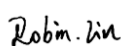




TEST REPORT

COMPULSORY SPECIFICATION FOR ENERGY EFFICIENCY AND FUNCTIONAL PERFORMANCE REQUIREMENTS OF GENERAL SERVICE LAMPS (GSLs) -VC 9109

Self-ballasted LED lamps for general lighting services with supply
voltages > 50 V - Performance requirements- IEC 62612

Report Reference No.	AOC251104046ER
Compiled by (print+ signature).....	Bill Hu 
Approved by (print+ signature).....	Robin Liu 
	Lab Supervisor
Date of issue.....	2025-11-21
Testing Laboratory	Shenzhen AOCE Electronic Technology Service Co., Ltd
Address.....	Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China
Testing location/address.....	Same as above
Applicant's name	Major Tech (Pty) Ltd
Address.....	T9 Industrial Village, 7 Sam Green Rd, Elandsfontein, South Africa
Manufacturer name	Zhejiang Meka Optoelectronic Co., Ltd.
Address.....	No.8 Canghai Road, Lihai Town, Binhai New City 312366 Shaoxing, Zhejiang Province PEOPLE'S REPUBLIC OF CHINA
Test Object.....	LED BULBS
Trade Mark.....	
Model / Type reference	LHG45E27-4W (See page 4 of the report)
Rated voltage (V).....	220-240 V~
Rated frequency (Hz).....	50/60 Hz
Rated Power (W).....	4.5 W
Rated luminous (lm).....	473 lm
Rated color temperature (CCT).....	3000K
Rated color tendering (CRI).....	80
Rated life (h).....	25000
Test specification:	
Standard	COMPULSORY SPECIFICATION FOR ENERGY EFFICIENCY AND FUNCTIONAL PERFORMANCE REQUIREMENTS OF GENERAL SERVICE LAMPS (GSLs) -VC 9109 Self-ballasted LED lamps for general lighting services with supply voltages > 50 V - Performance requirements- IEC 62612
Test procedure	Test report
Non-standard test method	N/A
Test Report Form No.	IECEE TRF No. VC 9109
Test Report Form(s) Originator	AOCE
Master TRF.....	2019-11-30

Summary of Testing:	
Tests performed (name of test and test clause):	Testing location:
The sample(s) tested complies with the requirements of VC 9109 When determining the test conclusion. The Measurement Uncertainty of test has be enconsidered.	Shenzhen AOCE Electronic Technology Service Co., Ltd Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China
Normative References:	
Standard reference	Describe
IEC / SANS 62612	Self-ballasted LED lamps for general lighting services with supply voltages > 50 V - Performance requirements
CIE S 025/E:2015	Test Method for LED Lamps, LED Luminaires and LED Modules
IEC 63103:2020	Lighting equipment - Non-active mode power measurement
CIE 13.3	Method of Measuring and Specifying Colour Rendering Properties of Light Sources
CIE 84:1989	Measurement of Luminous Flux (1st Edition).
IEC TR 61547-1:2020	Equipment for general lighting purposes - EMC immunity requirements -Part 1: Objective light flickermeter and voltage fluctuation immunity test method
IEC TR 63158:2018	Equipment for general lighting purposes - Objective test method for stroboscopic effects of lighting equipment
Copy of Marking Plate:	
N/A	

Type of light source:	
Product type.....	☒ Light source ☐ Separate control gears
Lighting technology used.....	☒ LED ☐ OLED ☐ Other
Non-directional or directional.....	☐ DLS (Directional) ☒ NDLS (Non-directional)
Use of lamp.....	☒ Indoor ☐ Outdoor ☐ Industry
Light source cap-type (or other electric interface).....	E27/E14/ B15d/ B22d
Mains or non-mains.....	☒ MLS (mains light source) ☐ NMLS (non-mains light source)
Connected light source (CLS).....	☐ Yes ☒ No
Colour-tuneable light source.....	☐ Yes ☒ No
Envelope.....	☐ Yes ☒ No
High luminance light source.....	☐ Yes ☒ No
Anti-glare shield.....	☐ Yes ☒ No
Dimmable.....	☐ Yes ☒ No
Product parameters	
Parameter.....	220-240 V~, 50/60 Hz, 4.5 W
Energy consumption in on-mode (KWh/1000h).....	4.5
Energy efficiency class.....	See table 7
Beam angle correspondence.....	See table 3
Correlated colour temperature (K).....	See table 2
On-mode power (W).....	See table 1
Standby power (W).....	See table 1
Networked standby power for CLS (W).....	See table 1
Colour rendering index.....	See table 2
Colour rendering index range (Minimum).....	See table 2
Colour rendering index range (Maximum).....	See table 2
Claim of equivalent power.....	☐ Yes ☒ No
Equivalent power (W).....	/
Chromaticity coordinate (x).....	See table 2
Chromaticity coordinate (y).....	See table 2
PARAMETERS FOR DIRECTIONAL LIGHT SOURCES	
Peak luminous intensity (cd).....	See table 3
Beam angle (degrees).....	See table 3
Beam angle range (Minimum) (degrees).....	See table 3
Beam angle range (Maximum) (degrees).....	See table 3
PARAMETERS FOR LED AND OLED LIGHT SOURCES	
R9 Colour rendering index.....	See table 2
Survival factor.....	See table 3
Lumen maintenance factor.....	See table 3
PARAMETERS FOR LED AND OLED MAINS LIGHT SOURCES	

Displacement factor.....	See table 1
Colour consistency in McAdam ellipses.....	See table 2
Claims that an LED light source replaces a fluorescent light source without integrated ballast of a particular wattage.....	☐ Yes ☒ N.A
Replacement claim (W).....	/
Flicker metric (W).....	See table 4
Stroboscopic effect metric (W).....	See table 4
Outer dimensions (Millimetre).....	Ø45×H80
Spectral power distribution in the range 250 nm to 800 nm, at full-load.....	See table 5
Possible Test Case Verdicts:	
Test case does not apply to the test object.....	N/A (Not Applicable)
Test object does meet the requirement.....	P (Pass)
Test object does not meet the requirement.....	F (Fail)
Name and address of factory.....	Zhejiang Meka Optoelectronic Co., Ltd. No.8 Canghai Road, Lihai Town, Binhai New City 312366 Shaoxing, Zhejiang Province PEOPLE'S REPUBLIC OF CHINA
Testing:	
Ambient temperature of tested	25.0 °C
Test inputs.....	230 V~
Sample size for tested	10 pcs
Date of receipt of test item.....	2024-12-16
Date (s) of performance of tests.....	2024-12-16 to 2025-11-04
General Remarks:	
Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Shenzhen AOCE Electronic Technology Service Co., Ltd	
Note:	
1. Derived models: LHG45B22-4W, LHG45B15-4W, LHG45E14-4W.	
2. All models are same except model name and lamp cap type.	

VC 9109																									
Clause	Requirement + Test	Result – Remark	Verdict																						
4	EFFICIENCY REQUIREMENTS		-																						
a)	GSLs shall comply with the luminous efficacy requirements in Table 1 or Table 2, as relevant:		P																						
	<table><tr><td colspan="2">Table 1: Minimum luminous efficacy, phase 1</td></tr><tr><td>Product Type</td><td>Phase 1 Minimum luminous efficacy (lm/W)</td></tr><tr><td>General Service Lamp</td><td>90</td></tr></table>	Table 1: Minimum luminous efficacy, phase 1		Product Type	Phase 1 Minimum luminous efficacy (lm/W)	General Service Lamp	90		P																
Table 1: Minimum luminous efficacy, phase 1																									
Product Type	Phase 1 Minimum luminous efficacy (lm/W)																								
General Service Lamp	90																								
	<table><tr><td colspan="2">Table 2: Minimum luminous efficacy, phase 2</td></tr><tr><td>Product Type</td><td>Phase 2 Minimum luminous efficacy (lm/W)</td></tr><tr><td>General Service Lamp</td><td>105</td></tr></table>	Table 2: Minimum luminous efficacy, phase 2		Product Type	Phase 2 Minimum luminous efficacy (lm/W)	General Service Lamp	105		P																
Table 2: Minimum luminous efficacy, phase 2																									
Product Type	Phase 2 Minimum luminous efficacy (lm/W)																								
General Service Lamp	105																								
b)	Depending on the lamp characteristics, the minimum luminous efficacy values may be decreased by the following correction factors (C):		N/A																						
	<table><tr><td colspan="2">Table 3: Correction factors</td></tr><tr><td>Lamp Characteristics</td><td>C</td></tr><tr><td>Luminous flux Φ (lm) below 400 lm</td><td>-10%</td></tr><tr><td>Directional lamps</td><td>-15%</td></tr><tr><td>Colour-tunable lamps (CTL)</td><td>-10%</td></tr><tr><td>Connected LED Lamps – rated luminous flux Φ (lm):</td><td></td></tr><tr><td>60 lm ≤ Φ ≤ 300 lm</td><td>-15%</td></tr><tr><td>300 lm < Φ ≤ 650 lm</td><td>-10%</td></tr><tr><td>650 lm < Φ ≤ 1200 lm</td><td>-7.5%</td></tr><tr><td>1200 lm < Φ ≤ 2000 lm</td><td>-5.0%</td></tr><tr><td>2000 lm < Φ ≤ 3300 lm</td><td>-2.5%</td></tr></table>	Table 3: Correction factors		Lamp Characteristics	C	Luminous flux Φ (lm) below 400 lm	-10%	Directional lamps	-15%	Colour-tunable lamps (CTL)	-10%	Connected LED Lamps – rated luminous flux Φ (lm):		60 lm ≤ Φ ≤ 300 lm	-15%	300 lm < Φ ≤ 650 lm	-10%	650 lm < Φ ≤ 1200 lm	-7.5%	1200 lm < Φ ≤ 2000 lm	-5.0%	2000 lm < Φ ≤ 3300 lm	-2.5%		N/A
Table 3: Correction factors																									
Lamp Characteristics	C																								
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Directional lamps	-15%																								
Colour-tunable lamps (CTL)	-10%																								
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300 lm < Φ ≤ 650 lm	-10%																								
650 lm < Φ ≤ 1200 lm	-7.5%																								
1200 lm < Φ ≤ 2000 lm	-5.0%																								
2000 lm < Φ ≤ 3300 lm	-2.5%																								
4.2	Displacement Factor		P																						
	Lamp displacement factor (Df) with integrated control gear and integrated luminaires: ☐ P ≤ 2W: no requirement ☒ 2W < P ≤ 5W: Df > 0.4 ☐ 5W < P ≤ 10W: Df > 0.7 ☐ P > 10W: Df > 0.9	See test sheet	P																						
4.2.1	Standby Power for connected lamps		N/A																						
	Standby power for lamps shall not exceed 0.5 W.		N/A																						
	Networked standby power for Connected LED Lamps shall not exceed 0.5 W.		N/A																						
	The allowable values for Standby power and networked standby power shall not be added together.		N/A																						
4.3	Functional Performance Requirements		P																						
	Colour Rendering Index (CRI) CRI ≥80	See test sheet	P																						

VC 9109			
Clause	Requirement + Test	Result – Remark	Verdict
	Lumen Maintenance Factor (for LED and OLED): $X_{LMF,MIN}\% = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$	See test sheet	P
	Survival factor: No less than 90% of sample units should be operational following endurance testing according	See test sheet	P
	Short term flicker indicator (P_{stLM}): ≤1.0 at full load and a sinusoidal input voltage	See test sheet	P
	Short term flicker indicator (SVM): ≤0.4 at full load and a sinusoidal input voltage	See test sheet	P
	Colour consistency: Variation of x,y chromaticity coordinates within a five -step Standard Deviation of Colour Matching (SDCM) or less.	See test sheet	P
4.4	Product Information Requirements		P
4.4.1	Lamp information		P
	a) Rated power in Watts (mandatory).		P
	b) Rated operating voltage (mandatory).		P
	c) Trade name or brand name (mandatory).		P
	d) Rated initial luminous flux in lumens (mandatory).		P
	e) Rated correlated colour temperature (CCT) in Kelvin (K) (mandatory).		P
	f) Beam angle (mandatory for directional lamps).		N/A
4.4.2	Packaging information		P
	a) Rated power in Watts (mandatory).		P
	b) Rated operating voltage (mandatory).		P
	c) Rated initial luminous flux in lumens (mandatory).		P
	d) Rated efficacy in lumens per Watt (lm/W) (mandatory).		P
	e) Rated lifetime in hours and L70B50 if longer (mandatory)		P
	f) Rated correlated colour temperature (CCT) in Kelvin (K) combined with a sliding scale: (mandatory).		P
	g) Beam angle (mandatory for directional lamps).		N/A
	h) Statement on Dimmability. Clearly state whether dimmable or not dimmable. If yes, then information on dimmer compatibility, or web link to this information. (mandatory).		P

VC 9109																																	
Clause	Requirement + Test	Result – Remark	Verdict																														
	i) For general service lamps which are, according to paragraph 1.2, exempted from the requirements of paragraph 3, the intended purpose shall be stated on all forms of packaging, product information and advertisement, together with a clear indication in large font on the front of the package that the Lamp is NOT Intended for General Illumination Purposes. (mandatory).		P																														
	j) Base type (mandatory).		P																														
	k) Efficiency label compliant with the current version of the Department of Energy guideline for energy efficiency label compliance in South Africa: A Guide for Energy Efficiency Labelling (mandatory).		P																														
	l) Incandescent equivalency claim (optional).		N/A																														
	m) Manufacturers are not required to provide an incandescent equivalency claim (i.e. "This lamp is as bright as a 60W incandescent" or "10W = 60W "). However, if they do, then the equivalency shall be based on the table below which depicts the minimum initial luminous flux that is required to claim a specific incandescent lamp wattage equivalency: Table 6: Incandescent wattage equivalencies for LED lamps <table><tr><th>Incandescent Equivalency [W]</th><th>Wattage</th><th>Minimum Initial Luminous Flux [lm]</th></tr><tr><td></td><td></td><th>Non-directional Lamps</th></tr><tr><td>15</td><td></td><td>150</td></tr><tr><td>25</td><td></td><td>250</td></tr><tr><td>40</td><td></td><td>500</td></tr><tr><td>60</td><td></td><td>800</td></tr><tr><td>75</td><td></td><td>1000</td></tr><tr><td>100</td><td></td><td>1500</td></tr><tr><td>150</td><td></td><td>2500</td></tr><tr><td>200</td><td></td><td>3500</td></tr></table>	Incandescent Equivalency [W]	Wattage	Minimum Initial Luminous Flux [lm]			Non-directional Lamps	15		150	25		250	40		500	60		800	75		1000	100		1500	150		2500	200		3500		N/A
Incandescent Equivalency [W]	Wattage	Minimum Initial Luminous Flux [lm]																															
		Non-directional Lamps																															
15		150																															
25		250																															
40		500																															
60		800																															
75		1000																															
100		1500																															
150		2500																															
200		3500																															
	Voltage surge and dip immunity claim (optional). Manufacturers are not required to provide a voltage surge and dip immunity claim (e.g. "Withstands Power Surge ", "Power Surge Protected "). However, if they do, then the claim shall meet the EMC immunity requirements for equipment for general lighting purposes as set out in IEC 61547 for conditions in South Africa.		N/A																														
ANNEX B	NDURANCE TEST METHOD AND SEQUENCE		P																														
B1	Ambient conditions and test setup:		P																														
B1.1	The switching cycles are to be conducted in a room with an ambient temperature of 25 ± 10 °C and an average air velocity of less than 0,2 m/s.		P																														

VC 9109			
Clause	Requirement + Test	Result – Remark	Verdict
B1.2	The switching cycles on the sample shall be conducted in free air in a vertical base-up position. However, if a manufacturer or importer has declared the light source suitable for use in a specific orientation only, then the sample shall be mounted in that orientation.		P
B1.3	The applied voltage during the switching cycles shall have a tolerance within 2 %. The total harmonic content of the supply voltage shall not exceed 3 %. Standards provide guidance on the supply voltage source.		P
B2	Provisional Endurance Test Method		P
B2.1	Initial flux measurement: measure the luminous flux of the light source prior to starting the endurance test switching cycle.		P
B2.2	Switching cycles: operate the light source for 1 200 cycles of repeated, continuous switching cycles without interruption. One complete switching cycle consists of 150 minutes of the light source switched ON at full power followed by 30 minutes of the light source switched OFF. The hours of operation recorded (i.e. 3 000 hours) include only the periods of the switching cycle when the light source was switched ON, i.e. the total test time is 3 600 hours.		P
B2.3	Final flux measurement: at the end of the 1 200 switching cycles, note if any light sources have failed (see 'Survival factor' in Annex IV, Table 6 of this Regulation) and measure the luminous flux of the light sources that have not failed.		P
B2.4	For each of the units in the sample which have not failed, divide the measured final flux by the measured initial flux. Average the resulting values over all the units that did not fail to compute the determined value for the lumen maintenance factor XLMF %.		P

Test data sheet

Table 1

Model No.: LHG45E27-4W

Sample No.	Pon(W)	No-load power $P_{no}(W)$	Standby power $P_{sb}(W)$	Networked standby power $P_{net}(W)$	Displacement factor
S01	4.45	N/A	N/A	N/A	0.54
S02	4.48	N/A	N/A	N/A	0.55
S03	4.44	N/A	N/A	N/A	0.55
S04	4.48	N/A	N/A	N/A	0.53
S05	4.47	N/A	N/A	N/A	0.53
S06	4.45	N/A	N/A	N/A	0.53
S07	4.45	N/A	N/A	N/A	0.55
S08	4.42	N/A	N/A	N/A	0.53
S09	4.48	N/A	N/A	N/A	0.55
S10	4.51	N/A	N/A	N/A	0.54
Average value	4.46	N/A	N/A	N/A	0.54

Table 2

Model No.: LHG45E27-4W

Sample No.	Chromaticity Coordinates		CCT(K)	CRI	SDCM	R9
	x	y				
S01	0.4350	0.4020	3021	81.3	2.1	2
S02	0.4381	0.4040	3070	81.0	2.5	2
S03	0.4363	0.4024	3067	81.5	1.5	2
S04	0.4385	0.4040	3030	80.7	1.9	3
S05	0.4359	0.4032	3070	81.3	2.2	2
S06	0.4324	0.4016	3048	81.4	1.6	2
S07	0.4355	0.4012	2974	81.5	1.3	2
S08	0.4372	0.4028	2978	80.7	2.1	3
S09	0.4376	0.4024	2947	81.1	2.2	2
S10	0.4368	0.4040	2916	81.1	1.3	2
Average value	0.4363	0.4028	3012	81.2	1.9	2

Test data sheet

Table 3

Model No.: LHG45E27-4W

Sample No.	Useful luminous flux Φ_{use} (lm) at 0h	Useful luminous flux Φ use (lm) at 3600h	Lumen maintenance factor	Survival factor	Beam angle(°)	Peak luminous intensity (cd)
S01	479.8	462.2	96.33%	100%	N/A	N/A
S02	486.6	470.7	96.73%	100%	N/A	N/A
S03	492.9	474.3	96.23%	100%	N/A	N/A
S04	481.2	460.9	95.77%	100%	N/A	N/A
S05	479.8	461.2	96.12%	100%	N/A	N/A
S06	470.1	455.2	96.83%	100%	N/A	N/A
S07	478.3	457.9	95.74%	100%	N/A	N/A
S08	478.8	461.8	96.45%	100%	N/A	N/A
S09	475.4	456.5	96.02%	100%	N/A	N/A
S10	486.6	469.7	96.53%	100%	N/A	N/A
Average value	480.9	463.0	96.28%	100%	N/A	N/A

Table 4

Model No.: LHG45E27-4W

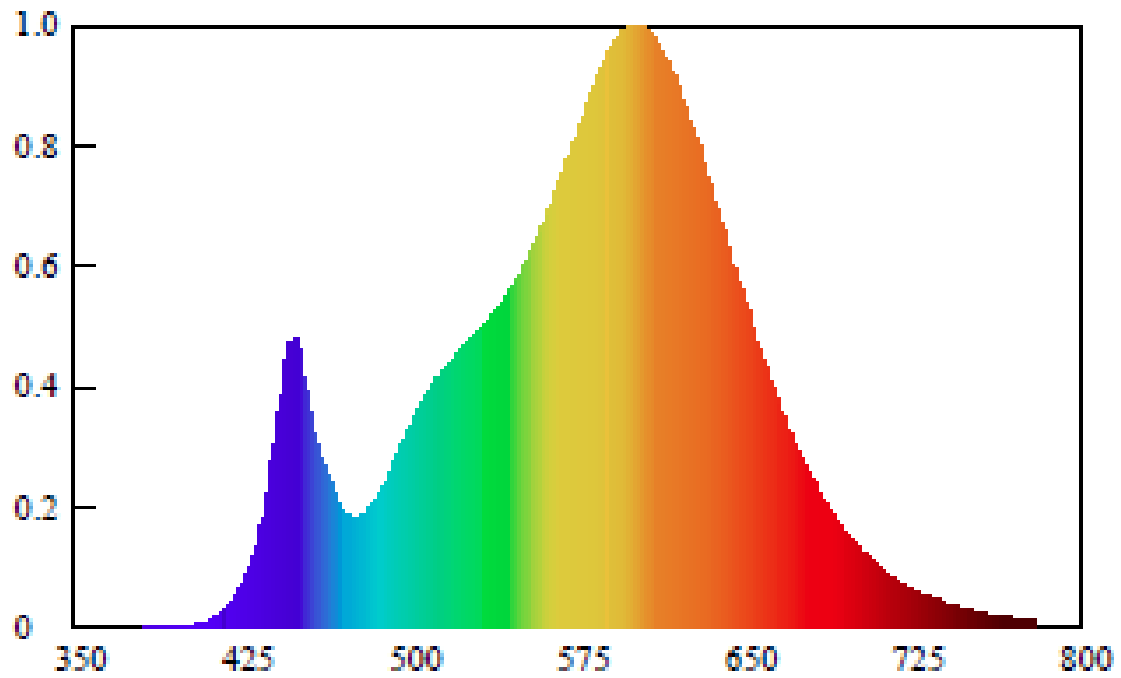
Sample No.	Flicker for LED and OLED MLS ($P_{st} LM \leq 1.0$)	Stroboscopic effect for LED and OLED MLS ($SVM \leq 0.4$)
S01	0.204	0.127
S02	0.170	0.085
S03	0.252	0.064
S04	0.048	0.075
S05	0.207	0.046
S06	0.178	0.096
S07	0.218	0.043
S08	0.093	0.072
S09	0.126	0.051
S10	0.104	0.070
Average value	0.160	0.073

Test data sheet

Table 5

Model No.: LHG45E27-4W

Spectral Distribution



Test data sheet

Table 7

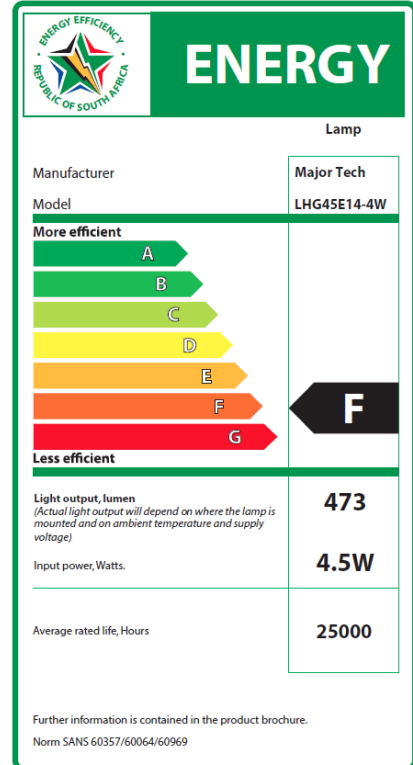
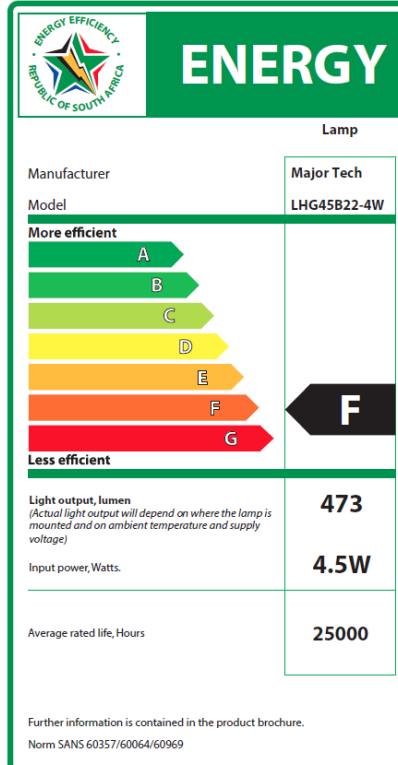
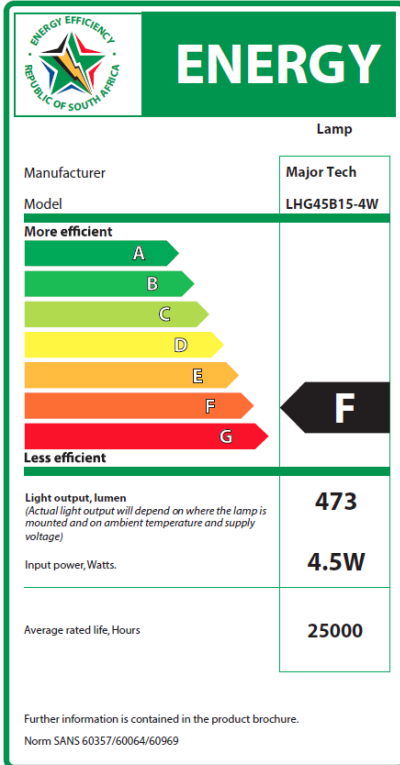
Model No.: LHG45E27-4W

Energy efficiency classes				
According to rated value				
Total mains efficacy η_{TM} (lm/W)	Useful luminous flux Φ_{use} (lm) at 0h	$P_{on}(W)$	Factor F_{TM}	Energy Efficiency Class
105.1	473.0	4.5	1.000	F
Energy efficiency class	Total mains efficacy η_{TM} (lm/W)	Factors F_{TM} by light source type		
		Light source type	Factor F_{TM}	
A	$210 \leq \eta_{TM}$	Non-directional (NDLS) operating on mains (MLS)	1,000	
B	$185 \leq \eta_{TM} < 210$	Non-directional (NDLS) not operating on mains (NMLS)	0,926	
C	$160 \leq \eta_{TM} < 185$	Directional (DLS) operating on mains (MLS)	1,176	
D	$135 \leq \eta_{TM} < 160$	Directional (DLS) not operating on mains (NMLS)	1,089	
E	$110 \leq \eta_{TM} < 135$			
F	$85 \leq \eta_{TM} < 110$			
G	$\eta_{TM} < 85$			

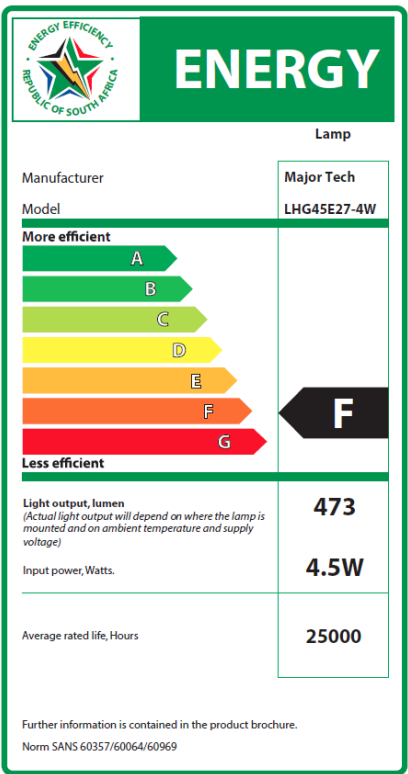
According to measured value				
Total mains efficacy η_{TM} (lm/W)	Useful luminous flux Φ_{use} (lm) at 0h	$P_{on}(W)$	Factor F_{TM}	Energy Efficiency Class
107.8	480.9	4.46	1.000	F
Energy efficiency class	Total mains efficacy η_{TM} (lm/W)	Factors F_{TM} by light source type		
		Light source type	Factor F_{TM}	
A	$210 \leq \eta_{TM}$	Non-directional (NDLS) operating on mains (MLS)	1,000	
B	$185 \leq \eta_{TM} < 210$	Non-directional (NDLS) not operating on mains (NMLS)	0,926	
C	$160 \leq \eta_{TM} < 185$	Directional (DLS) operating on mains (MLS)	1,176	
D	$135 \leq \eta_{TM} < 160$	Directional (DLS) not operating on mains (NMLS)	1,089	
E	$110 \leq \eta_{TM} < 135$			
F	$85 \leq \eta_{TM} < 110$			
G	$\eta_{TM} < 85$			

Test data sheet

Energy efficiency label:



Test data sheet



Test Equipment List

Equipment Name	Manufacturer	Model No.	Reference No.	Calibration Due Date
2m Integrating Sphere	SENSING	SL-300	AOC-S-126	2025-04-12
Horizontal Distribution Photometer	SENSING	GMS1800D	AOC-S-124	2025-04-12
Standard Lamp	SENSING	240V/150W	AOC-S-156	2025-04-01
Digital power meter	HENGHE	WT310E	AOC-S-012	2025-04-12
Digital power meter	SENSING	UI2008	AOC-S-123	2025-04-12
Digital power meter	SENSING	UI2021	AOC-S-123	2025-04-12
DC source	OYHS	OYHS-Z120V-50A	AOC-S-062	2025-04-12
Variable frequency power supply	WOSEN	BP6005	AOC-S-129	2025-04-12
Variable frequency power supply	AIPUSI	KDF-500	AOC-S-130	2025-04-12
Oscilloscope	TEKTRONIX	MDO3012	AOC-S-028	2025-04-12

Product Photo



Fig. 1 (Lamp cap type: E27)



Fig. 2 (Lamp cap type: E27)



Fig. 3 (Lamp cap type: B15d)



Fig. 4 (Lamp cap type: B22d)



Fig. 5 (Lamp cap type: E14)

-- End of Report --