 v'_i —— Colour coordinate in any units centre point. μ'_0 、 v'_0 is multi-screen average value

7.2 Adjacent unit colour uniformity

7.2.1 General

The purpose of this test is to verify the adjacent unit colour uniformity of multi-screen LCD display system.

7.2.2. Test method

- 1) Set multi-screen LCD display system all units to standard states.
- 2) Input a full white signal to multi-screen LCD display system, using Chroma meter measure adjacent units edge centre points colour coordinate u'_{i2} 、 v'_{i2} 、 u'_{i4} 、 v'_{i4} 、 u'_{i5} 、 v'_{i5} 、 u'_{i7} 、 v'_{i7} as figure 6. $i=1, 2, 3...n$
- 3) Calculating the adjacent unit colour uniformity of multi-screen LCD display system as the formula below:

$$\Delta u'v' = \sqrt{(u'_{left5} - u'_{i4})^2 + (v'_{left5} - v'_{i4})^2} \dots\dots\dots (6)$$

u'_{left5} 、 v'_{left5} are left adjacent unit edge center point Color coordinate

- 4) Calculating color coordinate in right、up、down adjacent unit edge center point also refer formula (6)

