

# Laboratory Test report

FORM L54 Edition 01 - Revision 00 - Date: 14/06/2018



R-Tech  
 Rue de la Meuse 3 - 1410000 Lokeren - Belgium  
 Tel: +32 4 224 11 40 - Fax: +32 4 224 23 90  
 Member of Schriber Group

## EMC test

### General information

**Subject:** AXIA 3.2 - 32 led's OSOLON SQUARE GIANT - LG 75W driver @ 800mA - Class I

**Asked by:** THIJS Marcel

**Created on:** 11/04/2019

**Test number:** D190303

**Reference norm:** EN 55015 - EN 61547 + IEC 61000-3-2 Standards

**Sample(s):** E190204

**Folder:** P-F18071

### Test conditions

**Luminaire:** AXIA 3.2

**Description:**

32 led's Osolon Square Giant

Dimmable: DALI

LuCo P7 CM

**Electrical class:** Class I EU

**Driver:** LG 75W 300-1000mA Prog Modular EU / 00-36-981

**Current setting (mA):** 800

**Auxiliaries:** VS Lighting Solutions SP3

**Testing facility:** External - EMC - Laborelec

**Exposure:** CELESTRA - LBE04135955 - 1.0

**Operator:** External Lab

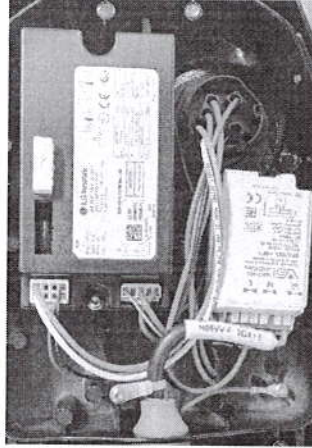
## Summary of test

### Test(s)

Name	Description	Result
Complete EMC test (10 Kv Surges)	Emission measurements (EN 55015): - Terminal disturbance - Radiated emissions - Conducted emissions  Harmonics (IEC/EN 61000-3-2)  Immunity measurements (IEC/EN 61547) - Electrostatic discharge (IEC/EN 61000-4-2) - Radiated, radio frequency electromagnetic field (IEC/EN 61000-4-3) - Fast transients (IEC/EN 61000-4-4) - Surges (IEC/EN 61000-4-5) - Injected currents (IEC/EN 61000-4-6) - Power frequency magnetic field immunity (IEC/EN 61000-4-8) - Voltage clips & interruptions (IEC/EN 61000-4-11)	Success

### Complete EMC test (10 Kv Surges)

#### Annex(es)



AXIA 3.2 - 32 led's OSOLON SQUARE GIANT - LG 75W driver complies with EN 55015 and EN 61547 Standards.

Validated by:

LERHO Xavier

Duplicate to: THIJS Marcel, JORIS Philippe, GALLOPPA

Sandro, DETAILLE Ludovic, MULS Sophie, BOS Peter

LAB: 11/04/2019

D190303

1/26



802-Test  
ISO/IEC 17025

Report of test  
Electromagnetic Compatibility number 677775

**CENTRAAL LABORATORIUM VOOR ELEKTRICITEIT (C.L.E.)  
LABORATOIRE CENTRAL D'ELECTRICITE (L.C.E.)**

Rodestraat, 125 – B-1630 Linkebeek

**Electromagnetic Compatibility**

**TEST REPORT**

**Purpose of the test** Measurement of radio-disturbances and examination of compliance with EMC standards.  
**Trademark and type** R-Tech Axia 3.2 (LG) 75W Cl I **Dimmable**

**Delivered to**  
R-TECH  
M. Maghe Laurent  
Rue de Mons, 3  
B – 4000 LIEGE

**Performed on** 29/03/2019

**Delivered on** 10/04/2019

**CLE task No.** 19/21019

**CLE report No.** LBE04135955 - 1.0

**Contents** 24 pages

**Applicant reference No.** Order P0003254 of 27/03/2019



<b>Author</b> Fonck Yves Technical Operator	<b>Verifier</b> Herbert Denis Technical Operator	<b>Approver</b> Deswert Jean Michel Technology Manager
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This report concerns type tests on one or a series of specimens  
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If the version of this document is greater than 1.0 it automatically replaces all previous version.

**A. Specifications of the Equipment Under Test**

*The accuracy of the description and identification of the equipment under test, it's operating conditions, modifications and monitoring of its behaviour during and or after the test performed by Laborelec are under the responsibility of the customer.*

**Product name:** Led's Luminaire  
**Type:** Axia 3.2  
**Manufacturer:** R-Tech SA  
**Trademark:** Schröder

**Number of samples:** 1  
**CLE Number:** 19/190204/1  
**Date of entrance:** 29/03/2019

**Specifications:**  
Driver

LG INNOTEK Model PISE-A075Y  
LLP 75W 1.0A 54 -125 V  
P<sub>in</sub>: 85 W  
U<sub>in</sub>: 220 - 240 V  
I<sub>in</sub>: 0.45 A  
λ: 0.95 C (lout 1.0 A)  
0.85 C (lout 0.3 A)  
η: 88.5 % min  
P<sub>out</sub>: 75 W max  
U<sub>out</sub>: 54 – 125 V  
I<sub>out</sub>: 0.3 – 1.0 A  
t<sub>c</sub>: 80 °C  
t<sub>a</sub>: -40 + 55 °C

**Surge Protector Device:** VS Lighting Solutions SP3 / 230 / 10K / i  
U<sub>in</sub>: 100 – 277 Vac / 50-60Hz  
U<sub>oc</sub>: 10 kV  
U<sub>c</sub>: 305 VAC  
U<sub>p</sub> L-N: < 1.5 kV  
U<sub>p</sub> L-GND: < 1.8 kV  
U<sub>p</sub> N-GND: <1.8 kV  
I<sub>c</sub>: 16 A

**Class:** I

**Dimming protocol:** Dali

All tests have been practiced on sample 19/190204/1.  
Pictures of the appliance are given in appendix 1.

## B. Program of the tests

### Program

Tests, or verification by other means, of compliance with the EMC standards CISPR 15 / EN 55015 (radio-interference), IEC 61000-3-2 / EN 61000-3-2 (harmonics), IEC 61000-3-3 / EN 61000-3-3 (voltage fluctuations) and IEC 61547 / EN 61547 (immunity of electrical lighting equipment).

All EMC tests against the above mentioned standards are covered by the quality system EN ISO 17025.

### Reference documents:

EMC standards:	CISPR 15 IEC 61000-3-2 IEC 61000-3-3 IEC 61547	(2013) + A1 (2015) (2014) (2013) + A1 (2017) (2009)
	EN 55015 EN 61000-3-2 EN 61000-3-3 EN 61547	(2013) + A1 (2015) (2014) (2013) (2009)

### Supplier:

None, all tests and measurements have been performed at Laborelec.

## C. Methods

### C.1. Radio-interference measurements according to CISPR 15 / EN 55015

Disturbance voltages are measured at the terminals of the 50  $\mu$ H/50  $\Omega$  artificial mains network from 9 kHz to 30 MHz (between each conductor L or N and earth) with a CISPR radio-receiver.

#### Method of measurement following pt. 8.1.4.1 of CISPR 15 / EN 55015:

- For light regulating controls which regulate the light output via a ballast or convertor, then the disturbance voltage at the mains and control terminals, if any, shall be measured at the maximum and minimum light output levels.

From 9 kHz to 30 MHz, the radiated electromagnetic disturbances are measured by means of 2 m loop antennas and a CISPR radio-receiver.

Conducted RF emission is measured at the RF output of a coupling / decoupling network (CDN-M2 or CDN-M3, EN/IEC 61000-4-6 compliant or CDNE) from 30 MHz to 300 MHz with a CISPR radio-receiver.

#### Method of measurement following pt. 9.1.4. of CISPR 15 / EN 55015:

If the lighting equipment incorporates a light-regulating control or is controlled by an external device, the radiated electromagnetic disturbance shall be determined in the following way:

- For light regulating controls which regulate the light output via a ballast or convertor, measurements shall be performed at maximum and minimum light output levels.

Those methods and the instrumentation used are in accordance with CISPR 15 / EN 55015 and CISPR 16 / EN 55016.



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### C.2. Harmonics according to IEC / EN 61000-3-2

Where needed, the harmonics of the mains supply input current are measured by means of a resistive shunt and a wave analyser.

Method of measurement following pt. C.5.3. of IEC 61000-3-2 / EN 61000-3-2.

*if a luminaire has a built-in dimming device, the harmonic currents shall be measured at the maximum load of the lamps as specified by the manufacturer. The setting of the dimming device is varied in five equidistant steps between the minimum and the maximum power in order to obtain comprehensive results.*

### C.3. Voltage fluctuations according to IEC / EN 61000-3-3

Voltage fluctuations are assessed by direct measurement at the terminals of the equipment under test using a flicker-meter, which complies with the specifications given in IEC / EN 61000-4-15.

### C.4. Immunity according to IEC 61547 / EN 61547

Tests are carried out on the accessible parts of the appliance or on the mains supply, during normal operation of the appliance.  
Test methods and the instrumentation used are in accordance with the basic standards that are referred to in the tables of this standard.

Conditions during testing following pt. 8. of IEC 61547-1 / EN 61547-1:

*An EUT including a light-regulating control should be tested at a light output level of 50 % ± 10 % from the maximum light output. If a light output level of 50 % is not available for the EUT including a light regulation function, the test shall be done at the level which is closest to 50 %. If two steps equally distant to 50 % are available, the lower level (<50 % shall be used for the test)*



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## D. Results

### D.1. Radio-interference measurements between 0,009 and 30 MHz

The table below gives the results of terminal voltages between each input conductor (L or N) and earth in dB with reference to 0 dB corresponding to 1 µV.  
Unless otherwise specified, the test voltage is 230 V - 50 Hz.  
It is checked that radio-interference does not exceed the limits in a frequency range between 0,15 and 30 MHz.

D.1.1. Complete scan at full light output:

D.1.1.1. Measurements:

Results of the final analysis with quasi-peak and average detectors are given only at the most critical levels.

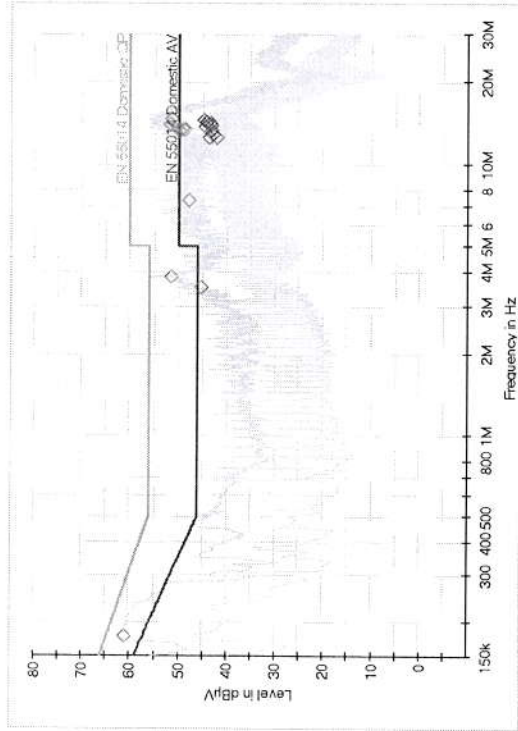
Quasi-Peak and Average Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Exceed (Yes/No)	Meas. Time (s)	PE	Line
0.1770	60.99	---	64.63	No	1.00	GND	N
3.4935	45.50	---	56.00	No	1.00	GND	N
3.8490	51.49	---	56.00	No	1.00	GND	N
7.3185	47.91	---	60.00	No	1.00	GND	L1
12.4530	---	43.78	50.00	No	1.00	GND	L1
12.5295	---	42.29	50.00	No	1.00	GND	L1
12.8310	---	43.02	50.00	No	1.00	GND	L1
13.1325	---	43.28	50.00	No	1.00	GND	L1
13.2090	49.96	---	60.00	No	1.00	GND	L1
13.3125	48.67	---	60.00	No	1.00	GND	L1
13.5150	49.45	---	60.00	No	1.00	GND	L1
13.6590	---	44.74	50.00	No	1.00	GND	L1
13.7175	50.35	---	60.00	No	1.00	GND	L1
13.8120	---	43.33	50.00	No	1.00	GND	L1
13.9605	51.85	---	60.00	No	1.00	GND	L1
14.1135	---	43.58	50.00	No	1.00	GND	L1
14.1855	---	44.34	50.00	No	1.00	GND	L1
14.3385	---	44.46	50.00	No	1.00	GND	L1
14.4870	---	44.81	50.00	No	1.00	GND	L1
14.5410	51.67	---	60.00	No	1.00	GND	L1

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D.1.1.2. Graphical representation of the test results



Preview Result 2-AVG EN 55014 Domestic AV  
Preview Result 1-PK+ Final Result QPK EN 55014 Domestic QP  
Final Result AVG

Ambient temperature: 22°C



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D.1.2. Complete scan at minimum light output.

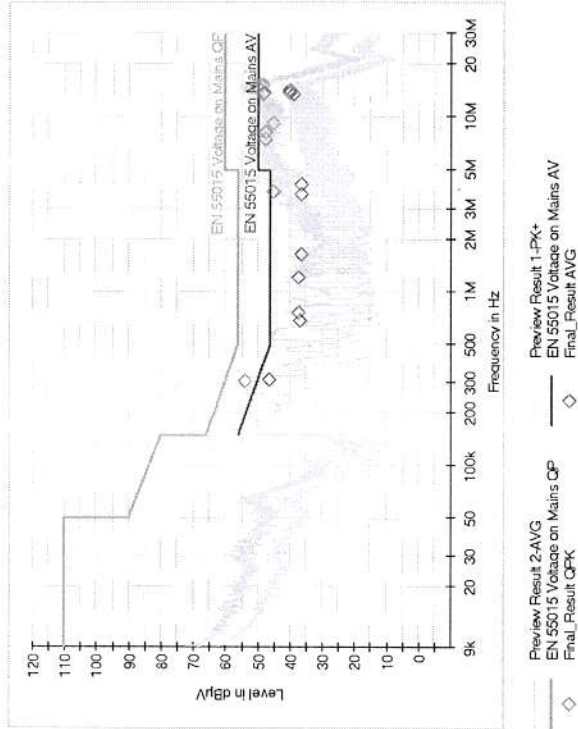
D.1.2.1. Measurements:

Results of the final analysis with quasi-peak and average detectors are given only at the most critical levels.

Quasi-Peak and Average Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Exceed (Yes/No)	Meas. Time (s)	PE	Line
0.3030	53.95	---	60.16	No	1.00	GND	N
0.3120	---	46.67	49.92	No	1.00	GND	N
0.6810	---	37.10	46.00	No	1.00	GND	N
0.7575	---	37.55	46.00	No	1.00	GND	N
1.2120	---	37.43	46.00	No	1.00	GND	N
1.6665	---	36.74	46.00	No	1.00	GND	N
3.6330	---	36.54	46.00	No	1.00	GND	N
3.7905	45.12	---	56.00	No	1.00	GND	N
4.0875	---	36.64	46.00	No	1.00	GND	N
7.3725	47.77	---	60.00	No	1.00	GND	L1
8.1465	47.83	---	60.00	No	1.00	GND	L1
9.1680	45.23	---	60.00	No	1.00	GND	N
13.5555	---	38.96	50.00	No	1.00	GND	L1
13.5600	48.79	---	60.00	No	1.00	GND	L1
13.6320	48.35	---	60.00	No	1.00	GND	L1
13.7040	---	40.41	50.00	No	1.00	GND	L1
14.2305	---	40.30	50.00	No	1.00	GND	L1
14.6220	50.39	---	60.00	No	1.00	GND	L1
15.1485	49.59	---	60.00	No	1.00	GND	L1
15.2520	48.52	---	60.00	No	1.00	GND	L1

D.1.1.2. Graphical representation of the test results



Ambient temperature: 21 °C



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D.2. Radiated electromagnetic disturbance measurements from 9 kHz to 30 MHz

The table gives the radiated electromagnetic disturbance measurements of the appliance measured by 2 m loop antennas and a radio-receiver (with quasi-peak detector) according to CISPR 15 and CISPR 16. It is checked that the radiated electromagnetic disturbance is well below the CISPR 15 / EN 55015 limits when a quasi-peak detector is used. Unless otherwise specified the test voltage is 230 V - 50 Hz.

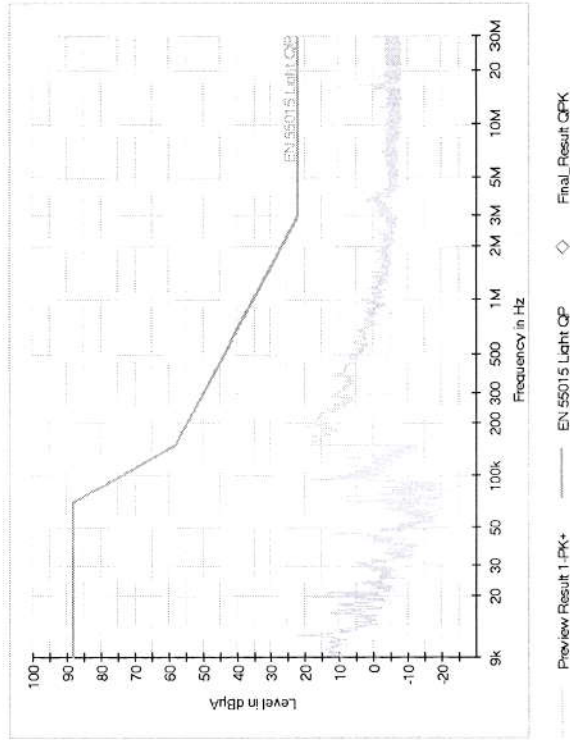
D.2.1. Measurements at maximum light output level

D.2.1.1. Measurements

Quasi-Peak Measurements

No final analysis with Quasi-Peak detector because the measured levels are 30 dBµV below the limit

D.2.1.2. Graphical representation of the test results



Ambient temperature: 21 °C

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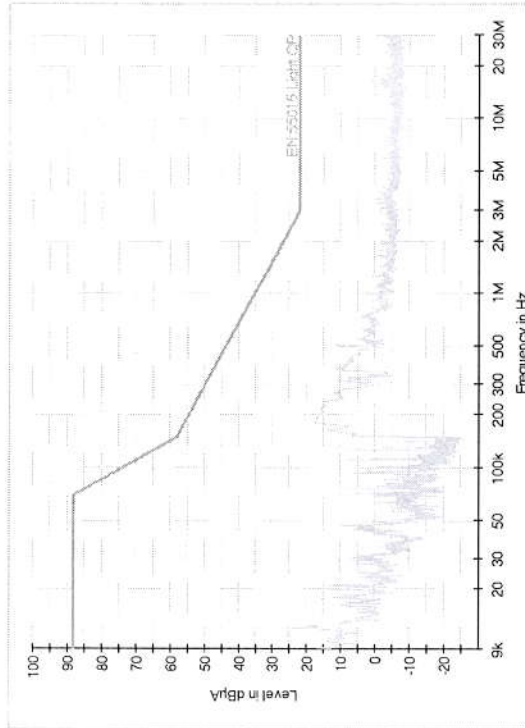
**D.2.2. Measurements at minimum light output level**

**D.2.2.1. Measurements**

**Quasi-Peak Measurements**

No final analysis with Quasi-Peak detector because the measured levels are 30 dBµV below the limit

**D.2.2.2. Graphical representation of the test results**



Preview Result 1-PK+      EN 55015 Limit QP      Final Result QPK

Ambient temperature: 21°C



**D.3. Measurements of the Conducted RF emission**

The table gives the conducted RF disturbance measurements of the appliance measured through a coupling / decoupling network (CDN-M2 or CDN-M3, EN/IEC 51000-4-6 compliant or a CDNE) from 30 MHz to 300 MHz with a CISPR radio-receiver (with quasi-peak detector) according to CISPR 15 and CISPR 16.

It is checked that the conducted RF disturbance is well below the EN 55015 limits when a quasi-peak detector is used.

Unless otherwise specified the test voltage is 230 V - 50 Hz.

**D.3.1. Measurements at maximum light output level**

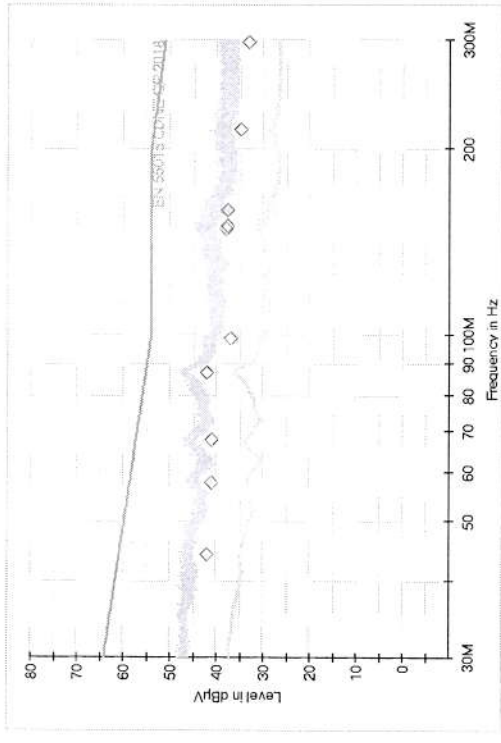
**D.3.1.1. Measurements**

**Quasi-Peak Measurements**

Frequency (MHz)	Quasi-Peak (dBµV)	Limit (dBµV)	Exceed (Yes/No)	Meas. Time (s)
43.9305	41.90	60.83	No	1.00
57.7950	41.20	58.55	No	1.00
67.5240	41.11	57.26	No	1.00
86.6895	42.16	55.19	No	1.00
98.7675	37.18	54.10	No	1.00
149.1000	37.98	54.00	No	1.00
150.8280	37.80	54.00	No	1.00
159.9900	37.84	54.00	No	1.00
214.3410	34.73	53.49	No	1.00
296.3940	33.02	51.09	No	1.00



D.3.1.2. Graphical representation of the test results



Preview Result 2-AVG  
 EN 55015 CDNE CP 2018  
 Final Result GPK

Ambient temperature: 21°C

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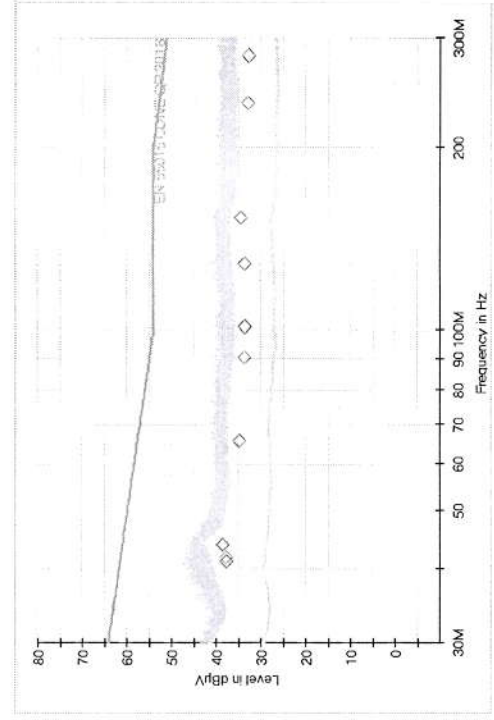
D.3.2. Measurements at minimum light output level

D.3.2.1. Measurements

Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Limit (dBµV)	Exceed (Yes/No)	Meas. Time (s)
41.1360	37.68	61.38	No	1.00
41.8020	37.81	61.25	No	1.00
43.8180	38.59	60.85	No	1.00
65.7105	34.90	57.49	No	1.00
90.4965	33.66	54.83	No	1.00
101.2020	33.58	54.00	No	1.00
128.1975	33.78	54.00	No	1.00
153.2220	34.48	54.00	No	1.00
237.1425	32.93	52.74	No	1.00
282.8535	32.99	51.44	No	1.00

D.3.2.2. Graphical representation of the test results



Preview Result 2-AVG  
 EN 55015 CDNE CP 2018  
 Final Result GPK

Ambient temperature: 22°C

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**D.4. Measurements of the harmonics of the input current in five equidistant steps between the minimum and the maximum power**

Harmonic order	Meas. 1 Min (A)	Meas. 2 (A)	Meas. 3 (A)	Meas. 4 (A)	Meas. 5 Max (A)	Class C a) Limits (A)
1	0.1255 (*)	0.2805 (*)	0.3139 (*)	0.3358 (*)	0.3510 (*)	0.0070
2	0.0231 (*)	0.0131 (*)	0.0099 (*)	0.0074 (*)	0.0062 (*)	0.1053
3	0.0073 (*)	0.0091 (*)	0.0095 (*)	0.0095 (*)	0.0094 (*)	0.0351
4	0.0082 (*)	0.0117 (*)	0.0118 (*)	0.0119 (*)	0.0120 (*)	0.0246
5	0.0068 (*)	0.0068 (*)	0.0076 (*)	0.0081 (*)	0.0083 (*)	0.0175
6	0.0053 (*)	0.0053 (*)	0.0060 (*)	0.0064 (*)	0.0068 (*)	0.0105
7	0.0050 (*)	0.0050 (*)	0.0050 (*)	0.0050 (*)	0.0050 (*)	0.0105
8	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	≤ 0.0105
9	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105
10	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105
11	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105
12	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105
13	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105
>13	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105 (*)	0.0105

(\*) Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.  
 (IEC / EN 61000-3-2: § 6.2.3.4)

Ambient temperature: 21°C

Measurement uncertainties:

The measurement uncertainties can be obtained on request.



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**D.5. Immunity according to IEC 61547 / EN 61547**

Unless otherwise specified the test voltage is 230 V - 50 Hz.

The normal behaviour of the appliance has been monitored by checking the luminous intensity and the current consumption.

As requested by the standard, the light output level has been set at 50 % ± 10 %

**D.5.1. Electrostatic discharge (IEC / EN 61000-4-2)**

Twenty 4 kV contact discharges (ten positive and ten negative polarity) have been applied on the metal parts of the appliance and on the coupling planes.

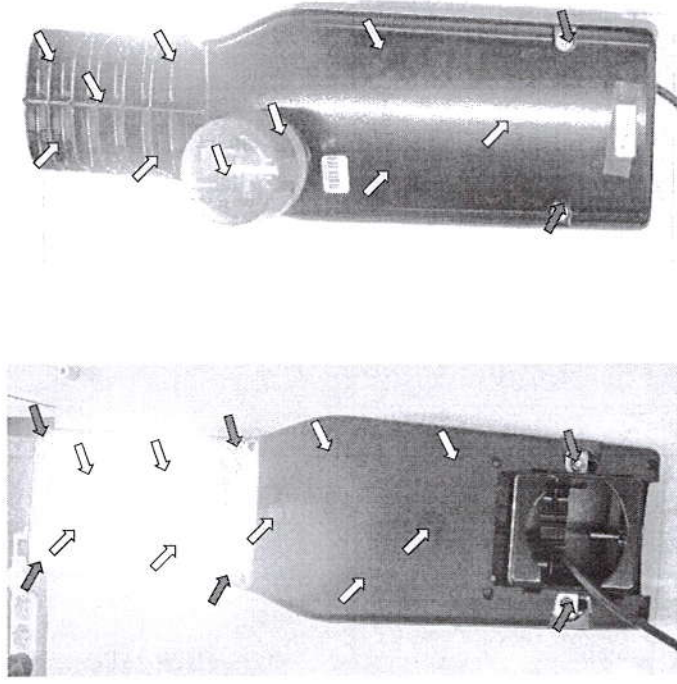
Twenty 8 kV air discharges (ten positive and ten negative polarity) have been applied on the accessible insulated parts.

No noticeable degradation has been recorded.

Ambient temperature: 22°C

Relative humidity: 36 %

Yellow arrow: air discharges  
 Red arrow: contact discharges



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**D.5.2. Radiated, radio frequency electromagnetic field (EN 61000-4-3)**

The EUT has been placed in the full anechoic room on a wooden table, 0,8 m high above the floor.

The cable of the power supply connected to the EUT is falling on the floor.

The Back side (opening) of the EUT has been illuminated in vertical and in horizontal polarisation with an electromagnetic field.

Frequencies: 80 MHz to 1000 MHz  
Electromagnetic field level: 3 V/m  
Amplitude modulation: 80%AM 1kHz  
Frequency step: 1%  
Dwell time: 1 s

No noticeable degradation has been recorded.

**D.5.3. Fast transients (IEC / EN 61000-4-4)**

During four minutes (two minutes positive and two minutes negative polarity) fast transients 1 kV 5/50 ns, 5 kHz rep. freq., have been applied on the mains supply in common mode.

Ambient temperature: 22°C  
Relative humidity: 36 %

No noticeable degradation has been recorded.

**D.5.4. Surges (IEC / EN 61000-4-5)**

Ten surge pulses 0,5 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – N).

No noticeable degradation has been recorded.

Ten surge pulses 0,5 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

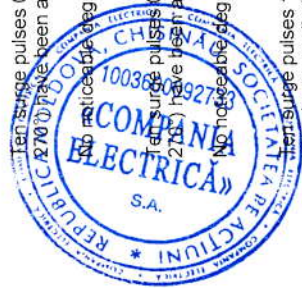
No noticeable degradation has been recorded.

Ten surge pulses 0,5 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.

Ten surge pulses 1 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and phase (L – N).

No noticeable degradation has been recorded.



Ten surge pulses 1 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

No noticeable degradation has been recorded.

Ten surge pulses 1 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.

Ten surge pulses 2 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

No noticeable degradation has been recorded.

Ten surge pulses 2 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.

*At the request of the customer:*

Ten surge pulses 2 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and phase (L – N).

No noticeable degradation has been recorded.

Ten surge pulses 4 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and phase (L – N).

Blinking of the light has been observed when the pulses (positive and negative) were applied.

Ten surge pulses 4 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

No noticeable degradation has been recorded.

Ten surge pulses 4 kV 1,2/50 µs (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.



Ten surge pulses 8 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and phase (L – N).

Blinking of the light has been observed when the pulses (positive and negative) were applied.

Ten surge pulses 8 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

No noticeable degradation has been recorded.

Ten surge pulses 8 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.

Ten surge pulses of 10 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and phase (L – N).

Blinking of the light has been observed when the pulses (positive and negative) were applied.

Ten surge pulses 10 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (L – PE).

No noticeable degradation has been recorded.

Ten surge pulses 10 kV 1,2/50  $\mu$ s (five positive pulses at 90° and five negative pulses at 270°) have been applied between phase and protective earth (N – PE).

No noticeable degradation has been recorded.

Ambient temperature: 22°C  
Relative humidity: 37%

**D.5.5. Injected currents (IEC / EN 61000-4-6)**

R.F. current from 0,15 MHz to 80 MHz, 80% AM 1 kHz modulation, 3 V<sub>RMS</sub> amplitude, has been applied, through a coupling/decoupling network CDN-M3, on the mains supply in common mode.

Frequency step: 1 %  
Dwell time: 1 s

No noticeable degradation has been recorded.

**D.5.6. Voltage dips (IEC / EN 61000-4-11)**

The test voltage is 230V - 50Hz.

A voltage dip of 30 % U<sub>r</sub> (161 V) during 200 ms has been applied on the mains supply.

No noticeable degradation has been recorded.

**D.5.7. Interruptions (IEC / EN 61000-4-11)**

Interruptions of supply during 10 ms have been applied on the mains supply.

Blinking of the light has been observed when the interruption of supply was applied.



*[Handwritten signature]*

**E. Conclusions**

For the tested appliance (see section A – Specifications of the EUT) the following results are obtained :

**E.1. Emission measurements:**

Measurement uncertainties

The measurement uncertainties can be obtained on request.

CISPR 15 / EN 55015 - see test results in parts D. 1., D.2. & D.3.

- Terminal disturbance voltages
- Radiated emissions
- Conducted RF emissions

IEC / EN 61000-3-2

The appliance complies with EN 61000-3-2 on the basis of the measurements in D.4.

IEC / EN 61000-3-3

The appliance complies with the requirements of IEC / EN 61000-3-3 as it does not produce voltage fluctuations by its principle of operation.

Complies

**E.2. Immunity tests results:**

IEC 61547 / EN 61547 - see test results in parts D.5.

**Performance criteria following IEC 61547 / EN 61547**

**Performance criterion A:**

During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

**Performance criterion B:**

During the test, the luminous intensity may change to any value. After the test, the luminous intensity shall restore to its initial value within 1 min. Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

**Performance criterion C:**

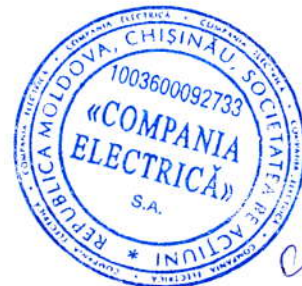
During and after the test, any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the power supply and/or operating the regulating control.

Additional requirement for lighting equipment incorporating a starting device:

After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.

Tests	Standards	Requested performance criteria	Obtained criteria
Electrostatic discharges	IEC / EN 61000-4-2	A	A
Radiated, RF electromagnetic field	IEC / EN 61000-4-3	A	A
Fast transients	IEC / EN 61000-4-4	B	A
Surges	IEC / EN 61000-4-5	C	A (*)
Injected currents	IEC / EN 61000-4-6	A	A
Voltage dips	IEC / EN 61000-4-11	C	A
Voltage Interruptions	IEC / EN 61000-4-11	B	B

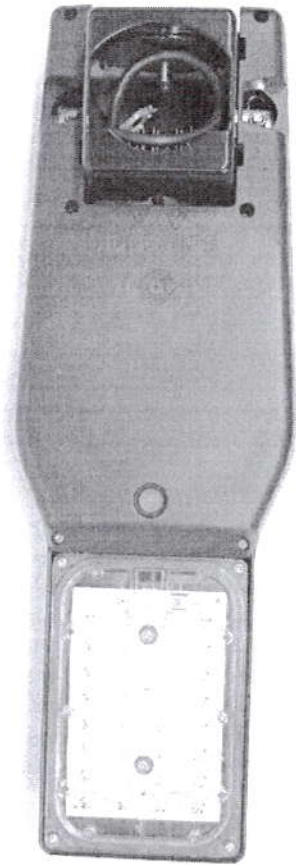
(\*): for the surges with the special requirements of the customers, a "B" criteria has been obtained.



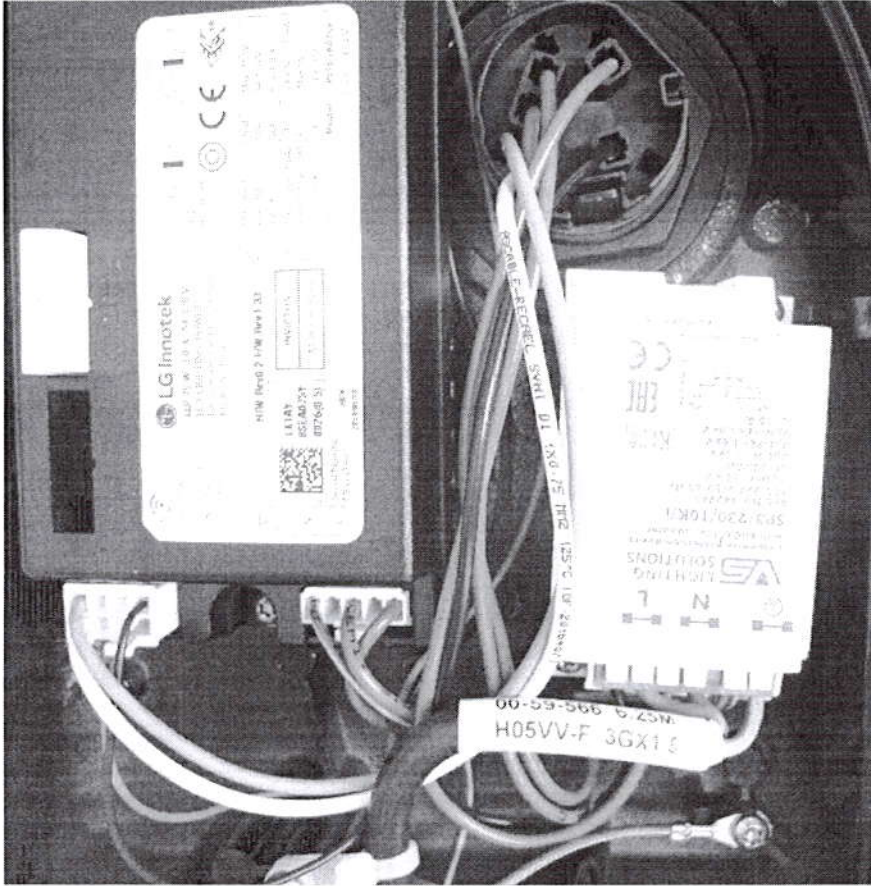


**APPENDIX 1**

**Pictures of the EUT**



**Open view of the EUT**





# 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 Schröder Group

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

## Endurance test

### General information

Subject : AXIA 3.2 - 32 led's OSOLON SQUARE GIANT - LG 75W driver @ 800mA

Asked by : CHEUVART Geoffrey

Created on : 10/04/2019

Validated on : 10/04/2019

Test number : D190293

Reference norm : IEC/EN 60598-1

Sample(s) : E190219

Folder : P-F18071

### Test conditions

Luminaire : AXIA 3.2

Number of LED : 32

LED : Osram OSOLON SQUARE GIANT

Driver current (mA) : 800

Protector material : PC

Additional info :

Pcba thickness: 1.64

Test description :

Supply voltage: 1,10 x Un = 253 V Ac 50 Hz

Room Temperature: Ta + 10 °C = 45 °C

Test duration: 10 cycles 21 h ON + 3 h OFF

IP check after endurance and visual inspection

Operator : Philippe Léonard



IMG\_7715

### Conclusion



Success

Conclusion :

No sign of dangerous behavior. IP check after endurance passed.

Validated by :

GHYSENS Gilles

Duplicate to : CHEUVART Geoffrey

LAB : 15/04/2019

D190293

1/2

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## Test details

### Test(s)

Name	Description	Result
Test @ 45°C	<ul style="list-style-type: none"><li>- Luminaire switched ON until stable T°</li><li>- Luminaire switched OFF and immediately sprayed with water jet</li><li>- Hose diam. 12,5 mm</li><li>- Water pressure: 1 kg/cm<sup>2</sup></li><li>- Spraying distance: 3 m</li><li>- Duration of test: 3 minutes</li></ul>	Success

### Test @ 45°C

### Result(s)

✓ Test succeeded no water ingress in the optical and auxiliary part no cracks on the lens.



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# 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 Schröder Group

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

## Mechanical impact resistance test

### General information

Subject : AXIA 3.2

Asked by : THIJS Marcel

Created on : 16/04/2019

Validated on : 23/04/2019

Test number : D190332

Reference norm : IEC/EN 60598-1 & 62696 Standards

Sample(s) : E190198

Folder : P-F18071

### Test conditions

Luminaire : AXIA 3.2

Quantity of sample under test : 5

Protector Material : PC

Protector supplier : External - Gaggione

Remark :

Star washer replaced by spring washer.

Torque applied on the luminaire fixation: 17 Nm.

Method of test :

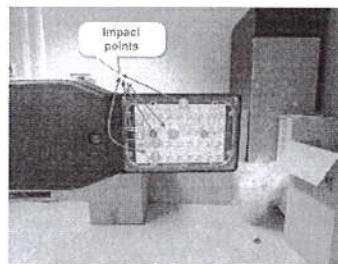
At pendulum hammer

5 impact points distributed on protector surface

One impact on each point

2 supplementary impacts on the most fragile point

Operator : WINA BOMBIL Patrick



IMG\_24706

### Conclusion



Success

IK10 granted.

Validated by :  
GHYSENS Gilles

Duplicate to : THIJS Marcel, GALLOPPA Sandro, DETAILLE  
Ludovic, MULS Sophie, BOS Peter

D190332

1/2

LAB : 23/04/2019



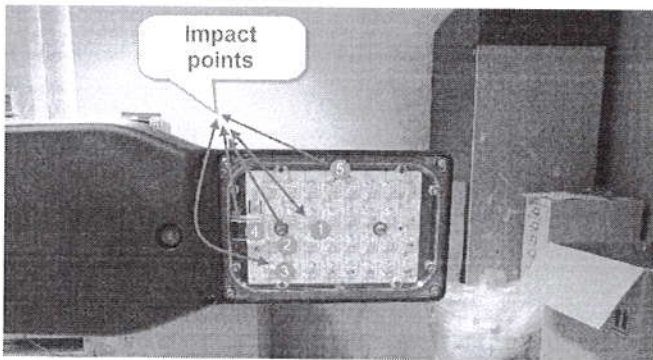


# IK10

## Test(s)

Name	Description	Result
Impact points distribution		Informative
IK10	Impact Energy: 20 joules Hammer Weight: 5 Kg Height of fall: 40 cm	Informative

### Impact points distribution



## IK10

### Result(s)

Tested
No tested

IK10	Impact	1			2			3			4			5		
Sample	Shot	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1		✓			✓			✓			✓			✓	✓	✓
2		✓			✓			✓			✓			✓	✓	✓
3		✓			✓			✓			✓			✓	✓	✓
4		✓			✓			✓			✓			✓	✓	✓
5		✓			✓			✓			✓			✓	✓	✓



*[Handwritten signature]*

# 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

## Tightness test

### General information

Subject : AXIA 3.2 - 32 led's OSOLON SQUARE GIANT - LG 75W driver - 800mA

Asked by : THIJS Marcel

Created on : 25/03/2019

Validated on : 28/03/2019

Test number : D190248

Reference norm : IEC/EN 60598-1 Standard

Sample(s) : E190197

Folder : P-F18071

### Test conditions

Luminaire : AXIA 3.2

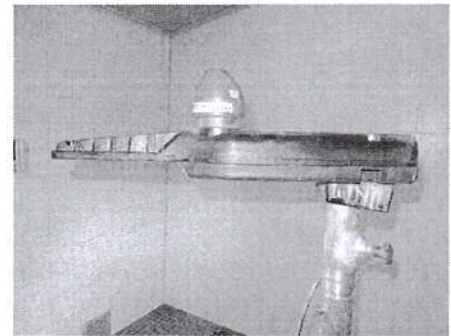
Number of LED : 32

LED : Osram OSOLON SQUARE GIANT

Driver current (mA) : 800


Protector Material : PC

Operator : Philippe Léonard



IMG\_2505a

### Conclusion

 Success

Conclusion :

IP66 granted.

Validated by :  
GHYSENS Gilles

Duplicate to : THIJS Marcel, GALLOPPA Sandro, DETAILLE  
Ludovic, MULS Sophie, BOS Peter

D190248

LAB : 02/04/2019

1/3

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# Tightness

## Test(s)

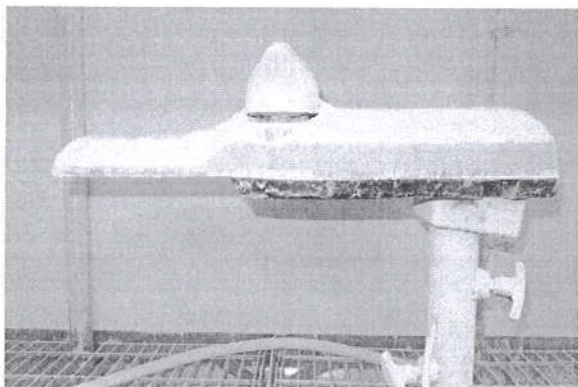
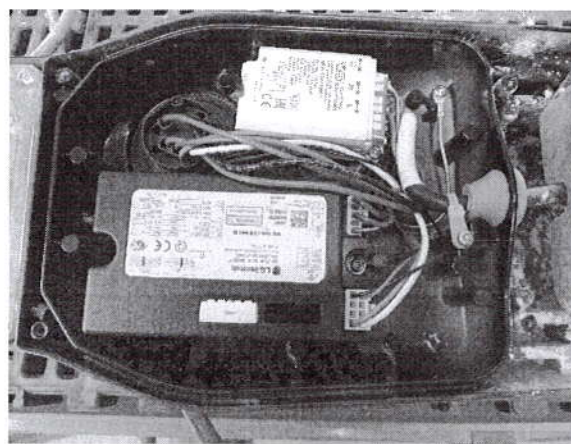
Name	Description	Result
IP6X	<ul style="list-style-type: none"><li>- Luminaire switched ON until stable T°</li><li>- Talcum in suspension (blowing ON)</li><li>- After 1', luminaire OFF</li><li>- Talcum for 3 hours</li></ul>	Success
IPX6	<ul style="list-style-type: none"><li>- Luminaire switched ON until stable T°</li><li>- Luminaire switched OFF and immediately sprayed with water jet</li><li>- Hose diam. 12,5 mm</li><li>- Water pressure: 1 kg/cm2</li><li>- Spraying distance: 3 m</li><li>- Duration of test: 3 minutes</li></ul>	Success

### IP6X

#### Result(s)

✓ Ok, no dust in optical and the auxiliary part

#### Annex(es)





IPX6

Result(s)

✓ Ok no water inlet for the optical and auxiliary part.

D190248



3/3

A handwritten signature in blue ink, appearing to be the initials "A. I." or similar, located at the bottom right of the page.

# Thermal Test LED

## General information

Subject : AXIA 3.2 - 32 led's OSRON SQUARE GIANT - LG 75W driver @ 800mA

Asked by : THIJS Marcel

Created on : 25/03/2019

Validated on : 10/04/2019

Test number : D190251

Reference norm : IEC/EN 60598-1; 60598-2-3; 60598-2-5 Standards

Sample(s) : E190199

Folder : P-F18071

## Test conditions

Luminaire : AXIA 3.2

Number of LED : 32

LED : Osram OSRON SQUARE GIANT

Driver : LG 75W 300-1000mA Prog Modular EU / 00-36-981

Driver info : Tc max 80°C, Tc life (100hours) 70°C

Driver current (mA) : 800

SPD : VS SP3/230/10K/i

Measurements devices :

Norma 4000 (electrical measurements) E116

Keithley 2701 + 7708 scanner card, Thermal measurements E101

Power Supply :

APT 320XAC (E108) set on 230V 50Hz

Junction Temperature measurement method : Junction temperature measurement by base temperature measurement and electrical measurement.  $T^*j = T^*b + R_{jb} \times I_{Pled}$

Operator : CLOSSET Frédéric



## Conclusion



Informative

$\Delta T_s < 80^\circ C$  no risk of solder crack

Ta: 45°C limited by driver; according IEC 60598-2-3 and IEC 60598-2-5 (outdoor use only)

Ta: 35°C limited by driver; indoor use and UL standard

Tq: 25°C limited by driver; according IEC 62722-2-1

Tq given for 100 khrs of lifetime

Validated by :

GHYSENS Gilles

Duplicate to : THIJS Marcel, GALLOPPA Sandro, DETAILLE  
Ludovic, MULS Sophie, BOS Peter

LAB : 15/04/2019

D190251

1/2



# Test details

## Test(s)

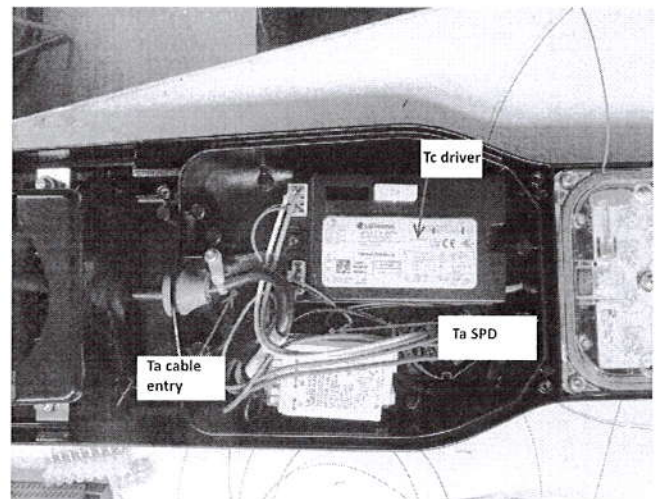
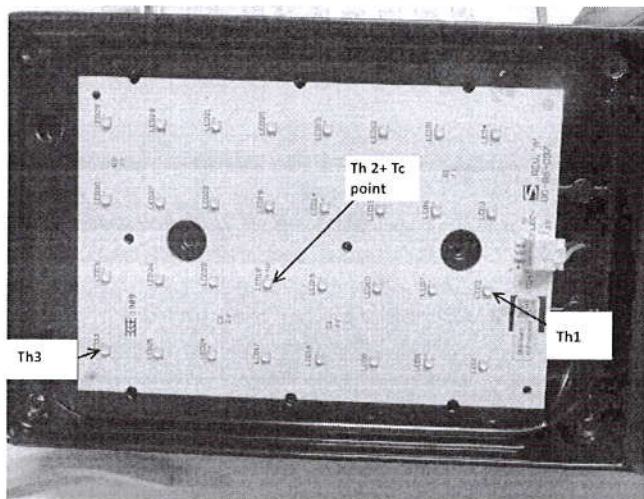
Name	Description	Result
Test @ 800mA		Informative

## Test @ 800mA

## Result(s)

	Th1	Th2 & Tc point	Th3	Th Tc Driver	Th ambience SPD	Th cable entry
T° limite				80 °C	70 °C	90 °C
T° jonction	70.4 °C	74.3 °C	77.5 °C			
T° thermocouple	65.8 °C	69.7 °C	72.9 °C	68.8 °C	46.0 °C	35.2 °C
Local	24.9 °C	24.9 °C	24.9 °C	24.9 °C	24.9 °C	24.9 °C
E led	2.85V	2.85V	2.85V			
I led	0.798 A	0.798 A	0.798 A			
P led	2.27W	2.27W	2.27W			
Rth jonction-base	2.0 K/W	2.0 K/W	2.0 K/W			
Echauffement				44.0 K	21.1 K	10.4 K
Δ Ts	40.9 K	44.8 K	48.1 K			
ME primaire		ME Dr1				
U	229.9V	U	91.1 V			
I	0.348 A	I	0.798 A			
P	79.4 W	P	72.6 W			
PF	0.992					
Efficiency	91%					

## Thermal sensors disposition



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# Vibration test following IEC Standard

## General information

Subject : AXIA 3.2 Side entry configuration for pole 60 mm  
Asked by : THIJS Marcel  
Created on : 07/05/2019  
Test number : D190363  
Reference norm : Modified IEC 68-2-6 Standard  
Sample(s) : E190205  
Folder : P-F18071

## Test conditions

Luminaire : AXIA 3.2 Operator : External Lab  
Fixation type : Side-entry  
Pole diameter (mm) : 60  
Screw type : M10  
Tightening torque (Nm) : pole : 17  
Test date : 02/04/2019  
Testing facility : External - V21  
External test report reference :  
 Report\_R-TECH\_AXIA3.2\_ID2189\_TSH\_2019-04-02\_v1

## Conclusion

 Success  
 AXIA 3.2 complies with modified IEC 68-2-6-Standard.

Validated by : LERHO Xavier Duplicate to : THIJS Marcel, GALLOPPA Sandro, DETAILLE  
D190363  
1/18  
LAB : 07/05/2019 Ludovic, MULS Sophie, BOS Peter



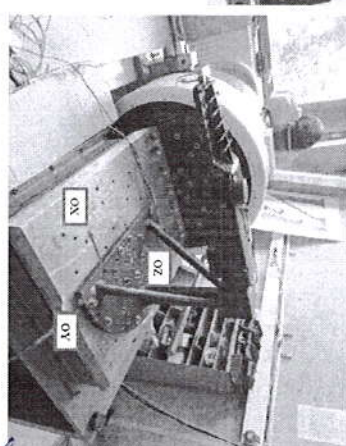
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## Test details

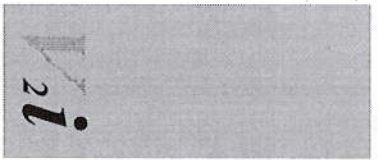
### Test(s)

Name	Description	Result
AXIS Z	Vibrations modified IEC 68-2-6	Success
AXIS Y	Vibrations modified IEC 68-2-6	Success
AXIS X	Vibrations modified IEC 68-2-6	Success

### Annex(es)



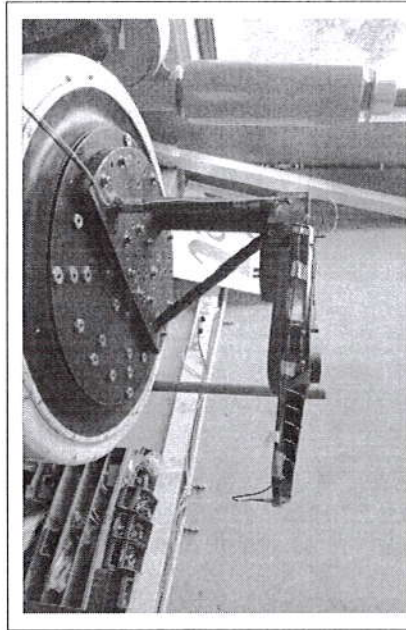
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### VIBRATION TEST REPORT

ITEM : AXIA3.2

- > Sample n° P-E 190205
- > Side entry Ø 60 mm configuration



TYPE OF TEST : MODIFIED IEC 68-2-6 STANDARD

**CUSTOMER :**

R-TECH  
Rue de Mons, 3  
B-4000 LIÈGE (BELGIUM)

APRIL 2019

<b>AUTHOR :</b>	F. MARIN 25/04/2019	
<b>CHECKED BY :</b>	M. BERTHA 29/04/2019	

V2i s.a.  
Avenue du Pré Ailly, 25  
4031 Angleur – Belgique  
Tél. +32-4-2871070 – Fax +32-4-2871071  
Website : www.v2i.be



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## 1 INTRODUCTION

### 1.1 Subject

The object of the report is to present the results of the vibration tests performed on the lighting device named:

AXIA 3.2 - Sample n° P-EI90205  
- Side entry Ø 60 mm configuration

following the modified IEC 68-2-6 standard (Table 1).

Test Item	IEC 68-2-6 standard	Modified
Direction	light 3 directions	light 3 directions
Search for frequencies and quality factor Q	Excitation : sine sweep Frequency band : 5 - 25 Hz Sweep speed : 1 oct/min. Acceleration : 1g	Excitation : sine sweep Frequency band : 5 - 55 Hz Sweep speed : 1 oct/min. Acceleration : 0.5g
Test	Q < 2 (no natural frequency) Excitation : sine sweep Frequency band : 5 - 25 Hz Sweep speed : 1 oct/min. Duration : 1h	Q < 2 (no natural frequency) Excitation : <b>RANDOM</b> Frequency band : 5 - 55 Hz Acceleration : 0.84 g <sub>avg</sub> Duration : 1h
	Q < 10 Excitation : sine Frequency : f <sub>n</sub> (Q <sub>max</sub> ) Acceleration : 0.5g Duration : 1h	Q > 2 Excitation : sine Frequency : f <sub>n</sub> (Q <sub>max</sub> ) Acceleration : 0.5g Duration : 30 minutes
	Q > 10 No test	

Table 1 - IEC 68-2-6 standard and modified specification

The **RANDOM equivalent test** consists in an accelerated aging process of one hour which presents, on a reference one-degree-of-freedom system, an equivalent fatigue damage spectrum than 20 years of mean wind and 90 hours of storms

## 2 GENERAL INFORMATION

Offer reference	-----	DB ID	2189
Order form reference	-----		
Test date	02/04/2019		

Customer project manager	X. Lehto		
V2i engineer in charge	V2i	F. Marin	L. Vehcees
	R-Tech	-----	-----
Test Staff	Schröder	-----	-----



## 3 VIBRATION TESTING FACILITIES

Electrodynamic Shaker	G&W V2664 26kN - 2 in. stroke	Control and Acquisition	LMS Instruments SCADAS III mainframe System SC20V Front end : Serial number: 62171631 Calibration chart : Appendix 1
Shaker	DSA-20K	Computer :	V2i-Shaker-6

**Software**  
LMS Test Lab 16A, for control, conditioning and acquisition.

Accelerometers						
manufacturer	model	name	direction	function	serial number	calibration due date
PCB	353B18	CTRL	X, Y or Z	Control	LW206786	01/10/2019
PCB	356A02	CG	X, Y, Z	Measure	114445	13/03/2020
PCB	356A02	TTP	X, Y, Z	Measure	LW145491	29/03/2020

Calibration chart: Appendix 2



4 NOMENCLATURE

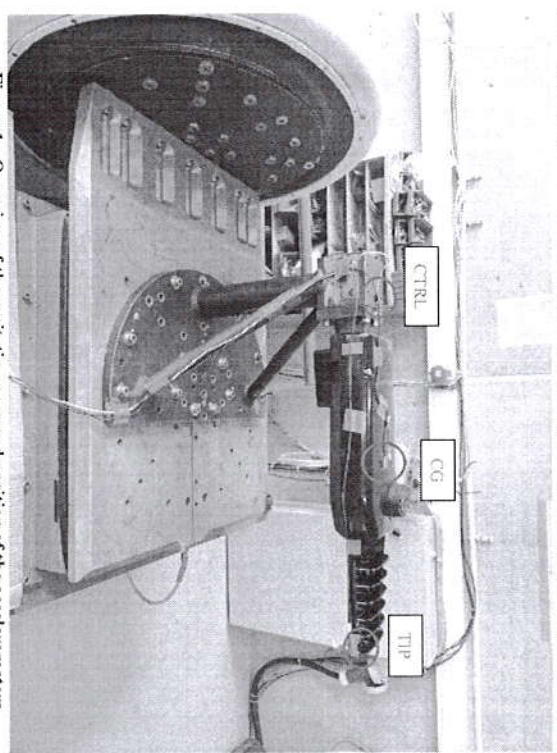
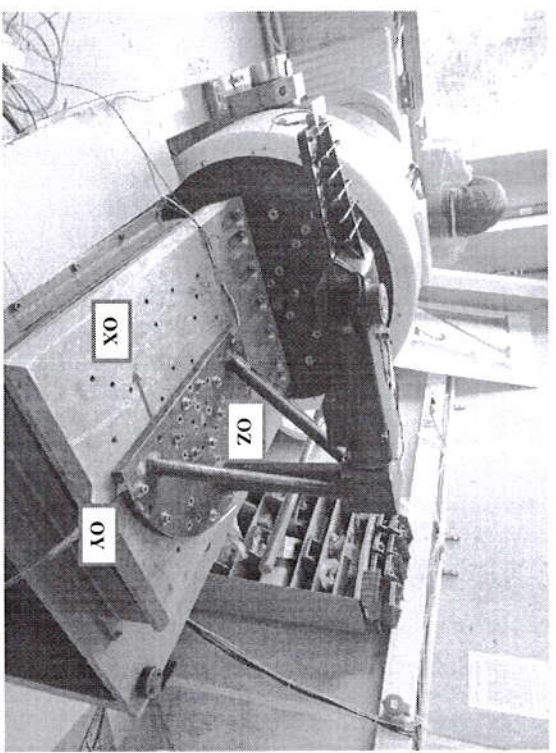


Figure 1 - Overview of the excitation axes and position of the accelerometers  
 (OX : longitudinal axis ; OY : Transversal axis, OZ : Vertical axis)

5 HISTORY AND COMMENTS ON THE PERFORMED VIBRATION TESTS

Initial remarks	- The tightening torque between the steel pole shaft and the fixing part is set to 17 Nm (2 x M10). - The tightening torque between the body and the fixing part is set to 15 Nm (2 x M8).			
	<b>OZ</b>			
Sine sweep	Frequency 59.9 Hz	Amplification 30.5	FRF TTP+Z/Ctrl+Z	Dwell criterion Amplitude
Sine dwell	Time 30'	END of test	History	
Sine sweep	Frequency 58.7 Hz	Amplification 34.4		Successfully completed
	<b>OY</b>			
Sine sweep	Frequency 70.3 Hz	Amplification 25.5	FRF TTP+Y/Ctrl+Y	Dwell criterion Amplitude
Sine dwell	Time 30'	END of test	History	
Sine sweep	Frequency 66.9 Hz	Amplification 17.9		Successfully completed
	<b>OX</b>			
Sine sweep	Frequency 64.5 Hz	Amplification 13.8	FRF TTP+Z/Ctrl+X	Dwell criterion Amplitude
Sine dwell	Time 30'	END of test	History	
Sine sweep	Frequency 63.8 Hz	Amplification 12.3		Successfully completed
Final remark	- "Fixing part/pole shaft" assembly : no untightening at the end of the endurance test. - "Fixing part/body" assembly : untightening of less than 1/8 turn for one of the two screws at the end of the endurance test.			



*cm*

6 FIGURES

6.1 Excitation in the vertical direction (OZ)

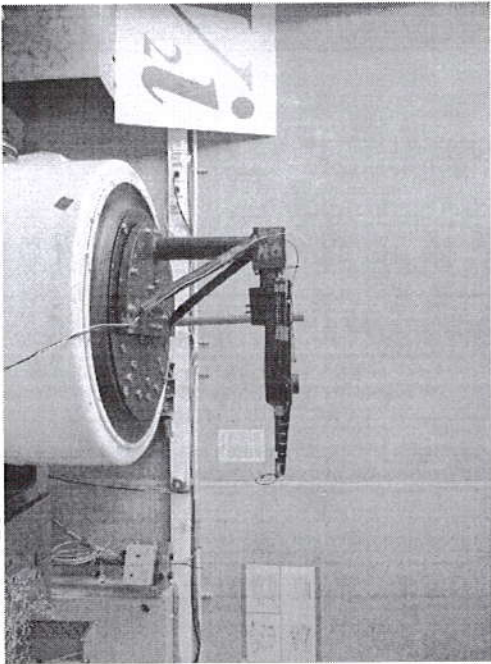
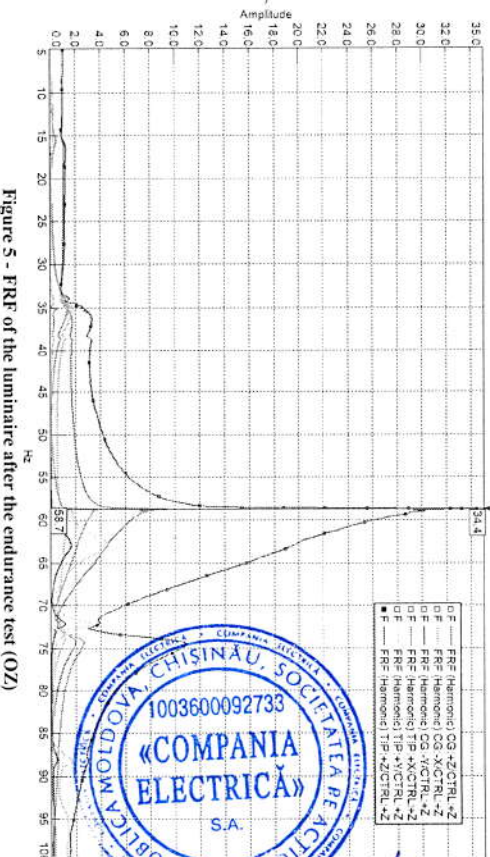
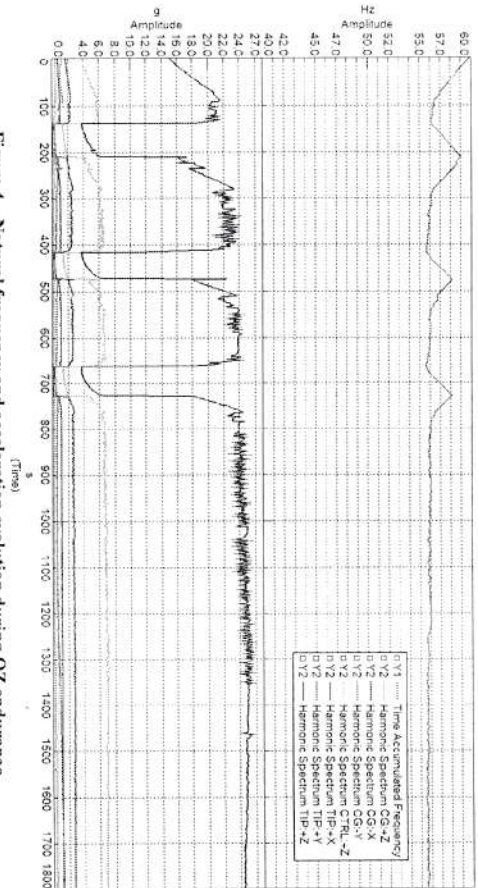
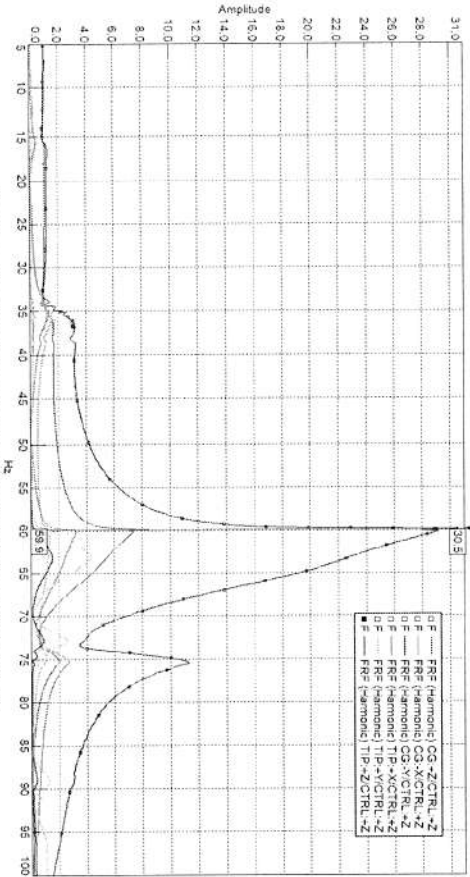


Figure 2 - Excitation in the vertical direction (OZ)



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6.2 Excitation in the transversal direction (OY)

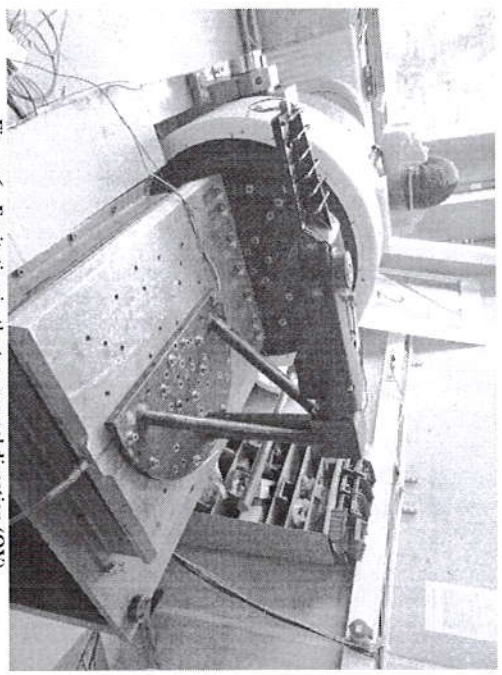


Figure 6 - Excitation in the transversal direction (OY)

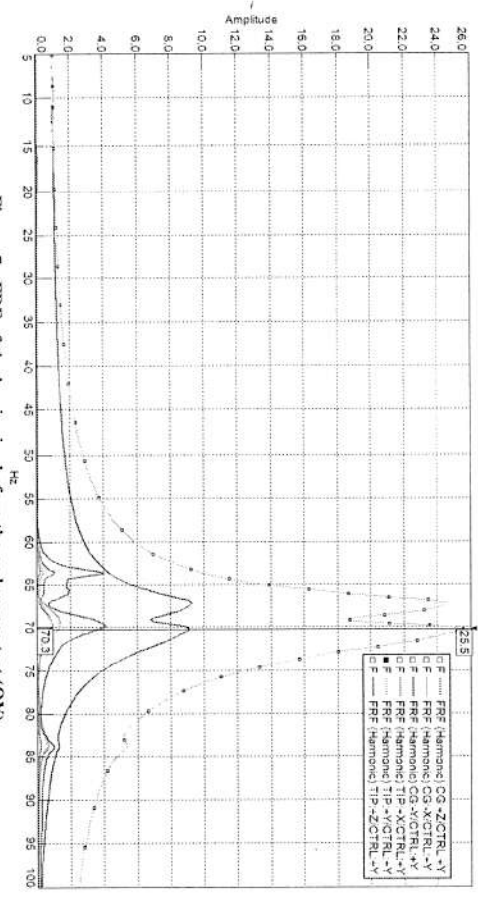


Figure 7 - FRF of the luminaire before the endurance test (OY)

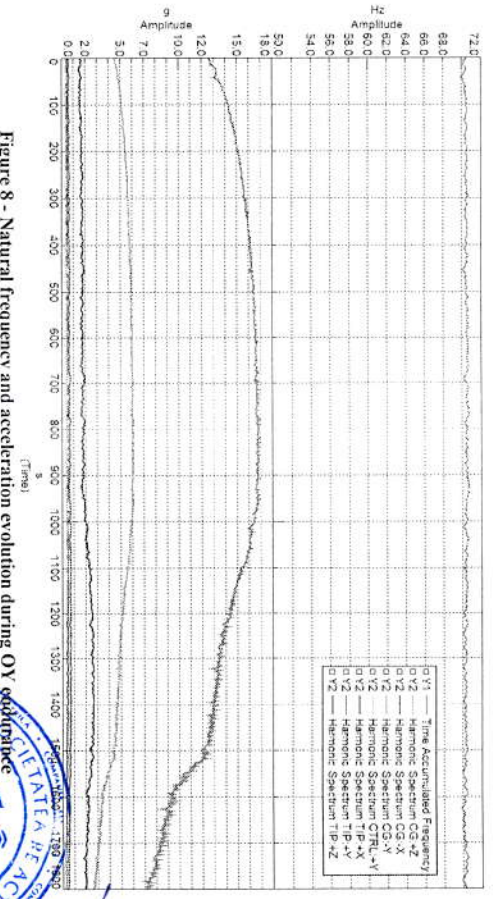


Figure 8 - Natural frequency and acceleration evolution during OY excitation

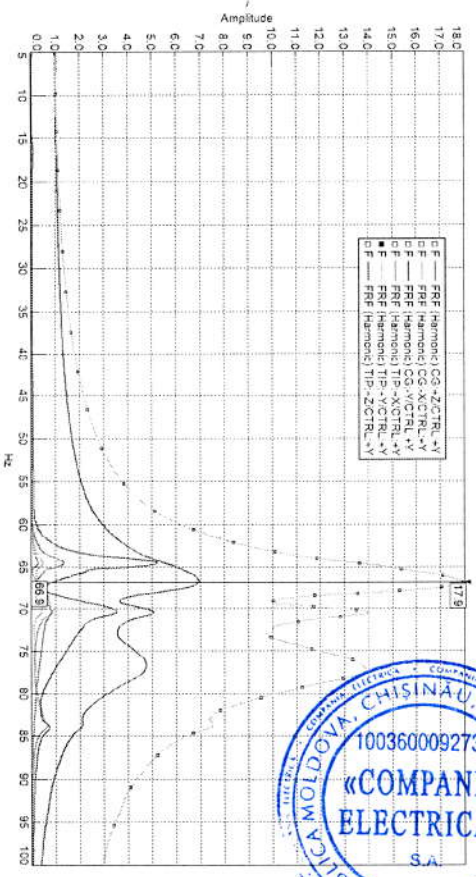


Figure 9 - FRF of the luminaire after the endurance test (OY)





6.3 Excitation in the longitudinal direction (OX)

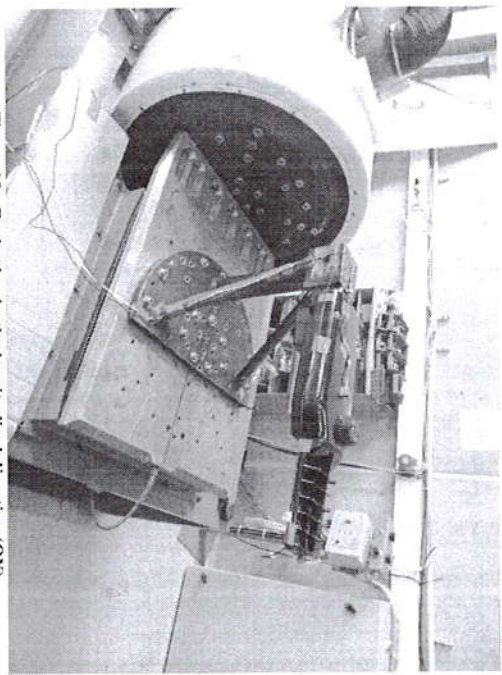


Figure 10 - Excitation in the longitudinal direction (OX)

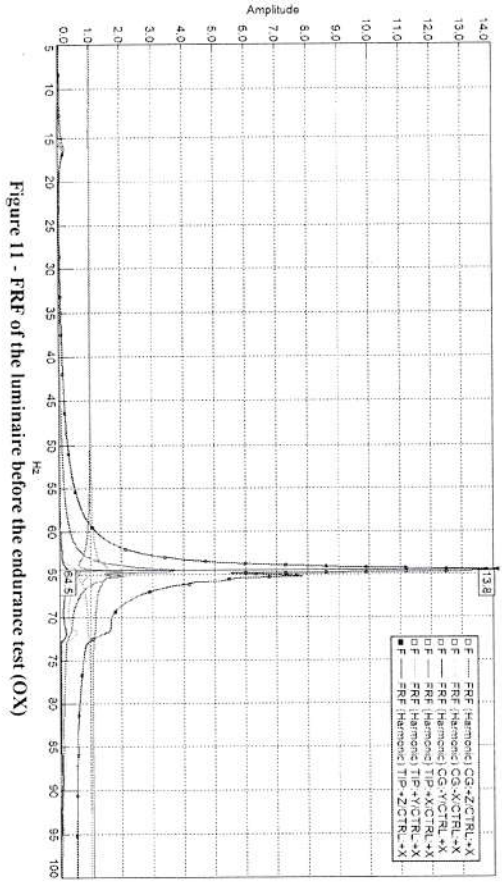


Figure 11 - FRF of the luminaire before the endurance test (OX)

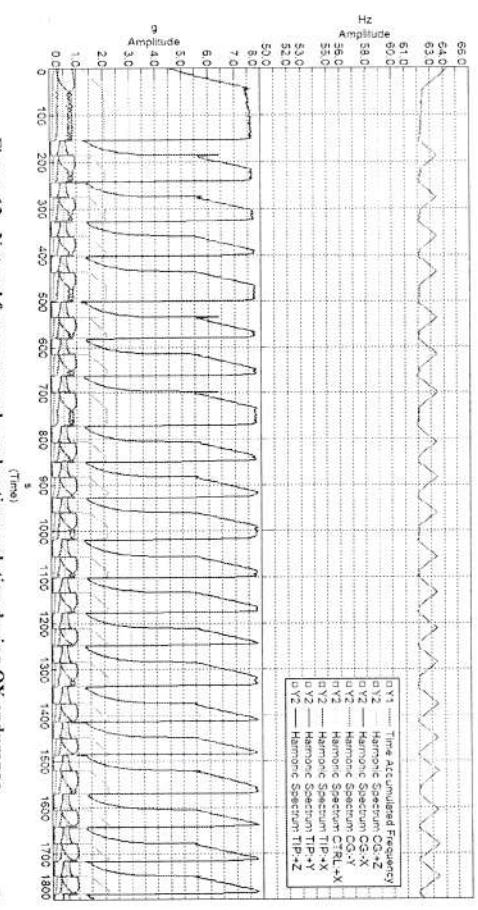


Figure 12 - Natural frequency and acceleration evolution during OX endurance

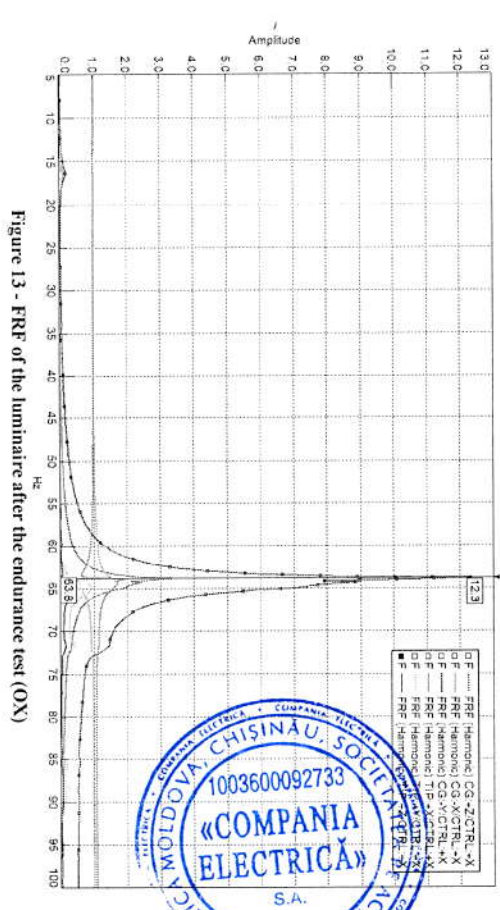


Figure 13 - FRF of the luminaire after the endurance test (OX)



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**7 CONCLUSIONS**

The conclusions of the vibration tests performed on the luminaire

AXIA 3.2 - Sample n° P-EI190205  
 - Side entry Ø 60 mm configuration

can be summarized as follows:

Fixing Part Tightening Evaluation		17 Nm
Performed	Yes X No	
Satisfied	Yes X No	
Remark		
Vibration Withstand Evaluation*		Modified IEC 68-2-6
Performed	Yes X No	
Satisfied	Yes X No	
Remarks	- "Fixing part/pole shaft" assembly : no untightening at the end of the endurance test. - "Fixing part/body" assembly : untightening of less than 1/8 turn for one of the two screws at the end of the endurance test.	

\*Evaluation is performed according to the GDE-GUI-007 document

**8 APPENDICES**

**8.1 Appendix 1**



Certificate number: 2018-52171631

**Calibration report**

- 'As Left data' -

Product type: LMS SCADAS

Calibration Suite: Calibration Software Production & Services  
 Calibration Suite Version: Z.13.0024

**Customer:**

Company name : V2i  
 Division / department : V2i  
 Location (city / country) : Liege / Belgium  
 Contact person : Jonathan Rochet

**System:**

System type(s) : SCL220V  
 Serial number(s) : 62171631

**Calibration conditions:**

TAC reference number : 8369383  
 Location (Factory, Office or On-site) : on-site  
 Date : May 3<sup>rd</sup> 2018  
 Ambient temperature : 18.7°C

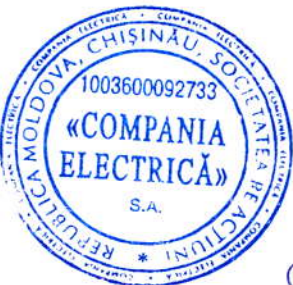
**Calibration performed by:**

Name : Mr. F. C. Jermiasse  
 Calibration label : YES

**Summary:**

- Calibration results within specification.

Signature:

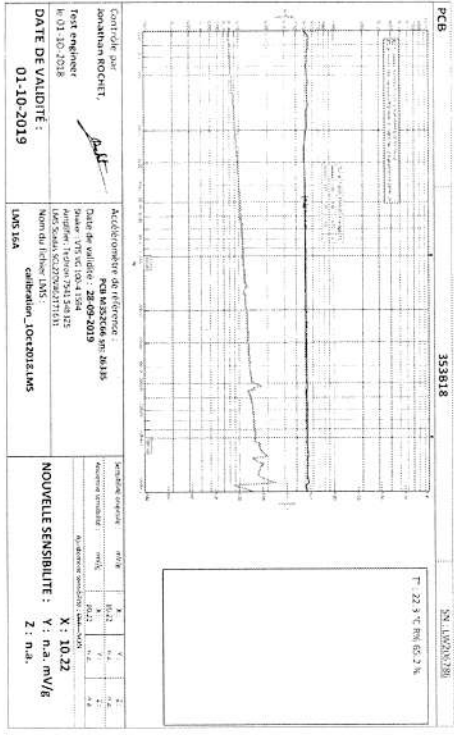




8.2 Appendix 2

<b>V2i</b>	Vibration test report	Report: R-TECH AXIA3.2_ID2189
	R-TECH - AXIA 3.2	TSH 2019-04-02 v1
		Date : 25/04/2019 Page : 15/16

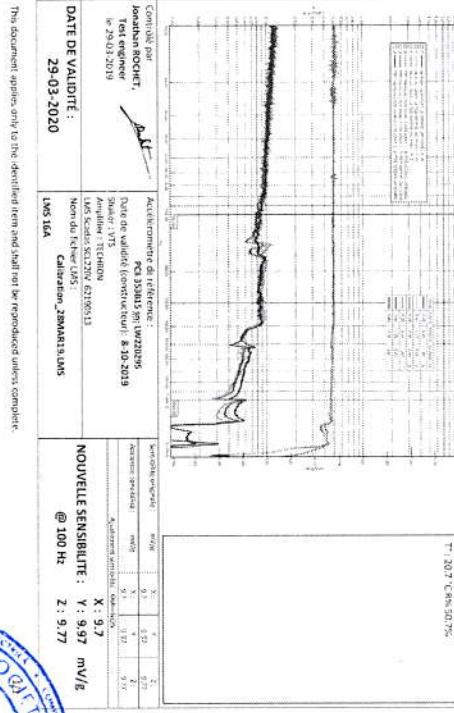
**V2i** *VERIFICATION DE CALIBRATION*



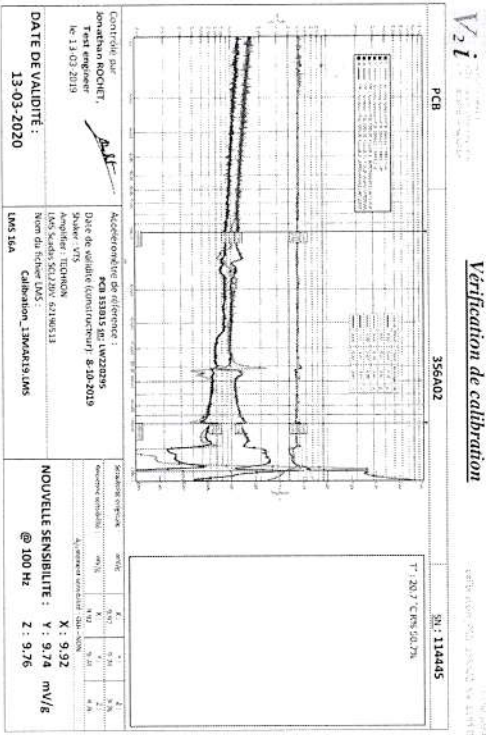
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<b>V2i</b>	Vibration test report	Report: R-TECH AXIA3.2_ID2189
	R-TECH - AXIA 3.2	TSH 2019-04-02 v1
		Date : 25/04/2019 Page : 16/16

**V2i** *VERIFICATION DE CALIBRATION*



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# Laboratory Test report

FORM L54 Edition 01 - Revision 00 Date: 14/06/2018



R-Tech  
 Rue de l'Inde 1, B-2000 Antwerpen, Belgium  
 Tel: +32 3 231 71 40 - Fax: +32 3 231 71 90  
 Member of Schneider Group

## Aerodynamic Wind Test

### General Information

Subject : AXIA 3.2  
Asked by : JORIS Philippe  
Created on : 10/04/2019  
Test number : D190291  
Sample(s) : E190205  
Folder : P-F18071

### Test conditions

Luminaire : AXIA 3.2  
Fixation : Post-top  
Tightening Torque (Nm) : 17  
Pole Diameter : 60  
Protector shape : Flat  
Testing Facility : External - Wind Tunnel - ULg  
See external report ref. : SOUF-RTech-QT-19002

Operator : External Lab

### Conclusion

Informative

This report concerns wind test on AXIA 3.2 and covers configurations 0°, 5°, 10°, 15° & Side positions.

Validated by :  
 LERHO Xavier  
 Duplicate to : THIJS Marcel, JORIS Philippe, GALLOPPA Sandro, DETAÏLLE Ludovic, MULLS Sophie, BOS Peter  
 LAB : 10/04/2019  
 D190291  
 1/19

The publication of this report in another form than the original one is not allowed without agreement of the laboratory. This report concerns type tests on one or a series of specimens.

### Test details

#### Test(s)

Name	Description	Result
Aerodynamic Coefficient Determination	Front 0°	Informative
Aerodynamic Coefficient Determination	Front 5°	Informative
Aerodynamic Coefficient Determination	Front 10°	Informative
Aerodynamic Coefficient Determination	Front 15°	Informative
Aerodynamic Coefficient Determination	Side	Informative
Endurance test: Wind test qualification	Front 15° - 188 km/h	Success

#### Aerodynamic Coefficient Determination

##### Result(s)

Wind Direction	Value (m <sup>2</sup> )	Ca, S (lateral)	Ci, S (lateral)
Front 0°	0.032	0.002	-0.022

#### Aerodynamic Coefficient Determination

##### Result(s)

Wind Direction	Value (m <sup>2</sup> )	Ca, S (lateral)	Ci, S (lateral)
Front 5°	0.028	-0.002	-0.014

#### Aerodynamic Coefficient Determination

##### Result(s)

Wind Direction	Value (m <sup>2</sup> )	Ca, S (lateral)	Ci, S (lateral)
Front 10°	0.024	0.002	0.007

D190291



**Aerodynamic Coefficient Determination**

**Result(s)**

Wind Direction	Value (m <sup>2</sup> )	Cd.S (drag)	Cs.S (Side)	Cls (Lift)
Front 15°	0.630	-0.001		0.010

**Aerodynamic Coefficient Determination**

**Result(s)**

Wind Direction	Value (m <sup>2</sup> )	Cd.S (drag)	Cs.S (Side)	Cls (Lift)
Side	0.640	-0.003		-0.029

Université de Liège

CAT - Soufflère

R-Tech

Test report / Rapport d'essais AXIA 3.2

Doc n° SOUF-RTTECH-QT-

19002

Date : 26/03/2019

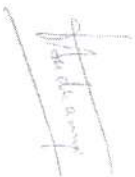
Page : 1

**R-Tech**

**Test report / Rapport d'essais  
AXIA 3.2**

Electronic report

Thomas Andrienne  
Wind Tunnel Manager



E-mail : t.andrienne@uliege.be

Institut de Mecanica et Génie Civil (Bât. B52/9)  
Quartier Polytech, 1, Allée de la Découverte, 9 - B-4000 LIEGE  
Tél. +32-4-366 9336 - Fax +32-4-3669396

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## 1. Order description / Description de la demande

### 1.1 Test customer / Demandeur des tests

The origin of the order is:  
Le demandeur des tests est :

**R-Tech s. a. (Schreder Group G.L.E.)**  
 Rue de Mons, 3  
 B - 4000 Liège  
 Maghe Laurent  
 Certification Manager

The order reference is:  
Les références associées à cette commande sont :

**SOUF-RTTECH-OT-19002**

### 1.2 Tested specimen / Specimen testé

The general characteristics of the tested specimen and the axes definition are given in Figure 1. The laminar is positioned in the wind tunnel's working section.

Les dimensions générales du spécimen testé ainsi que la convention d'axes sont données en Figure 1. Le laminaire est positionné dans la veine d'essais de la soufflerie.

	AXIA 3.1	AXIA 3.2	AXIA 3.3
A (mm)	513	585	550
B (mm)	191	191	277
C (mm)	130	130	130
Weight (kg)	TBD	TBD	TBD
CMS (m)	TBD	TBD	TBD

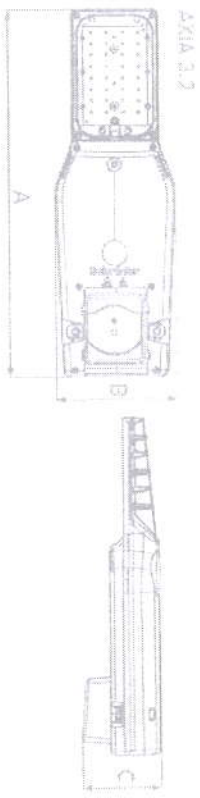


Figure 1: AXIA 3.2 general drawing / Plan d'ensemble du laminaire AXIA 3.2



*Maghe Laurent*



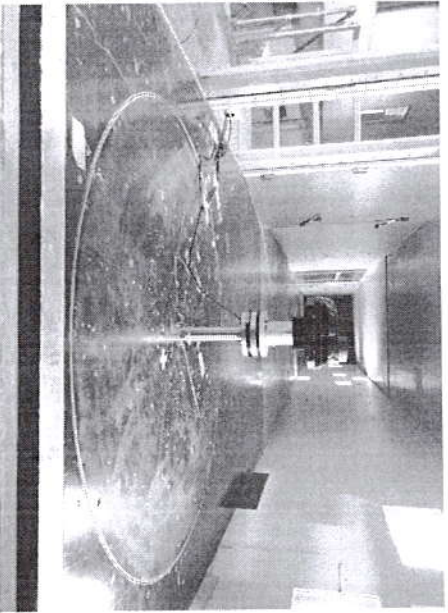


Figure 2: AXIA 3.2 mounted in the wind tunnel in the front 0° configuration  
AXIA 3.2 dans la veine d'essais dans la configuration face 0°

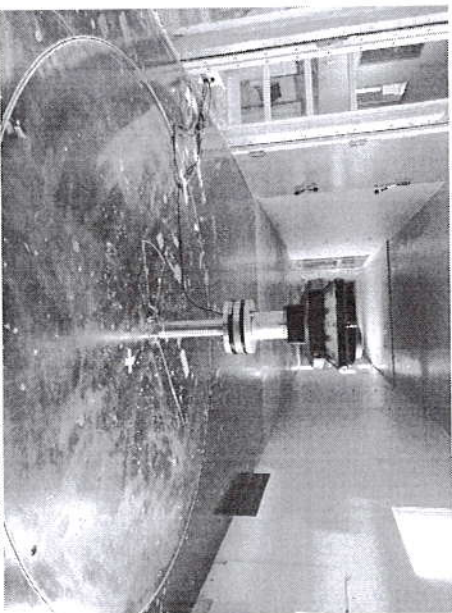


Figure 3: AXIA 3.2 mounted in the wind tunnel in the front 5° configuration  
AXIA 3.2 dans la veine d'essais dans la configuration face 5°

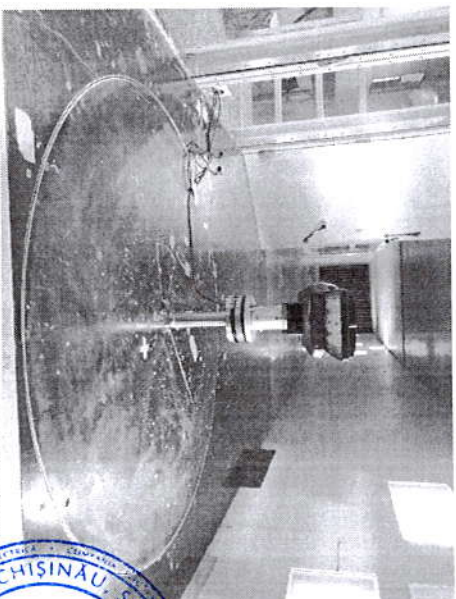


Figure 4: AXIA 3.2 mounted in the wind tunnel in the front 10° configuration  
AXIA 3.2 dans la veine d'essais dans la configuration face 10°



Figure 5: AXIA 3.2 mounted in the wind tunnel in the front 15° configuration  
AXIA 3.2 dans la veine d'essais dans la configuration face 15°



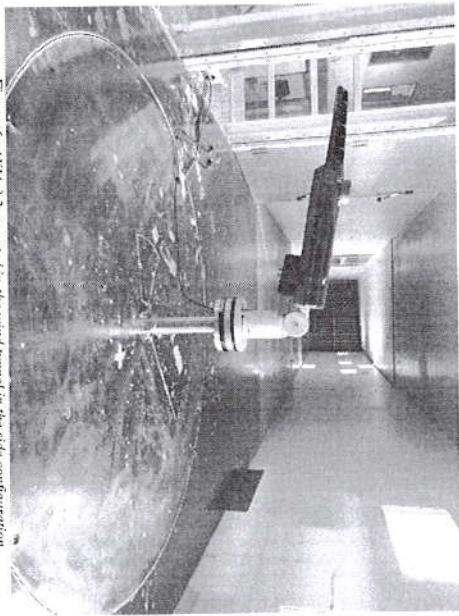


Figure 6: AXIA 3.2 mounted in the wind tunnel in the side configuration  
AXIA 3.2 dans le vent de essais dans la configuration latérale

## 2. Test procedure / Procédure d'essais

### 2.1 Wind tunnel description / Description de la soufflerie

The tests are performed in the wind tunnel facility of the Sart Tilman (figure 2.1). University of Liège, Belgium. The classical configuration is in closed loop, but if needed, an open-loop configuration is also available. The qualification of luminaires is performed in the aerodynamical section with the characteristics listed in table 2.1.

Les essais sont effectués dans la soufflerie pluridisciplinaire de l'Université de Liège (figure 2.1) – soufflerie en boucle fermée (possibilité d'essais en boucle ouverte) de 35 x 18 m – dans la veine dite « veine aérodynamique ». Ses caractéristiques sont décrites dans le tableau 2.1.

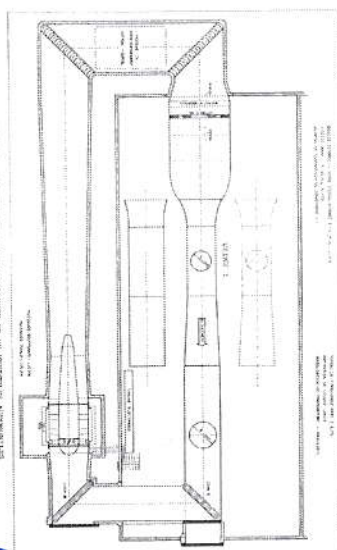


Figure 2.1 : Wind tunnel general drawing / Plan d'ensemble de la soufflerie

TABLE 2.1 : WIND TUNNEL CHARACTERISTICS / SOUFFLERIE DE SART-TILMAN.

Type d'essais	Veine aérodynamique	Veine d'industrie du véhicule
Dimensions (L x B)	Aérodynamique Luminaires ... 2 m x 1.5 m	Études de structures et de bâtiments de génie civil 2.5 m x 1.8 m
Section	3 m <sup>2</sup>	4.5 m <sup>2</sup>
Vitesse en boucle fermée	60 m/s	40 m/s
Vitesse en boucle ouverte	40 m/s	30 m/s
Plateforme d'essais	1.5 m, rotation ±90°	2 m, rotation ±180°
Stabilité thermique	±1°C	±1°C
Remarque	- Aspiration de la couche limite - Système de mesure de vitesse par différence de pression statique à l'entrée et la sortie du convergent	- Modélisation de la couche limite - Système de mesure de vitesse par différence de pression statique à l'entrée et la sortie du convergent



*[Handwritten signature]*



**2.2 Test description / Description des essais**

**2.2.1 Test procedure / Procédure de test**

Luminaires are tested following the general procedure 005 from the Fédération Professionnelle des Producteurs et Distributeurs d'Éclairage de Belgique relative to public lighting equipment. The luminaires have to withstand a wind speed of 188km/h, which has to be achieved in less than 2 minutes. The wind speed is then stabilized during 10 minutes. Under these constraints, the tested specimen has to withstand the wind pressure without undergoing damage, permanent deformations, or displacements at its support.

Les luminaires sont testés conformément au cahier des charges 005 de la Fédération Professionnelle des Producteurs et Distributeurs d'Éclairage de Belgique concernant les équipements d'éclairage public. Les appareils d'éclairage, placés dans les conditions classiques d'utilisation, doivent résister à une pression du vent correspondant à une vitesse de 188km/h. La vitesse de vent de 188km/h doit être atteinte en moins de deux minutes et maintenue pendant dix autres minutes. Sous ces contraintes, l'appareil ne peut présenter ni bris, ni déformation permanente et aucun déplacement de l'appareil par rapport à son support ne peut survenir.

**2.2.2 Conventions / Conventions**

The global drag coefficient is given by the following expression:

$$C_{DS} = \frac{D}{1/2\rho V^2}$$

- where
- $C_{DS}$  is the global drag coefficient, in  $m^2$
  - $C_{DS}$  is the non-dimensional drag coefficient
  - $S$  is the reference area of the luminaire, in  $m^2$
  - $D$  is the drag, in N
  - $\rho$  is the air density, in  $Kg/m^3$
  - $V$  is the wind speed, in  $m/s$

The lift coefficient is given by the following expression:

$$C_{LS} = \frac{L}{1/2\rho V^2}$$

- where
- $C_{LS}$  is the global lift coefficient, in  $m^2$
  - $C_{LS}$  is the non-dimensional lift coefficient
  - $L$  is the lift, in N

The air density is computed by taking into account the measured pressure and temperature, using the gas state equation:

$$\rho = \frac{P}{RT}$$

- where
- $P$  is the atmospheric pressure (Pa)
  - $T$  is the air temperature (K)
  - $R$  is the Specific Gas Constant = 286,9 Joules/Kg K

The coefficient de traînée est donné par l'expression suivante :

$$C_{DS} = \frac{D}{1/2\rho V^2}$$

- où
- $C_{DS}$  est le coefficient global de traînée (aussi connu sous le nom  $C_{x,S}$ ), en  $m^2$
  - $C_{DS}$  est le coefficient de traînée adimensionnel
  - $S$  est la surface frontale du luminaire, en  $m^2$

- $D$  est la traînée, en N
- $\rho$  est la masse volumique, en  $Kg/m^3$
- $V$  est la vitesse du vent, en  $m/s$

Le coefficient portance est donné par l'expression suivante :

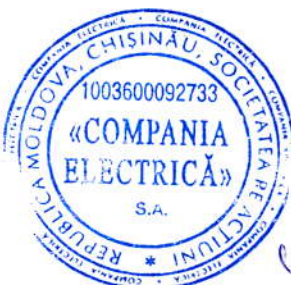
$$C_{LS} = \frac{L}{1/2\rho V^2}$$

- où
- $C_{LS}$  est le coefficient global de portance, en  $m^2$
  - $C_{LS}$  est le coefficient de portance adimensionnel
  - $L$  est la portance, en N

La valeur de la masse volumique  $\rho$  de l'air est calculée en fonction de la mesure de pression et de température suivant l'équation d'état des gaz.

$$\rho = \frac{P}{RT}$$

- où
- $P$  est la pression, atmosphérique en Pa
  - $T$  est la température en Kelvin
  - $R$  une constante = 287 Joules/Kg K



*[Handwritten signature]*



2.2.3. Tests applied on the specimen / Liste des essais  
The table 2.2. summarizes the test applied on the specimen described in §1.2.  
Le tableau 2.2 reprend la liste des tests appliqués sur le spécimen décrit au §1.2.

TABLE 2.2: APPLIED TESTS / LISTE DES ESSAIS

Aerodynamic coefficient measurement / Mesure des coefficients aérodynamiques	
Configuration	Drag / Traînée
Front 0° / Face 0°	9.4 m/s, 19.9 m/s
Front 5° / Face 5°	9.3 m/s, 19.9 m/s
Front 10° / Face 10°	9.4 m/s, 19.9 m/s
Front 15° / Face 15°	9.3 m/s, 19.9 m/s
Side / Latérale	9.3 m/s, 19.9 m/s

Wind qualification test / Essais de tenue au vent	
Front 15° / Face 15°	✓

### 3. Test results / Résultats des tests

#### 3.1 Aerodynamic coefficient measurements / Mesure des coefficients aérodynamiques

3.1.1 Front 0° / Face 0°

Luminaire configuration : front

Environment  
v1 = 9.4 m/s  
v2 = 19.9 m/s  
Luminaire Surface areas  
Front = 0.025

T° = 14.3 °C  
P = 100032 Pa

rho = 1.213 Kg/m³

Blocking factor correction  
Wind tunnel = 3 m²  
Specimen = 0.02 m²  
Area ratio = 0.8 %  
BFC = 0.99 Blocking Factor Correction

N.B. : The blocking factor correction is estimated by the procedure described in 'Wind effect on Structures: Fundamentals and Applications to Design', E. Simiu, R.H. Scanlan, p 298 - 300



Drag measurements				
Speed (m/s)	Drag (N)	Cd.S (m²)	Cd.S *BFC (m²)	Cd
9.4	1.7	0.0324	0.0320	1.2938
19.9	6.9	0.0289	0.0285	1.1546

Sideforce measurements				
Speed (m/s)	Sideforce (N)	Cs.S (m²)	Cs.S *BFC (m²)	Cs
9.4	0.1	0.0019	0.0019	0.0776
19.9	0.4	0.0016	0.0016	0.0629

Lift measurements				
Speed (m/s)	Lift (N)	Cl.S (m²)	Cl.S *BFC (m²)	Cl
9.4	-1.2	-0.0218	-0.0216	-0.8725
19.9	-4.1	-0.0171	-0.0169	-0.6849

3.1.2 Front 5° / Face 5°

Luminaire configuration : fronts

Environment	Luminaire Surface areas
v1 = 9.3 m/s	Front = 0.025
v2 = 19.9 m/s	

T° = 14.3 °C  
 P = 100032 Pa  
 rho = 1.213 Kg/m³

**Blocking factor correction**  
 Wind tunnel = 3 m²  
 Specimen = 0.02 m²  
 Area ratio = 0.8 %  
 BFC = 0.99 **Blocking Factor Correction**

N.B. : The blocking factor correction is estimated by the procedure described in 'Wind effect on Structures: Fundamentals and Applications to Design', E. Simiu, R.H. Scanlan, p 298 - 300

**Drag measurements**

Speed (m/s)	Drag (N)	Cd.S (m²)	Cd.S *BFC (m²)	Cd
9.3	1.5	0.0289	0.0285	1.1541
19.9	6.0	0.0251	0.0248	1.0037

**Sideforce measurements**

Speed (m/s)	Sideforce (N)	Cs.S (m²)	Cs.S *BFC (m²)	Cs
9.3	-0.1	-0.0022	-0.0021	-0.0869
19.9	0.1	0.0006	0.0006	0.0244

**Lift measurements**

Speed (m/s)	Lift (N)	Cl.S (m²)	Cl.S *BFC (m²)	Cl
9.3	-0.7	-0.0136	-0.0135	-0.5450
19.9	-3.4	-0.0141	-0.0139	-0.5616

3.1.3 Front 10° / Face 10°

Luminaire configuration : front10

Environment	Luminaire Surface areas
v1 = 9.4 m/s	Front = 0.025
v2 = 19.9 m/s	

T° = 14.3 °C  
 P = 100032 Pa  
 rho = 1.213 Kg/m³

**Blocking factor correction**  
 Wind tunnel = 3 m²  
 Specimen = 0.02 m²  
 Area ratio = 0.8 %  
 BFC = 0.99 **Blocking Factor Correction**

N.B. : The blocking factor correction is estimated by the procedure described in 'Wind effect on Structures: Fundamentals and Applications to Design', E. Simiu, R.H. Scanlan, p 298 - 300

**Drag measurements**

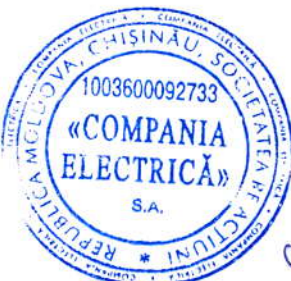
Speed (m/s)	Drag (N)	Cd.S (m²)	Cd.S *BFC (m²)	Cd
9.4	1.2	0.0217	0.0214	0.8652
19.9	6.0	0.0249	0.0245	0.9936

**Sideforce measurements**

Speed (m/s)	Sideforce (N)	Cs.S (m²)	Cs.S *BFC (m²)	Cs
9.4	0.1	0.0022	0.0021	0.0859
19.9	0.4	0.0019	0.0018	0.0744

**Lift measurements**

Speed (m/s)	Lift (N)	Cl.S (m²)	Cl.S *BFC (m²)	Cl
9.4	0.4	0.0076	0.0075	0.3039
19.9	1.6	0.0067	0.0066	0.2662



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3.1.4 Front 15° / Face 15°

Luminaires configuration : front15

Environment v1 = 9.3 m/s v2 = 19.9 m/s  
Luminaires Surface areas Front = 0.025

T° = 14.3 °C  
P = 100032 Pa

rho = 1.213 Kg/m³

Blocking factor correction  
Wind tunnel = 3 m²  
Specimen = 0.02 m²  
Area ratio = 0.8 %  
BFC = 0.99 Blocking Factor Correction

N.B. : The blocking factor correction is estimated by the procedure described in 'Wind effect on Structures: Fundamentals and Applications to Design', E. Simiu, R.H. Scanlan, p 298 - 300

Drag measurements				
Speed (m/s)	Drag (N)	Cd.S (m²)	Cd.S *BFC (m²)	Cd
9.3	1.5	0.0294	0.0290	1.1732
19.9	7.3	0.0304	0.0300	1.2154

Sideforce measurements				
Speed (m/s)	Sideforce (N)	Cs.S (m²)	Cs.S *BFC (m²)	Cs
9.3	0.0	-0.0008	-0.0008	-0.0328
19.9	0.0	-0.0002	-0.0002	-0.0079

Lift measurements				
Speed (m/s)	Lift (N)	Cl.S (m²)	Cl.S *BFC (m²)	Cl
9.3	0.1	0.0017	0.0017	0.0681
19.9	2.5	0.0106	0.0104	0.4221

3.1.5 Side / Laterale

Luminaires configuration : side

Environment v1 = 9.3 m/s v2 = 19.9 m/s  
Luminaires Surface areas Front = 0.076

T° = 14.3 °C  
P = 100032 Pa

rho = 1.213 Kg/m³

Blocking factor correction  
Wind tunnel = 3 m²  
Specimen = 0.08 m²  
Area ratio = 2.5 %  
BFC = 0.96 Blocking Factor Correction

N.B. : The blocking factor correction is estimated by the procedure described in 'Wind effect on Structures: Fundamentals and Applications to Design', E. Simiu, R.H. Scanlan, p 298 - 300

Drag measurements				
Speed (m/s)	Drag (N)	Cd.S (m²)	Cd.S *BFC (m²)	Cd
9.3	2.1	0.0395	0.0379	0.4989
19.9	10.0	0.0414	0.0398	0.5235

Sideforce measurements				
Speed (m/s)	Sideforce (N)	Cs.S (m²)	Cs.S *BFC (m²)	Cs
9.3	-0.1	-0.0028	-0.0027	-0.0360
19.9	-0.7	-0.0027	-0.0026	-0.0343

Lift measurements				
Speed (m/s)	Lift (N)	Cl.S (m²)	Cl.S *BFC (m²)	Cl
9.3	-1.6	-0.0295	-0.0284	-0.3734
19.9	-7.4	-0.0306	-0.0294	-0.3869



*[Handwritten signature]*



### 3.2 Qualification test / Test de tenue au vent

#### 3.2.1 Choice of test direction / Choix de la direction des essais

The test direction is the front 15° configuration (see Figure 5).

La configuration frontale 15° est choisie pour effectuer le test de tenue au vent (voir Figure 5).

#### 3.2.2 Qualification test / Test de qualification

The tested specimen passed the wind qualification test at 52.2m/s (188km/h) during 10 minutes: neither failure nor permanent deformations were detected. There were no displacements with respect to the specimen's support.

L'appareil n'a présenté aucun bris ni aucune déformation permanente hors du test à 52.2m/s (188km/h) durant 10 minutes. Aucun déplacement par rapport à son support n'est survenu.



Optic 5279  
 Protector Integrated lenses  
 Source 24 Osram OSLOM SQUARE QUANT  
 Matrix 430122



**Characteristics**

585	191	130	4.8	IP 68	IK 10	I EU	0.730
Length (mm)	Width (mm)	Height (mm)	Weight (kg)	Tightness level*	Impact resistance*	Electrical class*	CAS (m <sup>2</sup> )

\* According to IEC-EN60598 and IEC-EN60282

**Features**

Engineered for performance, designed for the customer experience

- Maximised savings in energy and maintenance costs
- PROFIX™ photometric engine, offering high efficiency lighting control and safety
- 3 sizes to provide the most accurate solutions for numerous road and urban applications
- Easy installation, pre-calculated and equipped with universal fixation adapted for side-entry and post-top mounting
- Adjustable inclination for optimised photometry and uniformity
- Connected-ready

**Information for 1000 lm matrix**

Efficacy (%)	86.5	G Class (EN 13201-2)	C2	Aperture 90-270°	K - X
DLOR (%)	88.5	G+ (EN 13201 2016)	G+2	I 70-90-90-95 (cd)	672 - 132 - X - X
ULOR (%)	0.0	Imax (cd)	879	CIE flux code N 1-5	23.3 - 70.0 - 96.0 -
ULR (%)	0.0	Aperture 0-180°	69 - 69		100.0 - 89.5

**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)
24	WW 730	260	15	2440	2159	144	873	B1 L0 G1	230
24	WW 730	300	22	3046	2739	143	2867	B1 L0 G1	230
24	WW 730	400	30	4244	4008	134	3719	B1 L0 G1	230
24	WW 730	500	37	5639	4929	133	4502	B1 L0 G1	230
24	WW 730	600	44	6481	5870	129	5183	B1 L0 G1	230
24	WW 730	730	53	7373	6675	125	5952	B1 L0 G1	230
24	WW 730	800	61	8194	7206	120	6692	B1 L0 G1	230
24	WW 730	950	68	8927	7983	116	7203	B1 L0 G1	230
24	WW 730	1000	76	9958	8486	112	7754	B1 L0 G1	230
24	NW 740	360	15	2872	2312	154	2712	B1 L0 G1	230
24	NW 740	400	22	3136	2380	103	3070	B1 L0 G1	230
24	NW 740	500	30	4318	4353	145	3977	B1 L0 G1	230
24	NW 740	600	37	5662	5271	143	4822	B1 L0 G1	230
24	NW 740	700	44	6862	6073	138	5548	B1 L0 G1	230
24	NW 740	800	51	7893	6988	134	6383	B2 L0 G1	230
24	NW 740	900	61	9741	7346	129	7088	B2 L0 G1	230
24	NW 740	1000	68	10265	8085	120	7711	B2 L0 G1	230

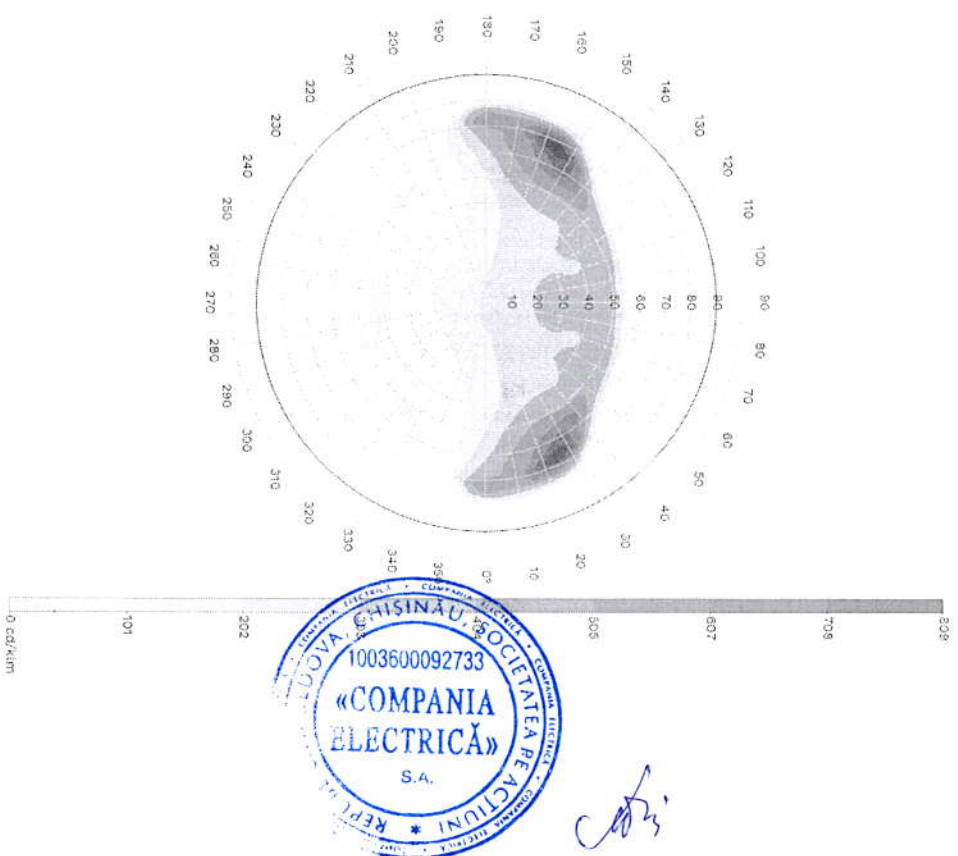
Tolerance on flux: ±5%



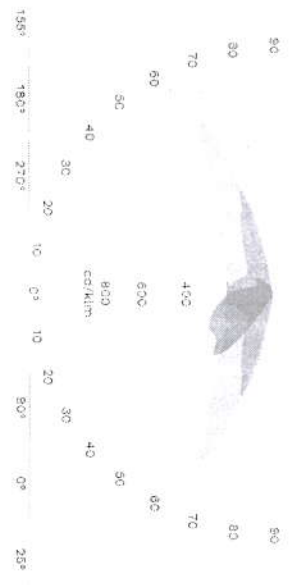
Axa 3 is a robust yet compact luminaire, designed with a focus on miniaturization and superior efficiency. Composed of high-pressure die-cast aluminium as well as composite materials, Axa 3 is available in three sizes. Thanks to its reduced weight, the road luminaire is easy to handle during installation. The Axa 31 which can be fitted with up to 16 LEDs, is perfectly suited to low-height applications, whereas Axa 32 and 33, with up to 32 or 64 LEDs, are ideal for lighting urban and larger roads, car parks and avenues. The Axa 3 range is shipped with Profiber® fibre-optic engines, providing the highest efficiency thanks to their ability to maximize their lumen output and to provide very extensive light distributions.

Axa 3 comes pre-cab and hence there is no need to open the luminaire. The complete range is available with an integrated universal fixation part adapted for post-top and side-entry mounting on various supports (Ø32mm with adapter-Ø42-Ø25mm, Ø50mm and Ø76mm). The inclination angle can be adjusted on-site for both post-top (EVA+15°) and side-entry (10°/100°) configurations to optimise lighting, reduce power consumption and control light pollution.

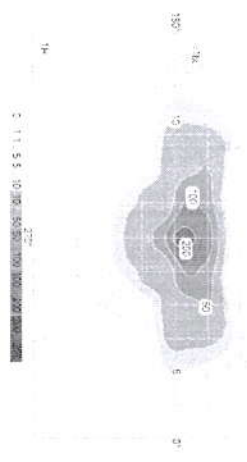
The highly efficient, cost-effective and connected-ready luminaire, offers towns and cities the ideal solution to improve lighting levels, increase safety, generate energy savings and reduce their ecological footprint. Axa 3 is the ideal tool to provide another 25 years of efficiency, sustainability and safety.



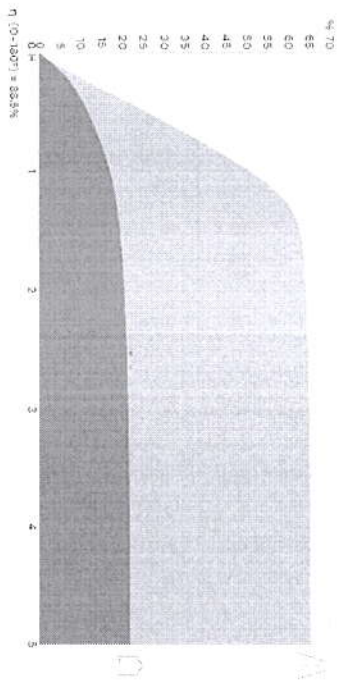




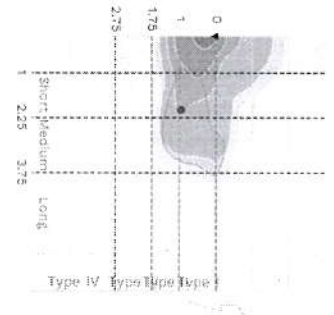
Isolux



K-Curve



### Schröder

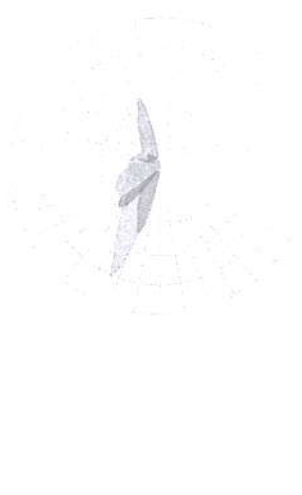


Luminaires classification system (LCS)

II - Short



Intensity diagram in max Cone and in CPlane



### Schröder



*[Handwritten signature]*

Copyright © 2019 Schröder SA. All rights reserved. Specifications are of an indicative nature and subject to change without notice.  
<http://www.schröder.com>

# Lumen maintenance report

## LED information

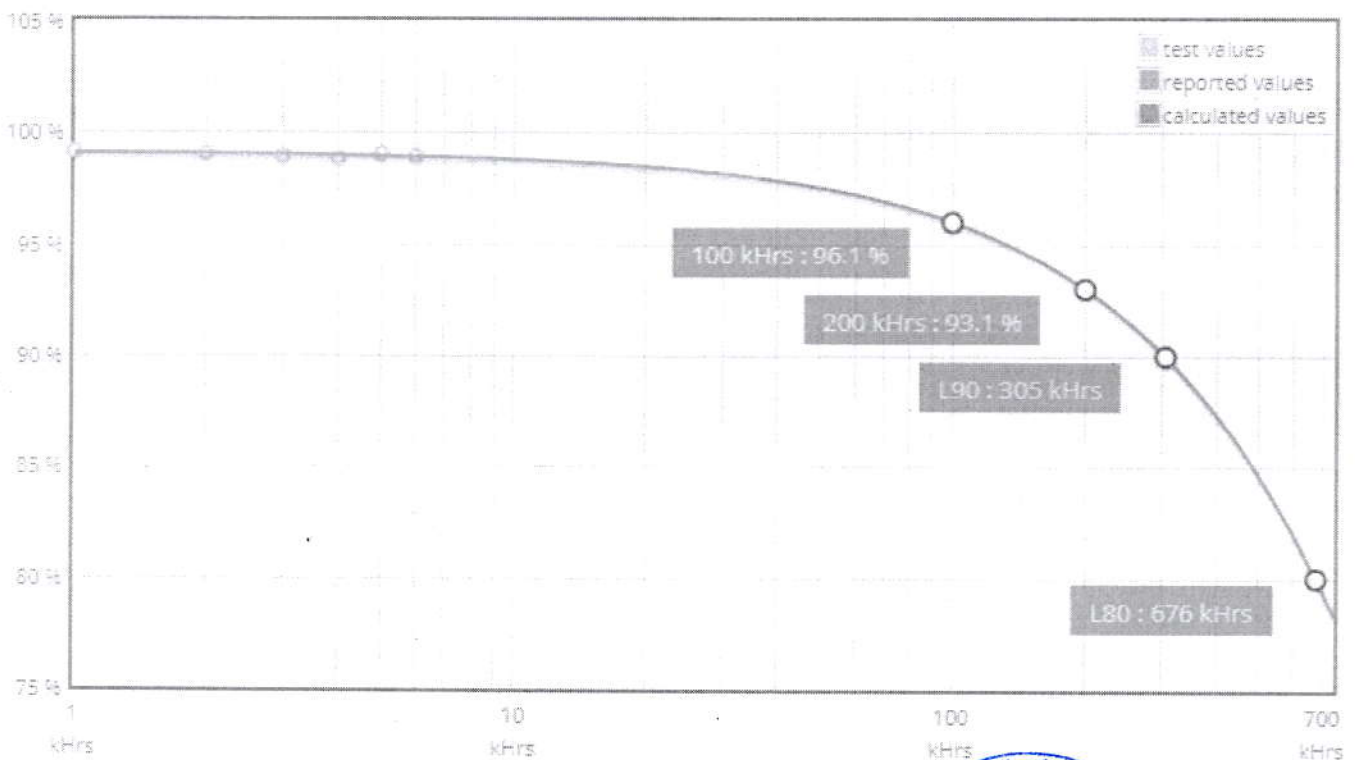
**LED type** LH351C  
**LED current** 700 mA  
**Ts** 55°C  
**Description** SLED-18-015

## Projection data

**Test duration** 6000 hrs       $\alpha$  3.172E-007  
**Time used for projection** 1000 to 6000hrs       $\beta$  0.992

L (%)	Time (kHrs)
80.0	677
90.0	305
93.1	200
96.1	100

## Projection graphic



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

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



# Lumen maintenance report

## LED information

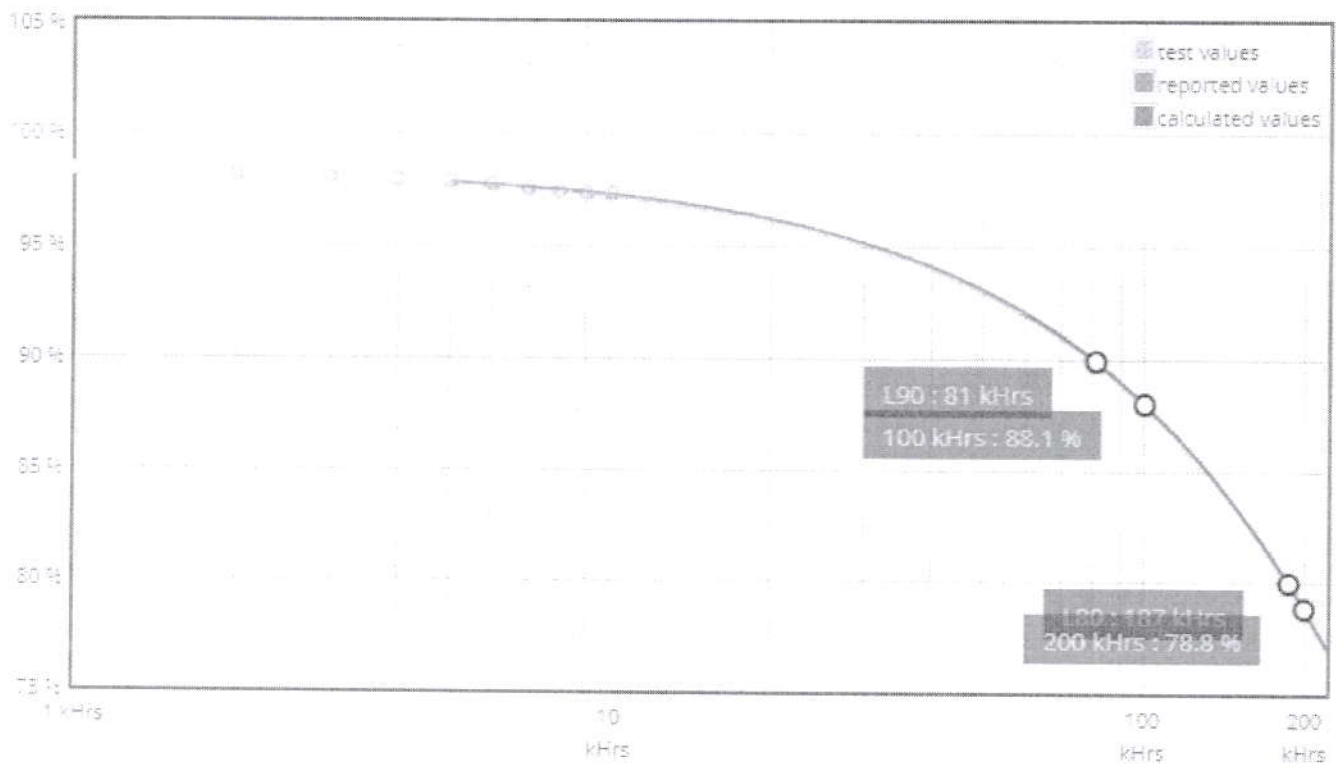
**LED type** LH351C  
**LED current** 1000 mA  
**Ts** 55°C  
**Description** SLED-17-017 ISSUE Revision 1

## Projection data

**Test duration** 10000 hrs **α** 1.112E-006  
**Time used for projection** 5000 to 10000hrs **β** 0.984

L (%)	Time (kHrs)
78.8	200
80.0	186
88.1	100
90.0	80

## Projection graphic



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

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





# Lumen maintenance report

## LED information

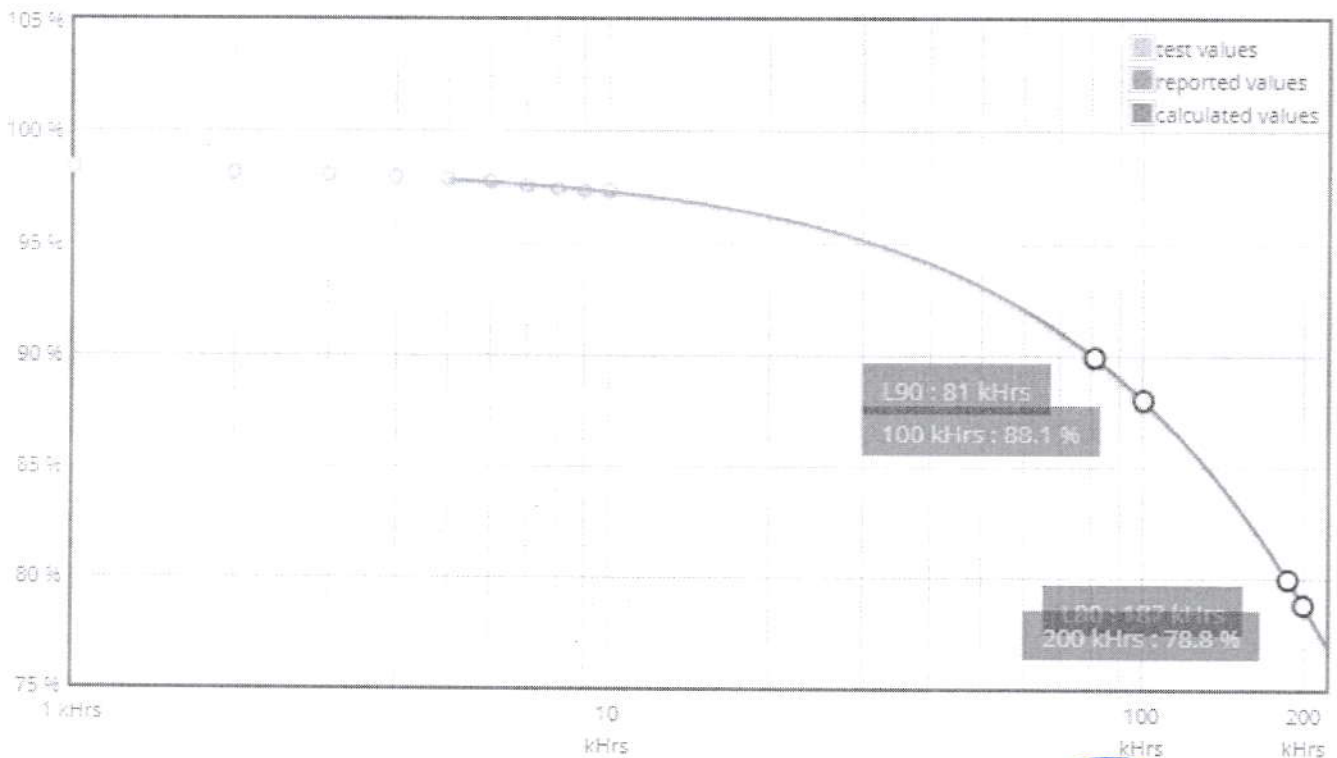
<b>LED type</b>	LH351C
<b>LED current</b>	1000 mA
<b>Ts</b>	55°C
<b>Description</b>	SLED-17-017 ISSUE Revision 1

## Projection data

<b>Test duration</b>	10000 hrs	<b><math>\alpha</math></b>	1.112E-006
<b>Time used for projection</b>	5000 to 10000hrs	<b><math>\beta</math></b>	0.984

L (%)	Time (kHrs)
78.8	200
80.0	186
88.1	100
90.0	80

## Projection graphic



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

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



02/10/2019



**RTECH-PHOTOMETRY LABORATORY**

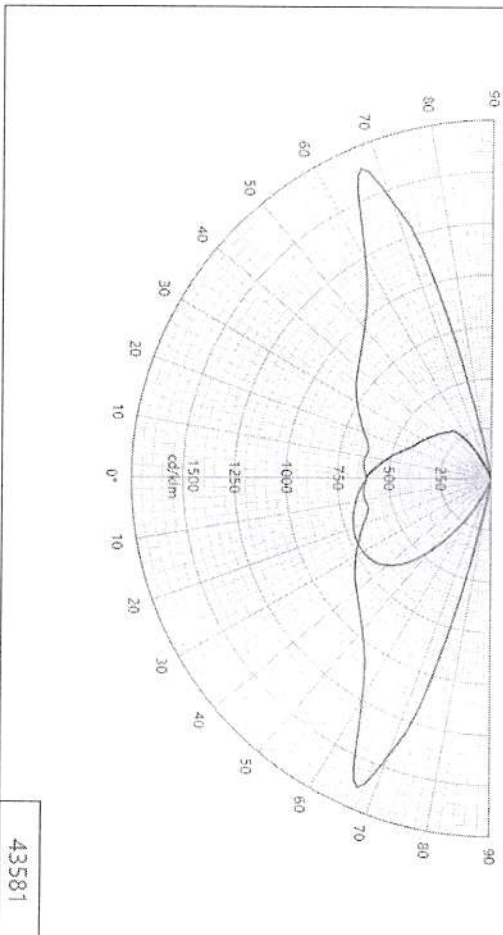
**LED**

Testreport : Measurement of luminous intensity distribution related to the standard  
 NBN-EN 13032-1; NBN-EN 13032-4; CIE 121-1:1996; CIE S 025/E; IES LM-79-08 and procedures P1-P-01  
 and P1-P-02  
 rue de Mons, 3 B-4000 LIEGE - Tel : 04/224 71 40 - Fax : 04/224 25 90  
 Measurement for Schreder group.

**LUMINOUS INTENSITY DIAGRAM**

Origin Schreder Soebee S.A.	Production Schreder Soebee S.A.	Luminaire AXIA 3.1	Inclination 0°	Request # F239131		
Source LED	BIN 40-70W-S-N6	Trademark OSRAM	Reference OSLON SQUARE GIANT	# LEDs 16		
Reflector	Schreder Led assembly Medium Assembled 0.0°			Reflector No		
Matrices	435811	$\phi$ 0.90° = 286.01m - 90.99° = 01m				
Protector Refractor Lens	Protector Integrated lenses Lens 6x6x3mm 5294 PC					
Observation	Electrical measurement on LED (41): Voltage = 44.19V Current = 0.350A Electrical measurement on driver (41): Voltage = 230.00V Current = 0.963A Total luminaires power = 100.35W Driver (4): See datasheet for driver details - PCB: 05-97-0808					
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date
20 - 160	1643	67	S			
90	721	26	D	609	23.1°	05-07-2018
270	609	0	G			

Origin Schreder Soebee S.A.	Production Schreder Soebee S.A.	Luminaire AXIA 3.1	Inclination 0°	Request # F239131
Type LED	BIN 40-70W-S-N6	Trademark OSRAM	Reference OSLON SQUARE GIANT	# LEDs 16
Master	Reflector Schreder Led assembly Medium Assembled 0.0°			Reflector No
	Protector Protector Integrated lenses Lens 6x6x3mm 5294 PC			
Laboratory observation				
Axia 3.1 with 16 Osram Dixon Giant Bin N6. Used flux for efficiency matrix calculation = 2897 lm - CCT = 3868 K - CRI = 70.7 (see sphere test report 2019/281 on appendix)				
Purpose	DDC	Sample date	25-06-2019	Sample # 398162
Observation				
DDC: Axia 3.1 with lenses 5294. Flux coefficient multiplier (only for efficiency matrix): From 350 to 200 mA : 0.595 From 350 to 300 mA : 1.978 From 350 to 700 mA : 1.978 From 350 to 870 mA : 2.158 Fixture powered with driver LG LLP 40W 0.2-0.6A 42-124Vdc PISE-A040X for matrix @200/350/500mA Fixture powered with driver LG LLP 40W 0.3-1.0A 20-67Vdc PISE-A040V for matrix @700/870mA				
Notes				
The publication of this report in another form than the original one is not allowed without agreement of the laboratory. This report concerns type tests on one or a series of specimens.				

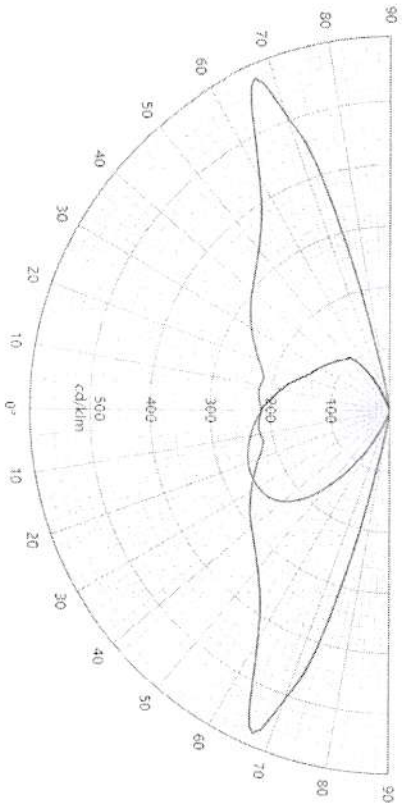


Asked by RCA	Measured by AUL	Approved by RLABO	Appendix 1	226-TEST NBN EN ISO/IEC 17025 2017	43581
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LUMINOUS INTENSITY DIAGRAM

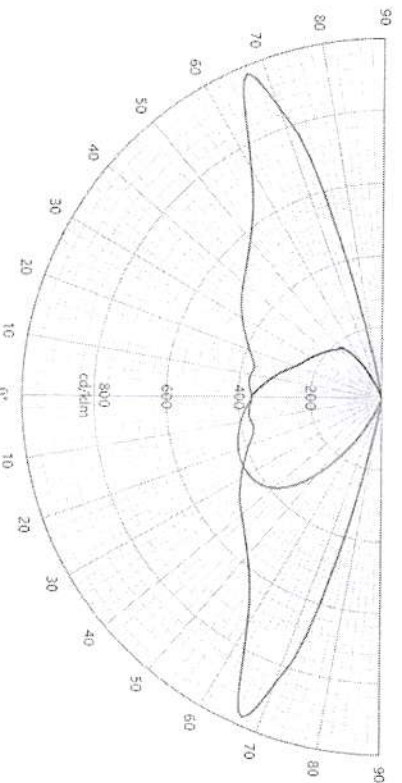
Origin Schröder Socelec S.A.	Production Schröder Socelec S.A.	Luminaire AXIA 3.1	Inclination 0°	Request # F239131		
Source LED	Type LED	BIN 40-70M-S-N6	Trademark Osram	Reference OSLON SQUARE GIANT		
Reflector	Schröder Led assembly Medium Assembled 0.0°			# LEDs 16		
Reflector Refractor Lens	Protector Integrated lenses Lens 16 x Osaglione 5294 PC			Reflector 5294		
<p>Matrices 435812 <math>\eta</math> 0.90° = 90.3% <math>\eta</math> 90.99° = 0.0%</p> <p>Relative measurement</p>						
<p>Observation Electrical measurement on LED (P1): Voltage = 42.18 V Current = 0.350 A Power = 15.47 W Electrical measurement on driver (P1): Voltage = 230.20 V Current = 0.083 A PF = 0.947 Total luminaires power = 19.16 W</p> <p>Driver #1: See observations for driver details - PCB: 00-57-0818</p>						
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date
20-160	579	67	S			
90	254	26	D			
270	215	0	G	215	25.1°	05-07-2019



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LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.	Production Schröder Socelec S.A.	Luminaire AXIA 3.1	Inclination 0°	Request # F239131		
Source LED	Type LED	BIN 40-70M-S-N6	Trademark Osram	Reference OSLON SQUARE GIANT		
Reflector	Schröder Led assembly Medium Assembled 0.0°			# LEDs 16		
Reflector Refractor Lens	Protector Integrated lenses Lens 16 x Osaglione 5294 PC			Reflector 5294		
<p>Matrices 435813 <math>\eta</math> 0.90° = 152.4lm <math>\eta</math> 90.99° = 4lm</p> <p>Relative measurement</p>						
<p>Observation Electrical measurement on LED (P1): Voltage = 43.55 V Current = 0.220 A Power = 9.71 W Electrical measurement on driver (P1): Voltage = 230.00 V Current = 0.055 A PF = 0.977 Total luminaires power = 10.94 W; Lm/Watt = 138.31 lm/W</p> <p>Driver #1: See observations for driver details - PCB: 00-57-0808</p>						
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date
20-160	917	57	S			
90	429	26	D			
270	362	0	G	362	25.0°	05-07-2019

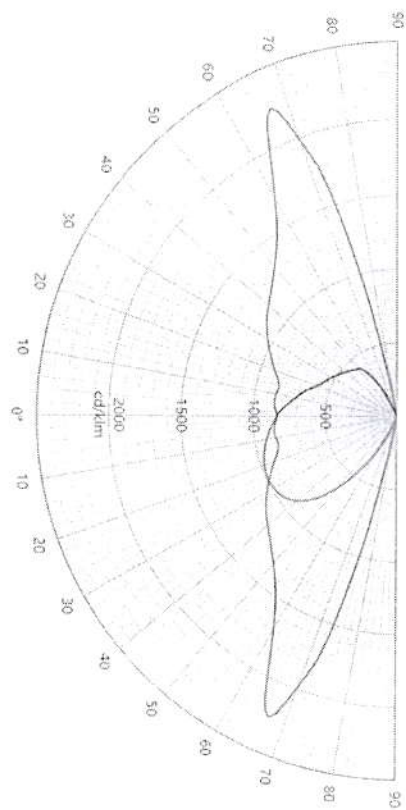


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LUMINOUS INTENSITY DIAGRAM

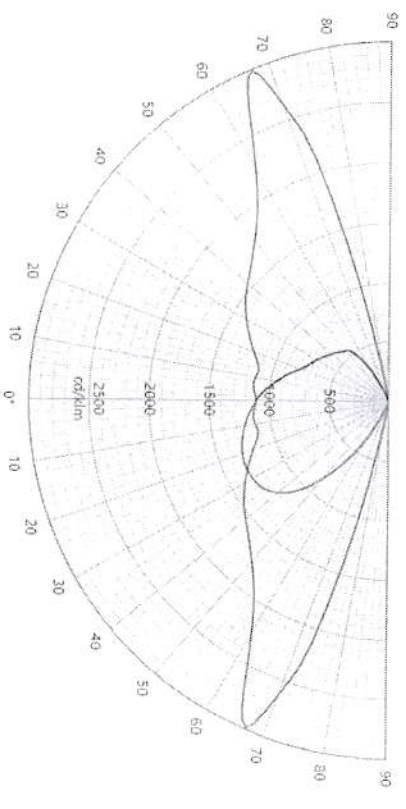
Origin	Schneider Socelec S.A.	Production	Schneider Socelec S.A.	Luminaire	AXIA 3.1	Inclination	0°	Request #	FP39131
Source	LED	BIN	40-70M-S-N6	Trademark	OSRAM	Reference	OSLON SQUARE GIANT	# LEDs	16
Reflector	Schneider Led assembly Medium Assembled 0.0°	Matrixes	435814	Matrixes	φ 0-90° = 3909lm - 90-99° = 0lm	Reflector	No	Absolute measurement	5294
Protector Refractor	Protector	Protector	Integrated lenses	Protector Refractor	16 x Cosignone 5294 PC				
Observation	Electrical measurement on LED (41): Voltage = 44.64 V Current = 0.500 A Power = 22.32 W Electrical measurement on driver (41): Voltage = 230.00 V Current = 0.114 A Power = 26.00 W PF = 0.973 Total luminaires power = 25.60 W : lm/Watt = 137.07 lm/W Driver #1 : See observations for driver details - PCB:00-S7-0608								
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date			
20 - 160	2351	67	S						
90	989	26	D						
270	834	9	G	834	25.0°	05-07-2019			



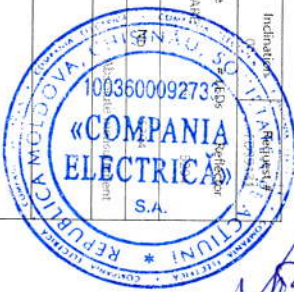
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LUMINOUS INTENSITY DIAGRAM

Origin	Schneider Socelec S.A.	Production	Schneider Socelec S.A.	Luminaire	AXIA 3.1	Inclination	0°	Request #	FP39131
Source	LED	BIN	40-70M-S-N6	Trademark	OSRAM	Reference	OSLON SQUARE GIANT	# LEDs	16
Reflector	Schneider Led assembly Medium Assembled 0.0°	Matrixes	435815	Matrixes	φ 0-90° = 4657lm - 90-99° = 0lm	Reflector	No	Absolute measurement	5294
Protector Refractor	Protector	Protector	Integrated lenses	Protector Refractor	16 x Cosignone 5294 PC				
Observation	Electrical measurement on LED (41): Voltage = 45.11 V Current = 0.270 A Power = 12.18 W Electrical measurement on driver (41): Voltage = 230.00 V Current = 0.158 A Power = 35.79 W PF = 0.985 Total luminaires power = 35.79 W : lm/Watt = 130.11 lm/W Driver #1 : See observations for driver details - PCB:00-S7-0608								
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date			
20 - 160	2987	67	S						
90	1311	26	D						
270	1107	0	G	1107	25.1°	05-07-2019			

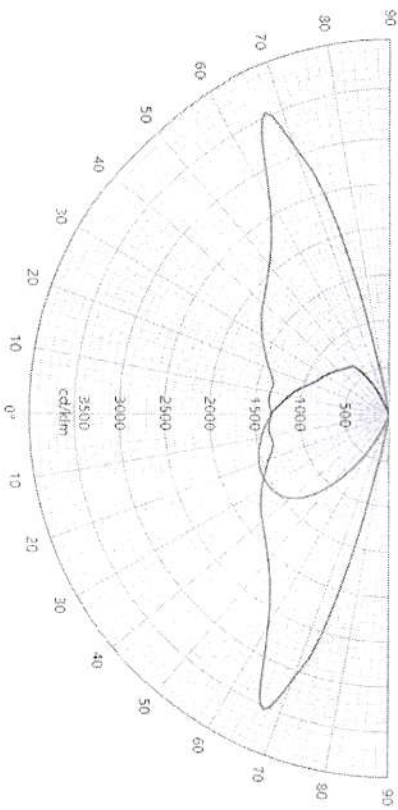


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LUMINOUS INTENSITY DIAGRAM

Origin Schröder Soeltec S.A.	Production Schröder Soeltec S.A.	Luminaire AXIA 3.1	Inclination 0°	Request # FD38131		
Source LED	Type LED	BIN 40-70A-5-N6	Trademark OSLON SQUARE	# LEDs 16		
Reflector Schröder Led assembly Medium Assembled 9.0°	Matrixes 435816	Φ 0-90° = 5522lm 90-99° = 0lm	Reference OSLON SQUARE GIANT	Reflector 5294		
Reflector Lens	Projector Integrated lenses	Lens 16 V G30q30ne 5.94 PC	No	Absolute measurement		
Observation Electrical measurement on LED (n1): Voltage = 45.43 V Current = 0.970 A Power = 38.57 W Electrical measurement on driver (n1): Voltage = 250.00 V Current = 0.196 A Power = 44.70 W PF = 0.990 Total luminous power = 44.70 W; LumWatt = 123.54 lm/W Driver n1: See observation for driver details - PCB:30-57-0608						
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date
20 - 160	3542	67	S			
90	1555	26	D			
270	1313	0	G		25.0°	05-07-2019



43581

CONFORMITY STATEMENT

Measurement light Standards:  
 IESNA-EN 13032-1  
 IESNA-EN 13032-4  
 IESNA-EN 17025:2017  
 CEI 121-1896  
 IEC 60794-0  
 CEI 5-025

Measurement quantities measured:  
 Light distribution in relative or absolute photometry  
 Led alone cold lumen package  
 Led CCT and CRI  
 Power consumption of the fitting  
 LRV/dst

Electrical measurement, if not specified:  
 Primary values are AC with 50Hz frequency  
 Secondary values on SSL are DC

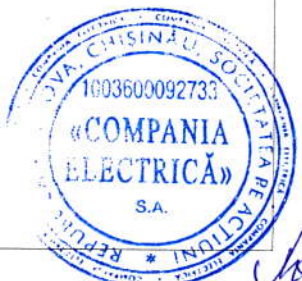
CCT, CRI and chromaticity coordinates are measured in Ultrichri sphere.  
 If specified Main test report refer to sphere extra test report.  
 Light distribution are measured on gonio. If not otherwise specified, measurement is done at 50 Hz.

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 Schröder format)  
 .dat format (European standard)  
 .IES format (American standard)

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

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: +/- 0.2%  
 Current: +/- 0.3%  
 Temperature: +/- 0.85%





IS2000	JETT	
CCT	+/- 5%	+/- 2.5%
CR	+/- 2%	+/- 2.75%
K/Y	+/- 2%	+/- 4.0%
Ind/Mult	+/- 3.5%	

Measuring instruments in use:

Gonio 1

Type C with Measuring meter

Manufacturer: LMT Lichtmesstechnik GmbH Berlin, Heinrichstrasse 9 10587 Berlin, Germany

Type: GO-DE 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: Technostrom Bildverarbeitung, Werner-von-Siemens-Strasse 5 98693 Ilmenau, Germany

Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Swvres)

Photometric test distance: Near Field

Sphere n°1

4p geometry

Manufacturer: LMT Lichtmesstechnik GmbH, Heinrichstrasse 9 10587 Berlin, Germany

Type: UT 2000 - U1000 V-Lambda photometer

Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Swvres)

Sphere n°2

4p geometry

Manufacturer: Instrument Systems GmbH, Neeracker Str. 93, 81673 München, Germany

Type: IS2000 - Spectroradiometer CAS 120 and CAS 140

Calibration: traceable to NIST

Colimetric portable spectroradiometer

Manufacturer: JETT Technische Instrumente GmbH, Tackerdeponstraße 2 07745 Jena

Type: SPECBO5 1201

Calibration: traceable to NIST

Multimeters

Manufacturer: Agilent

Type: 34407A

Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Swvres)

Wattneters

Manufacturer: Yokogawa

Type: WT310 and WT310

Calibration: traceable to BIPM (Bureau International des Poids et Mesures F-Swvres)

Thermometers

Manufacturer: Amtzell Precision

Type: Liquid in glass M63933

Calibration: traceable to LRT (Laboratoire Belge de Thermométrie)



*[Handwritten signature]*

## LED Flux measurement

Date : 16-05-19

Operator : FCE

FORM-L-41 ED1 REV 3

Filename : 2019\_381.xml



226-TEST

### LEDs

NBN EN ISO/IEC 17025 :2017

Trademark : Osram

Entry number : 38R137-1

Type : OSOLON SQUARE GIANT

Power (Catalogue) : 0,97 W

BIN Description : 40-70M-5-N6

Flux : 0 lm/LED

Part number : GWCSSRM2.PM

Color or CCT (Theoretical) : NW

Number of LEDs : 16

### Lenses

Trademark : None

Type : None

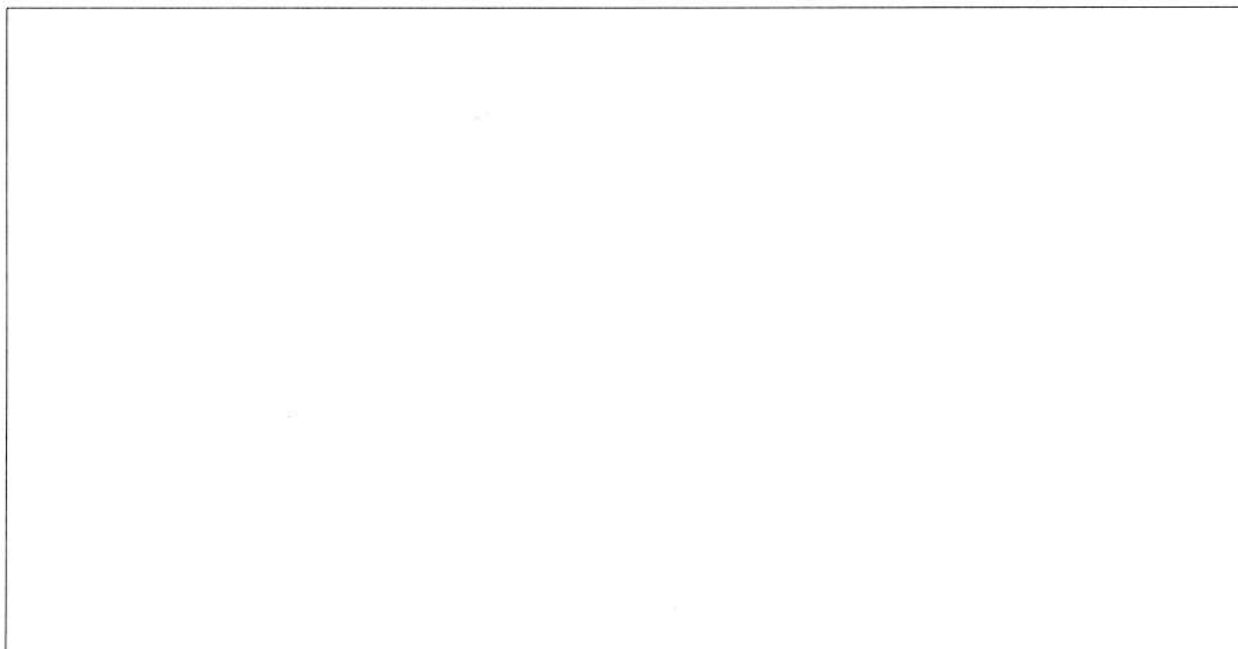
### Power & Print

Type : DELTA SM400-AR-4

Print description : 00-57-060 B - Axia 3.1

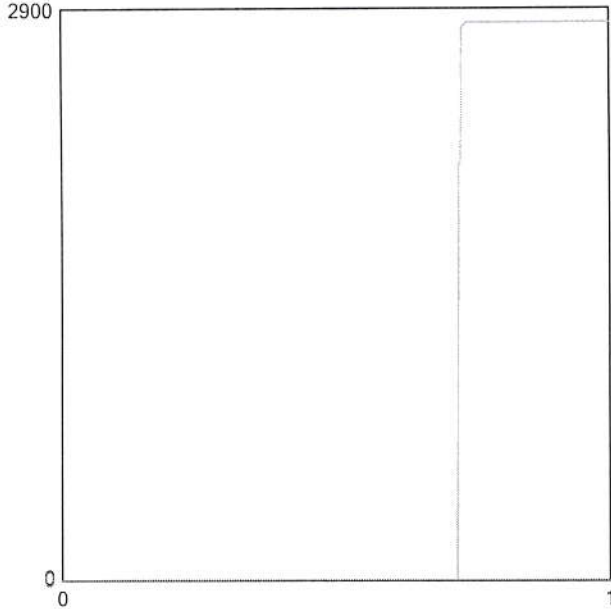
Active

### Picture



### Sphere photometric measurement

Maximum flux :  lumens



### Operating condition

Position in sphere :

Ambient sphere T ° : **24,0**

### Electrical measurement

#### ● Secondary electrical measurement

Voltage : **44,54** V

Current : **0,350** A

Power : **15,58** Watt

→ LEDs light efficiency at 25° :

**182,1** lm/W

**177,3** 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 Axia 3.1 - 16 Oslon Giant N6 - pcb N°1

Comment :

FORM-L-41 ED1 REV 3



226-TEST

Approved by :



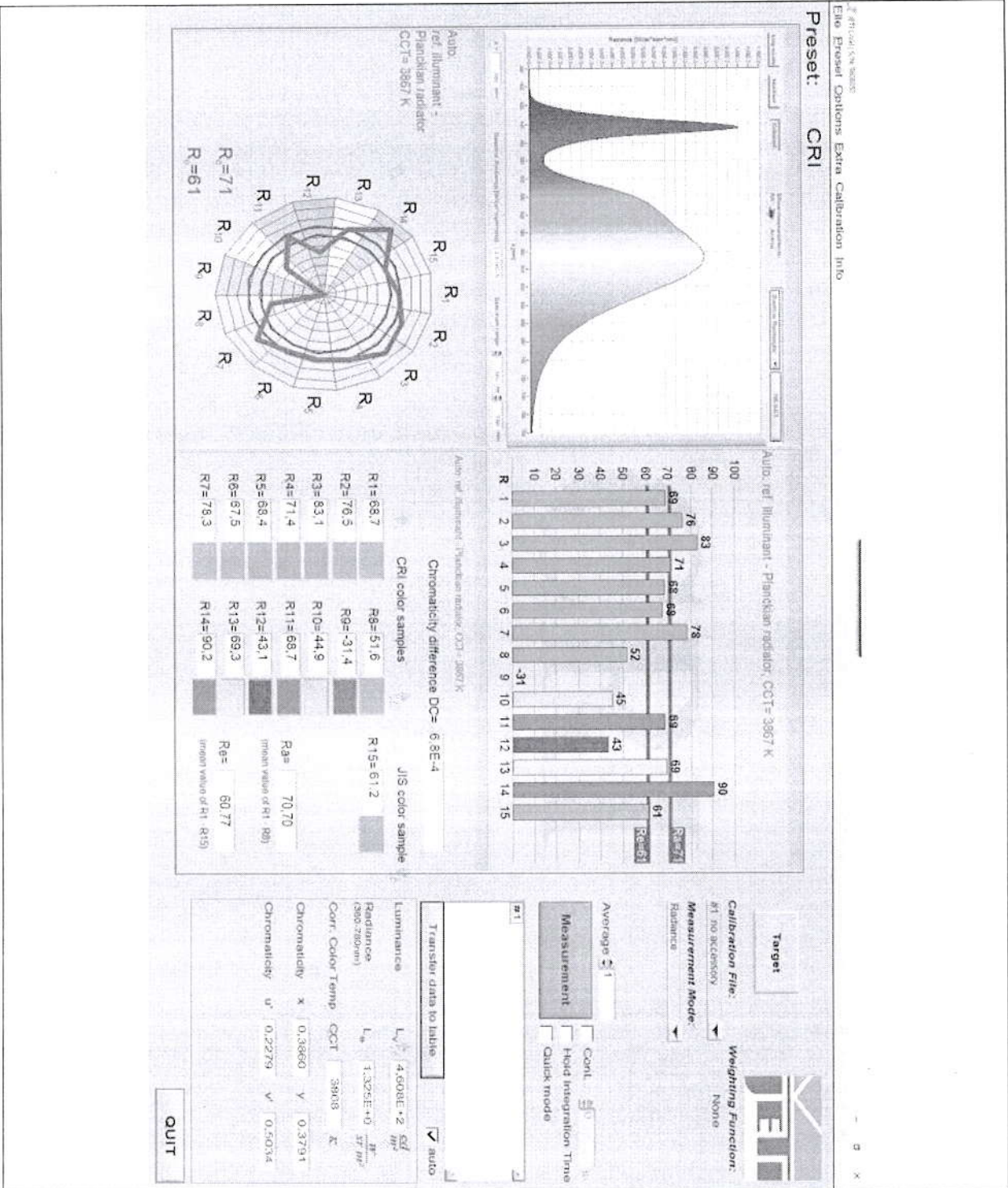




226-TEST

NBN EN ISO/IEC 17025 :2017

Colorimetry



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**RTECH-PHOTOMETRY LABORATORY**

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 Schröder group.



Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2	Inclination 0°	Request # FD39071
Type LED	BIN 40-70M-5-N6	Source Trademark Osram	Reference OSLON SQUARE GIANT	# LEDs 32	Reflector 5279	
Master		Reflector Schröder Led assembly Medium Assembled 0,0°				No 5279
Protector Refractor Lens						
Protector integrated lenses		Lens Gaggione 5279 PC				
Laboratory observation						
AXIA 3.2 with 32 OSRAM OSLON GIANT Used flux for efficiency matrix calculation = 5735 lm - CCT = 3962 K - CRI = 71,27 (see sphere test report 2019/185 on appendix).						
Purpose CTR			Sample date 22-03-2019		Sample # 39R104	
Observation						
CTR AXIA 3.2 with lenses 5279						
Flux coefficient multiplicator (only for efficiency matrix): From 350 to 500 mA : 1,365 From 350 to 700 mA : 1,807 From 350 to 800 mA : 2,000						
Fixture powered with driver LG INNOTEK LLP40W Model PISE-A040X for matrix @350mA Fixture powered with driver LG INNOTEK LLP75W Model PISE-A075Y for matrix @500/700/800mA						
Notes						
The publication of this report in another form than the original one is not allowed without agreement of the laboratory. This report concerns type tests on one or a series of specimens.						

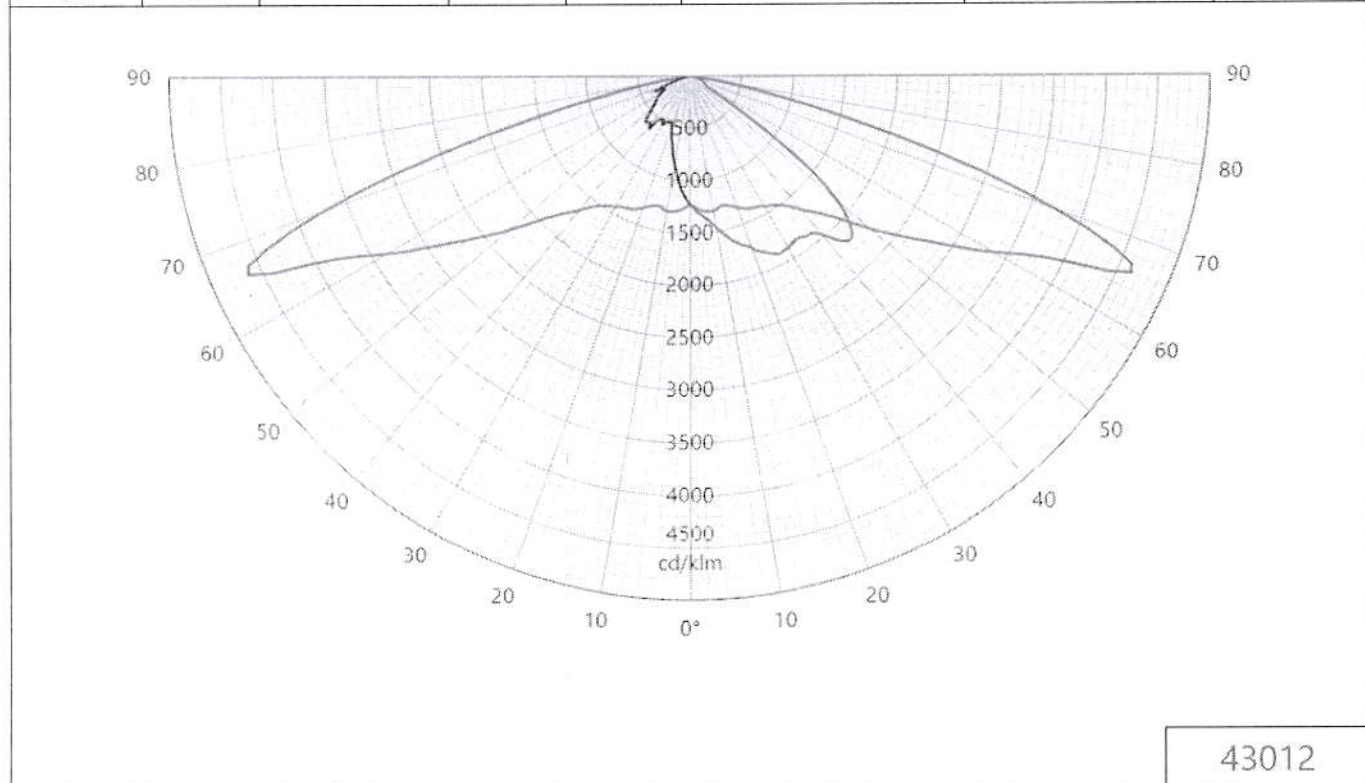
Asked by RCA	Measured by CLD	Approved by RLABO	Appendix 1	226-TEST NBN EN ISO/IEC 17025:2005		3012
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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2		Inclination 0°		Request # FD39071	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT	# LEDs 32	Reflector 5279		
Reflector	Schröder Led assembly Medium Assembled 0,0°					No	5279		
Matrices	430121	∅ 0-90° = 5075lm - 90-180° = 0lm					Absolute measurement		
Protector Refractor Lens	Protector integrated lenses Lens 32 x Gaggione 5279 PC								
Observation	Matrix in total flux @350mA Light losses due to thermal stabilization: 1,4 %  Electrical measurement on LED (#1): Voltage = 88,42 V    Current = 0,350 A    Power = 31,00 W Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,153 A    Power = 34,60 W    PF = 0,982  <b>Total luminaire power = 34,60 W : Lm/Watt = 146,67 lm/W</b>  Driver #1 : See observations for driver details - PCB: 00-57-144C								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
25 - 155	4637	66	S	1221	24,9°	05-04-2019	
90	2193	45	D				
270	1221	0	G				

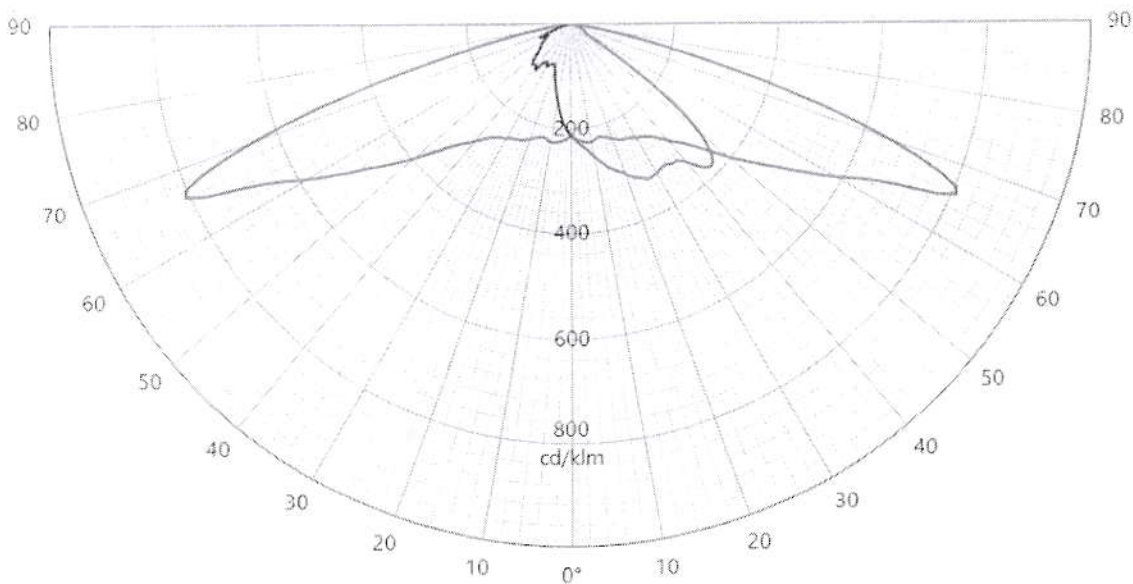




### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2		Inclination 0°		Request # FD39071		
Source		Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT		# LEDs 32	Reflector 5279	
Reflector		Schröder Led assembly Medium Assembled 0,0°						No	5279	
Matrices		430122	$\eta$ 0-90° = 88,5% - 90-180° = 0,0%						Relative measurement	
Protector Refractor Lens		Protector integrated lenses Lens 32 x Gaggione 5279 PC								
Observation		<p>Matrix in efficiency @350mA</p> <p>Light losses due to thermal stabilization: 1,4 %</p> <p>Electrical measurement on LED (#1): Voltage = 88,42 V Current = 0,350 A Power = 31,00 W</p> <p>Electrical measurement on driver (#1): Voltage = 230,00 V Current = 0,153 A Power = 34,60 W PF = 0,982</p> <p><b>Total luminaire power = 34,60 W</b></p> <p>Driver #1 : See observations for driver details - PCB: 00-57-144C</p>								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
25 - 155	809	66	S	213	24,9°	05-04-2019	
90	382	45	D				
270	213	0	G				



43012

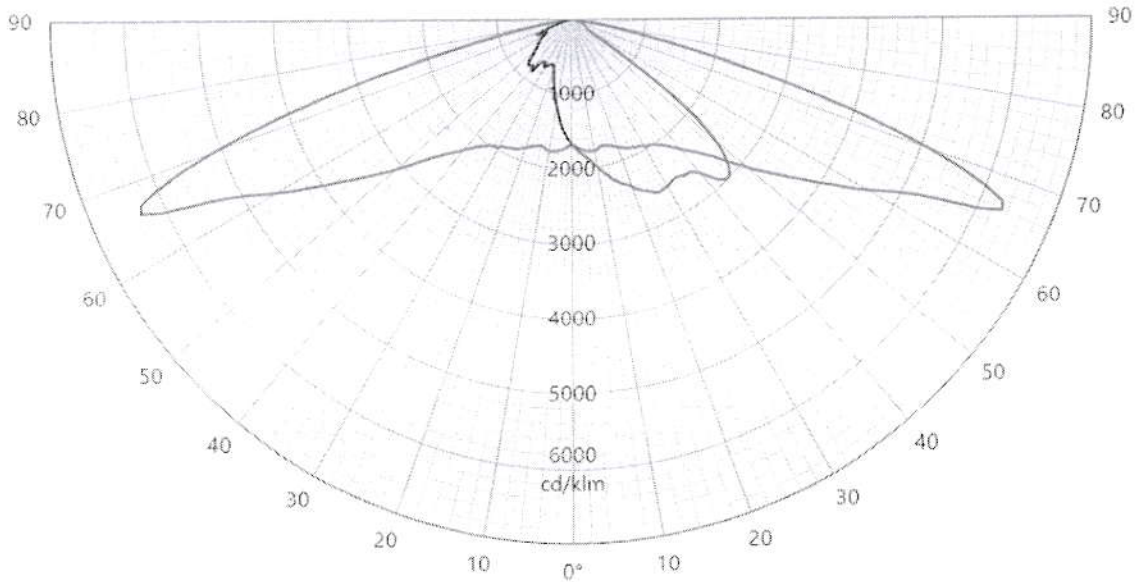


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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2		Inclination 0°		Request # FD39071	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT	# LEDs 32	Reflector 5279		
Reflector	Schröder Led assembly Medium Assembled 0,0°					No	5279		
Matrices	430123	Φ 0-90° = 6927lm - 90-180° = 0lm					Absolute measurement		
Protector Refractor Lens	Protector integrated lenses Lens 32 x Gaggione 5279 PC								
Observation	Matrix in total flux @500mA Light losses due to thermal stabilization: 1,7 %  Electrical measurement on LED (#1): Voltage = 89,19 V    Current = 0,500 A    Power = 44,60 W Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,219 A    Power = 49,45 W    PF = 0,978  Total luminaire power = 49,45 W : Lm/Watt = 140,09 lm/W  Driver #1 : See observations for driver details - PCB: 00-57-144C.								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
25 - 155	6329	66	S	1667	24,9°	08-04-2019	
90	2993	45	D				
270	1667	0	G				



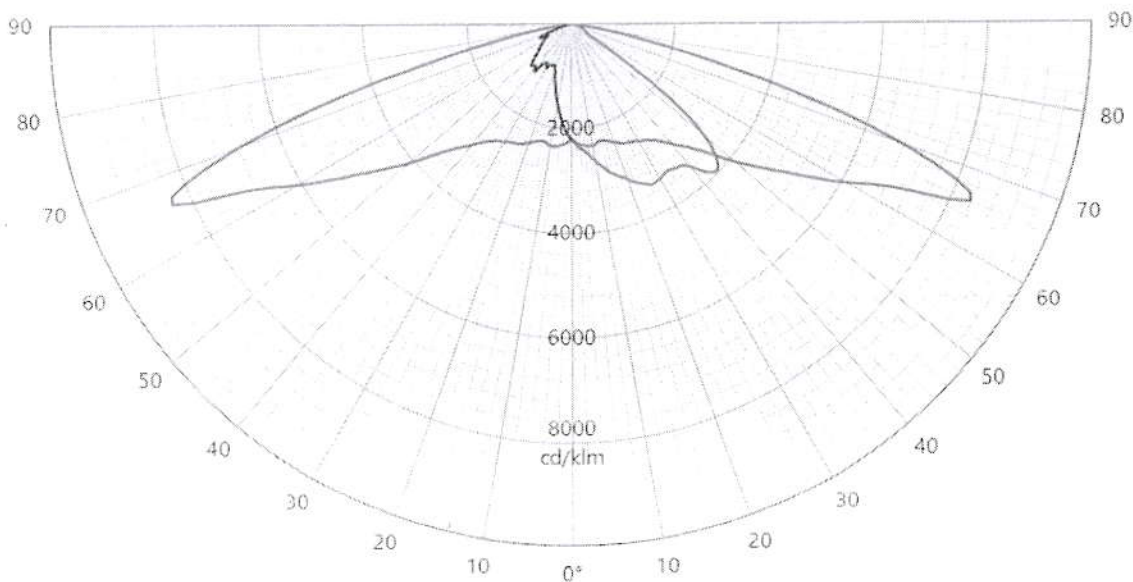
43012



### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2		Inclination 0°		Request # FD39071	
Source		Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT		# LEDs 32	Reflector 5279
Reflector		Schröder Led assembly Medium Assembled 0,0°						No	5279
Matrices		430124 $\Phi$ 0-90° = 9170lm - 90-180° = 0lm						Absolute measurement	
Protector Refractor Lens		Protector integrated lenses Lens 32 x Gaggione 5279 PC							
Observation		<p>Matrix in total flux @700mA Light losses due to thermal stabilization: 2,9 %</p> <p>Electrical measurement on LED (#1): Voltage = 90,05 V Current = 0,700 A Power = 63,06 W                      Electrical measurement on driver (#1): Voltage = 230,00 V Current = 0,304 A Power = 69,22 W PF = 0,989</p> <p><b>Total luminaire power = 69,22 W : Lm/Watt = 132,48 lm/W</b></p> <p>Driver #1 : See observations for driver details - PCB: 00-57-144C.</p>							

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
25 - 155	8379	66	S	2207	24,9°	08-04-2019	
90	3963	45	D				
270	2207	0	G				



43012

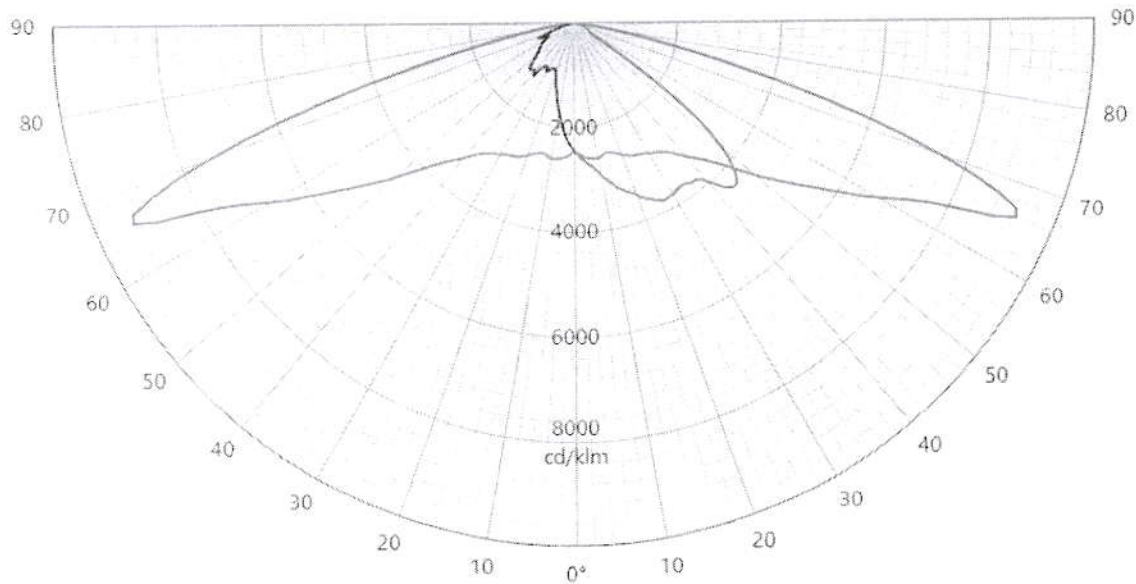




### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.2		Inclination 0°		Request # FD39071	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT	# LEDs 32	Reflector 5279		
Reflector	Schröder Led assembly Medium Assembled 0,0°					No	5279		
Matrices	430125	Φ 0-90° = 10150lm - 90-180° = 0lm					Absolute measurement		
Protector Refractor Lens	Protector integrated lenses Lens 32 x Gaggione 5279 PC								
Observation	<p>Matrix in total flux @800mA Light losses due to thermal stabilization: 3,7 %</p> <p>Electrical measurement on LED (#1): Voltage = 90,42 V    Current = 0,800 A    Power = 72,34 W                      Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,347 A    Power = 79,17 W    PF = 0,992</p> <p><b>Total luminaire power = 79,17 W : Lm/Watt = 128,20 lm/W</b></p> <p>Driver #1 : See observations for driver details - PCB: 00-57-144C.</p>								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
25 - 155	9274	66	S	2443	24,9°	08-04-2019	
90	4386	45	D				
270	2443	0	G				



43012



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## 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 50Hz 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).

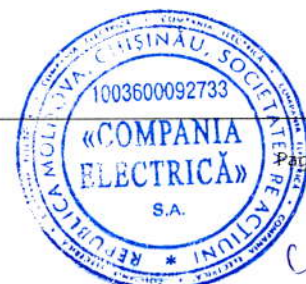
Stabilization time: If not otherwise specified, a minimal stabilization time of 0.5 hour is applied; and measurement will start when it exists no more variation above 0.5% in 15 minutes

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 Schröder format)  
 .ldt format (European standard)  
 .IES format (American standard)

Statement of uncertainties (K=2, 95% of confidence level):  
 Uncertainties calculated based on a typical Schröder 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: GÖ-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)





## LED Flux measurement

FORM-L-41 ED1 REV 2

Date : 13-03-19

Operator : FCE

Filename : 2019\_185.xml



226 - TEST

NBN EN ISO/IEC 17025 : 2005

### LEDs

Trademark : **Osram**

Entry number : **39R047-1**

Type : **OSLON SQUARE GIANT**

Power (Catalogue) : **0,97** W

BIN Description : **40-70M-5-N6**

Flux : **0** lm/LED

Part number : **GWCSSRM2.PM**

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

Number of LEDs : **32**

### Lenses

Trademark : **None**

Type : **None**

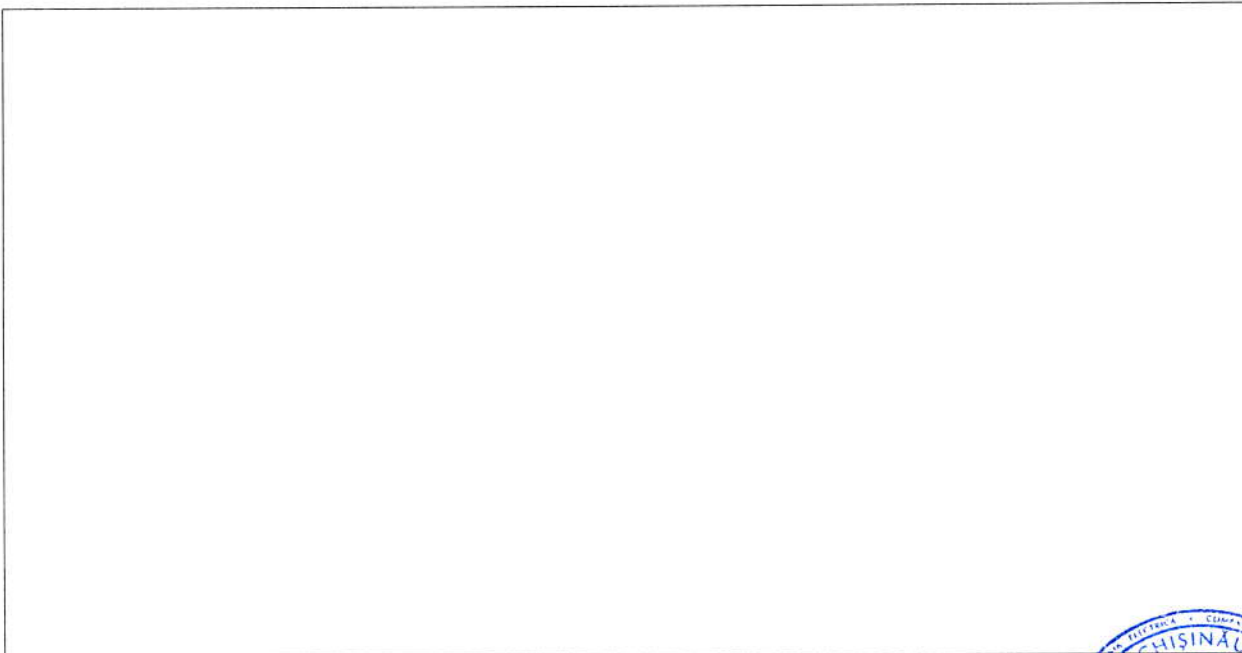
### Power & Print

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

Print description : **00-57-144 C - Axia 3.2/3.3**

Active

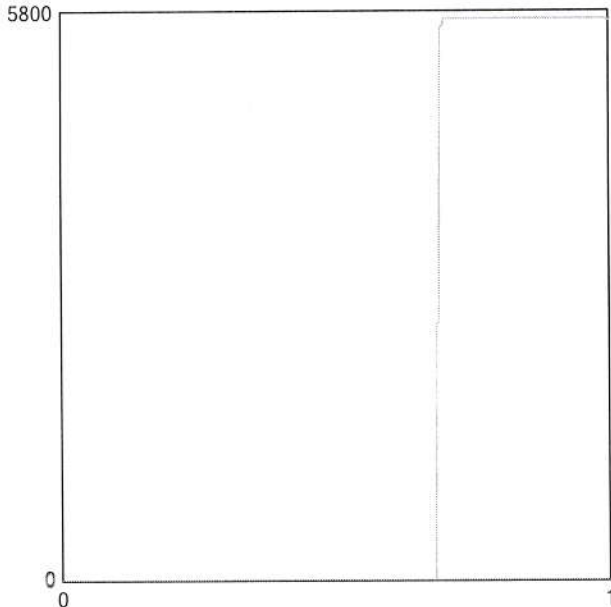
### Picture



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### Sphere photometric measurement

Maximum flux :  lumens



### Operating condition

Position in sphere :

Ambient sphere T ° : **24,0**

### Electrical measurement

#### ● Secondary electrical measurement

Voltage : **89,50** V

Current : **0,350** A

Power : **31,28** Watt

→ LEDs light efficiency at 25° :

**183,3** lm/W

**179,2** 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 Axia 3.2/3.3 - 32 Oslon Giant N6 - pcb N°1

Comment :

Approved by :

FORM-L-41 ED1 REV 2



226 - TEST



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226 - TEST

NBN EN ISO/IEC 17025 : 2005

Colorimetry

Presel: CRI

Auto ref illuminant - Planckian radiator CCT= 3962 K

Sample	Value
R1	89.8
R2	77.0
R3	82.7
R4	72.0
R5	69.5
R6	68.1
R7	78.2
R8	53.0
R9	28.1
R10	45.6
R11	69.5
R12	44.5
R13	70.2
R14	80.9
R15	62.9

Chromaticity difference DC= 2.9E-3

JIS color sample Ra= 71.27 (mean value of R1 - R9)

Transferring data to table

Measurement: #1

Calibration File: #1 NO RECESSARY

Measurement Mode: Radiance

Weighting Function: None

Average: 1

Measurement: [Cont] [Hold integration Time] [Quick mode]

Transfer data to table [auto]

Luminance  $L_v$  9.629E+2  $cd/m^2$

Radiance  $L_g$  2.811E+0  $W/m^2$

Color Temp CCT 3962 K

Chromaticity  $x$  0.3802  $y$  0.3709

Chromaticity  $u'$  0.2273  $v'$  0.4990

QUIT



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# AXIA 3.1

## 5270

Optic	5270
Protector	Integrated lenses
Source	16 Osram OSOLON SQUARE GIANT
Matrix	429112




### Characteristics

							
513	191	130	3.6	IP 66	IK 10	I EU	0.032
Length (mm)	Width (mm)	Height (mm)	Weight (kg)	Tightness level*	Impact resistance*	Electrical class*	CxS (m <sup>2</sup> )

\* According to IEC-EN60598 and IEC-EN62262

### Features

Engineered for performance, designed for the customer experience

- Maximised savings in energy and maintenance costs
- ProFlex™ photometric engines offering high efficiency lighting, comfort and safety
- 3 sizes to provide the most accurate solutions for numerous road and urban applications
- Easy installation: pre-cabled and equipped with universal fixation adapted for side-entry and post-top mounting
- Adjustable inclination for optimised photometry and uniformity
- Connected-ready

### Types of application

- Square and park
- Bridge
- Large area
- Roundabout
- Car park
- Road and highway
- Residential road
- Bike path

### Information for 1000 lm matrix

Efficacy (%)	89.8	G Class (EN 13201-2)	G3	Aperture 90-270°	X - X
DLOR (%)	89.8	G* (EN 13201 2015)	G*3	I 70-80-90-95 (cd)	918 - 89 - X - X
ULOR (%)	0.0	Imax (cd)	1012	CIE flux code N 1>5 (%)	35.5 - 70.0 - 97.1 - 100.0 - 89.8
ULR (%)	0.0	Aperture 0-180°	69 - 69		




## 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°									
16	WW 730	200	11	1620	1455	132	1639	B0 U0 G0	230
16	WW 730	300	16	2361	2121	133	2388	B0 U0 G1	230
16	WW 730	480	25	3601	3235	129	3643	B1 U0 G1	230
16	WW 730	500	26	3729	3350	129	3773	B1 U0 G1	230
16	WW 730	600	31	4360	3917	126	4411	B1 U0 G1	230
16	WW 730	700	36	4953	4450	124	5011	B1 U0 G1	230
16	WW 730	870	44	5864	5258	120	5933	B1 U0 G1	230
16	NW 740	200	11	1734	1558	142	1754	B0 U0 G0	230
16	NW 740	300	16	2528	2271	142	2557	B1 U0 G1	230
16	NW 740	480	25	3855	3464	139	3900	B1 U0 G1	230
16	NW 740	500	26	3992	3587	138	4039	B1 U0 G1	230
16	NW 740	600	31	4668	4194	135	4722	B1 U0 G1	230
16	NW 740	700	36	5303	4764	132	5365	B1 U0 G1	230
16	NW 740	870	44	6278	5640	128	6351	B1 U0 G1	230

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



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## Summary

Axia 3 is a robust yet compact luminaire, designed with a focus on miniaturisation and superior efficiency. Composed of high-pressure die-cast aluminium, as well as composite materials, Axia 3 is available in three sizes. Thanks to its reduced weight, this road luminaire is easy to handle during installation. The Axia 3.1, which can be fitted with up to 16 LEDs, is perfectly suited to low-height applications, whereas Axia 3.2 and 3.3, with up to 32 or 64 LEDs, are ideal for lighting urban and large roads, carriageways and avenues. The Axia 3 range is equipped with ProFlex™ photometric engines, providing the highest efficiency thanks to their ability to maximise the lumen output and to provide very extensive light distributions.

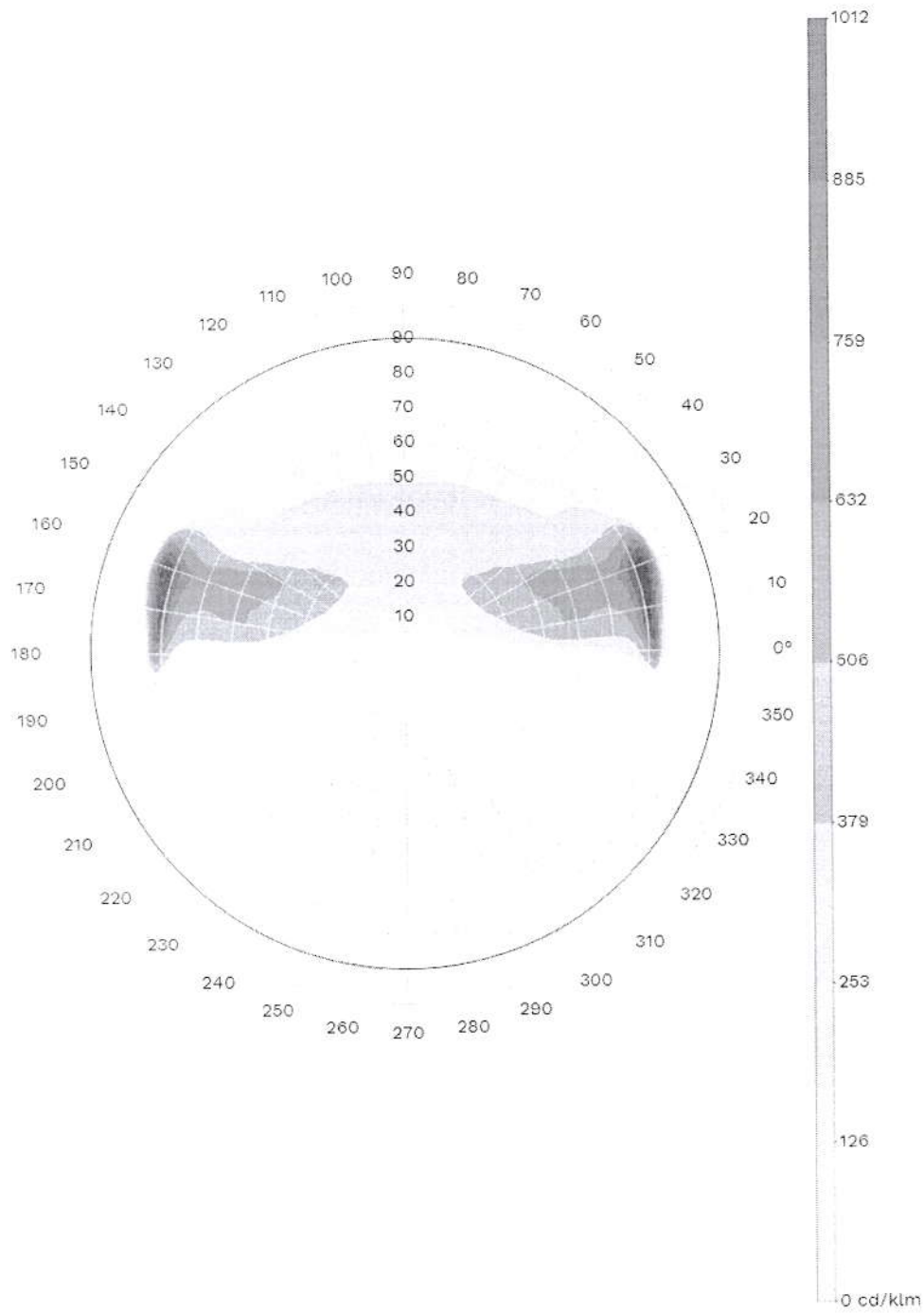
Axia 3 comes pre-cabled, hence there is no need to open the luminaire. The complete range is available with an integrated universal fixation part adapted for post-top and side-entry mounting on various spigots (Ø32mm with adapter, Ø42-48mm, Ø60mm and Ø76mm). The inclination angle can be adjusted on-site for both post-top (-5°/+15°) and side-entry (-10°/+10°) configurations to optimise lighting, reduce power consumption and control light pollution.

This highly efficient, cost-effective and connected-ready luminaire, offers towns and cities the ideal solution to improve lighting levels, increase safety, generate energy savings and reduce their ecological footprint. Axia 3 is the ideal tool to provide another 25 years of efficiency, sustainability and safety.



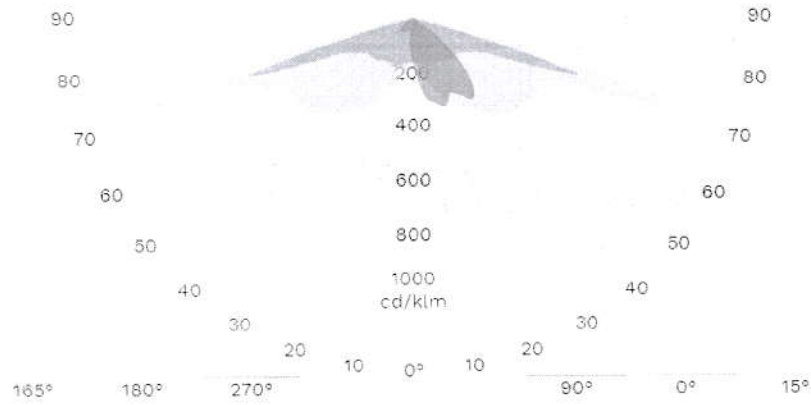
063



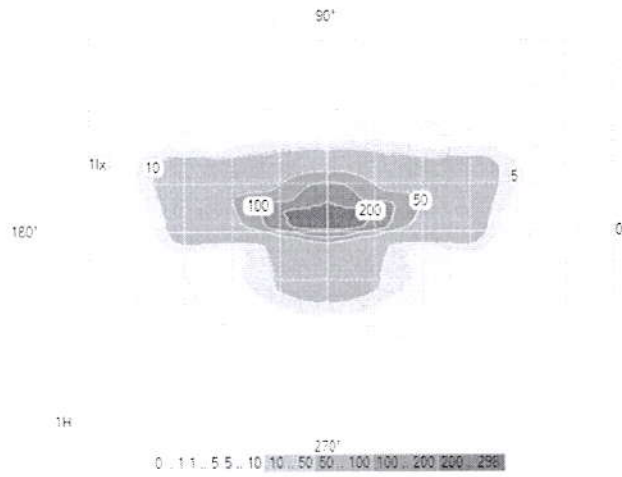


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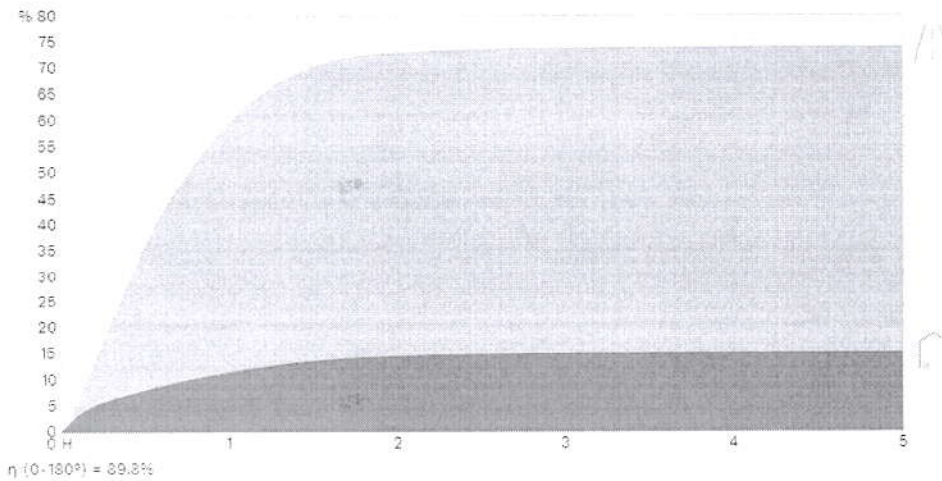
Polar/Cartesian diagram



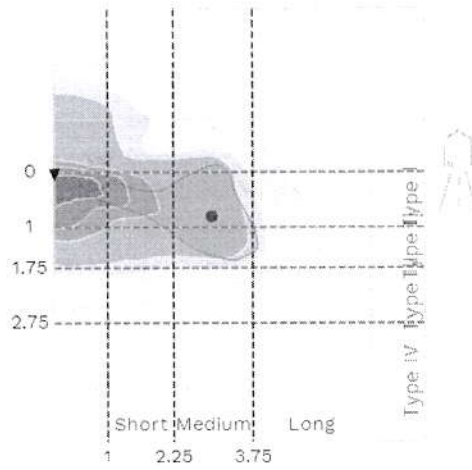
Isolux



K-Curve

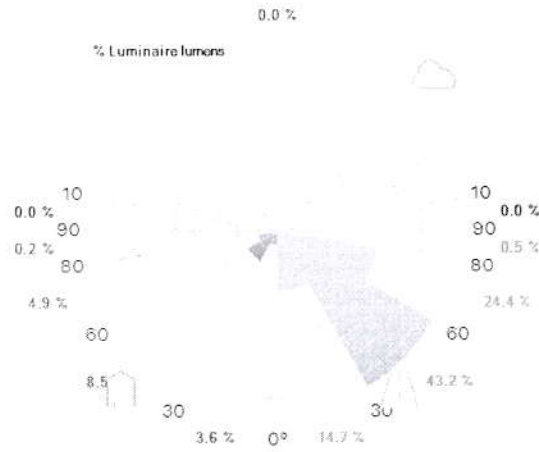


IES Roadway Classification / Nema Classification

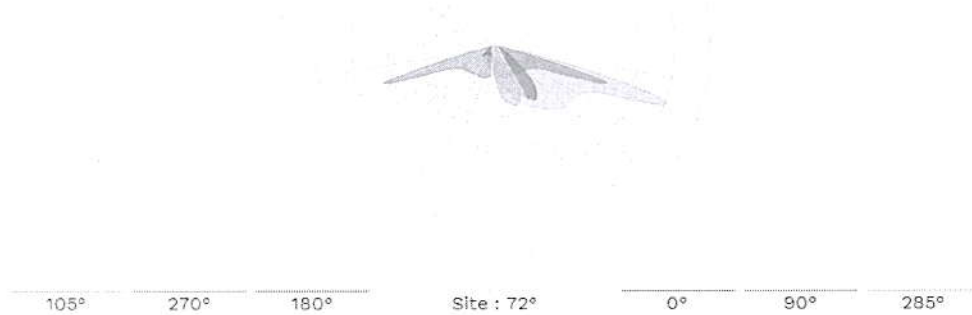


II - Medium

Luminaire classification system (LCS)



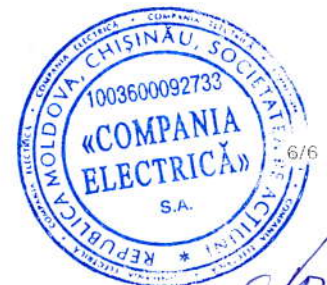
Intensity diagram in max Cone and in CPlane



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<http://www.schreder.com>

AXIA 3.1 - 5270 - 16 Osram OSOLON SQUARE GIANT - Integrated lenses - 429112





**LED Flux measurement**

FORM-L-41 ED1 REV 1

Date : 04-09-18

Operator : FCE

Filename : 2018\_505.xml



226 - TEST

NBN EN ISO/IEC 17025 : 2005

**LEDs**

Trademark : **Osram**

Entry number : **38R137-1**

Type : **OSLON SQUARE GIANT**

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

BIN Description : **N6**

Flux : **0** lm/LED

Part number : **GWCSSRM2.PM**

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

Number of LEDs : **16**

**Lenses**

Trademark : **None**

Type : **None**

**Power & Print**

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

Print description : **00-57-060 B - Axia 3.1**

Active

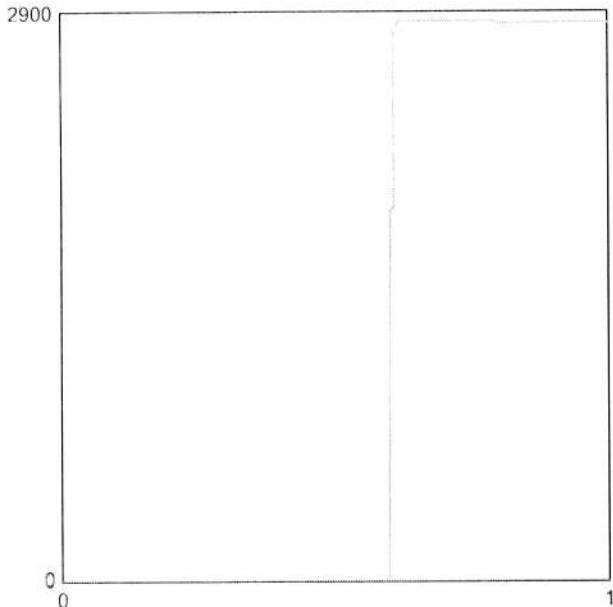
**Picture**



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### Sphere photometric measurement

Maximum flux :  lumens



### Operating condition

Position in sphere :

Ambient sphere T ° : **24,0**

### Electrical measurement

#### ● Secondary electrical measurement

Voltage : **44,59** V

Current : **0,350** A

Power : **15,60** Watt

→ LEDs light efficiency at 25° :

**182,9** lm/W

**178,4** 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 AXIA 3.1 - 16 Oslon Giant N6

Comment :

FORM-L-41 ED1 REV 1



226 - TEST

NBN EN ISO/IEC 17025 : 2005

Approved by :



LED 2018/505 2/3



226 - TEST

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Colorimetry

File: Preset Options Extra Calibration Info

Preset: CRI

Auto: ref. illuminant - Planckian radiator, CCT= 3871 K

R 1	68	R 11	51
R 2	76	R 12	45
R 3	83	R 13	43
R 4	71	R 14	61
R 5	88	R 15	61
R 6	67		
R 7	78		

Auto: ref. illuminant - Planckian radiator, CCT= 3871 K

Chromaticity difference DC= 4.3E-4

R1= 68.5	R9= 51.3	JIS color sample	R15= 60.9
R2= 76.3	R0= -32.3		
R3= 83.0	R10= 44.5		
R4= 71.3	R11= 68.5	Ra= 70.53	
R5= 66.2	R12= 42.8	(mean value of R1-R9)	
R6= 67.3	R13= 69.1	R#= 60.52	
R7= 78.2	R14= 90.2	(mean value of R1-R15)	

Target

Calibration File: Weighing Function: None

Measurement Mode: Radiance

Average: 51

Measurement: Cont. 50

Measurement: Held Integration Time

Measurement: Quick mode

Transfer data to table

auto

Luminance  $L_v$  4.721E+2  $\frac{cd}{m^2}$

Radiance  $L_w$  1.354E+0  $\frac{W}{sr \cdot m^2}$  (280-780nm)

Corr. Color Temp CCT 3871 K

Chromaticity x 0.3861 y 0.3798

Chromaticity u' 0.2277 v' 0.5077

QUIT



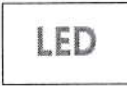
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### RTECH-PHOTOMETRY LABORATORY

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 Schröder group.



Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1	Inclination 0°	Request # FD39054
Type LED	BIN 40-70M-5-N6	Source Trademark Osram	Reference OSLON SQUARE GIANT	# LEDs 16	Reflector 5270	
Master	Reflector Schröder Led assembly Road lighting Assembled 0,0°					No 5270
Protector Refractor Lens						
Protector	integrated lenses					
Lens	Gaggione 5270 PC					
Laboratory observation						
Axia 3.1 with 16 Osram Oslon Giant bin N6. Used flux for efficiency matrix calculation = 2854 lm - CCT = 3871 K - CRI = 71,5 (see sphere test report 2018/505 on appendix).						
Purpose	DOC		Sample date 08-01-2019	Sample # 39R003		
Observation						
DOC Axia 3.1 with lenses 5270 rev. H.						
Flux coefficient multiplier (only for efficiency matrix): From 350 to 200 mA : 0,595 From 350 to 500 mA : 1,370 From 350 to 700 mA : 1,818 From 350 to 870 mA : 2,156						
Fixture powered with driver LG LLP 40W 0,2-0,6A 42-124Vdc PISE-A040X for matrix @200/350/500mA Fixture powered with driver LG LLP 40W 0,3-1,0A 20-67Vdc PISE-A040Y for matrix @700/870mA						
Notes						
The publication of this report in another form than the original one is not allowed without agreement of the laboratory. This report concerns type tests on one or a series of specimens.						

Asked by RCA	Measured by AUL	Approved by RLABO	Appendix 1	226 TEST NBN EN ISO/IEC 17025-2:2005		42911
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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram	Reference OSLON SQUARE GIANT	# LEDs 16	Reflector 5270			
Reflector	Schröder Led assembly Road lighting Assembled 0,0°				No	5270			
Matrices	429111		Φ 0-90° = 2564lm - 90-99° = 0lm		Absolute measurement				
Protector Refractor Lens	Protector integrated lenses Lens 16 x Gaggione 5270 PC								
Observation	<p>Matrix in total flux @350mA:</p> <p>Electrical measurement on LED (#1): Voltage = 44,19 V    Current = 0,350 A    Power = 15,47 W</p> <p>Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,083 A    Power = 18,16 W    PF = 0,947</p> <p><b>Total luminaire power = 18,16 W : Lm/Watt = 141,19 lm/W</b></p> <p>Driver #1 : See observations for driver details - PCBA: 00-57-060B</p>								
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date		↕	
15 - 165	2897	72	S	448	24,6°	20-03-2019			
90	1059	38	D						
270	448	0	G						
									42911



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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054	
Source		Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT		# LEDs 16	Reflector 5270
Reflector		Schröder Led assembly Road lighting Assembled 0,0°						No	5270
Matrices		429112		$\eta_{0-90^\circ} = 89,8\%$ - $90-99^\circ = 0,0\%$				Relative measurement	
Protector Refractor Lens		Protector integrated lenses Lens 16 x Gaggione 5270 PC							
Observation		<p>Matrix in efficiency @350mA</p> <p>Electrical measurement on LED (#1): Voltage = 44,19 V    Current = 0,350 A    Power = 15,47 W</p> <p>Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,083 A    Power = 18,16 W    PF = 0,947</p> <p><b>Total luminaire power = 18,16 W</b></p> <p>Driver #1 : See observations for driver details - PCBA: 00-57-060B</p>							
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date		↕	
15 - 165	1012	72	S	157	24,6°	20-03-2019			
90	371	38	D						
270	157	0	G						

42911



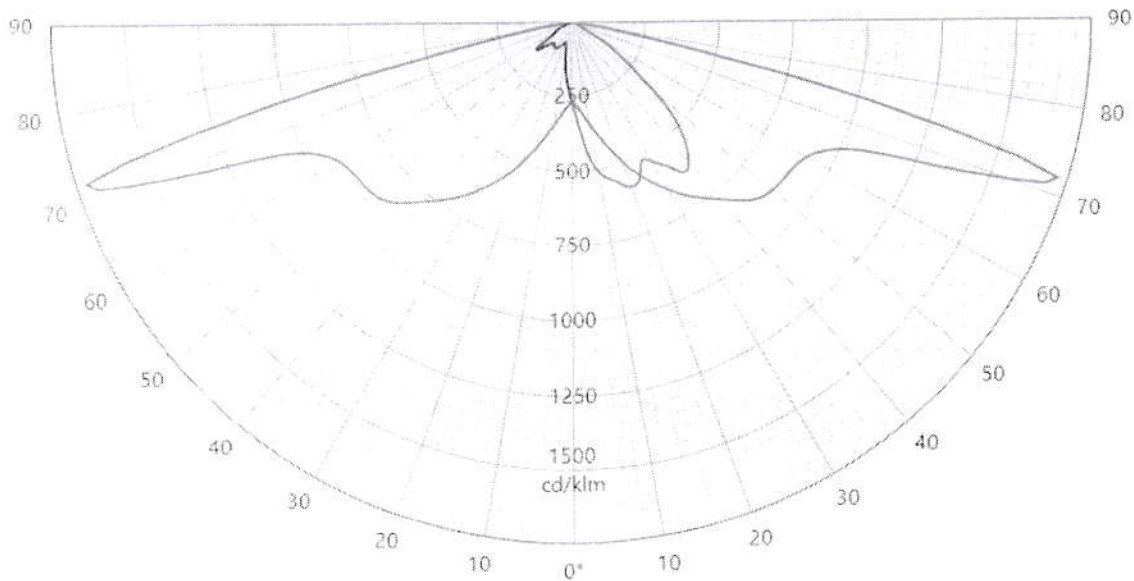
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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054		
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT	# LEDs 16	Reflector 5270			
Reflector	Schröder Led assembly Road lighting Assembled 0,0°					No	5270			
Matrices	429113	Φ 0-90° = 1526lm - 90-99° = 0lm					Absolute measurement			
Protector Refractor Lens	Protector integrated lenses Lens 16 x Gaggione 5270 PC									
Observation	Matrix in total flux @200mA  Electrical measurement on LED (#1): Voltage = 43,55 V Current = 0,200 A Power = 8,71 W Electrical measurement on driver (#1): Voltage = 230,00 V Current = 0,054 A Power = 10,94 W PF = 0,877 Total luminaire power = 10,94 W : lm/Watt = 139,45 lm/W  Driver #1 : See observations for driver details - PCBA: 00-57-060B									

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
15 - 165	1718	72	S	267	24,5°	20-03-2019	
90	630	38	D				
270	267	0	G				



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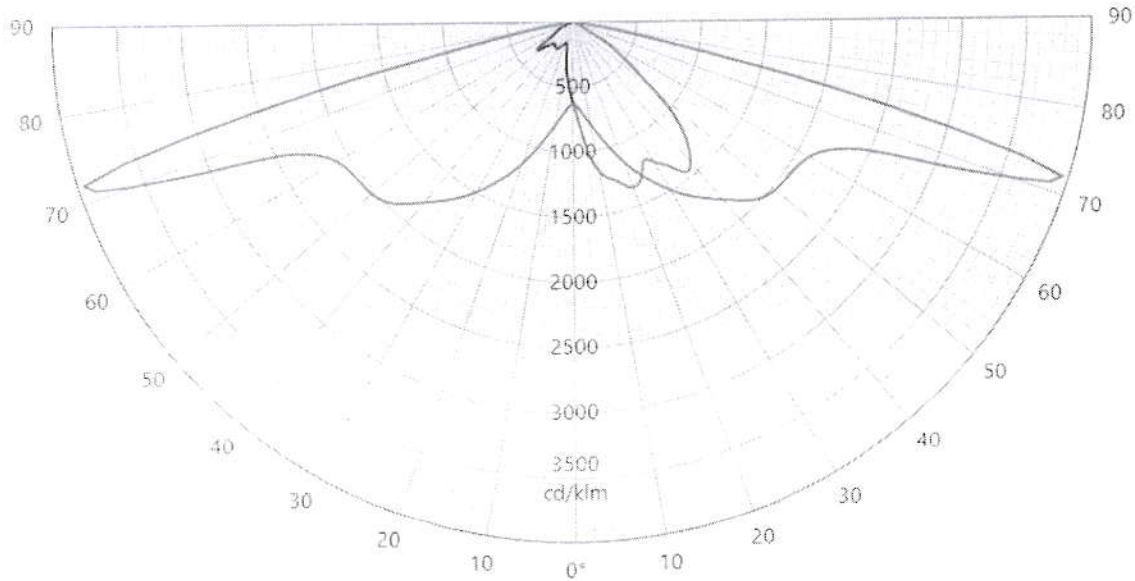


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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT	# LEDs 16	Reflector 5270		
Reflector	Schröder Led assembly Road lighting Assembled 0,0°						No	5270	
Matrices	429114	Φ 0-90° = 3513lm - 90-99° = 0lm						Absolute measurement	
Protector Refractor Lens	Protector integrated lenses Lens 16 x Gaggione 5270 PC								
Observation	Matrix in total flux @500mA  Electrical measurement on LED (#1): Voltage = 44,64 V    Current = 0,500 A    Power = 22,32 W Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,114 A    Power = 25,60 W    PF = 0,973 <b>Total luminaire power = 25,60 W : Lm/Watt = 137,21 lm/W</b>  Driver #1 : See observations for driver details - PCB A: 00-57-060B								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
15 - 165	3956	72	S	614	24,5°	20-03-2019	
90	1451	38	D				
270	614	0	G				



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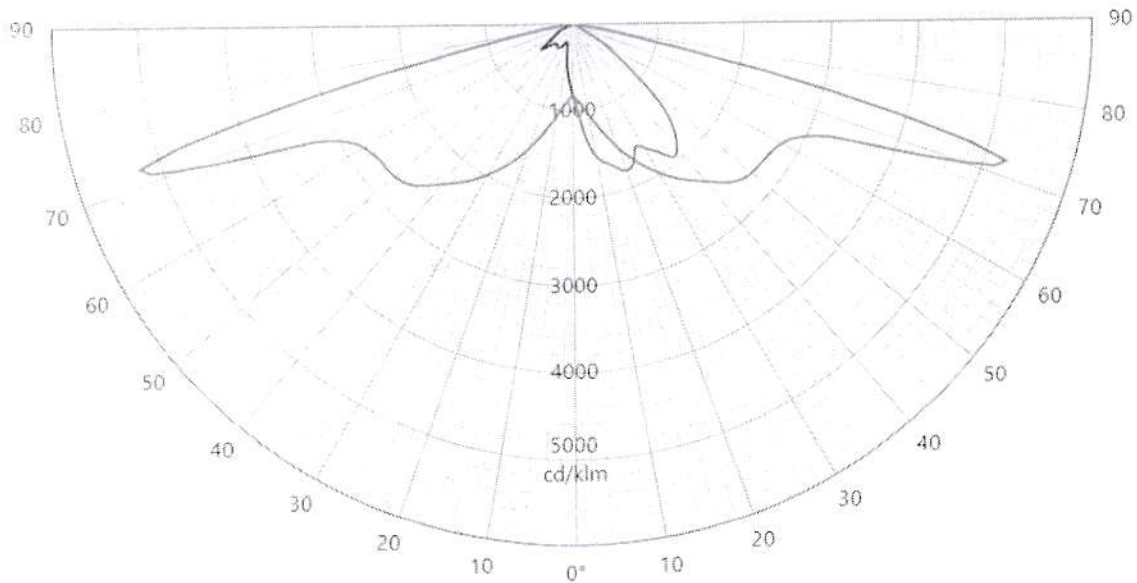


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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054		
Source		Type LED	BIN 40-70M-5-N6	Trademark Osram		Reference OSLON SQUARE GIANT		# LEDs 16	Reflector 5270	
Reflector		Schröder Led assembly Road lighting Assembled 0,0°						No	5270	
Matrices		429115 $\Phi$ 0-90° = 4661lm - 90-99° = 0lm						Absolute measurement		
Protector Refractor Lens		Protector integrated lenses Lens 16 x Gaggione 5270 PC								
Observation		<p>Matrix in total flux @700mA:</p> <p>Electrical measurement on LED (#1): Voltage = 45.11 V    Current = 0,700 A    Power = 31.58 W</p> <p>Electrical measurement on driver (#1): Voltage = 290.00 V    Current = 0,158 A    Power = 35.79 W    PF = 0,985</p> <p><b>Total luminaire power = 35,79 W : lm/Watt = 130,24 lm/W</b></p> <p>Driver #1 : See observations for driver details - PCBA: 00-57-060B</p>								

Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date	↕
15 - 165	5249	72	S	815	24,6°	20-03-2019	
90	1926	38	D				
270	815	0	G				



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### LUMINOUS INTENSITY DIAGRAM

Origin Schröder Socelec S.A.		Production Schröder Socelec S.A.		Luminaire AXIA 3.1		Inclination 0°		Request # FD39054	
Source	Type LED	BIN 40-70M-5-N6	Trademark Osram	Reference OSLON SQUARE GIANT	# LEDs 16	Reflector 5270			
Reflector	Schröder Led assembly Road lighting Assembled 0,0°					No	5270		
Matrices	429116	Φ 0-90° = 5528lm - 90-99° = 0lm				Absolute measurement			
Protector Refractor Lens	Protector integrated lenses Lens 16 x Gaggione 5270 PC								
Observation	<p>Matrix in total flux @870mA</p> <p>Electrical measurement on LED (#1): Voltage = 45,48 V    Current = 0,870 A    Power = 39,57 W</p> <p>Electrical measurement on driver (#1): Voltage = 230,00 V    Current = 0,196 A    Power = 44,70 W    PF = 0,990</p> <p>Total luminaire power = 44,70 W : Lm/Watt = 123,67 lm/W</p> <p>Driver #1 : See observations for driver details :    PCBA: 00-57-060B</p>								
Plane	I Peak	Peak position	Index	I zero	Laboratory ambient t°	Measurement date		↕	
15 - 165	6225	72	S	966	24,5°	20-03-2019			
90	2284	38	D						
270	966	0	G						
									42911



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## 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 50Hz 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 Schröder format)  
 .ldt format (European standard)  
 JES format (American standard)

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

