LED Flux measurement

FORM-L-41 ED1 REV 2

226 - TEST

NBN EN ISO/IEC 17025 : 2005

Date : **16-01-19**

Operator : **FCE**

Filename : **2019_58.xml**

LEDs

Trademark : **Samsung**

Entry number : **39R005-2**

Type : **LH351C**

Power (Catalogue) : **0,00** W

Flux : **0** lm/LED

BIN Description : **40-70M-4-TB-RB**

Part number : **Unknown**

Color or CCT (Theorical) : **NW**

Number of LEDs : **8**

Lenses

Trademark : **None**

Type : **None**

Power & Print

Type : **DELTA SM400-AR-4**

Print description : **00-71-636 A - Voltana 1**

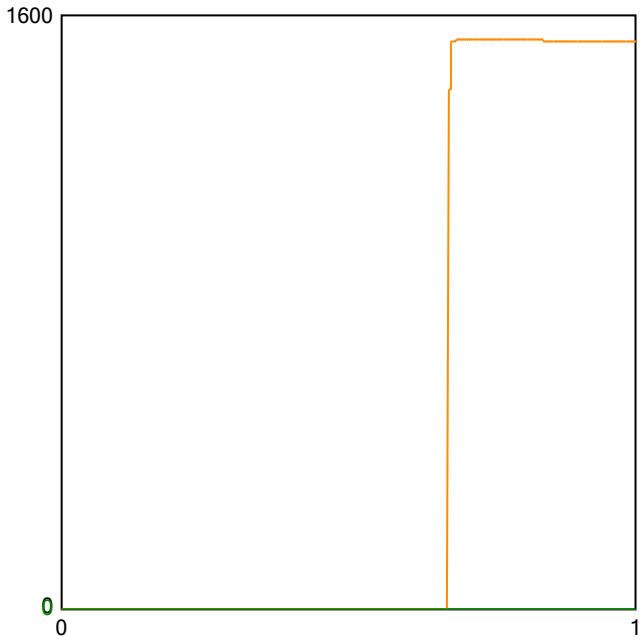
Active ☐

Picture

Digitally signed by Rotari Dmitrii
Date: 2021.09.23 10:41:34 MSK
Reason: MoldSign Signature
Location: Moldova

Sphere photometric measurement

Maximum flux : **1538** lumens



Operating condition

Position in sphere : 

Ambient sphere T ° : **24,3**

Electrical measurement

- Secondary electrical measurement

Voltage :	**22,37**	V
Current :	**0,350**	A
Power :	**7,82**	Watt

→ LEDs light efficiency at 25° :

196,6	lm/W
192,2	lm/Led

- Primary electrical measurement

Voltage :	**N/A**	V
Current :	**N/A**	A
Power :	**N/A**	Watt
Cos φ :	**N/A**	

→ Driver losses : **N/A** %

→ LEDS & Driver light efficiency :

N/A lm/W

Description :

Flux @25°/350mA - pcb Voltana 1 - 8 Samsung LH351C - pcb N°2

Comment :

FORM-L-41 ED1 REV 2

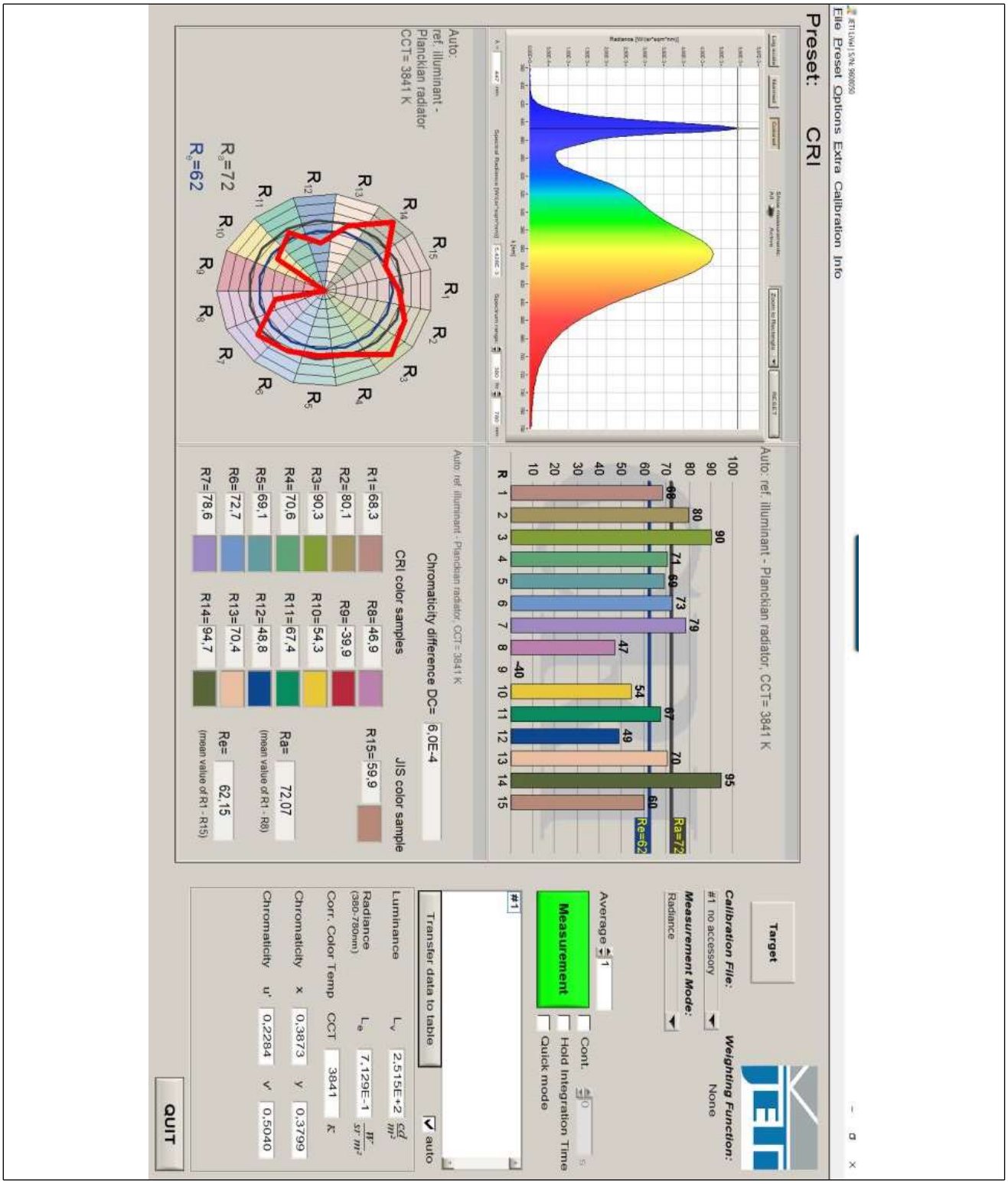
226 - TEST

Approved by :

Colorimetry

226 - TEST

NBN EN ISO/IEC 17025 : 2005



RTECH-PHOTOMETRY LABORATORY

LED

Testreport : Measurement of luminous intensity distribution related to the standard
NBN-EN 13032-1; NBN-EN 13032-4; CIE 121-1996; CIE S 025/E; IES LM-79-08 and procedures PT-P-01 and PT-P-02

rue de Mons, 3 B-4000 LIEGE - Tel : 04/224.71.40 - Fax : 04/224.25.90

Measurement for Schréder group.

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

Source

Type	BIN	Trademark	Reference	# LEDs	Reflector
LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137

Master	Reflector	No
-	Schreder Led assembly Medium Assembled 0.0°	5137

Protector Refractor Lens

Protector Glass Extra Clear Flat Smooth

Lens Gaggione 5137 PMMA

Laboratory observation

VOLTANA 0 with 8 SAMSUNG LH351C
Used flux for efficiency matrix calculation = 1538 lm - CCT = 3841 K - CRI = 72,07 (see sphere test report 2019/58 on appendix).

Purpose	Sample date	Sample #
DOC	08-01-2019	39R005

Observation

DOC VOLTANA 0 with lenses 5137

Flux coefficient multiplicator (only for efficiency matrix):
From 350 to 500 mA : 1,379
From 350 to 700 mA : 1,849
From 350 to 1000 mA : 2,474

Fixture powered with driver Philips Xi FP 22W 0,3-1,0A SNLDAE 230V S175 sXt DALI for matrix @350/500/700mA
Fixture powered with driver Philips Xi FP 40W 0,3-1,0A SNLDAE 230V S175 sXt DALI for matrix @1000mA

Notes

This report concerns type tests on one or a series of specimens.

Asked by	Measured by	Approved by	Appendix		
RCA	CLD	RLABO	1	226-TEST NBN EN ISO/IEC 17025 : 2005	42552

LUMINOUS INTENSITY DIAGRAM

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

Source	Type	BIN	Trademark	Reference	# LEDs	Reflector
	LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137

Reflector	Schreder Led assembly Medium Assembled 0.0°	No	5137
Matrices	**425521** Φ 0-90° = 1336lm - 90-180° = 0lm		Absolute measurement
Protector Refractor Lens	Protector Glass Extra Clear Flat Smooth - VOLTANA 1 Lens 8 x Gaggione 5137 PMMA		

Observation

Matrix in total flux @350 mA

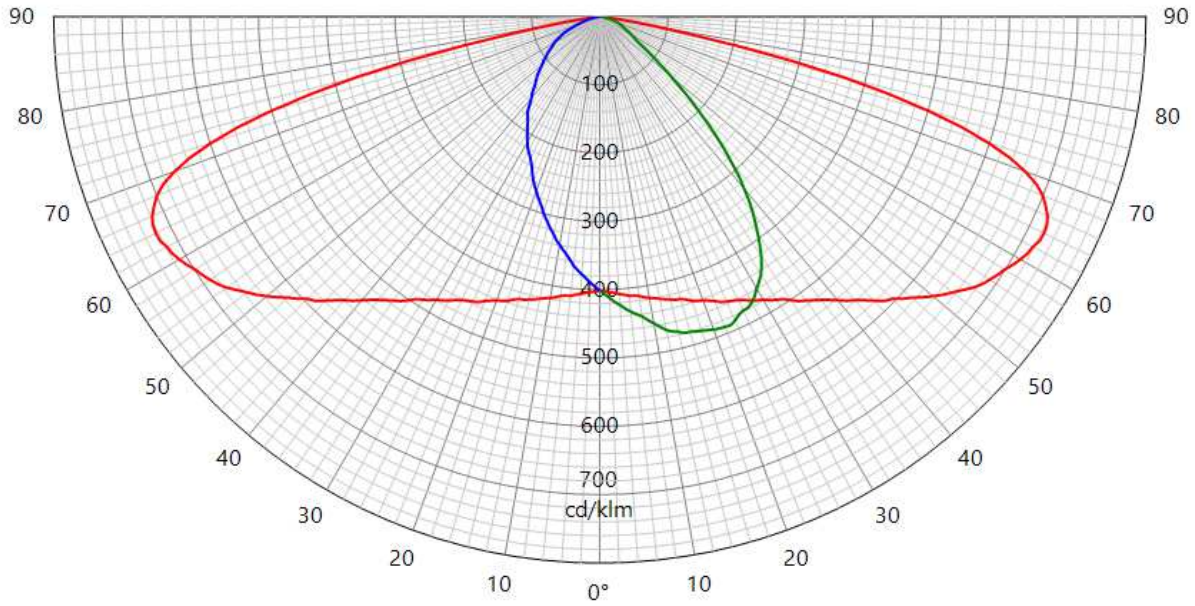
Light losses due to thermal stabilization: 1 %

Electrical measurement on LED (#1) :	Voltage = 22.32 V	Current = 0.350 A	Power = 7.81 W	
Electrical measurement on driver (#1) :	Voltage = 230.00 V	Current = 0.046 A	Power = 10.19 W	PF = 0.957

Total luminaire power = 10.19 W : Lm/Watt = 131.13 lm/W

Driver #1 : See observations for driver details - PCB 00-71-636 A

Plane	I Peak	Peak position	Index	I zero	Laboratory ambiant t°	Measurement date
15 - 165	724	64	S	401	25.1°	06-02-2019
90	491	23	D			
270	401	0	G			



42552

LUMINOUS INTENSITY DIAGRAM

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

Source	Type	BIN	Trademark	Reference	# LEDs	Reflector
	LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137

Reflector	Schreder Led assembly Medium Assembled 0.0°	No	5137
Matrices	**425522** η 0-90° = 86.9% - 90-180° = 0.0%		Relative measurement
Protector Refractor Lens	Protector Glass Extra Clear Flat Smooth - VOLTANA 1 Lens 8 x Gaggione 5137 PMMA		

Observation

Matrix in efficiency @350 mA

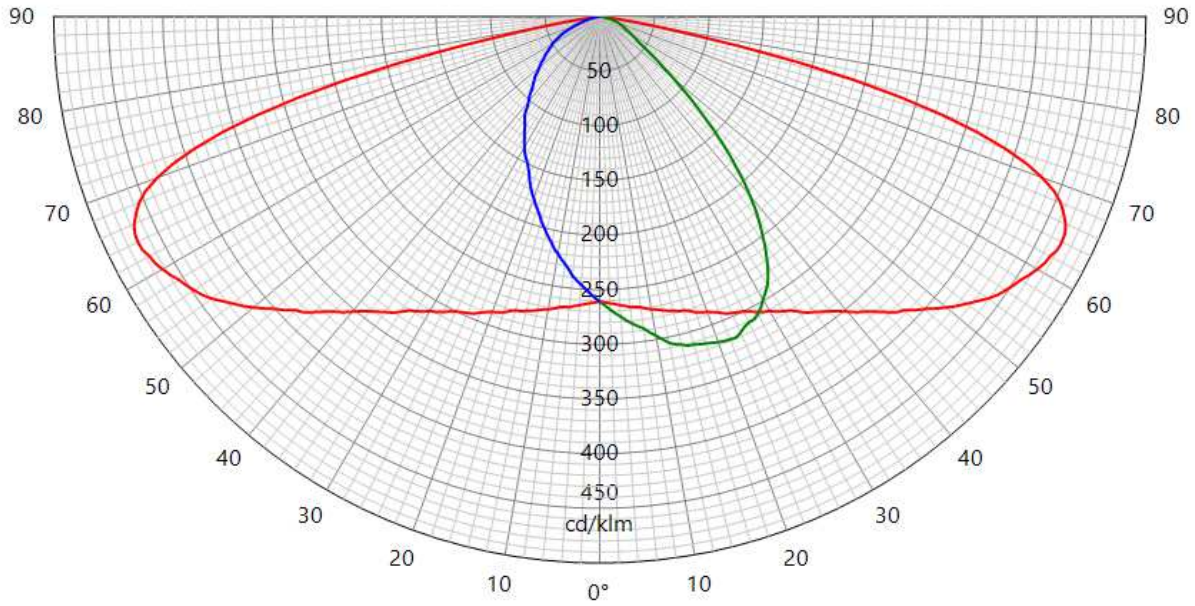
Light losses due to thermal stabilization: 1 %

Electrical measurement on LED (#1) :	Voltage = 22.32 V	Current = 0.350 A	Power = 7.81 W	
Electrical measurement on driver (#1) :	Voltage = 230.00 V	Current = 0.046 A	Power = 10.19 W	PF = 0.957

Total luminaire power = 10.19 W

Driver #1 : See observations for driver details - PCB 00-71-636 A

Plane	I Peak	Peak position	Index	I zero	Laboratory ambiant t°	Measurement date
15 - 165	471	64	S	261	25.1°	06-02-2019
90	319	23	D			
270	261	0	G			



42552

LUMINOUS INTENSITY DIAGRAM

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

Source	Type	BIN	Trademark	Reference	# LEDs	Reflector
	LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137

Reflector	Schreder Led assembly Medium Assembled 0.0°	No	5137
Matrices	**425523** Φ 0-90° = 1843lm - 90-180° = 0lm		Absolute measurement
Protector Refractor Lens	Protector Glass Extra Clear Flat Smooth - VOLTANA 1 Lens 8 x Gaggione 5137 PMMA		

Observation

Matrix in total flux @500 mA

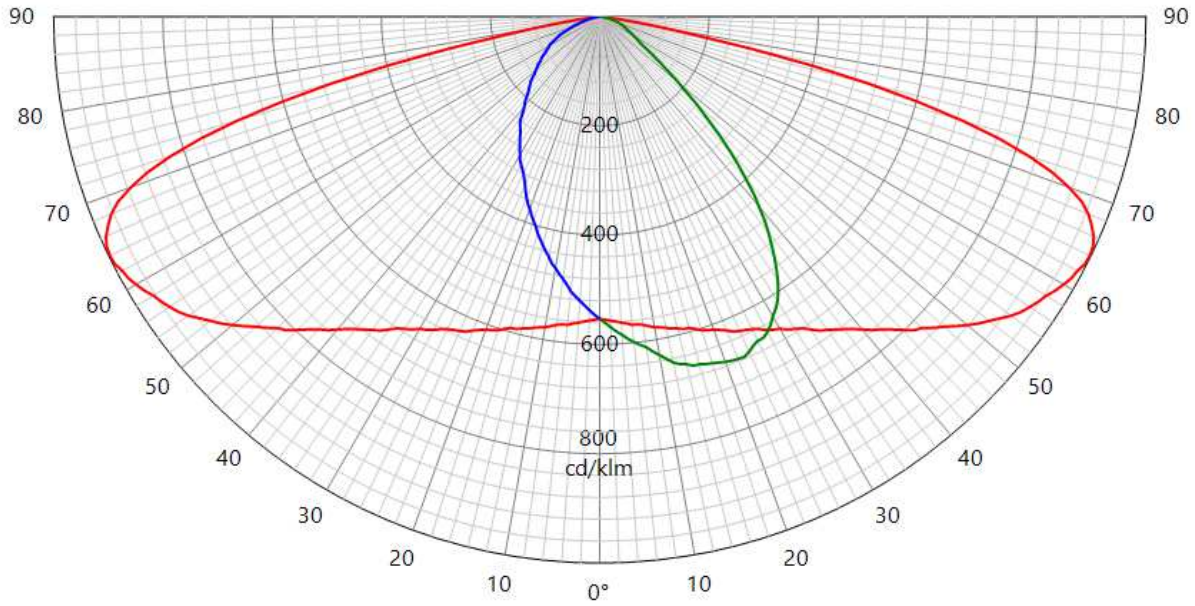
Light losses due to thermal stabilization: 1,5 %

Electrical measurement on LED (#1) :	Voltage = 22.76 V	Current = 0.500 A	Power = 11.38 W	
Electrical measurement on driver (#1) :	Voltage = 230.00 V	Current = 0.063 A	Power = 14.16 W	PF = 0.974

Total luminaire power = 14.16 W : Lm/Watt = 130.13 lm/W

Driver #1 : See observations for driver details - PCB 00-71-636 A

Plane	I Peak	Peak position	Index	I zero	Laboratory ambiant t°	Measurement date
15 - 165	998	64	S	553	25.1°	06-02-2019
90	677	23	D			
270	553	0	G			



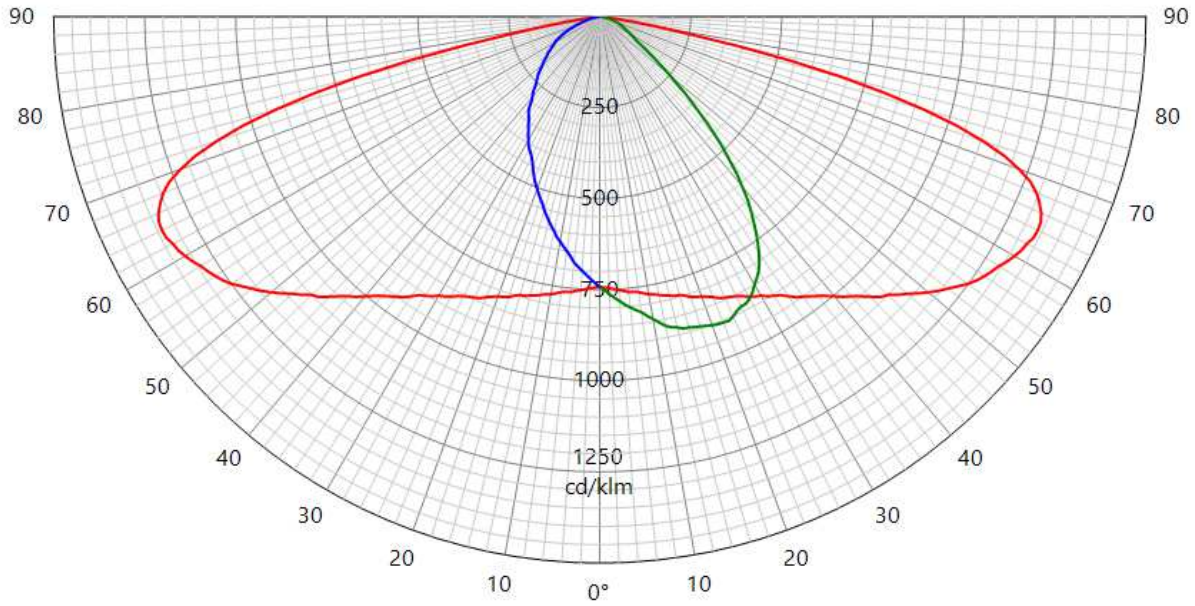
42552

LUMINOUS INTENSITY DIAGRAM

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

	Type	BIN	Trademark	Reference	# LEDs	Reflector
Source	LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137
Reflector	Schreder Led assembly Medium Assembled 0.0°			No	5137	
Matrices	**425524**	Φ 0-90° = 2471lm - 90-180° = 0lm			Absolute measurement	
Protector Refractor Lens	Protector Glass Extra Clear Flat Smooth - VOLTANA 1 Lens 8 x Gaggione 5137 PMMA					
Observation	Matrix in total flux @700 mA Light losses due to thermal stabilization: 2 % Electrical measurement on LED (#1) : Voltage = 23.26 V Current = 0.700 A Power = 16.29 W Electrical measurement on driver (#1) : Voltage = 230.00 V Current = 0.087 A Power = 19.79 W PF = 0.985 **Total luminaire power = 19.79 W : Lm/Watt = 124.84 lm/W** Driver #1 : See observations for driver details - PCB 00-71-636 A					

Plane	I Peak	Peak position	Index	I zero	Laboratory ambiant t°	Measurement date
15 - 165	1338	64	S	742	25.1°	06-02-2019
90	907	23	D			
270	742	0	G			



42552

LUMINOUS INTENSITY DIAGRAM

Origin	Production	Luminaire	Inclination	Request #
TUNGSRAM-Schréder Zrt. Hungary	TUNGSRAM-Schréder Zrt. Hungary	VOLTANA 0	0°	FD39019

Source	Type	BIN	Trademark	Reference	# LEDs	Reflector
	LED	40-70M-4-TB-RB	Samsung	LH351C	8	5137

Reflector	Schreder Led assembly Medium Assembled 0.0°	No	5137
Matrices	**425525** Φ 0-90° = 3306lm - 90-180° = 0lm		Absolute measurement
Protector Refractor Lens	Protector Glass Extra Clear Flat Smooth - VOLTANA 1 Lens 8 x Gaggione 5137 PMMA		

Observation

Matrix in total flux @1000 mA

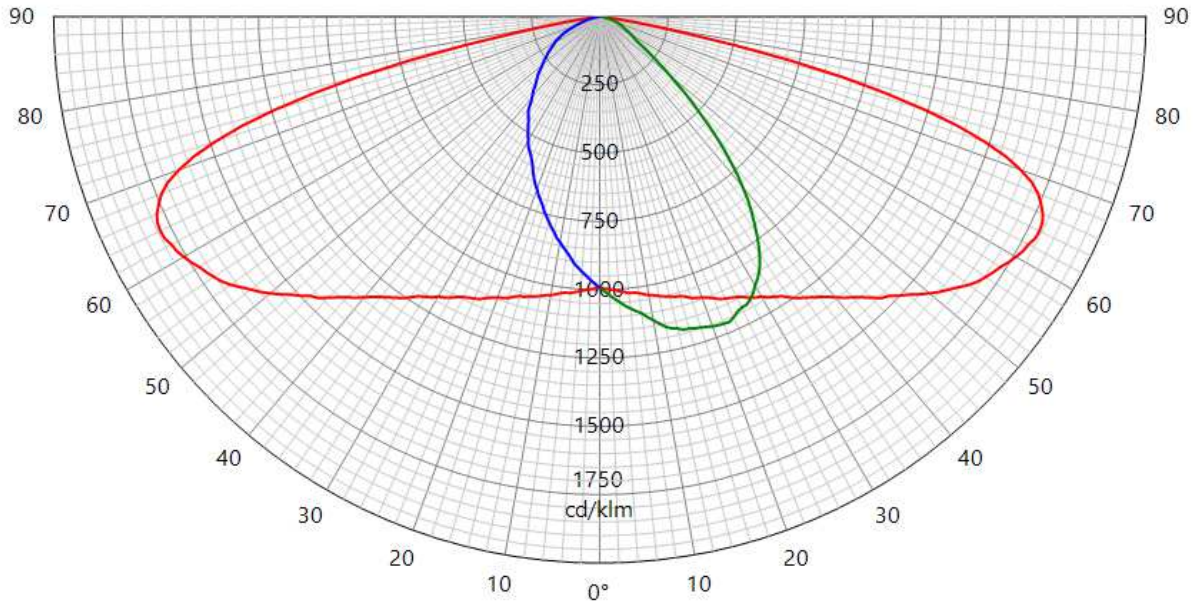
Light losses due to thermal stabilization: 2,5 %

Electrical measurement on LED (#1) :	Voltage = 23.93 V	Current = 1.000 A	Power = 23.93 W	
Electrical measurement on driver (#1) :	Voltage = 230.00 V	Current = 0.128 A	Power = 28.74 W	PF = 0.978

Total luminaire power = 28.74 W : Lm/Watt = 115.02 lm/W

Driver #1 : See observations for driver details - PCB 00-71-636 A

Plane	I Peak	Peak position	Index	I zero	Laboratory ambiant t°	Measurement date
15 - 165	1791	64	S	992	25.1°	11-02-2019
90	1214	23	D			
270	992	0	G			



42552

CONFORMITY STATEMENT

Measurement fulfil Standards:

NBN-EN 13032-1
NBN-EN 13032-4
NBN-EN 17025:2005
CIE 121-1996
LM79-08
CIE S 025

Measurement quantities measured:

Light distribution in relative or absolute photometry
Led alone cold lumen package
Led CCT and CRI
Power consumption of the fitting
Lm/watt

Electrical measurement, if not specified:

Primary values are AC with 50Htz frequency
Secondary values on SSL are DC

CCT, CRI and chromaticity coordinates: are measured in Ulbricht sphere.
If specified Main test report refer to sphere extra test report.

Light distribution are measured on gonio. If not otherwise specified, measurement is done at 50 Hz

Number of hours operated prior to measurement: if not otherwise specified, 0 hours (no aging).

Stabilization time: If not otherwise specified, a minimal stabilization time of 0.5 hour is applied; and measurement will start when it exists no more variation above 0.5% in 15 minutes

Total operating time of the product including stabilization:
45 minutes have to be added by measurement.
Minimal operating time is 75 minutes

Luminous intensity distribution: available on electronic file with
.mat format (internal Schréder format)
.ldt format (European standard)
.IES format (American standard)

Statement of uncertainties (K=2, 95% of confidence level):
Uncertainties calculated based on a typical Schréder fitting and PCBA

Intensity measurement: +/- 3%
Angle: +/- 0.5°
Flux: +/- 2.5%
Electrical DC
Power: +/- 0.25%
Voltage: +/- 0.15%
Current: +/- 0.15%
Electrical AC
Power: +/- 0.15%
Voltage: +/- 0.3%
Current: +/- 0.3%
Temperature: +/- 0.65%

	ISP2000	JETI
CCT:	+/- 5%	+/-7.5%
CRI:	+/- 2%	+/-2.75%
x/y:	+/- 2%	+/-4.6%

lm/Watt: +/-3.5%

Measuring instruments in use:

Gonio 1
Type C with Moving mirror
Manufacturer: LMT Lichtmesstechnik GmbH Berlin, Helmholtzstrasse 9 10587 Berlin, Germany
Type: GO-DS 2000
Calibration: traceable to PTB (Physikalisch-Technische Bundesanstalt D-Braunschweig) and METAS (Federal Institute of Metrology, CH-Bern)
Photometric test distance: By default 10 meter, on request 30 meter.

Gonio 2
Type C
Manufacturer: Technoteam Bildverarbeitung, Werner-von-Siemens-Strasse 5 98693 Ilmenau, Germany
Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Sèvres)
Photometric test distance: Near Field

Sphere n°1
4p geometry
Manufacturer: LMT Lichtmesstechnik GmbH, Helmholtzstrasse 9 10587 Berlin, Germany
Type: UL2000 + U1000 V-Lambda photometer
Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Sèvres)

Sphere n°2
4p geometry
Manufacturer: Instrument Systems GmbH, Neumarkter Str. 83, 81673 Muenchen, Germany
Type ISP2000 + Spectroradiometer CAS120 and CAS140
Calibration: traceable to NIST

Colorimetric portable spectroradiometer
Manufacturer: JETI Technische Instrumente GmbH, Tatzendpromenade 2 07745 Jena
Type: SPECBOS 1201
Calibration: traceable to NIST

Multimeters
Manufacturer: Agilent
Type: 34401A
Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Sèvres)

Wattmeters
Manufacturer: Yokogawa
Type: WT210 and WT310
Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Sèvres)

Thermometers
Amarell Precision
Type: Liquid in glass N63833
Calibration: traceable to LBT (Laboratoire Belge de Thermométrie)

Schréder
Experts in lightability™

DECLARAȚIE DE CONFORMITATE

CE

SCHRÉDER ROMANIA S.R.L., cu sediul în Cluj - Napoca, str. Corneliu Coposu, nr. 167A, Jud. Cluj, România, înregistrată la Registrul Comerţului cu nr. J12/1759/1998, membră a SCHRÉDER GROUP, în calitate de furnizori de aparate de iluminat marca SCHRÉDER

Declarăm pe propria răspundere că aparatul de iluminat: **VOLTANA 0**

Versiune: max. 8 LED-uri
Clasă electrică: I sau II
Balast: electronic
Tensiune nominală: 230V / 50Hz
Caracteristici: Max. 1000mA
Etanşeitate compartiment optic: IP 66
Etanşeitate compartiment aparataj: IP 66

Cu condiția ca acesta să fie instalat, întreținut și utilizat în conformtate cu standardele de instalare și instrucțiunile producătorului. Este în conformitate cu urmatoarele directive sau standarde:

- EN 60598-1 (2015)
- EN 60598-2-1 (1979)
- EN 60598-2-3 (2003 + A1 2011)
- EN 61547 (2009)
- EN 61347 (2015)
- EN 55015 (2013)
- EN 61000-3-2 (2014) & 3-3 (2013)
- EN 62471 (2008)
- EN 62493 (2010)
- Directiva 2014/30/EU
- Directiva 2014/35/EU
- Directiva 2009/125/EC
- Directiva 2012/19/EU
- Directiva 2003/108/EC
- Directiva RoHS 2011/65/EU (RoHS 2)
- R.D. 1890/2008, 14 Noiembrie
- R.D. 154/1.995, 3 Februarie
- R.D. 842/2002, 2 August

SCHRÉDER ROMANIA S.R.L.
Director General,

Alexandru SIRCA

Eliberat,
Martie 2019, Cluj-Napoca

02/09/2021

Lumen maintenance report

LED information

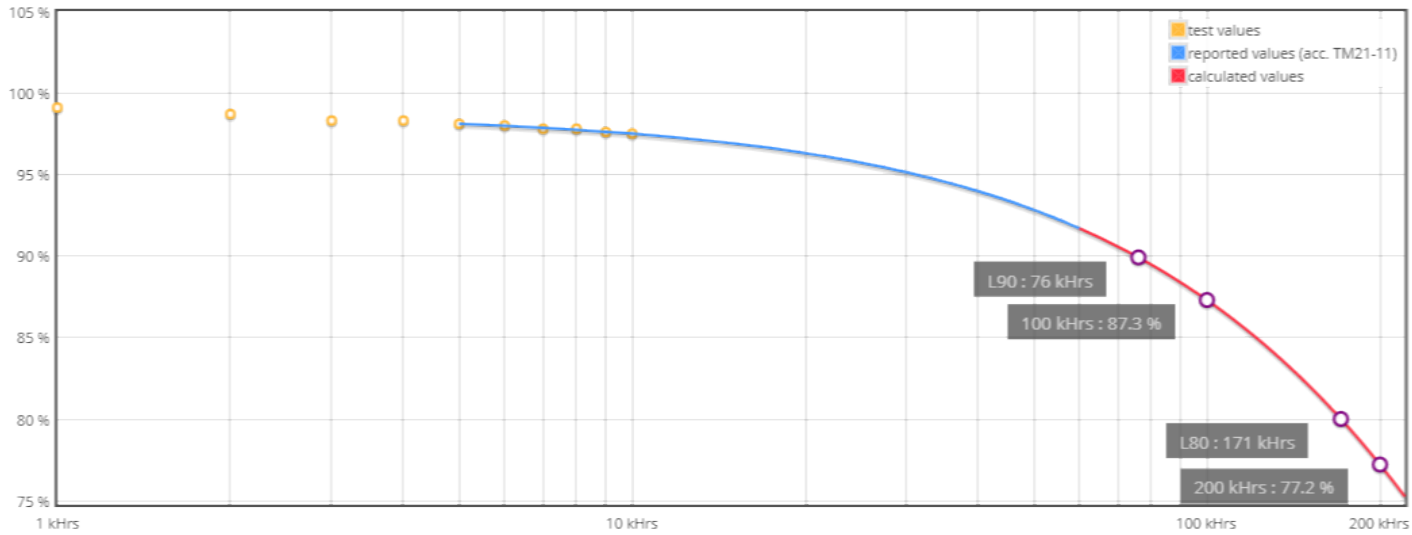
LED type	LH351C
LED current	1250 mA
Ts	55°C
Description	SLED-19-032 2019-05-31

Projection data

Test duration	10000 hrs	**α**	1.227E-006
Time used for projection	5000 to 10000hrs	**β**	0.987

L (%)	Time (kHrs)
77.2	200
80.0	171
87.3	100
90.0	75

Projection graphic



LxB50 results according to LM-80 and TM-21-11 procedures and norms.

LxBy results derived from LxB50 according to IEC 62717 Annex C.

Test Report

IES LM-80-15 Approved Method for Measuring Lumen Maintenance of LED Light Sources

Report no. : SLED-19-031-R02
Testing start date : 2017.07.28
Testing completion date : 2019.08.27
Report issued date : 2019.05.31
Report revised date : 2020.05.21

Client	**Testing performed by**
SAMSUNG ELECTRONICS LED BUSINESS Lighting Marketing Group	**SAMSUNG ELECTRONICS LED BUSINESS** 1, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do 17113, Korea e-mail) kwon.sc@samsung.com
Tested By	**Technical Manager**
KyungYeup Kwak	DooSung Park
Test Personal Name & Signatory	**Approval Name & Signatory**

The above test report is the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

※ If you need confirmation about the authenticity of the test report, please contact the above contact information.

SAMSUNG ELECTRONICS LED BUSINESS

Accredited by KOLAS, Republic of KOREA

■ Test Report Information ■

1. ■ This test report complies with KS Q ISO/IEC 17025 and KOLAS accreditation regulations.
2. □ This test report does not comply with KS Q ISO/IEC 17025 and KOLAS accreditation regulations.
3. The test results are limited to samples provided by the client and cannot be partially replicated without the approval of this authority, except as a whole.
4. If a statement of conformity is provided in this report, the applied decision rule does not apply the measurement uncertainty except for the case where the measurement uncertainty is mentioned in the above test method.
5. The test results marked ◎ are not accredited by KOLAS.
6. The test results received from external providers for the test results marked ◐.

■ Revision History ■

Data	Revision History	Writer	
		Drawn	Approved
2019.05.31	Rev.0 : New Version	K.Y.KWAK	D.S.PARK
2020.03.30	Rev.1 : Typos Correction	K.Y.KWAK	D.S.PARK
2020.05.21	Rev.2 : Extended Test Duration	K.Y.KWAK	D.S.PARK

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

■ Test Summary ■

Life test condition			Summary of result		
Test condition	Current (mA)	Case temperature (℃)	Test duration (h)	Average lumen maintenance (%)	Maximum chromaticity shift (△u'v')
1	1 000	55.2	17 000	98.1	0.000 8
2	1 000	85.1	17 000	97.9	0.001 4
3	1 000	105.1	17 000	96.5	0.002 3

1. Number of the sample

- 20 Packages tested at actual case temperature 55.2 ℃
- 20 Packages tested at actual case temperature 85.1 ℃
- 20 Packages tested at actual case temperature 105.1 ℃

※ Sampling method : Minimum three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

2. Description of LED light sources

- Tested model code : SPHWHTL3D50CE4W***
- Product series : LH351C (SPHWHTL3D50C******)
- Sample manufacturer : Samsung Electronics
- Sample Type : LED Package
- Package dimension : (3.5 × 3.5) ㎜
- Minimum die spacing : -
- CCT / CRI (Nominal) : 2 700 K / 70

3. Location of Test

■ Permanent Testing Lab ☐ On Site Testing

(Address : 1, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do 17113, Korea)

4. Description of auxiliary equipment and Operating time

1) Instrument Integrating sphere ISP1000-100
2) Instrument CAS140-CT
3) Keithley 2425 Sourcemeter
4) Electrical condition
- Drive current : 1 000 ㎃
- Typical voltage : 3.06 V
- Total input power : 3.06 W
- Average current density per LED die : 499 ㎃/㎟
- Average power density per LED die : 1.52 W/㎟

* LED packages are driven with a constant direct current.

5) Test duration : 17 000 h

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

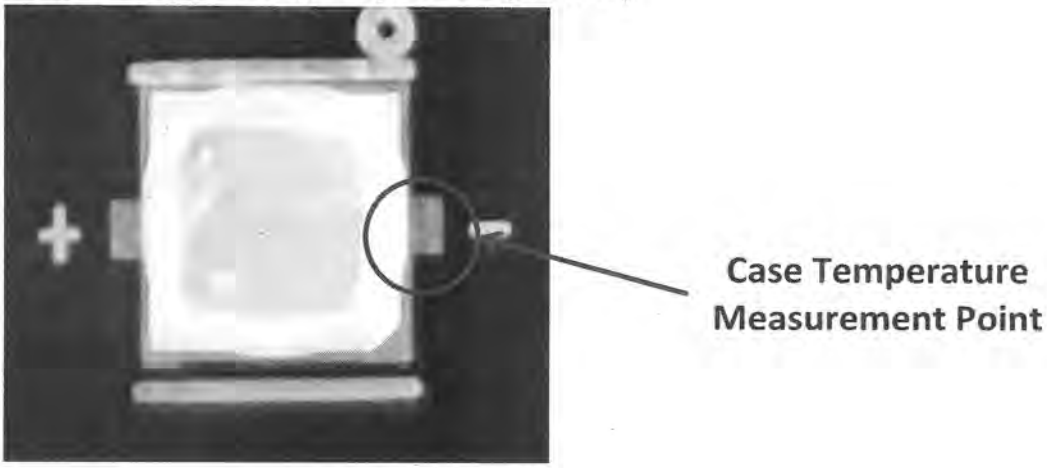
5. Ambient conditions including airflow, temperature and relative humidity

The minimal airflow is maintained in chamber.

The ambient temperature around the LED packages inside chamber is controlled by air flowing and the thermocouple readings are monitored.

- Case temperature : Contorlled to -2 ℃
- Surrounding air temperature : Contorlled to -5 ℃
- Relative humidity : < 65 % R.H.

6. Case temperature (Test point temperature)



7. Drive current of the LED light source during lifetime test

See Sub-clause 9.1, 9.2 and 9.3

8. Initial luminous flux and forward voltage

See the table

9. Lumen maintenance data for each individual LED light source

See the table

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Flux (lm)	Vf (V)	Lumen Maintenance (%)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	335.1	3.104	99.1	99.3	98.6	98.5	98.4	98.6	98.5
2	337.7	3.053	99.1	98.8	98.6	98.4	98.4	98.4	98.1
3	341.5	3.071	99.6	98.9	98.8	98.6	98.4	98.3	98.0
4	332.0	3.070	99.1	98.7	98.6	98.6	98.4	98.6	98.3
5	335.5	3.028	99.9	98.9	98.4	98.3	98.1	98.2	98.2
6	337.9	3.098	99.4	98.8	98.3	98.4	98.4	98.6	98.6
7	339.3	3.060	99.6	99.0	98.9	98.9	98.6	98.8	99.0
8	341.6	3.037	99.2	98.7	98.5	98.4	98.3	98.4	98.2
9	335.9	3.043	99.7	99.3	98.6	98.9	98.4	98.5	98.1
10	341.9	3.020	99.6	99.1	98.8	98.6	98.5	98.4	98.2
11	338.7	3.081	99.4	99.1	99.0	98.9	98.8	98.8	98.9
12	338.3	3.050	99.0	98.9	98.6	98.3	98.3	98.2	98.1
13	345.7	3.052	99.4	98.8	98.8	98.7	98.5	98.7	98.7
14	343.8	3.100	100.0	98.9	98.5	98.4	98.7	98.5	98.5
15	333.9	3.019	99.9	99.2	98.9	98.9	98.6	98.4	98.3
16	338.1	3.053	99.2	98.8	98.7	98.6	98.6	98.4	98.4
17	341.0	3.046	99.2	98.8	98.7	98.6	98.5	98.5	98.5
18	342.2	3.033	99.8	99.4	98.7	98.5	98.6	98.5	98.3
19	334.6	3.037	100.0	99.2	99.0	98.7	98.6	98.5	98.4
20	332.0	3.104	99.8	99.5	98.8	98.9	98.8	98.8	98.6
Mean	338.3	3.06	99.5	99.0	98.7	98.6	98.5	98.5	98.4
Median	338.2	3.05	99.5	98.9	98.7	98.6	98.5	98.5	98.4
std.dev	3.8	0.03	0.3	0.2	0.2	0.2	0.2	0.2	0.3
Max	345.7	3.10	100.0	99.5	99.0	98.9	98.8	98.8	99.0
Min	332.0	3.02	99.0	98.7	98.3	98.3	98.1	98.2	98.0

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	98.3	98.4	98.4	98.4	98.3	98.4	98.3	98.5	98.6
2	97.8	97.8	97.7	97.8	97.6	97.7	97.6	97.6	97.7
3	98.1	98.1	98.1	98.2	97.9	97.9	97.8	97.9	98.0
4	98.3	98.4	98.4	98.4	98.3	98.4	98.3	98.4	98.6
5	98.0	98.1	97.9	97.9	97.9	97.9	97.8	97.9	97.9
6	98.3	98.5	98.4	98.7	98.6	98.7	98.6	98.6	98.7
7	98.7	98.7	98.6	98.6	98.6	98.5	98.5	98.6	98.6
8	98.1	98.3	98.1	98.2	98.1	98.2	98.1	98.2	98.3
9	97.9	98.1	98.0	97.9	97.8	97.9	97.6	97.7	97.8
10	97.8	97.9	97.8	97.8	97.7	97.8	97.6	97.7	97.8
11	98.5	98.4	98.4	98.4	98.3	98.3	98.1	98.2	98.2
12	98.1	98.3	98.2	98.2	98.1	98.3	98.1	98.3	98.4
13	98.5	98.7	98.6	98.5	98.5	98.5	98.4	98.4	98.4
14	98.1	98.3	98.2	98.1	98.1	98.1	98.0	98.1	98.2
15	98.2	98.3	98.2	98.2	98.0	98.1	97.8	98.0	98.1
16	98.3	98.5	98.2	98.2	98.2	98.2	98.1	98.1	98.2
17	98.4	98.6	98.4	98.4	98.3	98.4	98.3	98.4	98.5
18	98.2	98.3	98.1	98.2	98.0	98.1	97.9	98.0	98.0
19	98.2	98.4	98.2	98.1	98.0	98.0	97.8	97.8	97.9
20	98.2	98.2	98.1	98.1	97.9	97.8	97.7	97.7	97.6
Mean	98.2	98.3	98.2	98.2	98.1	98.2	98.0	98.1	98.2
Median	98.2	98.3	98.2	98.2	98.1	98.2	98.0	98.1	98.2
std.dev	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Max	98.7	98.7	98.6	98.7	98.6	98.7	98.6	98.6	98.7
Min	97.8	97.8	97.7	97.8	97.6	97.7	97.6	97.6	97.6

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	98.5	98.6							
2	97.7	97.7							
3	97.9	97.9							
4	98.5	98.5							
5	97.8	97.8							
6	98.7	98.6							
7	98.6	98.6							
8	98.2	98.2							
9	97.7	97.7							
10	97.5	97.6							
11	98.1	98.1							
12	98.3	98.4							
13	98.5	98.4							
14	98.1	98.0							
15	97.9	97.8							
16	98.1	98.2							
17	98.4	98.5							
18	98.0	97.9							
19	97.8	97.7							
20	97.6	97.5							
Mean	98.1	98.1							
Median	98.1	98.1							
std.dev	0.4	0.4							
Max	98.7	98.6							
Min	97.5	97.5							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	u'	v'	Chromaticity Shift (△u'v')						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.261 1	0.526 2	0.000 4	0.000 5	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7
2	0.262 0	0.527 4	0.000 2	0.000 4	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6
3	0.263 4	0.529 1	0.000 1	0.000 2	0.000 3	0.000 3	0.000 4	0.000 4	0.000 4
4	0.262 5	0.527 1	0.000 2	0.000 4	0.000 5	0.000 5	0.000 5	0.000 6	0.000 6
5	0.263 2	0.530 0	0.000 2	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6	0.000 6
6	0.262 4	0.527 4	0.000 1	0.000 4	0.000 4	0.000 5	0.000 5	0.000 6	0.000 5
7	0.262 3	0.527 0	0.000 5	0.000 6	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8
8	0.262 2	0.528 5	0.000 1	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6	0.000 6
9	0.262 4	0.527 9	0.000 4	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7	0.000 8
10	0.262 7	0.529 9	0.000 3	0.000 5	0.000 5	0.000 6	0.000 7	0.000 7	0.000 7
11	0.262 0	0.527 2	0.000 3	0.000 3	0.000 5	0.000 6	0.000 6	0.000 5	0.000 5
12	0.263 4	0.528 2	0.000 3	0.000 3	0.000 5	0.000 5	0.000 5	0.000 6	0.000 6
13	0.263 0	0.526 6	0.000 0	0.000 4	0.000 5	0.000 5	0.000 6	0.000 6	0.000 6
14	0.262 1	0.526 8	0.000 3	0.000 4	0.000 4	0.000 5	0.000 5	0.000 6	0.000 6
15	0.262 3	0.527 8	0.000 4	0.000 5	0.000 6	0.000 7	0.000 7	0.000 7	0.000 8
16	0.262 5	0.526 9	0.000 4	0.000 4	0.000 6	0.000 5	0.000 6	0.000 6	0.000 6
17	0.262 1	0.526 8	0.000 3	0.000 5	0.000 6	0.000 6	0.000 6	0.000 7	0.000 7
18	0.260 9	0.526 6	0.000 1	0.000 4	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6
19	0.263 3	0.528 2	0.000 4	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6	0.000 7
20	0.262 3	0.528 0	0.000 2	0.000 4	0.000 6	0.000 5	0.000 5	0.000 6	0.000 6
Mean	0.262 4	0.527 7	0.000 3	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6	0.000 6
Median	0.262 3	0.527 4	0.000 3	0.000 4	0.000 5	0.000 5	0.000 6	0.000 6	0.000 6
std.dev	0.000 7	0.001 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Max	0.263 4	0.530 0	0.000 5	0.000 6	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8
Min	0.260 9	0.526 2	0.000 0	0.000 2	0.000 3	0.000 3	0.000 4	0.000 4	0.000 4

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	0.000 7	0.000 7	0.000 8	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
2	0.000 6	0.000 6	0.000 6	0.000 6	0.000 7	0.000 6	0.000 6	0.000 6	0.000 6
3	0.000 5	0.000 5	0.000 5	0.000 4	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5
4	0.000 6	0.000 7	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
5	0.000 6	0.000 6	0.000 7	0.000 6	0.000 7	0.000 6	0.000 7	0.000 7	0.000 6
6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6
7	0.000 8	0.000 9	0.000 9	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
8	0.000 7	0.000 7	0.000 7	0.000 7	0.000 8	0.000 7	0.000 7	0.000 7	0.000 7
9	0.000 8	0.000 8	0.000 9	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
10	0.000 7	0.000 8	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
11	0.000 6	0.000 6	0.000 6	0.000 5	0.000 6	0.000 5	0.000 6	0.000 5	0.000 5
12	0.000 6	0.000 6	0.000 6	0.000 6	0.000 7	0.000 6	0.000 6	0.000 6	0.000 6
13	0.000 6	0.000 6	0.000 7	0.000 6	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7
14	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6
15	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 6	0.000 6
16	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 8	0.000 7	0.000 7
17	0.000 7	0.000 7	0.000 8	0.000 7	0.000 8	0.000 7	0.000 8	0.000 8	0.000 7
18	0.000 6	0.000 6	0.000 6	0.000 6	0.000 7	0.000 6	0.000 6	0.000 6	0.000 6
19	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
20	0.000 7	0.000 7	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 6	0.000 7
Mean	0.000 7	0.000 7	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
Median	0.000 7	0.000 7	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
std.dev	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Max	0.000 8	0.000 9	0.000 9	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
Min	0.000 5	0.000 5	0.000 5	0.000 4	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	0.000 8	0.000 8							
2	0.000 6	0.000 6							
3	0.000 5	0.000 5							
4	0.000 7	0.000 8							
5	0.000 6	0.000 6							
6	0.000 6	0.000 6							
7	0.000 8	0.000 7							
8	0.000 7	0.000 7							
9	0.000 8	0.000 8							
10	0.000 8	0.000 8							
11	0.000 5	0.000 5							
12	0.000 6	0.000 6							
13	0.000 7	0.000 7							
14	0.000 5	0.000 5							
15	0.000 6	0.000 6							
16	0.000 7	0.000 7							
17	0.000 8	0.000 8							
18	0.000 6	0.000 6							
19	0.000 7	0.000 7							
20	0.000 6	0.000 6							
Mean	0.000 7	0.000 7							
Median	0.000 7	0.000 7							
std.dev	0.000 1	0.000 1							
Max	0.000 8	0.000 8							
Min	0.000 5	0.000 5							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)							
	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	2 730	2 737	2 740	2 741	2 743	2 743	2 743	2 743
2	2 705	2 710	2 713	2 713	2 715	2 715	2 716	2 716
3	2 668	2 670	2 672	2 674	2 673	2 676	2 675	2 675
4	2 696	2 698	2 702	2 705	2 704	2 705	2 707	2 707
5	2 671	2 674	2 678	2 680	2 681	2 681	2 682	2 682
6	2 697	2 698	2 704	2 704	2 706	2 706	2 707	2 707
7	2 701	2 711	2 712	2 714	2 716	2 716	2 715	2 715
8	2 698	2 699	2 705	2 707	2 707	2 708	2 709	2 709
9	2 694	2 701	2 704	2 705	2 707	2 707	2 708	2 708
10	2 681	2 687	2 690	2 691	2 692	2 692	2 693	2 693
11	2 707	2 712	2 713	2 716	2 717	2 717	2 716	2 716
12	2 672	2 676	2 678	2 680	2 680	2 681	2 682	2 681
13	2 688	2 688	2 695	2 697	2 696	2 698	2 699	2 699
14	2 707	2 712	2 714	2 714	2 716	2 716	2 717	2 717
15	2 697	2 705	2 706	2 708	2 709	2 710	2 709	2 711
16	2 696	2 703	2 704	2 706	2 705	2 706	2 707	2 707
17	2 706	2 711	2 714	2 717	2 717	2 717	2 718	2 718
18	2 732	2 733	2 740	2 740	2 742	2 743	2 744	2 744
19	2 674	2 680	2 681	2 683	2 684	2 685	2 684	2 685
20	2 697	2 700	2 704	2 707	2 706	2 707	2 707	2 707
Mean	2 696	2 700	2 703	2 705	2 706	2 706	2 707	2 707
Median	2 697	2 700	2 704	2 706	2 706	2 707	2 708	2 708
std.dev	17	18	18	18	18	18	18	18
Max	2 732	2 737	2 740	2 741	2 743	2 743	2 744	2 744
Min	2 668	2 670	2 672	2 674	2 673	2 676	2 675	2 675

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	2 743	2 743	2 744	2 743	2 744	2 742	2 743	2 742	2 742
2	2 716	2 716	2 715	2 716	2 716	2 715	2 715	2 715	2 714
3	2 676	2 676	2 676	2 675	2 676	2 675	2 675	2 675	2 674
4	2 706	2 708	2 707	2 707	2 708	2 707	2 707	2 707	2 707
5	2 682	2 682	2 683	2 682	2 682	2 681	2 682	2 681	2 681
6	2 707	2 707	2 707	2 707	2 707	2 706	2 707	2 706	2 706
7	2 716	2 716	2 716	2 715	2 716	2 714	2 715	2 714	2 713
8	2 710	2 710	2 710	2 709	2 710	2 709	2 709	2 708	2 708
9	2 707	2 708	2 709	2 707	2 708	2 707	2 708	2 707	2 707
10	2 693	2 694	2 693	2 694	2 694	2 693	2 693	2 693	2 693
11	2 717	2 717	2 717	2 716	2 716	2 715	2 715	2 714	2 714
12	2 683	2 682	2 682	2 681	2 683	2 681	2 682	2 681	2 681
13	2 698	2 698	2 699	2 699	2 699	2 698	2 699	2 698	2 698
14	2 716	2 716	2 716	2 716	2 716	2 715	2 715	2 715	2 714
15	2 709	2 710	2 710	2 709	2 709	2 708	2 708	2 707	2 706
16	2 708	2 708	2 709	2 707	2 709	2 707	2 708	2 707	2 707
17	2 717	2 718	2 719	2 718	2 719	2 717	2 718	2 717	2 717
18	2 743	2 743	2 743	2 743	2 744	2 742	2 742	2 742	2 741
19	2 685	2 685	2 685	2 685	2 685	2 684	2 684	2 684	2 683
20	2 708	2 708	2 708	2 707	2 708	2 707	2 707	2 706	2 706
Mean	2 707	2 707	2 707	2 707	2 708	2 706	2 707	2 706	2 706
Median	2 708	2 708	2 709	2 707	2 709	2 707	2 708	2 707	2 707
std.dev	18	18	18	18	18	18	18	18	18
Max	2 743	2 743	2 744	2 743	2 744	2 742	2 743	2 742	2 742
Min	2 676	2 676	2 676	2 675	2 676	2 675	2 675	2 675	2 674

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.1 Test condition 1 **55 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	2 742	2 741							
2	2 714	2 714							
3	2 674	2 674							
4	2 707	2 707							
5	2 680	2 680							
6	2 705	2 705							
7	2 713	2 712							
8	2 708	2 708							
9	2 706	2 706							
10	2 693	2 693							
11	2 713	2 713							
12	2 680	2 680							
13	2 698	2 698							
14	2 714	2 714							
15	2 706	2 705							
16	2 707	2 707							
17	2 717	2 716							
18	2 741	2 741							
19	2 683	2 683							
20	2 706	2 706							
Mean	2 705	2 705							
Median	2 707	2 707							
std.dev	18	18							
Max	2 742	2 741							
Min	2 674	2 674							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Flux (lm)	Vf (V)	Lumen Maintenance (%)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	339.4	3.084	98.9	98.9	98.8	98.7	98.2	98.3	98.1
2	335.6	3.055	99.3	98.7	98.4	98.2	97.9	97.9	98.1
3	344.1	3.029	99.7	99.2	99.3	99.0	98.5	98.7	98.6
4	332.5	3.037	99.9	99.5	99.0	98.9	98.6	98.8	98.5
5	339.4	3.043	99.3	99.4	99.2	99.0	98.7	98.6	98.4
6	343.6	3.104	99.7	99.4	98.6	98.6	98.5	98.5	98.4
7	334.1	3.093	99.6	98.9	98.5	98.4	98.1	98.3	98.2
8	336.1	3.073	99.1	99.0	98.6	98.2	98.0	98.1	98.1
9	333.9	3.058	98.9	98.7	98.5	98.4	97.9	98.0	97.9
10	333.8	3.033	99.5	99.4	99.1	98.9	98.6	98.7	98.5
11	342.9	3.082	99.6	98.9	98.6	98.5	98.5	98.5	98.3
12	338.3	3.056	99.6	98.8	98.3	98.2	97.7	98.0	97.9
13	336.8	3.041	99.3	99.0	98.7	98.1	97.8	98.0	97.9
14	337.9	3.033	99.6	99.3	98.7	98.6	98.3	98.4	98.2
15	335.2	3.028	99.8	99.0	98.6	98.3	98.1	98.2	98.0
16	332.7	3.074	99.1	98.7	98.4	98.3	98.0	98.1	98.1
17	331.6	3.085	99.0	98.7	98.3	98.2	97.8	97.9	97.8
18	346.2	3.063	99.0	98.8	98.5	98.4	98.2	98.4	98.2
19	336.9	3.105	99.3	98.9	98.7	98.4	98.2	98.4	98.3
20	337.2	3.016	99.8	99.2	99.0	98.6	98.2	98.2	98.1
Mean	337.4	3.06	99.4	99.0	98.7	98.5	98.2	98.3	98.2
Median	336.8	3.06	99.4	99.0	98.6	98.4	98.2	98.3	98.2
std.dev	4.1	0.03	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Max	346.2	3.10	99.9	99.5	99.3	99.0	98.7	98.8	98.6
Min	331.6	3.02	98.9	98.7	98.3	98.1	97.7	97.9	97.8

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	98.0	98.0	97.9	97.9	97.7	97.7	97.6	97.7	97.7
2	98.2	98.0	98.0	98.2	98.0	97.9	98.0	98.1	98.3
3	98.5	98.4	98.4	98.3	98.2	98.2	98.3	98.2	98.4
4	98.6	98.3	98.3	98.2	98.1	98.0	98.0	98.1	98.1
5	98.5	98.5	98.2	98.4	98.1	98.1	98.2	98.3	98.2
6	98.4	98.3	98.2	98.4	98.1	98.2	98.2	98.1	98.3
7	98.2	98.2	98.1	98.1	98.0	98.1	98.1	98.2	98.3
8	98.1	98.1	98.0	98.1	98.0	98.1	98.2	98.2	98.4
9	98.0	97.8	97.8	97.8	97.6	97.7	97.7	97.8	97.8
10	98.5	98.4	98.4	98.3	98.1	98.1	98.2	98.3	98.3
11	98.4	98.2	98.0	98.0	97.8	97.8	97.8	97.9	97.9
12	98.3	98.3	98.2	98.1	98.2	98.0	98.2	98.1	98.1
13	98.1	97.9	97.9	97.8	97.8	97.9	97.9	98.0	98.1
14	98.1	98.0	97.9	98.0	97.8	97.7	97.5	97.5	97.7
15	98.1	98.0	97.9	97.9	97.7	97.6	97.7	97.7	97.9
16	97.9	97.8	97.7	97.7	97.6	97.5	97.5	97.5	97.6
17	97.8	97.6	97.5	97.5	97.5	97.4	97.4	97.4	97.5
18	98.3	98.2	98.1	97.9	97.9	97.9	97.9	98.0	98.1
19	98.1	97.8	97.7	97.6	97.4	97.3	97.3	97.3	97.4
20	97.9	97.8	97.7	97.6	97.4	97.3	97.3	97.4	97.3
Mean	98.2	98.1	98.0	98.0	97.9	97.8	97.9	97.9	98.0
Median	98.1	98.1	98.0	98.0	97.9	97.9	97.9	98.0	98.1
std.dev	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Max	98.6	98.5	98.4	98.4	98.2	98.2	98.3	98.3	98.4
Min	97.8	97.6	97.5	97.5	97.4	97.3	97.3	97.3	97.3

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	97.6	97.7							
2	98.1	98.3							
3	98.2	98.2							
4	98.0	98.0							
5	98.1	98.2							
6	98.1	98.2							
7	98.1	98.3							
8	98.3	98.2							
9	97.7	97.8							
10	98.3	98.3							
11	97.9	97.9							
12	98.2	98.2							
13	98.0	98.1							
14	97.5	97.4							
15	97.8	97.9							
16	97.6	97.5							
17	97.4	97.4							
18	98.0	98.0							
19	97.2	97.2							
20	97.2	97.2							
Mean	97.9	97.9							
Median	98.0	98.0							
std.dev	0.3	0.4							
Max	98.3	98.3							
Min	97.2	97.2							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	u'	v'	Chromaticity Shift (△u'v')						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.262 3	0.527 9	0.000 3	0.000 4	0.000 6	0.000 6	0.000 6	0.000 7	0.000 7
2	0.263 3	0.529 2	0.000 1	0.000 4	0.000 4	0.000 5	0.000 6	0.000 7	0.000 6
3	0.262 4	0.528 2	0.000 1	0.000 4	0.000 4	0.000 6	0.000 6	0.000 7	0.000 6
4	0.263 5	0.527 6	0.000 4	0.000 5	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7
5	0.261 9	0.528 6	0.000 4	0.000 5	0.000 6	0.000 6	0.000 6	0.000 7	0.000 7
6	0.261 7	0.527 2	0.000 1	0.000 4	0.000 5	0.000 6	0.000 7	0.000 7	0.000 7
7	0.261 3	0.527 6	0.000 2	0.000 4	0.000 4	0.000 5	0.000 5	0.000 6	0.000 6
8	0.262 4	0.529 1	0.000 3	0.000 5	0.000 7	0.000 6	0.000 8	0.000 7	0.000 7
9	0.262 9	0.528 4	0.000 3	0.000 4	0.000 6	0.000 5	0.000 6	0.000 7	0.000 6
10	0.261 5	0.527 8	0.000 3	0.000 5	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7
11	0.263 7	0.529 0	0.000 2	0.000 4	0.000 5	0.000 6	0.000 7	0.000 6	0.000 7
12	0.262 3	0.527 8	0.000 4	0.000 5	0.000 6	0.000 7	0.000 9	0.000 9	0.000 9
13	0.261 3	0.527 0	0.000 4	0.000 5	0.000 7	0.000 9	0.000 8	0.000 9	0.000 9
14	0.263 5	0.528 7	0.000 4	0.000 4	0.000 5	0.000 5	0.000 7	0.000 8	0.000 6
15	0.262 1	0.527 7	0.000 3	0.000 6	0.000 8	0.000 8	0.000 9	0.000 8	0.000 8
16	0.261 4	0.527 1	0.000 2	0.000 5	0.000 6	0.000 7	0.000 9	0.000 8	0.000 8
17	0.262 5	0.527 3	0.000 3	0.000 3	0.000 5	0.000 6	0.000 6	0.000 7	0.000 7
18	0.261 9	0.527 0	0.000 3	0.000 4	0.000 6	0.000 6	0.000 7	0.000 8	0.000 7
19	0.263 2	0.528 1	0.000 2	0.000 3	0.000 5	0.000 5	0.000 6	0.000 5	0.000 6
20	0.264 0	0.529 6	0.000 2	0.000 4	0.000 4	0.000 5	0.000 6	0.000 6	0.000 7
Mean	0.262 4	0.528 0	0.000 3	0.000 4	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7
Median	0.262 3	0.527 8	0.000 3	0.000 4	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7
std.dev	0.000 8	0.000 8	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Max	0.264 0	0.529 6	0.000 4	0.000 6	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9
Min	0.261 3	0.527 0	0.000 1	0.000 3	0.000 4	0.000 5	0.000 5	0.000 5	0.000 6

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	0.000 6	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
2	0.000 6	0.000 6	0.000 7	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 7
3	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6	0.000 6
4	0.000 8	0.000 8	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
5	0.000 6	0.000 8	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
6	0.000 7	0.000 7	0.000 8	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8
7	0.000 6	0.000 6	0.000 5	0.000 6	0.000 5	0.000 5	0.000 5	0.000 5	0.000 6
8	0.000 8	0.000 8	0.000 8	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
9	0.000 6	0.000 7	0.000 7	0.000 6	0.000 7	0.000 7	0.000 7	0.000 7	0.000 7
10	0.000 7	0.000 7	0.000 8	0.000 7	0.000 7	0.000 7	0.000 7	0.000 8	0.000 8
11	0.000 9	0.000 9	0.001 0	0.001 0	0.001 0	0.001 0	0.001 0	0.001 1	0.001 1
12	0.000 9	0.001 0	0.001 1	0.001 1	0.001 2	0.001 2	0.001 2	0.001 3	0.001 3
13	0.001 0	0.001 0	0.001 1	0.001 2	0.001 2	0.001 2	0.001 2	0.001 2	0.001 3
14	0.000 8	0.000 8	0.001 0	0.001 0	0.001 1	0.001 1	0.001 2	0.001 2	0.001 2
15	0.001 0	0.001 0	0.001 0	0.001 0	0.001 0	0.001 1	0.001 1	0.001 1	0.001 2
16	0.001 0	0.001 0	0.001 1	0.001 0	0.001 1	0.001 1	0.001 1	0.001 1	0.001 1
17	0.000 8	0.000 9	0.000 9	0.000 9	0.001 0	0.001 1	0.001 1	0.001 1	0.001 1
18	0.000 9	0.000 9	0.001 0	0.001 1	0.001 1	0.001 1	0.001 1	0.001 2	0.001 2
19	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8	0.000 9	0.000 9	0.001 0	0.001 0
20	0.000 8	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9
Mean	0.000 8	0.000 8	0.000 8	0.000 8	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9
Median	0.000 8	0.000 8	0.000 8	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.000 9
std.dev	0.000 1	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
Max	0.001 0	0.001 0	0.001 1	0.001 2	0.001 2	0.001 2	0.001 2	0.001 3	0.001 3
Min	0.000 6	0.000 6	0.000 5	0.000 6	0.000 5	0.000 5	0.000 5	0.000 5	0.000 6

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	0.000 7	0.000 8							
2	0.000 7	0.000 7							
3	0.000 7	0.000 7							
4	0.000 7	0.000 7							
5	0.000 7	0.000 8							
6	0.000 9	0.000 9							
7	0.000 6	0.000 6							
8	0.000 7	0.000 7							
9	0.000 7	0.000 8							
10	0.000 8	0.000 8							
11	0.001 1	0.001 1							
12	0.001 3	0.001 4							
13	0.001 3	0.001 3							
14	0.001 2	0.001 2							
15	0.001 2	0.001 2							
16	0.001 2	0.001 2							
17	0.001 2	0.001 2							
18	0.001 2	0.001 2							
19	0.001 0	0.001 1							
20	0.001 0	0.001 0							
Mean	0.000 9	0.001 0							
Median	0.000 9	0.000 9							
std.dev	0.000 2	0.000 2							
Max	0.001 3	0.001 4							
Min	0.000 6	0.000 6							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)							
	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	2 698	2 702	2 704	2 708	2 707	2 707	2 708	2 707
2	2 672	2 673	2 677	2 678	2 680	2 681	2 681	2 680
3	2 694	2 695	2 700	2 700	2 703	2 703	2 704	2 703
4	2 673	2 678	2 680	2 682	2 682	2 683	2 683	2 683
5	2 703	2 709	2 710	2 712	2 711	2 712	2 713	2 712
6	2 712	2 713	2 718	2 719	2 721	2 722	2 722	2 721
7	2 720	2 723	2 726	2 727	2 728	2 728	2 729	2 728
8	2 691	2 695	2 699	2 701	2 700	2 703	2 701	2 700
9	2 683	2 687	2 688	2 691	2 690	2 691	2 692	2 691
10	2 715	2 720	2 722	2 724	2 725	2 725	2 726	2 724
11	2 663	2 665	2 668	2 669	2 671	2 672	2 672	2 672
12	2 698	2 703	2 705	2 706	2 709	2 711	2 711	2 711
13	2 722	2 728	2 729	2 732	2 735	2 734	2 736	2 735
14	2 669	2 674	2 674	2 676	2 676	2 679	2 680	2 677
15	2 702	2 707	2 711	2 714	2 713	2 715	2 715	2 714
16	2 719	2 721	2 726	2 727	2 729	2 732	2 730	2 730
17	2 696	2 700	2 700	2 704	2 705	2 705	2 706	2 705
18	2 709	2 714	2 715	2 719	2 718	2 720	2 722	2 719
19	2 678	2 680	2 682	2 685	2 683	2 685	2 685	2 684
20	2 654	2 657	2 659	2 660	2 661	2 663	2 663	2 663
Mean	2 694	2 697	2 700	2 702	2 702	2 704	2 704	2 703
Median	2 697	2 701	2 702	2 705	2 706	2 706	2 707	2 706
std.dev	20	21	21	21	21	21	21	21
Max	2 722	2 728	2 729	2 732	2 735	2 734	2 736	2 735
Min	2 654	2 657	2 659	2 660	2 661	2 663	2 663	2 663

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	2 707	2 706	2 707	2 705	2 706	2 705	2 705	2 705	2 704
2	2 680	2 679	2 680	2 678	2 678	2 678	2 677	2 677	2 677
3	2 702	2 701	2 700	2 701	2 700	2 699	2 699	2 699	2 698
4	2 684	2 683	2 682	2 680	2 680	2 680	2 679	2 679	2 679
5	2 711	2 713	2 711	2 710	2 710	2 710	2 709	2 709	2 709
6	2 721	2 720	2 722	2 720	2 721	2 720	2 720	2 720	2 720
7	2 728	2 727	2 725	2 726	2 725	2 724	2 724	2 724	2 723
8	2 702	2 701	2 701	2 698	2 698	2 698	2 698	2 697	2 697
9	2 691	2 692	2 691	2 689	2 690	2 689	2 689	2 689	2 689
10	2 725	2 723	2 725	2 723	2 723	2 723	2 723	2 722	2 722
11	2 675	2 675	2 675	2 675	2 676	2 676	2 675	2 676	2 675
12	2 711	2 712	2 713	2 713	2 714	2 714	2 714	2 714	2 715
13	2 736	2 736	2 738	2 738	2 739	2 738	2 737	2 737	2 738
14	2 680	2 679	2 682	2 682	2 683	2 683	2 684	2 683	2 684
15	2 716	2 716	2 716	2 715	2 715	2 716	2 716	2 716	2 716
16	2 733	2 733	2 733	2 733	2 733	2 733	2 733	2 732	2 732
17	2 706	2 708	2 708	2 708	2 709	2 709	2 709	2 709	2 709
18	2 722	2 721	2 723	2 723	2 723	2 724	2 723	2 724	2 724
19	2 687	2 687	2 686	2 686	2 687	2 687	2 688	2 688	2 688
20	2 665	2 664	2 665	2 664	2 665	2 665	2 664	2 665	2 665
Mean	2 704	2 704	2 704	2 703	2 704	2 704	2 703	2 703	2 703
Median	2 706	2 707	2 707	2 707	2 707	2 707	2 707	2 707	2 707
std.dev	21	21	21	21	21	21	21	21	21
Max	2 736	2 736	2 738	2 738	2 739	2 738	2 737	2 737	2 738
Min	2 665	2 664	2 665	2 664	2 665	2 665	2 664	2 665	2 665

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.2 Test condition 2 **85 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	2 704	2 704							
2	2 677	2 676							
3	2 698	2 698							
4	2 679	2 679							
5	2 709	2 709							
6	2 720	2 720							
7	2 723	2 723							
8	2 697	2 696							
9	2 689	2 689							
10	2 722	2 722							
11	2 675	2 674							
12	2 715	2 715							
13	2 736	2 736							
14	2 684	2 684							
15	2 717	2 717							
16	2 732	2 732							
17	2 710	2 709							
18	2 724	2 723							
19	2 689	2 689							
20	2 666	2 665							
Mean	2 703	2 703							
Median	2 706	2 706							
std.dev	21	21							
Max	2 736	2 736							
Min	2 666	2 665							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Flux (lm)	Vf (V)	Lumen Maintenance (%)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	339.7	3.071	99.6	99.0	98.8	98.6	98.2	97.8	97.7
2	336.4	3.049	99.0	98.1	98.0	97.7	97.1	97.0	97.0
3	343.8	3.042	99.9	99.6	98.5	98.3	97.9	97.7	97.4
4	334.9	3.017	99.5	98.7	98.2	98.1	97.5	97.5	97.4
5	341.0	3.025	98.7	98.2	97.9	98.0	97.6	97.7	97.4
6	343.3	3.089	98.6	98.4	98.1	97.9	97.5	97.7	97.2
7	330.7	3.083	99.4	99.1	98.3	97.9	97.6	97.3	97.0
8	342.4	3.028	99.3	98.5	98.3	97.8	97.8	97.3	96.9
9	344.2	3.039	99.6	98.2	98.5	98.3	97.8	97.5	97.3
10	340.9	3.030	99.5	98.8	98.7	98.3	98.2	97.6	97.6
11	337.5	3.059	98.5	98.1	97.7	97.4	97.1	97.2	97.1
12	339.9	3.039	99.0	98.4	98.2	97.8	97.6	97.3	97.0
13	339.8	3.061	99.3	98.7	98.4	98.2	97.7	97.4	97.0
14	341.9	3.042	98.8	98.5	98.4	98.2	97.9	97.6	97.6
15	330.5	3.056	100.1	99.8	99.4	98.5	98.1	98.1	98.0
16	336.6	3.096	98.7	98.3	98.3	97.9	97.4	97.5	97.4
17	334.9	3.095	99.0	98.6	98.3	98.2	97.4	97.3	97.2
18	341.1	3.087	98.7	98.5	98.3	98.0	97.7	97.4	97.0
19	340.5	3.059	99.2	99.1	98.8	98.5	98.0	97.5	97.5
20	334.3	3.018	99.7	99.2	98.8	98.5	98.0	97.5	97.3
Mean	338.7	3.05	99.2	98.7	98.4	98.1	97.7	97.5	97.3
Median	339.8	3.05	99.3	98.5	98.3	98.1	97.7	97.5	97.3
std.dev	4.1	0.03	0.5	0.5	0.4	0.3	0.3	0.2	0.3
Max	344.2	3.10	100.1	99.8	99.4	98.6	98.2	98.1	98.0
Min	330.5	3.02	98.5	98.1	97.7	97.4	97.1	97.0	96.9

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	97.4	97.4	97.5	97.4	97.3	97.2	97.2	97.1	97.2
2	96.9	96.8	97.0	97.0	96.9	97.0	97.0	97.0	97.1
3	97.4	97.1	97.3	97.3	97.2	97.2	97.1	97.1	97.2
4	97.2	97.2	97.4	97.1	97.1	97.0	97.0	96.9	97.0
5	97.1	96.9	97.0	97.0	96.7	96.7	96.6	96.5	96.6
6	97.0	97.0	97.2	97.0	96.8	96.8	96.8	96.7	96.8
7	96.7	96.7	96.8	96.8	96.6	96.5	96.5	96.4	96.4
8	96.6	96.6	96.5	96.4	96.4	96.3	96.2	96.0	96.1
9	97.1	97.0	97.2	97.1	97.0	97.0	97.0	96.9	97.0
10	97.5	97.3	97.5	97.4	97.3	97.1	97.0	96.9	96.9
11	97.0	96.9	97.1	97.1	97.0	97.0	97.1	97.0	97.1
12	96.9	97.0	96.9	96.9	96.8	96.8	96.9	96.7	96.9
13	97.2	97.0	97.1	96.9	96.7	96.7	96.6	96.6	96.7
14	97.2	96.9	96.8	96.6	96.3	96.1	96.1	96.0	96.0
15	97.7	97.2	97.2	97.2	96.9	96.7	96.5	96.3	96.3
16	97.3	97.2	97.1	97.0	96.9	96.8	96.7	96.6	96.6
17	97.0	97.0	97.1	97.1	97.0	97.0	97.0	96.8	96.9
18	97.0	97.0	97.1	97.0	96.9	96.9	96.9	96.9	96.9
19	97.2	97.1	97.3	97.1	97.1	97.0	97.1	97.0	97.1
20	96.9	96.6	96.9	96.6	96.5	96.4	96.4	96.2	96.3
Mean	97.1	97.0	97.1	97.0	96.9	96.8	96.8	96.7	96.8
Median	97.1	97.0	97.1	97.0	96.9	96.9	96.9	96.8	96.9
std.dev	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4
Max	97.7	97.4	97.5	97.4	97.3	97.2	97.2	97.1	97.2
Min	96.6	96.6	96.5	96.4	96.3	96.1	96.1	96.0	96.0

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current - **1 000 mA**

Measurement Current **1 000 mA**

No.	Lumen Maintenance (%)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	97.1	97.0							
2	97.0	96.9							
3	97.0	97.0							
4	96.9	96.8							
5	96.4	96.3							
6	96.6	96.6							
7	96.3	96.2							
8	96.0	95.9							
9	96.9	96.9							
10	96.7	96.5							
11	96.9	96.8							
12	96.8	96.6							
13	96.5	96.5							
14	95.8	95.8							
15	96.0	95.9							
16	96.5	96.3							
17	96.8	96.8							
18	96.9	96.7							
19	96.9	96.8							
20	96.1	96.1							
Mean	96.6	96.5							
Median	96.7	96.6							
std.dev	0.4	0.4							
Max	97.1	97.0							
Min	95.8	95.8							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	u'	v'	Chromaticity Shift (△u'v')						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.260 9	0.526 2	0.000 9	0.001 3	0.001 4	0.001 6	0.001 6	0.001 6	0.001 6
2	0.264 2	0.528 9	0.000 6	0.000 7	0.001 0	0.000 8	0.001 0	0.001 1	0.001 1
3	0.261 9	0.527 2	0.000 9	0.001 3	0.001 7	0.001 5	0.001 6	0.001 5	0.001 5
4	0.261 4	0.527 2	0.001 0	0.001 3	0.001 4	0.001 5	0.001 6	0.001 5	0.001 4
5	0.263 3	0.528 5	0.000 6	0.000 9	0.001 1	0.001 2	0.001 2	0.001 5	0.001 4
6	0.263 0	0.527 7	0.000 6	0.000 5	0.000 8	0.000 9	0.000 8	0.000 9	0.001 0
7	0.263 7	0.528 6	0.000 9	0.000 8	0.001 3	0.001 1	0.001 3	0.001 1	0.001 2
8	0.262 3	0.529 6	0.000 9	0.001 2	0.001 4	0.001 5	0.001 6	0.001 5	0.001 4
9	0.263 0	0.528 7	0.000 8	0.001 2	0.001 4	0.001 5	0.001 4	0.001 5	0.001 4
10	0.261 2	0.528 7	0.000 4	0.001 0	0.001 4	0.001 3	0.001 3	0.001 4	0.001 5
11	0.263 1	0.527 1	0.001 1	0.001 2	0.001 4	0.001 2	0.001 5	0.001 3	0.001 3
12	0.261 9	0.528 0	0.001 0	0.001 3	0.001 3	0.001 4	0.001 6	0.001 5	0.001 4
13	0.262 0	0.526 3	0.000 9	0.001 2	0.001 3	0.001 4	0.001 4	0.001 5	0.001 4
14	0.262 1	0.527 3	0.001 0	0.001 1	0.001 3	0.001 5	0.001 4	0.001 5	0.001 5
15	0.262 2	0.527 9	0.000 7	0.001 1	0.001 3	0.001 1	0.001 3	0.001 2	0.001 2
16	0.261 8	0.525 8	0.001 0	0.001 3	0.001 6	0.001 5	0.001 7	0.001 5	0.001 4
17	0.261 1	0.527 0	0.000 5	0.000 7	0.001 0	0.001 1	0.001 3	0.001 1	0.001 1
18	0.261 3	0.527 0	0.000 7	0.000 6	0.001 0	0.001 3	0.001 2	0.001 3	0.001 3
19	0.263 5	0.528 3	0.001 0	0.001 0	0.001 3	0.001 1	0.001 3	0.001 5	0.001 1
20	0.261 8	0.527 0	0.001 1	0.001 3	0.001 6	0.001 5	0.001 7	0.001 6	0.001 5
Mean	0.262 3	0.527 6	0.000 8	0.001 1	0.001 3	0.001 3	0.001 4	0.001 4	0.001 3
Median	0.262 0	0.527 5	0.000 9	0.001 1	0.001 3	0.001 4	0.001 4	0.001 5	0.001 4
std.dev	0.001 0	0.001 0	0.000 2	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
Max	0.264 2	0.529 6	0.001 1	0.001 3	0.001 7	0.001 6	0.001 7	0.001 6	0.001 6
Min	0.260 9	0.525 8	0.000 4	0.000 5	0.000 8	0.000 8	0.000 8	0.000 9	0.001 0

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	0.001 8	0.002 0	0.002 0	0.002 0	0.002 0	0.002 1	0.002 1	0.002 1	0.002 2
2	0.001 1	0.001 0	0.001 2	0.001 1	0.001 2	0.001 3	0.001 3	0.001 3	0.001 3
3	0.001 7	0.001 6	0.001 6	0.001 5	0.001 6	0.001 6	0.001 6	0.001 6	0.001 6
4	0.001 7	0.001 6	0.001 6	0.001 5	0.001 6	0.001 6	0.001 6	0.001 6	0.001 7
5	0.001 4	0.001 7	0.001 6	0.001 5	0.001 7	0.001 8	0.001 8	0.001 8	0.001 9
6	0.001 0	0.000 9	0.001 1	0.001 2	0.001 2	0.001 3	0.001 3	0.001 3	0.001 4
7	0.001 3	0.001 3	0.001 2	0.001 2	0.001 3	0.001 3	0.001 3	0.001 3	0.001 4
8	0.001 6	0.001 6	0.001 5	0.001 4	0.001 6	0.001 6	0.001 5	0.001 5	0.001 6
9	0.001 4	0.001 6	0.001 6	0.001 4	0.001 6	0.001 6	0.001 6	0.001 6	0.001 7
10	0.001 3	0.001 2	0.001 4	0.001 3	0.001 4	0.001 4	0.001 4	0.001 4	0.001 5
11	0.001 5	0.001 5	0.001 5	0.001 6	0.001 6	0.001 7	0.001 7	0.001 7	0.001 8
12	0.001 5	0.001 6	0.001 5	0.001 5	0.001 6	0.001 6	0.001 6	0.001 5	0.001 6
13	0.001 5	0.001 7	0.001 7	0.001 7	0.001 8	0.001 9	0.001 9	0.001 9	0.002 0
14	0.001 5	0.001 5	0.001 7	0.001 6	0.001 7	0.001 8	0.001 7	0.001 7	0.001 8
15	0.001 3	0.001 2	0.001 5	0.001 3	0.001 4	0.001 5	0.001 4	0.001 4	0.001 5
16	0.001 8	0.001 9	0.001 9	0.001 8	0.001 9	0.002 0	0.002 0	0.002 0	0.002 1
17	0.001 2	0.001 4	0.001 3	0.001 3	0.001 4	0.001 5	0.001 5	0.001 5	0.001 5
18	0.001 2	0.001 2	0.001 4	0.001 3	0.001 3	0.001 4	0.001 4	0.001 4	0.001 5
19	0.001 3	0.001 3	0.001 6	0.001 5	0.001 6	0.001 6	0.001 7	0.001 6	0.001 7
20	0.001 6	0.001 6	0.001 5	0.001 5	0.001 6	0.001 6	0.001 5	0.001 5	0.001 6
Mean	0.001 4	0.001 5	0.001 5	0.001 5	0.001 6	0.001 6	0.001 6	0.001 6	0.001 7
Median	0.001 5	0.001 5	0.001 5	0.001 5	0.001 6	0.001 6	0.001 6	0.001 5	0.001 6
std.dev	0.000 2	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
Max	0.001 8	0.002 0	0.002 0	0.002 0	0.002 0	0.002 1	0.002 1	0.002 1	0.002 2
Min	0.001 0	0.000 9	0.001 1	0.001 1	0.001 2	0.001 3	0.001 3	0.001 3	0.001 3

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	Chromaticity Shift (△u'v')								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	0.002 3	0.002 3							
2	0.001 4	0.001 5							
3	0.001 7	0.001 7							
4	0.001 7	0.001 8							
5	0.002 0	0.002 1							
6	0.001 5	0.001 6							
7	0.001 4	0.001 5							
8	0.001 6	0.001 7							
9	0.001 7	0.001 8							
10	0.001 5	0.001 6							
11	0.001 8	0.001 9							
12	0.001 7	0.001 7							
13	0.002 1	0.002 2							
14	0.001 9	0.001 9							
15	0.001 6	0.001 7							
16	0.002 2	0.002 3							
17	0.001 6	0.001 7							
18	0.001 5	0.001 6							
19	0.001 8	0.001 9							
20	0.001 6	0.001 7							
Mean	0.001 7	0.001 8							
Median	0.001 7	0.001 7							
std.dev	0.000 3	0.000 3							
Max	0.002 3	0.002 3							
Min	0.001 4	0.001 5							

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)							
	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	2 735	2 751	2 758	2 761	2 762	2 762	2 762	2 759
2	2 652	2 664	2 664	2 669	2 664	2 667	2 669	2 666
3	2 709	2 727	2 734	2 740	2 735	2 738	2 735	2 733
4	2 718	2 737	2 744	2 745	2 746	2 747	2 744	2 741
5	2 674	2 685	2 690	2 694	2 694	2 693	2 698	2 695
6	2 682	2 692	2 690	2 695	2 695	2 693	2 693	2 693
7	2 665	2 680	2 680	2 689	2 683	2 686	2 682	2 682
8	2 691	2 709	2 714	2 717	2 717	2 719	2 716	2 713
9	2 680	2 696	2 701	2 705	2 706	2 705	2 706	2 702
10	2 717	2 723	2 735	2 742	2 740	2 738	2 739	2 740
11	2 683	2 702	2 704	2 709	2 704	2 707	2 703	2 701
12	2 705	2 724	2 730	2 730	2 730	2 732	2 730	2 727
13	2 710	2 728	2 734	2 735	2 735	2 734	2 735	2 732
14	2 704	2 723	2 723	2 728	2 729	2 727	2 728	2 728
15	2 699	2 710	2 718	2 721	2 717	2 720	2 716	2 715
16	2 717	2 733	2 739	2 746	2 742	2 744	2 741	2 735
17	2 726	2 734	2 738	2 742	2 744	2 747	2 742	2 740
18	2 722	2 734	2 733	2 740	2 744	2 742	2 743	2 740
19	2 669	2 688	2 688	2 693	2 686	2 691	2 693	2 684
20	2 712	2 733	2 738	2 740	2 739	2 742	2 739	2 736
Mean	2 698	2 714	2 718	2 722	2 721	2 722	2 721	2 718
Median	2 704	2 723	2 727	2 729	2 730	2 730	2 729	2 727
std.dev	23	23	25	24	26	26	25	25
Max	2 735	2 751	2 758	2 761	2 762	2 762	2 762	2 759
Min	2 652	2 664	2 664	2 669	2 664	2 667	2 669	2 666

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	2 763	2 765	2 763	2 760	2 761	2 761	2 760	2 760	2 760
2	2 664	2 662	2 661	2 657	2 658	2 658	2 656	2 656	2 655
3	2 733	2 732	2 727	2 723	2 724	2 722	2 719	2 717	2 717
4	2 744	2 741	2 737	2 733	2 734	2 732	2 730	2 728	2 728
5	2 695	2 698	2 695	2 690	2 694	2 694	2 692	2 692	2 693
6	2 691	2 689	2 689	2 686	2 686	2 685	2 683	2 682	2 681
7	2 682	2 679	2 674	2 672	2 672	2 670	2 667	2 665	2 665
8	2 714	2 713	2 708	2 705	2 706	2 704	2 701	2 700	2 699
9	2 700	2 703	2 699	2 694	2 696	2 694	2 692	2 691	2 691
10	2 734	2 732	2 732	2 727	2 727	2 725	2 722	2 721	2 721
11	2 704	2 702	2 699	2 700	2 698	2 698	2 696	2 694	2 694
12	2 728	2 727	2 723	2 720	2 720	2 719	2 716	2 715	2 714
13	2 734	2 736	2 734	2 730	2 732	2 732	2 730	2 730	2 730
14	2 726	2 726	2 728	2 724	2 725	2 725	2 723	2 722	2 722
15	2 715	2 712	2 714	2 707	2 708	2 707	2 705	2 703	2 703
16	2 741	2 744	2 740	2 734	2 737	2 736	2 734	2 733	2 734
17	2 739	2 743	2 738	2 735	2 736	2 734	2 732	2 731	2 732
18	2 736	2 735	2 734	2 727	2 728	2 726	2 723	2 722	2 722
19	2 686	2 685	2 687	2 684	2 684	2 683	2 682	2 680	2 680
20	2 737	2 735	2 731	2 727	2 727	2 725	2 723	2 721	2 721
Mean	2 718	2 718	2 716	2 712	2 713	2 712	2 709	2 708	2 708
Median	2 727	2 726	2 725	2 721	2 722	2 720	2 718	2 716	2 716
std.dev	25	26	26	25	25	25	26	26	26
Max	2 763	2 765	2 763	2 760	2 761	2 761	2 760	2 760	2 760
Min	2 664	2 662	2 661	2 657	2 658	2 658	2 656	2 656	2 655

SAMSUNG ELECTRONICS LED BUSINESS
1, Samsung-ro, Giheung-gu, Yongin-si,
Gyeonggi-do 17113, Korea

9.3 Test condition 3 **105 ℃**

Drive Current **1 000 mA**

Measurement Current **1 000 mA**

No.	CCT (K)								
	16 000 h	17 000 h	18 000 h	19 000 h	20 000 h	21 000 h	22 000 h	23 000 h	24 000 h
1	2 762	2 762							
2	2 654	2 654							
3	2 718	2 717							
4	2 729	2 728							
5	2 694	2 695							
6	2 682	2 681							
7	2 665	2 666							
8	2 700	2 699							
9	2 692	2 692							
10	2 722	2 721							
11	2 695	2 695							
12	2 715	2 714							
13	2 732	2 732							
14	2 724	2 724							
15	2 704	2 703							
16	2 735	2 735							
17	2 732	2 731							
18	2 722	2 721							
19	2 681	2 680							
20	2 722	2 721							
Mean	2 709	2 709							
Median	2 716	2 716							
std.dev	26	26							
Max	2 762	2 762							
Min	2 654	2 654							

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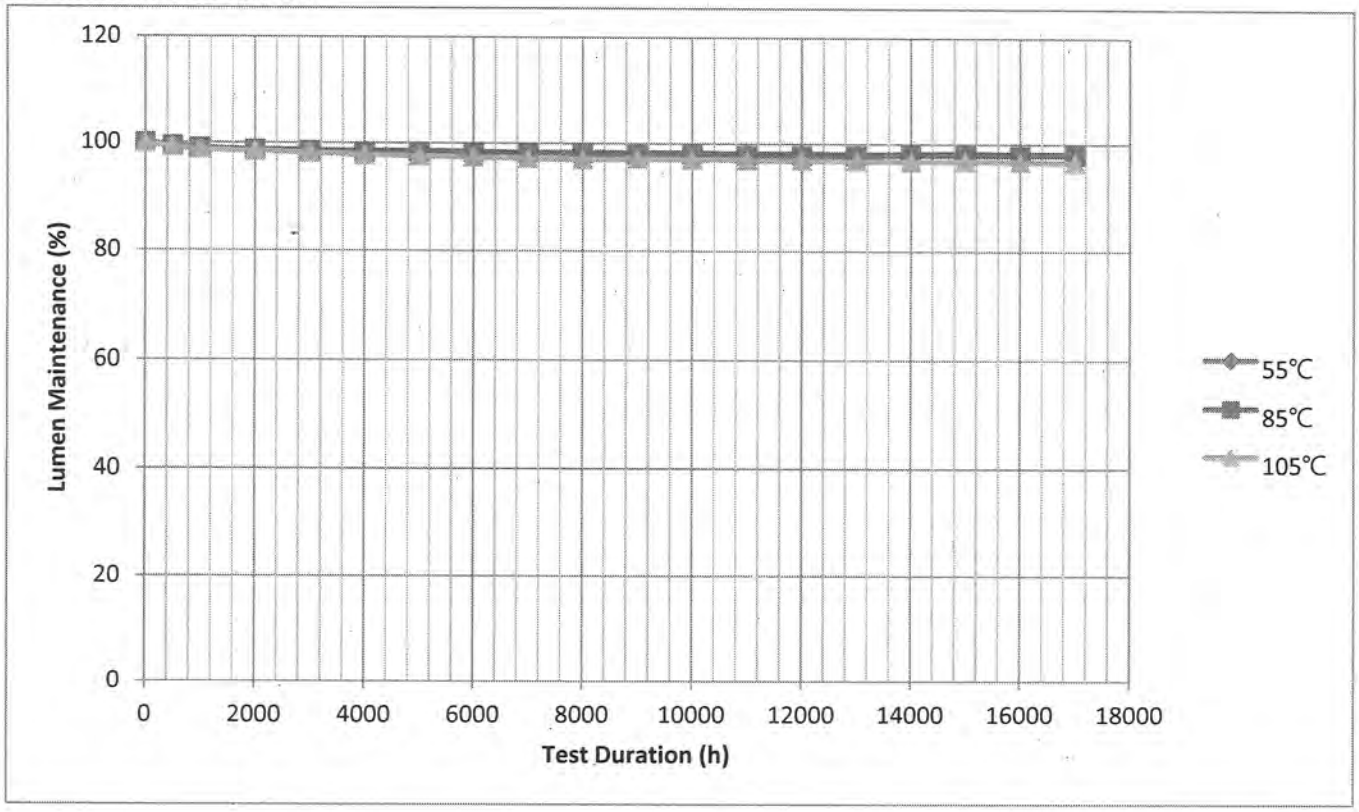
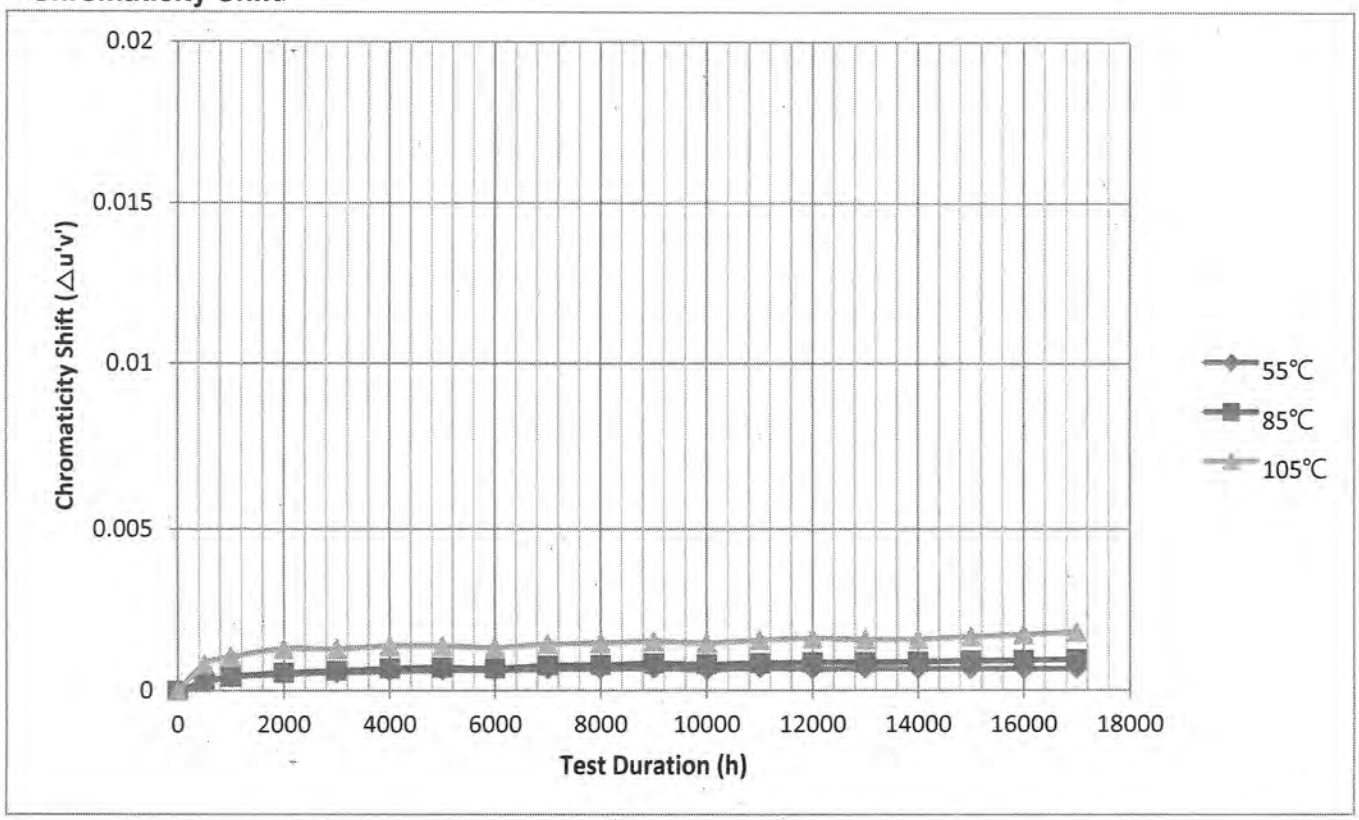
Gyeonggi-do 17113, Korea

9.4 Chart

<Lumen Maintenance>



<Chromaticity Shift>



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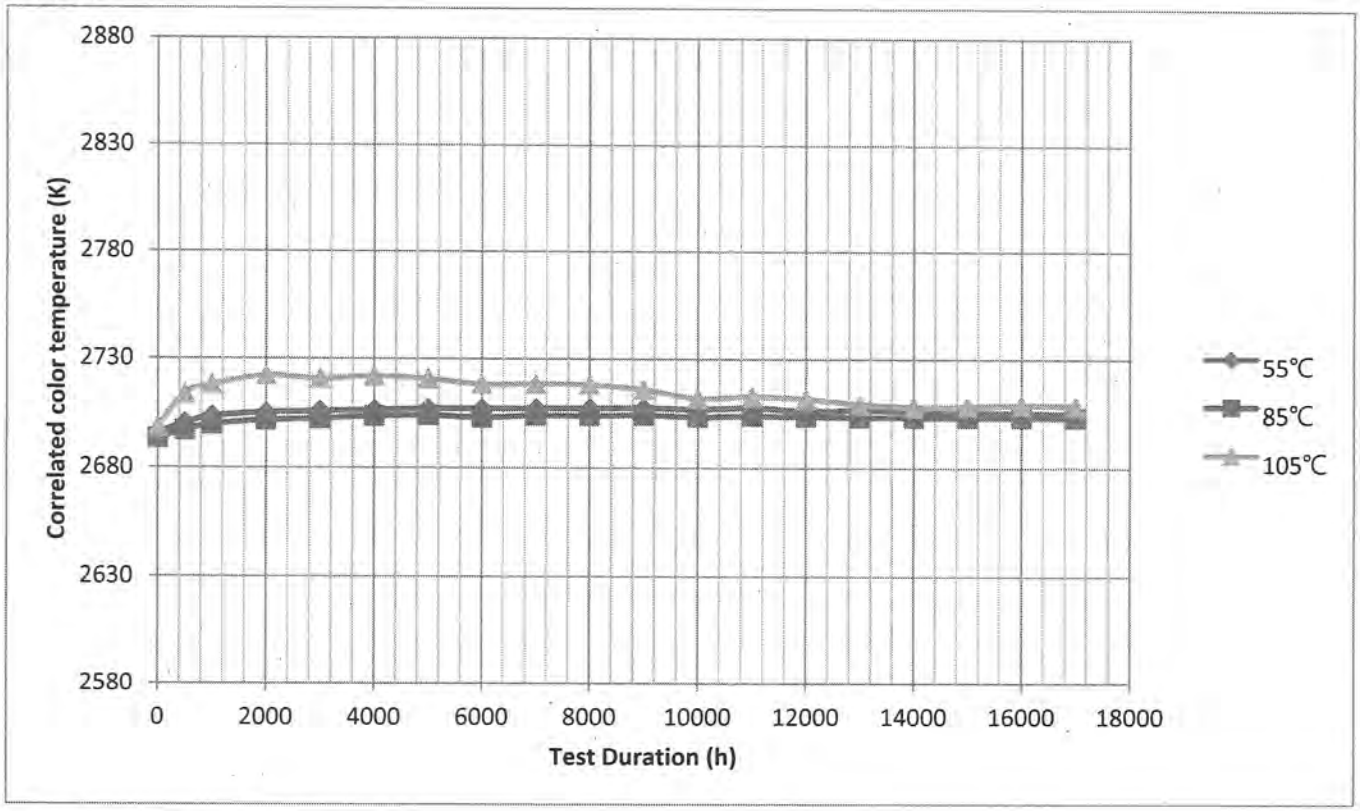
Gyeonggi-do 17113, Korea

<CCT>



10. Observation of failures

No optical, Electrical or mechanical failure of any LED Package was seen during the lifetime testing.

11. LED light source monitoring interval

0 500 1 000 2 000 3 000 4 000 5 000 6 000 7 000 8 000
9 000 10 000 11 000 12 000 13 000 14 000 15 000 16 000 17 000

12. Photometric measurement uncertainty

3.5%

13. TM-21-11 Report : Projecting Long Term Lumen Maintenance of LED Light Source

Table 1: Report at each LM-80 Test Condition					
Description of LED Light Source Tested (manufacturer, model, catalog number)					
Test Condition 1 - 55°C Case Temp		**Test Condition 2 - 85°C Case Temp**		**Test Condition 3 - 105°C Case Temp**	
Sample size	20	Sample size	20	Sample size	20
Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	1 000	DUT drive current used in the test (mA)	1 000	DUT drive current used in the test (mA)	1 000
Test duration (hours)	17,000	Test duration (hours)	17,000	Test duration (hours)	17,000
Test duration used for projection (hour to hour)	8,000 - 17,000	Test duration used for projection (hour to hour)	8,000 - 17,000	Test duration used for projection (hour to hour)	8,000 - 17,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	105
α	1.667E-07	α	1.484E-07	α	6.010E-07
B	0.984	B	0.981	B	0.975
Reported L90(17k) (hours)	>102000	Reported L90(17k) (hours)	>102000	Reported L90(17k) (hours)	>102000

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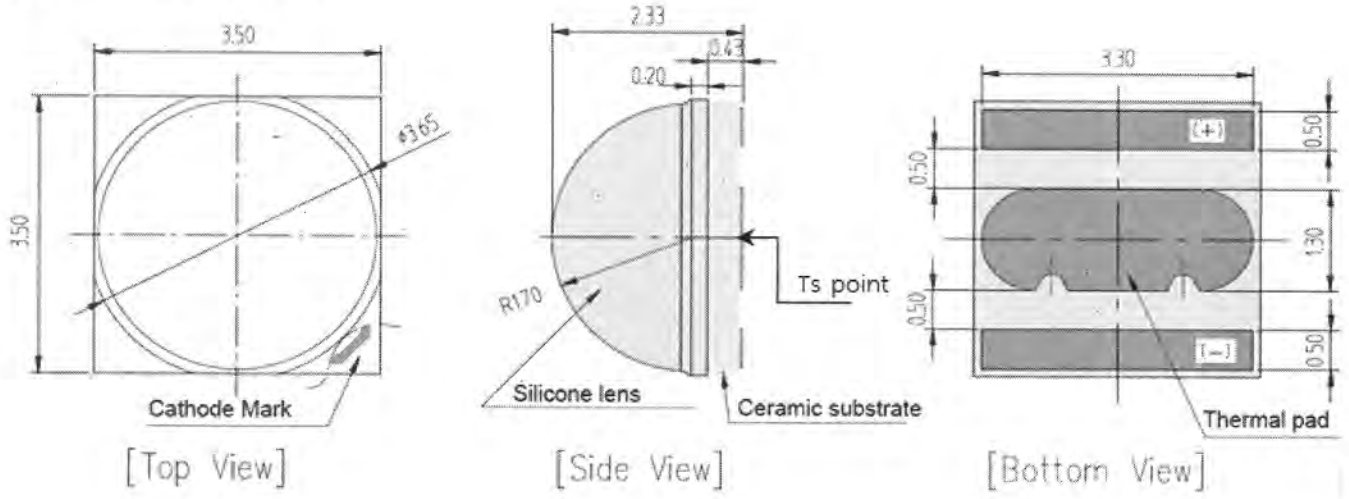
Gyeonggi-do 17113, Korea

14. Dimension of samples



15. Cover models

**********END OF TEST REPORT**********

LICENCE

No. 20254 replaces No.20142

Issued to:
Applicant:
R-Tech
Rue de Mons, 3
4000 LIEGE
Belgium

Licensee:
Schreder S.A.
Rue de Lusambo, 67
1190 BRUXELLES
Belgium

Product	:	road, square, street, flood lighting
Trade name(s)	:	SCHREDER
Type(s)/model(s)	:	VOLTANA0 6 LED xx, VOLTANA0 8 LED xx

The product and any acceptable variation thereto is specified in the annex to this licence and the documents therein referred to.

SGS CEBEC hereby declares that the above-mentioned product has been certified on the basis of:

- a type test according to the standard specified in annex
- an inspection of the production location
- a certification agreement with the number 1173

SGS CEBEC hereby grants the right to use the CEBEC certification mark

The ENEC/CEBEC certification mark may be applied to the product as specified in this licence for the duration of the ENEC/CEBEC certification agreement and under the conditions of the ENEC/CEBEC certification agreement.

This licence is issued on: 15/03/2017

ir. C. Lana,
Certification Manager

SGS Belgium NV-Division SGS CEBEC
Business Riverside Park
Bld Internationalelaan 55 Build. D
B-1070 Brussels
Tel.+32(0)2 556 00 20 Fax.+32(0)2 556 00 36

SPECIFICATION OF THE CERTIFIED PRODUCT

Product data

Product	:	road, square, street, flood lighting
Trade name(s)	:	SCHREDER
Type(s)/Model(s)	:	VOLTANA0 6 LED xx, VOLTANA0 8 LED xx
description	:	Street lighting
rated voltage (Un)	:	200-240 V
rated frequency	:	50-60 Hz
class	:	class I
degree of protection	:	IP66
additional information	:	IK08
rated output current (In out)	:	max. 1050 mA

Additional information

xx = Color Temperature can be :
NW neutral white
CW cool white
WW warm white

Product data - type VOLTANA0 6 LED xx

rated power	:	8-10-15-23 W
lamp(s)	:	6 LED
temperature class	:	Ta max.50°C

Product data - type VOLTANA0 8 LED xx

rated power	:	11-14-20-31 W
lamp(s)	:	8 LED
temperature class	:	Ta max. 40°C

TESTS

Test requirements

EN 60598-1:2015
EN 60598-2-3:2003 + A1:2011

Test results

The test results are laid down in test report(s) ref. P-1560-Ia

Remarks

This certificate is based on test reports Nos. P1560-Ia

Conclusion

The examination proved that all test requirements were met.

Checked by, project leader : Christian Maes - 15/03/2017

Department Manager, Product Certification :

Certification Manager : 2017-03-15

SGS Belgium NV-Division SGS CEBEC
Business Riverside Park
Bld Internationalelaan 55 Build. D
B-1070 Brussels
Tel.+32(0)2 556 00 20 Fax.+32(0)2 556 00 36

FACTORY LOCATION(S)

Schréder do Brasil Iluminação Ltda.
Rua Iracema Lucas, 415
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13280-000 SAO PAULO
Brazil

Schreder TOV
Vul. Mykulynetska 46B
46000 TERNOPIL
Ukraine

Schreder (China) Lighting Industrial Co., Ltd
No.40 Xinye 2 Street, Tianjin Economic Technological Development Zone West Zone,
300462 Tianjin City, P.R.China
China

Socelec S.A.
Av. de Roanne, 66
Poligono Industrial "EL HENARES"
19180 MARCHAMALO (GUADALAJARA)
Spain

Schréder Iluminação S.A.
Rua da Fraternidade Operária, n° 3
2795-491 CARNAXIDE, OEIRAS
Portugal

Comatelec S.A.
Z.I.
18400 SAINT FLORENT S/CHER
France

Tungsram-Schréder Világitási Berendezések Zrt
Tópart 2
2084 PILISSZENTIVAN
Hungary

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA-0 / 6 led's / Moons PU025H105AQ 0-10V driver**
Sample n°: P-E16371, P-E16375

Test purpose: **Electrical measurements @ 1.05A**

Remarks:
Test request n°: P-D16542
Folder n°: P-F16041

TEST CONDITIONS:

Operator: CLOSSET Frédérick

Load: 6 Led's
Typical Vf: 3,1 V

Driver: Moon's PU025H105AQ_0-10V Series

Power supply: Elgar ET3500 230V 50Hz

Measurement device: Fluke Norma 4000 HF power meter

CONCLUSIONS:

PF: 0.97

Efficiency: 82.1 %

THD: 9.1 %

Harmonics we are under the 25W => no measurements

Duplicate to: Mr M. Thijs
LAB 05/10/2016
L. Maghe

//P-16CR542

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA-0 8 led's class II PHILIPS driver 40 W**
Sample n°: P-E17149

Test purpose: **EMC tests according to EN 55015 & EN 61547 Standards**

Remarks:
Test request n°: P-D17187
Folder n°: P-F16041

TEST CONDITIONS:

Operator: EMC - ULg

Test Summary
EN 55015 & EN 61547 Standards

Emission

Standard	Limit / Level	Result	
		PASS	FAIL
EN 55015 Conducted Emission	9kHz- 30 MHz	X	
EN 55015 Annex B	30 MHz – 300 MHz	X	
EN 61000-3-2	Class C a)	X	

Immunity

Standard	Limit / Level	Result	
		PASS	FAIL
EN 61000-4-2	4 kV at contact 2, 4 & 8 kV in the air Criteria B required	X	
EN 61000-4-3	3 V/m 80 MHz – 1 GHz AM 80 % 1 kHz Criteria A required	X	
EN 61000-4-4	1 kV 5 kHz Criteria B required	X	
EN 61000-4-5	0.5 & 1 kV MD Criteria C required	X	
EN 61000-4-5	Complementary levels 2, 4, 8 & 10 in MD Criteria C required	X	
EN 61000-4-6	3 V 150 kHz – 80 MHz AM 80 % 1 kHz Criteria A required	X	
EN 61000-4-11	0% U 0.5 period 70% U 10 periods Criteria B/C required	X	

VOLTANA-0 8 led's class II PHILIPS driver 40 W

Driver: Philips FP 40W 0.3-1A

EMC Auxiliaries: Varistors

CONCLUSIONS:

VOLTANA 0 8 led's driven by PHILIPS FP 40 W driver complies with the CISPR/EN 55015 and EN 61547 Standards.

Remark: Surge protection tested OK up to 10 KV for Differential mode for the equipment with eventual Fuse replacement.

Duplicate to: Mr Ph. Verbeeck
LAB 24/04/2014 //P-17CR187
G. Cheuvart

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA-0 with Glass protector**
Sample n°: P-E16420

Test purpose: **Mechanical impact resistance test following IEC/EN 62262 Standard**

Remarks:
Test request n°: P-D16604
Folder n°: P-F16041

TEST CONDITIONS:

Operator: BOMBIL Patrick

Glass thickness: 5 mm

At pendulum hammer
5 impact points distributed on protector surface
1 impact on clamp
One impact on each point

Test on 5 samples

Test	**Result**
IK08 : Impact energy: 5 joules Hammer weight: 1,7 kg Height of fall: 29,4 cm	OK for the 5 samples for all tested points

CONCLUSIONS:

VOLTANA 0 equipped with glass protector complies with IK08 test following IEC/EN 62262 Standard.

Duplicate to: Mr M. Thijs
LAB 07/11/2016
L. Maghe

//P-16CR604

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA-0 equipped with 5205 & 5206 lenses**
Sample n°: P-E16393, P-E16460

Test purpose: **Mechanical impact resistance test following IEC/EN 62262 Standard**

Remarks:
Test request n°: P-D16655
Folder n°: P-F16041

TEST CONDITIONS:

Operator: BOMBIL Patrick

VOLTANA-0 equipped with 6 led's

At pendulum hammer
5+2 impact points distributed on lens protector surface
One impact on each point

Test on 5 samples

Test	**Result**
IK08 : Impact energy: 5 joules Hammer weight: 1,7 kg Height of fall: 29,4 cm	OK for all tested samples

CONCLUSIONS:

VOLTANA 0 equipped with 5205 & 5206 lenses complies with IK08 test following IEC/EN 62262 Standard.

Duplicate to: Mr M. Thijs
LAB 23/11/2016
L. Maghe

//P-16CR655

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA 0 – 8 led's – Flat glass protector**
Sample n°: P-E16377, P-E16394

Test purpose: **Tightness test IP66 following IEC/EN 60598-1 Standard**

Remarks:
Test request n°: P-D16575
Folder n°: P-F16041

TEST CONDITIONS: Operator: BOMBIL Patrick

VOLTANA-0 8 led's with flat glass protector

Pre-conditioning: endurance test

Test	Result
IP6X : -Luminaire switched ON until stable T° -Talcum in suspension (blowing ON) -After 1', luminaire OFF -Talcum for 3 hours	OK
IPX6 : - Luminaire switched ON until stable T° - Luminaire switched OFF and immediately sprayed with water jet - Hose Φ 12,5 mm - Water pressure: 1 kg/cm2 - Spraying distance: 3 m - Duration of test: 3 minutes	OK

CONCLUSIONS:

VOLTANA-0 8 led's with flat glass protector complies with IP66 test following IEC/EN 60598-1 Standard.

Duplicate to: Mr M. Thijs
LAB 21/11/2016
L. Maghe

//P-16CR575

Laboratory Service PHYSICAL TEST REPORT

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

Subject: **VOLTANA 0 – 6 led's NW @ 1050 mA**
Sample n°: P-E16418

Test purpose: **Photobiological safety tests following IEC-EN 62471 Standard**

Remarks:
Test request n°: P-D17045
Folder n°: P-F16041

TEST CONDITIONS: Operator: Laborelec

VOLTANA 0 – 6 led's NW @ 1050 mA

Test program:
Spectral radiance and irradiance measurements of the device under test in the following wavelength ranges:
- 200 to 400 nm : « Actinic UV skin & eye » irradiance
- 315 to 400 nm : « Eye UV-A » irradiance
- 300 to 700 nm : « Blue Light » radiance
- 380 to 1400 nm : « Thermal Retinal » radiance
- 780 to 1400 nm : « Thermal Retinal » radiance (weak visual stimulus)

Determination of the Risk Group classification for each hazard and recommendation about the marking of the product.

CONCLUSIONS:

RG2 @ 20 cm

RG1 @ 30 cm

Duplicate to: Mr Ph. Verbeeck
LAB 08/06/2017
G. Cheuvart

//P-17CR045

Laboratory
Test report

R-Tech
Rue de Mons 3 – B-4000 Liège – Belgium
Tel.: +32 4 224 71 40 – Fax: +32 4 224 25 90
Member of Schréder Group

FORM L-54 Edition 01 – Revision 00 - Date: 14/06/2018

Thermal Test LED

General information

Subject : VOLTANA 0 - 8 LEDs Oram 50 W driver
Created on : 08/11/2018
Validated on : 21/11/2018
Test number : D180791
Reference norm : IEC/EN 60598-1 Standard
Sample(s) : E180590
Folder : P-F16041

Test conditions

Luminaire : VOLTANA 0
Number of LED : 8

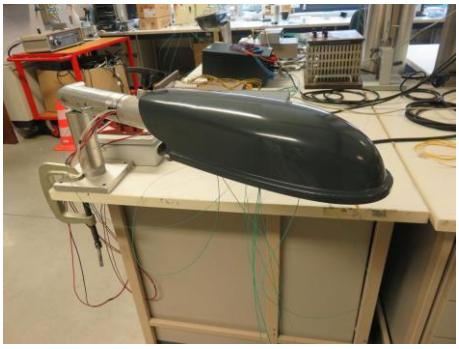
Driver : Optotronic OT50/120-277/1A2 2DIM LT2 P / 00-14-565
Driver info : Tc (max: 80°C)
Driver current (mA) : 1250
SPD : Vossloh Lighting Solutions SPC3 230/10 K

Measurements devices :
Fluke Norma 4000 - HF Powermeter - (E110) : Electrical measurements
Keithley 2701 (E097) – Ethernet Multimeter/Data Acquisition System : Thermal & VF led measurements

Power Supply :
APT 300XAC AC power supply (E096)
Supply voltages: 230 V 50 Hz

Junction Temperature measurement method : Junction temperature measurement by base temperature measurement and electrical measurement.T°j =T°b + Rjb x Pled

Operator : MESPOUILLE Loic



IMG_0885

Conclusion

Informative

Ta: 40°C limited by lenses and driver; according IEC 60598-2-3 and IEC 60598-2-5 (outdoor use only)
Ta: 30°C limited by lenses and driver; indoor use and UL standard
Tq: 15°C limited by lenses and driver; according IEC 62722-2-1

Tq given for 100 khrs of lifetime

Validated by :	Duplicate to : BOS Peter	**//CR180791**
GHYSENS Gilles	LAB : 22/11/2018	1/1

Schréder
Experts in lightability™

VOLTANA 0

5137

Optic	5137
Protector	Flat glass
Source	8 Samsung LH351C
Matrix	425522

Characteristics

416	156	91	2.6	IP 66	IK 10	I EU	0.012
Length (mm)	Width (mm)	Height (mm)	Weight (kg)	Tightness level*	Impact resistance*	Electrical class*	CxS (m²)

** According to IEC-EN60598 and IEC-EN62262*

Features

The ultimate, cost-effective, performing family of luminaires that pays for itself

- Cost-effective and efficient lighting solution for a fast return on investment
- High performance with safety and comfort
- 5 sizes for flexibility
- IP 66 tightness level
- ThermiX® to withstand high temperatures
- Designed to incorporate the Owlet range of control solutions

Types of application

- Square and park
- Roundabout
- Residential road
- Urban road

Information for 1000 lm matrix

Efficacy (%)	86.9
DLOR (%)	86.9
ULOR (%)	0.0
ULR (%)	0.0
Incl ULR 4%	-44/40°

G Class (EN 13201-2)	G4
G* (EN 13201 2015)	G*3
Imax (cd)	471
Aperture 0-180°	75 - 75
Aperture 90-270°	38 - 7

I 70-80-90-95 (cd)	439 - 63 - X - X
CIE flux code N 1→5 (%)	45.0 - 79.3 - 98.2 - 100.0 - 86.9
Gradient 90°	14cd
Gradient 270°	6cd

Photometrical characteristics

LED count	Colour code	Current (mA)	Luminaire power (W)	Source flux (lm)	Luminaire output flux (lm)	Luminaire efficacy (lm/W)	Peak (cd)	BUG Rating	Voltage (V)
			Ambient temp = 25°						
8	NW 740	350	10	1520	1321	132	715	B1 U0 G0	230
8	NW 740	500	14	2096	1821	130	986	B1 U0 G0	230
8	NW 740	700	19	2810	2442	129	1323	B1 U0 G1	230
8	NW 740	1000	29	3760	3267	113	1770	B1 U0 G1	230
8	NW 740	1050	29	3861	3354	116	1817	B1 U0 G1	230
8	NW 740	1250	37	4362	3790	102	2053	B1 U0 G1	230
8	WW 730	350	10	1440	1251	125	678	B1 U0 G0	230
8	WW 730	500	14	1986	1725	123	935	B1 U0 G0	230
8	WW 730	700	19	2663	2313	122	1253	B1 U0 G1	230
8	WW 730	1000	29	3563	3095	107	1677	B1 U0 G1	230
8	WW 730	1050	29	3658	3178	110	1721	B1 U0 G1	230
8	WW 730	1250	37	4133	3591	97	1945	B1 U0 G1	230

Tolerance on flux +- 7% - Tolerance on power +- 5%

Summary

CONCEPT

Family of 6 road LED luminaires

Recommended installlation height: between 4.00 and 12.00m

For optimal heat dissipation, the driver and LED engine are in separate compartments and juxtaposed in a horizontal section

HOUSING & FINISH

- Housing in high-pressure, die-cast aluminium, polyester powder coated
- Colour: RAL 7038

INSTALLATION

- Luminaire can be fixed by side-entry with a clamp, suitable for 42-60mm diameter
- Built-in inclination steps: -10°, -5°, 0°, 5°
- Post-top adapter diameter 48-60mm or 76mm, tightened with 2 stainless steel screws
- Direct access to the driver compartment with screws for easy maintenance on-site

OPTICAL UNIT

- Protected against lens degradation by 5mm thick extra-clear hardened glass
- Flatbed PCB with acrylic lens overlay principle
- Various photometric distributions: from narrow road to motorway, medium and large area
- CRI > 70
- ULOR: 0%

LED lumen depreciation

- Lifetime residual flux @ Tq=25°C @ 100.000 hrs: 350mA & 500mA; 90%; 700mA: 80%; 1A: 70%

ELECTRICAL

- Class I or Class II
- Input voltage: 120-277V - 50-60Hz
- Power factor > 90% at full load
- Surge protection: 4kV minimum (10kV + 10kA optional)
- Thermal protection on LED PCBA (see Thermix concept)

STANDARDS & CERTIFICATIONS

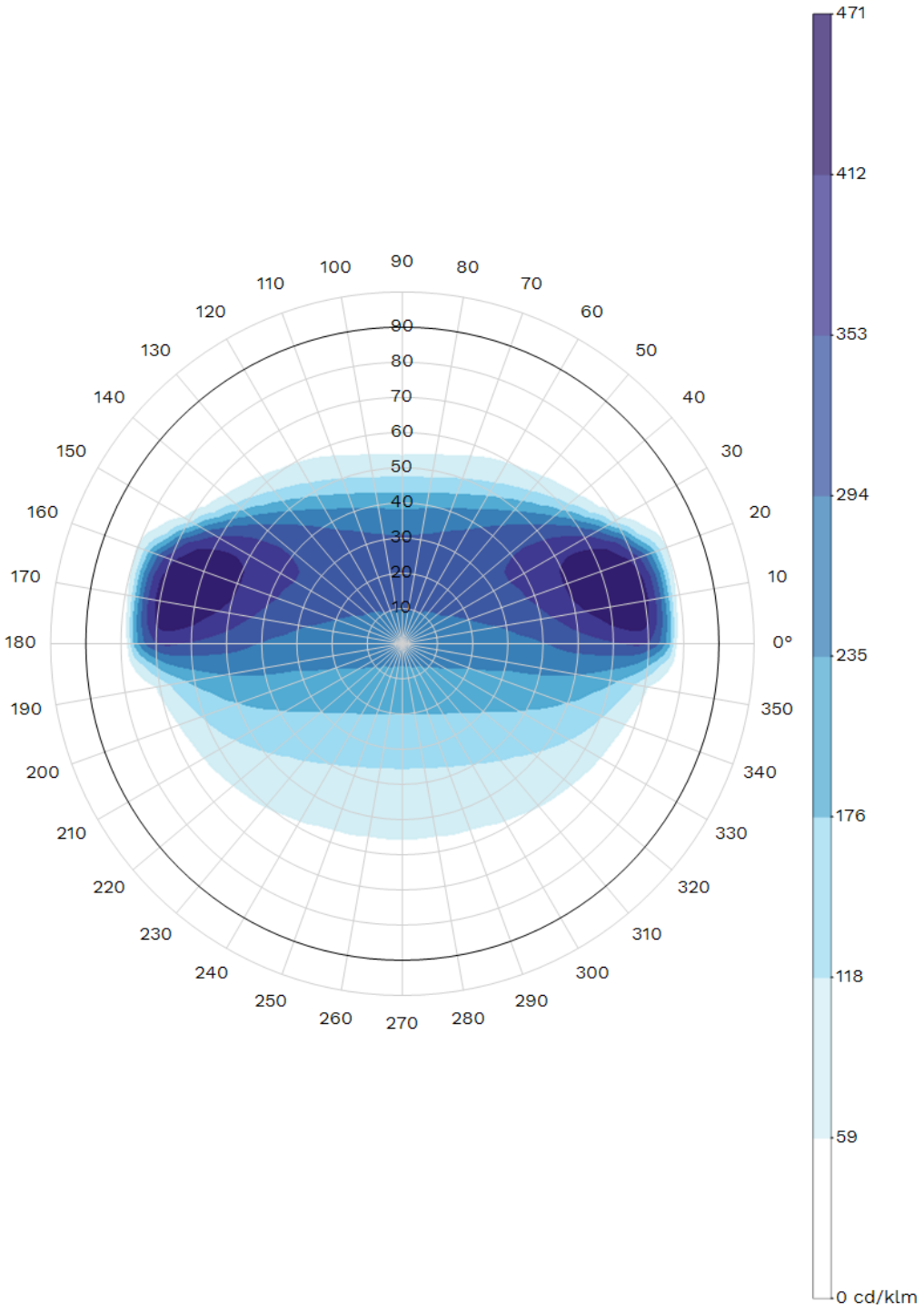
- CE
- ENEC
- LM79-80
- ROHS
- Certified for 3G vibration
- All measurements in ISO17025 accredited laboratory

OPTIONS

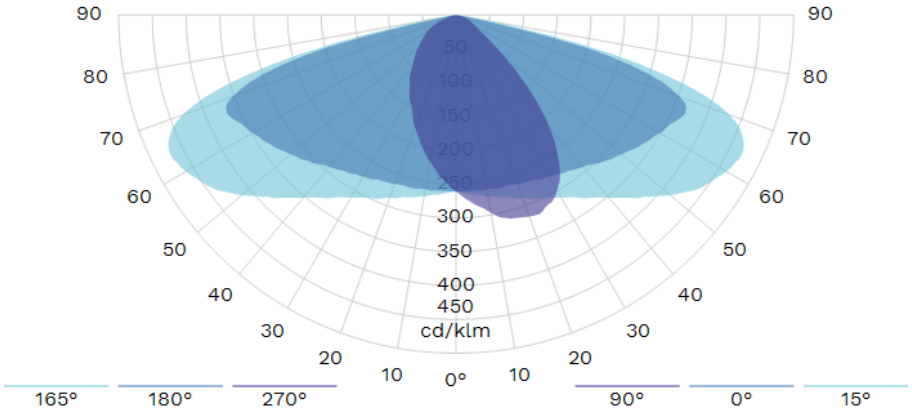
- Other RAL or AKZO colours
- Back Light control system
- OWLET remote management
- Custom dimming profile

- Photocell

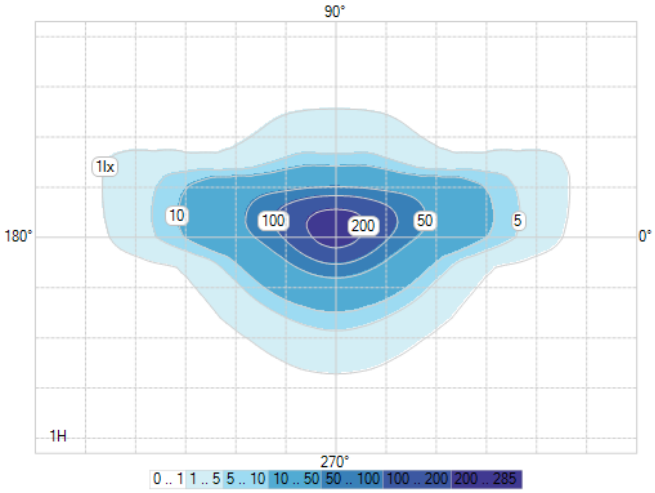
Hypergon view



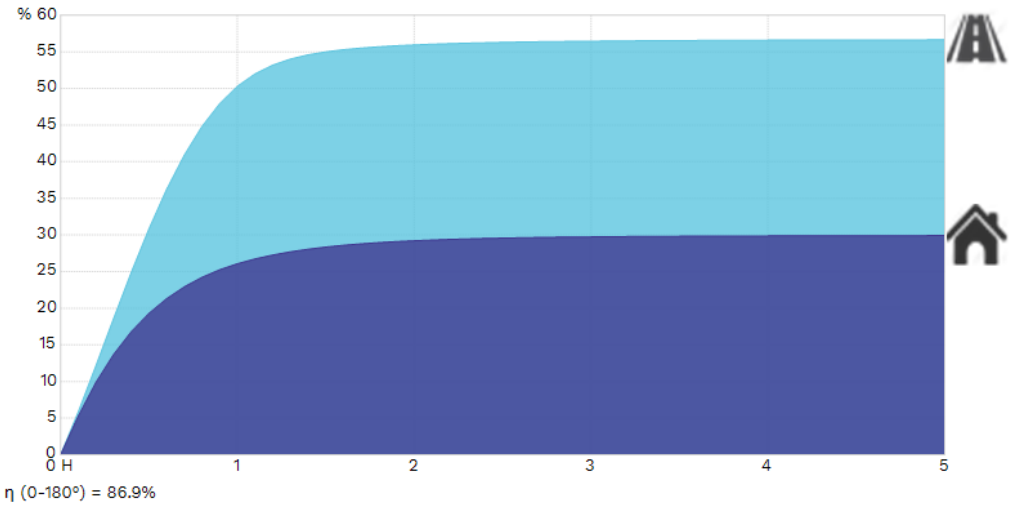
Polar/Cartesian diagram



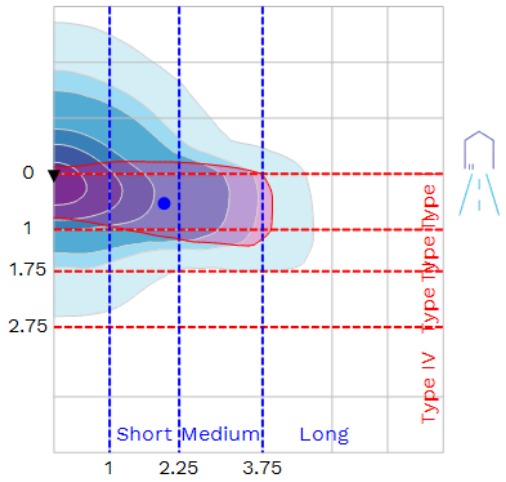
Isolux



K-Curve

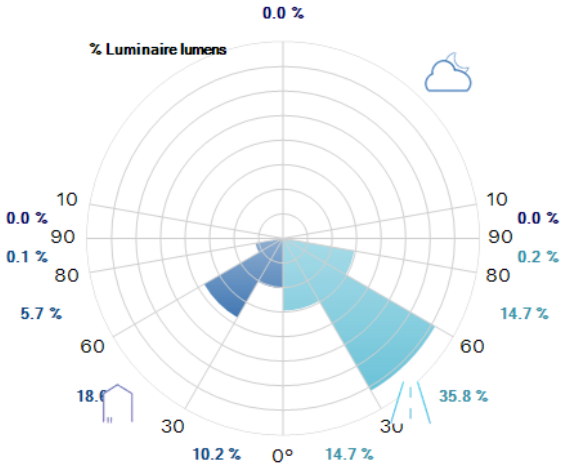


IES Roadway Classification / Nema Classification

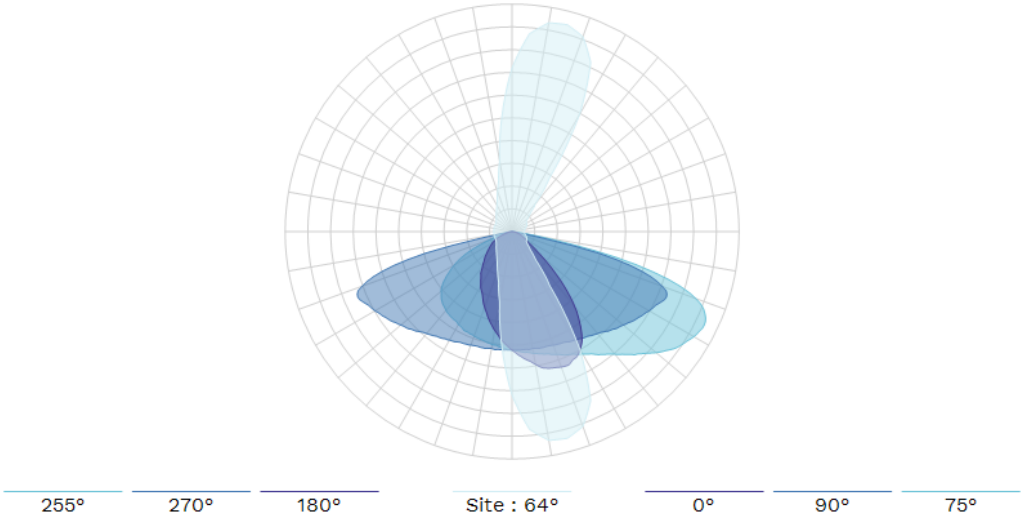


II - Short

Luminaire classification system (LCS)



Intensity diagram in max Cone and in CPlane



http://www.schreder.com