

TCO Certified Generation 8 for Displays**Verification Letter**

Product: LCD Monitor

Name/address of the applicant: Top Victory Electronics (Taiwan) Co., Ltd.
10F., No. 230, Liancheng Rd., Zhonghe Dist., New Taipei City 23553, Taiwan

Brand name: AOC

Model/Type: 27*2*

Type key description: 1st "*" can be P or E. "P" means "pivot base", "E" means "Standard base". 2nd "*" can be E, D, Q, H or blank. "E" means "TN panel model for brazil", "D" means "VA PANEL", "Q" means "IPS/ADS PANEL", "H" means "TN panel for non pivot base", "Blank" means "TN PANEL".

Panel: TPV / TPM270WF1

Rating: Build-in Power
Input: 1.5A 100-240V~ 50/60Hz (Class I)

Standard: TCO Certified generation 8 for displays

Test mode: 1920x1080, fh: 68kHz, fv: 60Hz

Additional information: N/A

Compliance: The product has shown compliance with the following requirements in TCO Certified generation 8 for displays:

- Electrical safety (Clause 4.1)
- Low emission (Clause 4.2-4.3)
- Workload ergonomics (Clause 4.5-4.6)
- Energy efficiency (Clause 5.1)
- Visual ergonomics (Clause 5.2-5.14)

Update concern: N/A

Note: This Verification letter is the result of testing a sample of product submitted in accordance with the provisions of the relevant specific standard. This Verification letter is not a certificate, neither must be used as one.

Issue date:
2020-04-27



Bill Yang
Engineer



Zoe Chan
Project Manager



Report No.: 397850/TCO_01

TCO Certified Generation 8 for Displays TEST REPORT

Product: LCD Monitor

Name/address of the applicant: Top Victory Electronics (Taiwan) Co., Ltd.
10F., No. 230, Liancheng Rd., Zhonghe Dist., New Taipei City 23553, Taiwan

Name/address of the manufacturer: TPV Electronics (Fujian) Co., Ltd.
Rongqiao Economic and Technological Development Zone, FUQING CITY FUJIAN PROVINCE, CHINA

Brand name: AOC

Model/Type: 27*2*

Panel: TPV / TPM270WF1

Rating: Build-in Power
Input: 1.5A 100-240V~ 50/60Hz (Class I)

Serial no.: NEMKO's Sample No. 20200417001001

Test period: 2020-04-22

Testing Standards: TCO Certified generation 8 for displays
ENERGY STAR® Program Requirements Product Specification for Displays Eligibility Criteria Version 7.1

Test results: This model has shown compliance with requirements of the test items in this report according to TCO Certified generation 8 for displays.

Signature:

Tested by:		Verified by:	
			
Name:	Date:	Name:	Date:
Bill Yang	2020-04-27	Zoe Chan	2020-04-27
Engineer		Project Manager	

Test facility: Nemko Shanghai Ltd., Shenzhen Branch
Unit C &D, Floor 2 & Floor 10, Financial Base Tower 2, Kefa Road 8#,
Hi-Technology Park, Nanshan District, Shenzhen 518057, China

Laboratories are accredited by the Taiwan Accreditation Foundation (TAF) under the terms of TAF legislation. The accredited laboratory activities meet the requirements in ISO 17025 (2005). This report apply only to the sample(s) tested. It is manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Nemko Shanghai Ltd., Shenzhen Branch

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Test Condition and Configuration

UUT Information	
Product name:	LCD Monitor
Model name:	27*2*
Panel brand / model number:	TPV / TPM270WF1
Panel specification:	1920x1080, 27inches, LED Backlight, Aspect ratio:16:9
Screen rotation:	Pivot Screen
External power supply:	N/A
Model difference:	1st "*" can be P or E."P" means "pivot base", "E" means "Standard base".2nd "*" can be E, D, Q, H or blank."E" means "TN panel model for brazil", "D" means "VA PANEL", "Q" means "IPS/ADS PANEL", "H" means "TN panel for non pivot base", "Blank" means "TN PANEL".
Additional information:	

Test Condition (Visual test)	
Ambient temperature:	24.1°C
Ambient humidity:	59.4%
Supply voltage/frequency:	230Vac/50Hz
Brightness setting:	90 / Total
Contrast setting:	50 / Total
CCT setting:	Standard
Backlight setting:	N/A
Test luminance:	217.7 cd/m ²
Signal input port:	DVI
Test font:	12 point Arial
Test mode:	1920x1080, fh: 68kHz, fv: 60Hz
Test Condition (Emission test)	
Background magnetic fields in band I:	5 nT
Background magnetic fields in band II:	1.2 nT
Background electric fields in band I:	0.33 V/m
Background electric fields in band II:	0.006 V/m
Test Condition (Energy test)	
Brightness setting:	40 / Total
Contrast setting:	100 / Total
Test luminance:	200.7 cd/m ²
Signal input port:	Display port

Test Equipments					
Item	Instrument Name	Manufacturer	Model	Asset No.	Due. Date
1	Electric Field Meter	Combinova	EFM-100	NSZ2064	2020-06-03
2	Magnetic Field Meter	Combinova	MFM-10	NSZ2001	2020-06-03
3	Magnetic Field Meter	Combinova	MFM-1000	NSZ2002	2020-06-03
4	Thermo-hygrometer	Corintech	EL-WiFi-TH+	NSZ2065	2020-12-30
5	Digital power meter	YOKOGAWA	WT210	NSZ2015	2020-07-28
6	CCD/RTM Module	MicroVision	SS410	NSZ2054	2020-03-20
7	Goniometer	MicroVision	SS420	NSZ2055	2020-03-20
8	Thermo-hygrometer	Corintech	EL-WiFi-TH+	NSZ2050	2020-12-30
9	AC Power Source	All Power	APW-150N	NSZ2018	2020-12-23

Other information:
The near-field approach applied as test method to instead of measurement distance of 1.5 D or 4 H. Expanded uncertainty: Level of confidence at 95%, coverage factor equals 2. This report may not be reproduced other than in full, except with the prior written approval of Nemko.



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Emission Test

4.2 Alternating electric fields

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

Band I: 5 Hz to 2 kHz, ≤ 10 V/m

Displays ≤ 26 " are measured at 0.30 m and 0.50 m in front of the product.

Displays > 26 " are measured at 0.50 m in front of the product.

Band II: 2 kHz to 400 kHz, ≤ 1.0 V/m

Displays ≤ 26 " are measured at 0.30 m in front of and 0.50 m around the product.

Displays > 26 " are measured at 0.50 m from the surface around the product.

Measured result:

BAND I: 5Hz - 2kHz (ELF)	
	Result (V/m)
0° at 0.30 m	
0° at 0.50 m	$<10 \pm 0.45$

BAND II: 2kHz - 400kHz (VLF)	
	Result (V/m)
0° at 0.30 m	
0° at 0.50 m	$<1.0 \pm 0.035$
90° at 0.50 m	$<1.0 \pm 0.035$
180° at 0.50 m	$<1.0 \pm 0.035$
270° at 0.50 m	$<1.0 \pm 0.035$

4.3 Alternating magnetic fields

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

Band I: 5 Hz to 2 kHz, ≤ 200 nT

Displays ≤ 26 " are measured at 0.30 m in front of, and at 0.50 m around the product.

Displays > 26 " are measured at 0.50 m from the surface of the product around the product.

Band II: 2 kHz to 400 kHz, ≤ 25 nT

Displays ≤ 26 " are measured at 0.50 m around the product.

Displays > 26 " are measured at 0.50 m from the surface of the product around the product.

Measured result:

Item	BAND I: 5Hz - 2kHz (ELF)			BAND II: 2kHz - 400kHz (VLF)		
	Result (nT)			Result (nT)		
	Z=-30 cm	Z=0 cm	Z=+30 cm	Z=-30 cm	Z=0 cm	Z=+30 cm
30 cm						
0.0°	$<200 \pm 8.3$	$<200 \pm 8.3$	$<200 \pm 8.2$	$<10.0 \pm 1.8$	$<10.0 \pm 2.5$	$<10.0 \pm 2.5$
22.5°						
45.0°						
67.5°						
90.0°	$<200 \pm 6.5$	$<200 \pm 6.7$	$<200 \pm 10.4$	$<10.0 \pm 1.4$	$<10.0 \pm 1.5$	$<10.0 \pm 2.5$
112.5°						
135.0°						
157.5°						
180.0°	$<200 \pm 10.4$	$<200 \pm 7.4$	$<200 \pm 10.4$	$<10.0 \pm 1.8$	$<10.0 \pm 1.8$	$<10.0 \pm 2.5$
202.5°						
225.0°						
247.5°						
270.0°	$<200 \pm 8.3$	$<200 \pm 8.3$	$<200 \pm 10.4$	$<10.0 \pm 2.5$	$<10.0 \pm 1.8$	$<10.0 \pm 2.5$
292.5°						
315.0°						
337.5°						



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Energy Test

5.1 Energy efficiency

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

The energy consumption requirements in version 7.1 of the ENERGY STAR® program for displays must be fulfilled and verified through testing by a verification organization approved by TCO Development or at any other verification facility accredited according to ISO 17025.

ENERGY STAR® Information and Requirements:

Product Information	
External Power Supplies (EPSs)	Level VI
Power Conversion Type	AC-DC
Screen Area	311.7 in ²
Screen Resolution in megapixels	2.07
Enhanced Performance Display	No
Automatic Brightness Control (ABC)	N/A
Full Network Connectivity	N/A
Occupancy Sensor	N/A
Touch Technology	N/A
Energy Allowances	
Enhanced Performance Display (E _{EP})	N/A
Automatic Brightness Control (E _{ABC})	N/A
Full Network Connectivity (E _N)	N/A
Occupancy Sensor (E _{OS})	N/A
Touch Technology (E _T)	N/A
eff _{AC_DC}	1
Requirement	
EPSs	Level VI or higher
On Mode	N/A
Sleep Mode	N/A
Off Mode	≤ 0.5 W
Maximum Total Energy Consumption (E _{TEC_MAX})	64.05 kWh
Limit Total Energy Consumption (E _{TEC_Limit})	≤ 64.05 kWh
$E_{TEC_Limit} = (E_{TEC_MAX} + E_{EP} + E_{ABC} + E_N + E_{OS} + E_T) \cdot \text{eff}_{AC_DC}$	

Measured result:

	Result	
On Mode (W)	13.60	±0.154
Sleep Mode (W)	0.30	±0.004
Off Mode (W)	0.21	±0.003
P ₁₂ for displays with ABC (W)	N/A	
P ₃₀₀ for displays with ABC (W)	N/A	
E _{TEC} (kWh)	43.40	±0.537

Visual Test

5.2 Display resolution

MANDATE	MEASURED	COMPLIANCE
≥70 PPI	81.6	PASS

Mandate:

The display panel should have a pixel density of at least 70 PPI.

Measured result:

Horizontal pixel	1920	Diagonal	27 inches
Vertical pixels	1080	PPI	81.6

5.3 Correlated color temperature

MANDATE	MEASURED	COMPLIANCE
$\Delta u'v' \leq 0.012$	0.011 ±0.001	PASS

Mandate:

The product's default preset correlated color temperature may have any name but must have a color difference $\Delta u'v' \leq 0.012$ when compared to CIE u' and v' chromaticity coordinates for

Measured result:

Preset mode	CCT	Measured u'	Measured v'	$\Delta u'v'$
Standard	7480K	0.195 ±0.002	0.457 ±0.001	0.011 ±0.001

5.4 Color gamut

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

- The minimum colour triangle shall be ≥ 29%
- The following tolerances to the sRGB coordinates:

	Red		Green		Blue	
Coordinate	u'	v'	u'	v'	u'	v'
Requirement	≥0.411	≥0.503	≤0.140	≥0.508	≥0.150	≤0.210

Measured result:

Colour triangle	29.49 ± 0.24%
-----------------	---------------

	Red		Green		Blue	
Coordinate	u'	v'	u'	v'	u'	v'
Measured	0.449 ± 0.002	0.525 ± 0.001	0.124 ± 0.002	0.564 ± 0.001	0.159 ± 0.002	0.205 ± 0.001

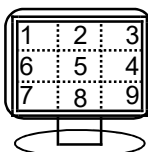
5.5 Colour uniformity

MANDATE	MEASURED	COMPLIANCE
$\Delta u'v' \leq 0.012$	0.006 ±0.002	PASS

Mandate:

The maximum colour deviation between measured active areas on the screen that are intended to maintain the same colour shall be $\Delta u'v' \leq 0.012$.

Measured result:



Position	Measured u'	Measured v'
Position 9	0.196 ±0.002	0.459 ±0.001
Position 2	0.194 ±0.002	0.454 ±0.001
Max $\Delta u'v'$	0.006 ± 0.002	



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Visual Test

5.6 Color uniformity – angular dependence

MANDATE	MEASURED	COMPLIANCE
$\Delta u'v' \leq 0.024$	0.008 ± 0.002	PASS

Mandate:

In landscape mode, the $\Delta u'v'$ between areas on the left side and the right side of the screen when it is positioned at $+30^\circ$ and at -30° horizontally to the screen normal (rotated around the vertical axis through the centre of the screen) shall be $\Delta u'v' \leq 0.024$.

Measured result:

	Measured u'	Measured v'	$\Delta u'v'$
$P_L +30^\circ$	0.200 ± 0.002	0.465 ± 0.001	0.007 ± 0.002
$P_R +30^\circ$	0.197 ± 0.002	0.460 ± 0.001	
$P_L -30^\circ$	0.196 ± 0.002	0.459 ± 0.001	0.008 ± 0.002
$P_R -30^\circ$	0.200 ± 0.002	0.466 ± 0.001	

5.7 Color grayscale linearity

MANDATE	MEASURED	COMPLIANCE
$\Delta u'v' \leq 0.020$	Refer table below	PASS

Mandate:

$\Delta u'v' \leq 0.020$ between 28 evenly distributed grayscale levels combinations

Greyscale	Maximum $u'v'$ difference						
	255	225	195	165	135	105	75
225	≤ 0.020						
195	≤ 0.020	≤ 0.020					
165	≤ 0.020	≤ 0.020	≤ 0.020				
135	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020			
105	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020		
75	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	
45	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020

Measured result:

Greyscale	255	225	195	165	135	105	75
225	0.001 ± 0.003						
195	0.001 ± 0.002	0.001 ± 0.003					
165	0.001 ± 0.002	0.001 ± 0.003	0.001 ± 0.003				
135	0.001 ± 0.002	0.001 ± 0.003	0.001 ± 0.003	0.001 ± 0.002			
105	0.002 ± 0.002	0.001 ± 0.002	0.001 ± 0.002	0.001 ± 0.002	0.001 ± 0.002		
75	0.002 ± 0.002	0.001 ± 0.002	0.001 ± 0.003	0.001 ± 0.003	0.001 ± 0.003	0.001 ± 0.003	
45	0.001 ± 0.002	0.001 ± 0.003	0.001 ± 0.003	0.000 ± 0.002	0.000 ± 0.002	0.001 ± 0.002	0.001 ± 0.003

Visual Test

5.8 Luminance level

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

The luminance at default setting shall be $\geq 150 \text{ cd/m}^2$

The maximum luminance shall be $\geq 200 \text{ cd/m}^2$

The minimum luminance shall be $\leq 100 \text{ cd/m}^2$

Measured result:

	Brightness	Contrast	Luminance (cd/m^2)
Default setting luminance	90	50	218 ± 6.9
Maximum luminance	100	100	328 ± 10.4
Minimum luminance	0	0	25 ± 0.8

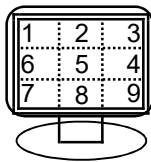
5.9 Luminance uniformity

MANDATE	MEASURED	COMPLIANCE
≤ 1.50	1.37 ± 0.07	PASS

Mandate:

Luminance variation across the active screen, $L_{\max} : L_{\min}$ shall be ≤ 1.50

Measured result:



L_{\max}	Position 5	$218 \pm 6.9 \text{ cd/m}^2$
L_{\min}	Position 1	$160 \pm 5.1 \text{ cd/m}^2$
$L_{\max} : L_{\min}$		1.37 ± 0.07

5.10 Luminance uniformity - angular dependence

MANDATE	MEASURED	COMPLIANCE
≤ 1.73	1.70 ± 0.07	PASS

Mandate:

1) In landscape mode, when the screen is rotated around the vertical axis through the centre of the screen the mean value of the L_{\max} to L_{\min} ratios at $\pm 30^\circ$ shall be ≤ 1.73 .

2) In landscape mode, when the screen is rotated around the horizontal axis through the centre of the screen, the largest value of the L_{\max} to L_{\min} ratios at $\pm 15^\circ$ shall be ≤ 1.73 .

Measured result:

$L_L + 30^\circ$	$106 \pm 3.4 \text{ cd/m}^2$	$L_T + 15^\circ$	$152 \pm 4.9 \text{ cd/m}^2$
$L_R + 30^\circ$	$189 \pm 6.0 \text{ cd/m}^2$	$L_B + 15^\circ$	$192 \pm 6.1 \text{ cd/m}^2$
$L_L - 30^\circ$	$173 \pm 5.5 \text{ cd/m}^2$	$L_T - 15^\circ$	$189 \pm 6.0 \text{ cd/m}^2$
$L_R - 30^\circ$	$107 \pm 3.4 \text{ cd/m}^2$	$L_B - 15^\circ$	$170 \pm 5.4 \text{ cd/m}^2$
LR_{Hor}	1.70 ± 0.07	LR_{Ver}	1.26 ± 0.06

5.11 Luminance contrast - characters

MANDATE	MEASURED	COMPLIANCE
≥ 0.70	0.87 ± 0.01	PASS

Mandate:

The luminance contrast shall be ≥ 0.70 measured orthogonally to the screen.

Measured result:

Net white value	$240 \pm 9.6 \text{ cd/m}^2$
Net black value	$16 \pm 0.7 \text{ cd/m}^2$
C_m	0.87 ± 0.01



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Visual Test

5.12 Luminance contrast - angular dependence

MANDATE	MEASURED	COMPLIANCE
≥0.80	0.99 ± 0.01	PASS

Mandate:

In landscape mode, the luminance contrast-angular dependence shall be ≥ 0.80 at ± 30° horizontally from the viewing direction (rotated around the vertical axis through the centre of

Measured result:

L _{White} +30°	166 ± 5.3 cd/m ²	L _{White} -30°	162 ± 5.1 cd/m ²
L _{Black} +30°	0.73 ± 0.03 cd/m ²	L _{Black} -30°	0.72 ± 0.03 cd/m ²
C _m	0.99 ± 0.01	C _m	0.99 ± 0.01

5.13 Black level

MANDATE	MEASURED	COMPLIANCE
≤2 cd/m ²	1.3 ± 0.05	PASS

Mandate:

The luminance of black shall be ≤ 2 cd/m² at a white luminance setting of ≥ 200 cd/m².

Measured result:

White luminance setting at:

328 ± 10.4 cd/m ²

The luminance of black level is:

1.3 ± 0.05 cd/m ²

5.14 Greyscale gamma curve

MANDATE	MEASURED	COMPLIANCE
Refer table below	Refer table below	PASS

Mandate:

The different grey scale luminance levels shall be within the Max- and Min levels according to the table below, where 100% means the luminance level measured for white, RGB 255, 255,

Grey level	Mandate range in (%)		
	L _{sRGB}	L _{min}	L _{max}
255	100	100	100
225	75	70	93
195	55	46	68
165	38	29	49
135	24	17	36
105	14	8	24
75	7	3	14
45	3	1	7

Measured result:

Grey level	Luminance (cd/m ²)	L level (%)
255	219 ± 6.9	100
225	167 ± 5.3	76
195	123 ± 3.9	56
165	88 ± 2.8	40
135	58 ± 1.9	27
105	35 ± 1.1	16
75	19 ± 0.6	9
45	8 ± 0.3	4



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Front/Rear View of Product





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Inner View of Product





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Marking Plate

