TEST REPORT CONCERNING THE COMPLIANCE OF A LED LIGHTNING TUBE-150, BRAND LEDLIGHTING B.V., WITH THE STANDARDS EN 55015: 2007 INCLUDING AMD A1: 2007 AND A2: 2009, EN 61547: 2009, EN 61000-3-2: 2006 INCLUDING AMD A1: 2009 AND A2: 2009, EN 61000-3-3: 2008

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Industry Canada	: 2932G-1
VCCI Registered	: R-1518, C-1598
R&TTE, LVD, EMC Notified Body	: 1856

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Description of test item

Test items	:	Led Lighting Tube
Manufacturer	:	LedLighting b.v.
Brand	:	LedLighting b.v.
Model/Version	:	EE-2176
Serial #/ID	:	262031
Receipt date	:	April 13, 2010

Applicant information

Applicant's representative	:	Ms. N. Weekers
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Test(s) performed

Location	:	Niekerk
Test(s) started	:	April 21, 2010
Test(s) completed	:	May 7, 2010
Purpose of tests	:	Compliance with standards
Test specification(s)	:	EN55015: 2007 including A1: 2007 and A2:2009; EN 61547:2009; EN 61000-3-2: 2006, including A1: 2009 and A2: 2009 and EN61000-3-3:2008.
Project leader	:	A.W. Kars
Test engineer	:	A.J.K Hut
Report written by	:	A.J.K Hut
Report approved by	:	T.E.T. Koning
Report date	:	May 10, 2010

Table of contents

1 General.

1.1 Applied standards.

The Led lightning tube, brand LedLighting b.v., as described in this report in paragraph 2.1.1, has been tested in conformity with the standards:

EN 55015: 2007 including A1:2007 and A2:2009. Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

EN 61547: 2009 Equipment for general lighting purposes – EMC immunity requirements.

EN 61000-3-2: 2006 including A1:2009 and A2:2009. Limits for harmonic current emissions.

EN61000-3-3: 2008. Limits of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16A per phase and not subject to conditional connection.

1.2 Description of EUT.

The Led lightning tube, brand LedLighting b.v., as described in this report in paragraph 2.1.1, will be referred to as EUT for the purpose of this test report.

2 Test conditions.

2.1 General.

Environmental condition	Parameter	Range
Temperature	°C	20 – 22
Relative humidity	%	30 – 50
Air pressure	hPa	990 - 1030
Supply voltage	Volts AC	230V 50Hz

The system was configured for testing in a typical fashion (as a customer would normally use it). During all tests the EUT was set up to function in accordance with the manufacturer's instructions.

2.1.1 Description of test configuration.

Test item (EUT)	:	Led Lighting Tube
Manufacturer	:	LedLighting b.v.
Brand	:	LedLighting b.v.
Model/partnumber	:	EE-2176
Serial #/ID	:	262031
Voltage input rating	:	230 V AC 50Hz

2.1.2 Description of tested input and output ports EUT.

Number	Terminal	From	To	Length
1	AC Power	Mains	EUT	1.5 m

2.1.3 Operation mode(s).

Operation mode 1: Lamp burning at 100% power level.

3 Emission.

The EUT has been tested in conformity with the standards:

EN 55015: 2007 including A1:2007 and A2:2009: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

EN 61000-3-2:2006 including A1:2009 and A2:2009. Limits for harmonic current emissions.

EN 61000-3-3:2008. Limits of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16A per phase and not subject to conditional connection.

3.1 AC mains power input ports.

The disturbance voltage levels at the AC mains power input port of the EUT to be measured in conformity with- and according to the criteria as stated below. Tested in mode 1 and at port 1. The results are stated in Table 2 and 3.

Basic standard	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Test set-up	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Frequency range 1	:	9 kHz –50 kHz
Limit	:	110 dB(μV)
Frequency range 2	:	50 kHz – 150 kHz
Limit	:	90 - 80 dB(μV)
Frequency range 3	:	0.15 MHz – 0.5 MHz
Limit	:	66.0 – 56.0 dB(μV) quasi peak, 56.0 – 46.0 dB(μV) average
Frequency range 4	:	0.5 – 5.0 MHz
Limit	:	56.0 dB(μV) quasi peak, 46.0 dB(μV) average
Frequency range 5	:	5.0 - 30 MHz
Limit	:	60.0 dB(μV) quasi peak, 50.0 dB(μV) average

Result of the measurements concerning the emission of disturbance voltage levels at the AC mains input port of the EUT	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 21, 2010
REMARKS: **None**	

Utilized test equipment:

Inventory number	Description	Brand	Type
12507	Artificial mains network 3-phase	Rohde & Schwarz	ESH2-Z5
13313	Impulse limiter	Rohde & Schwarz	ESH3Z2.357...
15667	EMI test receiver	Rohde & Schwarz	ESCS 30
99113	Probe	Rohde & Schwarz	TK9416

Frequency	Measured values (QP)		Limits *)
	Line	Neutral	
(MHz)	(dBµV)	(dBµV)	(dBµV)
0.009- 0.05	< 60.0	<60.0	110.0
0.05 – 0.15	< 50.0	< 50.0	90.0 – 80.0
0.15 – 0.5	< 50.0	< 50.0	66.0-56.0
Except for:			
0.18	51.5	51.9	64.5
0.5-5.0	< 45.0	< 45.0	56.0
5.0-30.0	< 35.0	< 35.0	56.0
Except for:			
2.47	39.4	38.5	60.0

*) Limits of all emission standards as stated in this report

Table 1

The results of the measurements, carried out in conformity with the standard, EN 55015: 2007 including A1:2007 and A2:2009, concerning conducted disturbance levels, emitted by the EUT in the configuration and operation mode(s) as stated in this test report, are depicted in table 1. Results are quasi-peak values.

Frequency	Measured values (AV)		Limits *)
	Line	Neutral	
(MHz)	(dBµV)	(dBµV)	(dBµV)
0.15 – 0.5	< 20.0	<20.0	56.0-46.0
Except for:			
0.18	23.8	23.5	53.0
0.5-5.0	< 25.0	< 25.0	46.0
5.0-30.0	< 35.0	< 35.0	50.0
Except for:			
2.47	38.6	36.9	46.0

*) Limits of all emission standards as stated in this report

Table 2

The results of the measurements, carried out in conformity with the standard, EN 55015: 2007 including A1:2007 and A2:2009, concerning conducted disturbance levels, emitted by the EUT-1 in the configuration and operation mode(s) as stated in this test report, are depicted in table 2. Results are average values.

Photo 2. Test set-up during conducted emission tests

3.1.1 Enclosure

The radiated field strength levels (electric component) have been measured in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Test set-up	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Measuring distance	:	10 meters
Frequency range 1	:	30 MHz - 230 MHz
Limits	:	30 dB(μV/m)
Frequency range 2	:	230 MHz - 1000 MHz
Limits	:	37 dB(μV/m)

Detailed results of the measurements concerning radiated field strength levels (electric component), emitted by the EUT, are depicted in table 3 of this test report.

Result of the measurements concerning radiated electromagnetic fields (electric component) emitted by the EUT (enclosure)	**PASS / ~~FAIL~~ / ~~NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K Hut  April 29, 2010
REMARKS: **None**	

Utilized test equipment:

Inventory number	Description	Brand	Type
12636	Plastic measurement room	Polyforce	-
13886	Open Area Test Site	Comtest	-
14277	Antenna mast 4.7m	Shoshin	AP-4702C
14278	Controller OATS	Comtest	4630-100
15633	Biconilog antenna 30MHz – 1000MHz	Chase	CBL6111B
15667	EMI test receiver 9kHz – 2.75Ghz	Rohde & Schwarz	ESCS 30
99108	Turntable OATS	Heinrich Deisel	HD050
99608	Controller antenna mast	EMCS	DOC-202
12526	Field site source	EMCO	Model 4610
99071	Coax cable	Intercond	RG213
99069	Coax cable (for 10m)	Intercond	RG213

Frequency (MHz)	Measurement results dB(µV)/m @ 10 meters Quasi-peak		Limits dB(µV)/m @ 10 meters Quasi-peak (Class B)	Result
	Vertical	Horizontal		
30.0-230.0	<15.0	<15.0	30.0	PASS
Except for: 30.7	18.9	<<	30.0	PASS
230.0-1000.0	<25.0	<25.0	37.0	PASS

Table 3

The results of the measurements, carried out in conformity with the standard EN 55015: 2007 including A1:2007 and A2:2009 concerning radiated disturbance levels, emitted by the EUT-1 in the configuration and operation mode(s) as stated in this test report, are depicted in table 3. Results are Quasi-Peak values.

Photo 3. Radiated Emission setup

3.2 Harmonic current emissions.

The emission of harmonic currents at the AC mains connection terminals of the EUT to be measured in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard : EN 61000-3-2: 2006 including A1:2009 and A2:2009
Test set-up : EN 61000-3-2: 2006 including A1:2009 and A2:2009
Frequency range : 100 Hz - 2000 Hz

Result of the measurements concerning the emission of harmonic currents at the AC mains connection terminals of the EUT.	**PASS / ~~FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **As the LED tube is not a discharge lamp, Par. 7.3. a of EN 61000-3-2: 2006 is not applicable. Also Table 2 (Class C products) is not applicable because the lamp is < 75 W. Therefore these results are meant as indicative.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15354	Profline interface	Schaffner	CCN2000-3P/5
99009	Blind cover	Schaffner	-
99030	Universal power analyzer/flicker meter	Voltech	PM 3000A
99031	Profline AC switching unit	Schaffner	888-0165-V2.30
99032	AC power source	Schaffner	3120-AMX
99033	AC power source	Schaffner	3120-AMX
99034	Magnetic module	Schaffner	134350
99035	Magnetic module	Schaffner	134350
99036	Personal computer	Dell	Dimension 133
99037	System cabinet	Schaffner	30U/He
99038	System cabinet	Schaffner	30U/He

Power: 31.42 W, Power Factor: 0.96, I = 0.14Amp			
	Measured value	Limit EUT as	Verdict for
Harm #	EUT	Class C	Class C
	(A)	(A) *)	(PASS/FAIL)
1	0.139500	-- -- --	---
2	0.00989	0.0027804	PASS
3	0.19650	0.04003776	PASS
4	0.001809	-- -- --	PASS
5	0.7053	0.013902	PASS
6	0.000828	-- -- --	PASS
7	0.2618	0.0097314	PASS
8	0.00044	-- -- --	PASS
9	0.10141	0.006951	PASS
10	0.000261	-- -- --	PASS
11	0.081	0.0041706	PASS
12	0.000152	-- -- --	PASS
13	0.03272	0.0041706	PASS
14	0.000326	-- -- --	PASS
15	0.04486	0.0041706	PASS
16	0.000103	-- -- --	PASS
17	0.03844	0.0041706	PASS
18	0.000153	-- -- --	PASS
19	0.03029	0.0041706	PASS
20	0.000182	-- -- --	PASS
21	0.02886	0.0041706	PASS
22	0.000047	-- -- --	PASS
23	0.018531	0.0041706	PASS
24	0.000053	-- -- --	PASS
25	0.017146	0.0041706	PASS
26	0.000122	-- -- --	PASS
27	0.014252	0.0041706	PASS
28	0.000133	-- -- --	PASS
29	0.011933	0.0041706	PASS
30	0.000108	-- -- --	PASS
31	0.012713	0.0041706	PASS
32	0.000039	-- -- --	PASS
33	0.010578	0.0041706	PASS
34	0.000074	-- -- --	PASS
35	0.010474	0.0041706	PASS
36	0.000023	-- -- --	PASS
37	0.009457	0.0041706	PASS
38	0.000052	-- -- --	PASS
39	0.008025	0.0041706	PASS
40	0.000088	-- -- --	PASS

*) Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency

Table 4. Results mains harmonics

3.3 Voltage fluctuations and flicker.

Voltage fluctuations and flicker at the AC mains connection terminals of the EUT to be measured in conformity with- and according to the criteria as stated below.

Basic standard : EN 61000-3-3: 2008
Test set-up : EN 61000-3-3: 2008

Result of the measurements concerning voltage fluctuations and flicker at the AC mains connection terminals of the EUT.	**PASS / ~~FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **None**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15354	Profline interface	Schaffner	CCN2000-3P/5
99009	Blind cover	Schaffner	-
99030	Universal power analyzer/flicker meter	Voltech	PM 3000A
99031	Profline AC switching unit	Schaffner	888-0165-V2.30
99032	AC power source	Schaffner	3120-AMX
99033	AC power source	Schaffner	3120-AMX
99034	Magnetic module	Schaffner	134350
99035	Magnetic module	Schaffner	134350
99036	Personal computer	Dell	Dimension 133
99037	System cabinet	Schaffner	30U/He
99038	System cabinet	Schaffner	30U/He

	DC	dMax	dT	PST	PLT
Limits ➔	3.0	4	200	1	---
Test-1	0.0168	0.0916	0.00	0.0719	---

Table 5

The results of the flicker level measurements, carried out in conformity with the standards EN 61000-3-3: 2008 at the mains power supply line of the EUT, in the configuration and operation mode(s) as stated in this test report, are depicted in table 5.

Photo4: EUT during the test

3.4 Enclosure Magnetic Component.

The radiated field strength levels (magnetic component) have been measured with the 2-meter Large Loop Antenna System (LLAS) in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Test set-up	:	EN 55015: 2007 including A1: 2007 and A2: 2009
Frequency range 1	:	9 kHz - 70 kHz
Limits	:	88 dB(μA)
Frequency range 2	:	70 kHz - 150 kHz
Limits	:	88 to 58 dB(μA)
Frequency range 3	:	150 kHz – 2.2 MHz
Limits	:	58 to 26 dB (μA)
Frequency range 4	:	2.2 MHz - 3 MHz
Limits	:	58 dB(μA)
Frequency range 5	:	3 MHz - 30 MHz
Limits	:	22 dB(μA)

Result of the measurements concerning radiated electromagnetic fields (magnetic component) emitted by the EUT (enclosure of ancillary equipment measured on a stand-alone basis).	**PASS / ~~FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **None**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15112	Triple loop antenna 2 meter	Rohde & Schwarz	HM020
15113	Antenna Control unit	Rohde & Schwarz	BG020
12491	Receiver 9kHz – 30MHz	Rohde & Schwarz	ESH3
12493	Spectrum monitor	Rohde & Schwarz	EZM

Frequency range (MHz)	Measurement results dB(µA) Quasi-peak	Frequency MHz	Limits dB(µA) Quasi-peak	Result
9kHz – 70kHz	< 20.0	---	88	PASS
70kHz – 150kHz	30.2	0.1058	88 to 58	PASS
150kHz – 2.2MHz	30.2	0.577	51 to 26	PASS
2.2 – 3.0 MHz	< 20.0	-	58	PASS
3.0MHz – 30MHz	15.0	15.81	22	PASS

Table 6

Emission results of the EUT, measured in accordance with EN 55015:2007 including A1: 2007 and A2: 2009

Notes:

1. (QP) quasi peak detector
2. The reported field strength values are the worst-case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna and maximizing EUT wiring.

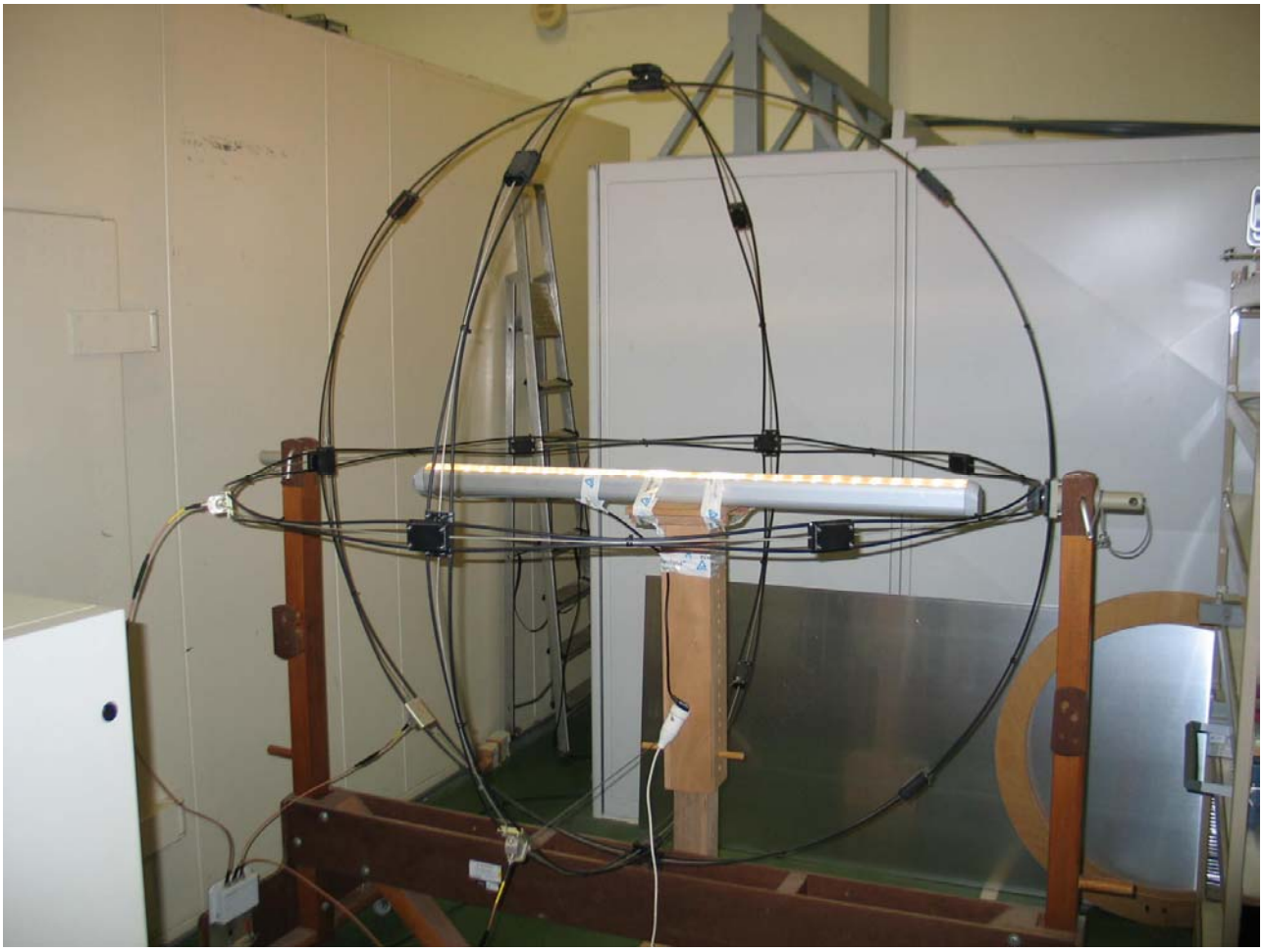


Photo 5 EUT during the magnetic emission test.

4 Immunity.

The EUT has been tested in conformity with parts of the standards:

EN 61547: 2009 Equipment for general lighting purposes – EMC immunity requirements

4.1 Performance criteria.

The general principles (performance criteria) for the evaluation of the immunity test results are given below. The details are in EN 61547:2009.

4.1.1 Performance criterion A.

During testing, normal performance, no change of settings after start-up shall occur during testing.

4.1.2 Performance criterion B.

During testing, temporary degradation, or loss of function or change of settings after start-up may occur during testing which is self recovering after finishing testing.

4.1.3 Performance criterion C.

During testing, temporary degradation, or loss of function or change of settings after start-up may occur during testing which requires operator intervention or system reset after testing.

4.2 Enclosure port.

4.2.1 Radio-frequency electromagnetic field. Amplitude modulated.

The susceptibility of the EUT to radio-frequency electromagnetic fields has been tested based upon the criteria as stated below. Tested in mode 1

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-3: 2006
Frequency range	:	80 MHz - 1000 MHz
Field strength level	:	3V_{rms}/m (selected without modulation, applied with modulation)
Modulation	:	1 kHz, modulation depth 80%
Performance criterion	:	A

Result of the tests concerning the susceptibility of the EUT to radio-frequency electromagnetic fields (amplitude modulated, enclosure port)	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K Hut  April 21, 2010
REMARKS: **During and after the tests no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
12527	Generator 10kHz – 5.4GHz	Marconi	Model 2032
80000+80001	RF measuring probe system 0.5-6GHz	Holaday	HI-4416+HI4433
12485	Biconical antenna 30MHz - 200MHz	Eaton	
80052	Log per antenna 200MHz – 1000MHz	Comtest	96005
12483	Guide horn antenna 1GHz – 18GHz	Emco	3115
13886	Open Area Test Site	Comtest	--
12636	Plastic measurement room	Polyforce	--
99130	Amplifier 1-200MHz 80W	EATON	5020B
99133	Amplifier 100-512MHz 50W	EATON	3552B
99134	Amplifier 500-1000MHz 25W	EATON	15100B
13826	Amplifier 1-2GHz 30 W	Milmega	AS0102
80005	Amplifier 2-4GHz 15W	Milmega	AS0204

Photo 4. Set-up RF Radiated Immunity

4.2.2 Electrostatic discharge.

The susceptibility of the EUT to electrostatic discharges has been tested in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-2: 2008
Test levels	:	±4 kV and ±8 kV air discharge ±2 kV and ±4 kV contact discharge
Performance criterion	:	B

Result of the tests concerning the susceptibility of the EUT to electrostatic discharges (enclosure port)	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **During and after testing no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
99002	ESD simulator system	Schaffner	NSG 435-01
99604	ESD validation unit	TUV	
99660+99661	Resistor 470K	Philips	

4.3 Signal ports.

4.3.1 Radio-frequency (common mode). Amplitude modulated.

The susceptibility of the EUT to radio-frequency (common mode)[1)], amplitude modulated, to be tested based upon the criteria as stated below.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-6: 2007
Frequency range	:	0.15 MHz - 80 MHz
Test level	:	3 V_{rms} (selected without modulation, applied with modulation)
Modulation	:	1 kHz, modulation depth 80%
Source impedance	:	150 Ohms
Performance criterion	:	A

Note[1)] : Conducted only on ports interfacing with cables whose total length, according to the manufacturer's functional specification, may exceed 3 meters

Result of the tests concerning the susceptibility of the EUT to radio-frequency (common mode, amplitude modulated, ports for signal lines including telecommunication ports)	~~**PASS / FAIL /**~~ **NOT APPLICABLE**
Name of test engineer: Signature: Date:	A.J.K Hut  April 29, 2010
REMARKS: **EUT has no signal ports**	

4.3.2 Fast transients.

The susceptibility of the EUT to fast transients to be tested based upon the criteria as stated below.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-4: 2005
Test level	:	± 0.5 kV
Tr/Th	:	5/50 ns
Repetition frequency	:	5 kHz
Performance criterion	:	B

Note[1)] : Conducted only on ports interfacing with cables whose total length, according to the manufacturer's functional specification, may exceed 3 meters

Result of the tests concerning the susceptibility of the EUT to fast transients	~~PASS / FAIL /~~ **NOT APPLICABLE**
Name of test engineer:	A.J.K. Hut
Signature:	
Date:	April 29, 2010
REMARKS: **EUT has no signal ports**	

4.4 AC input and AC output power ports.

4.4.1 Radio-frequency (common mode). Amplitude modulated.

The susceptibility of the EUT to radio-frequency (common mode), amplitude modulated, has been tested based upon the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-6: 2007
Frequency range	:	0.15 MHz - 80 MHz
Test level	:	3 V_{rms} (selected without modulation, applied with modulation)
Modulation	:	1 kHz, modulation depth 80%
Source impedance	:	150 Ohms
Performance criterion	:	A

Result of the tests concerning the susceptibility of the EUT to radio-frequency (common mode, amplitude modulated, AC input and AC output power ports)	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K Hut  April 29, 2010
REMARKS: **During and after testing no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15690	Signal generator 0.1 MHz - 1000 MHz	Rohde & Schwarz	SMG
15627	Amplifier 10 kHz - 250 MHz, 75 Watts	Amplifier Research	75A250
99039	Attenuator 6 dB	Trilithic	HFP-560/6-NM/NF
99138	RF injection clamp	Lüthi	EM101
99393	Power meter	Rohde & Schwarz	NRVD
99395	Power sensor, 2 mV - 100 V	Rohde & Schwarz	URV5-Z4
59601/x	CDN coupling devices	Air Parts	Mx
-	Test software conducted immunity	Rohde & Schwarz	ES-K1
-	Personal computer + monitor	Hewlett-Packard	HP Vectra VE 5/75

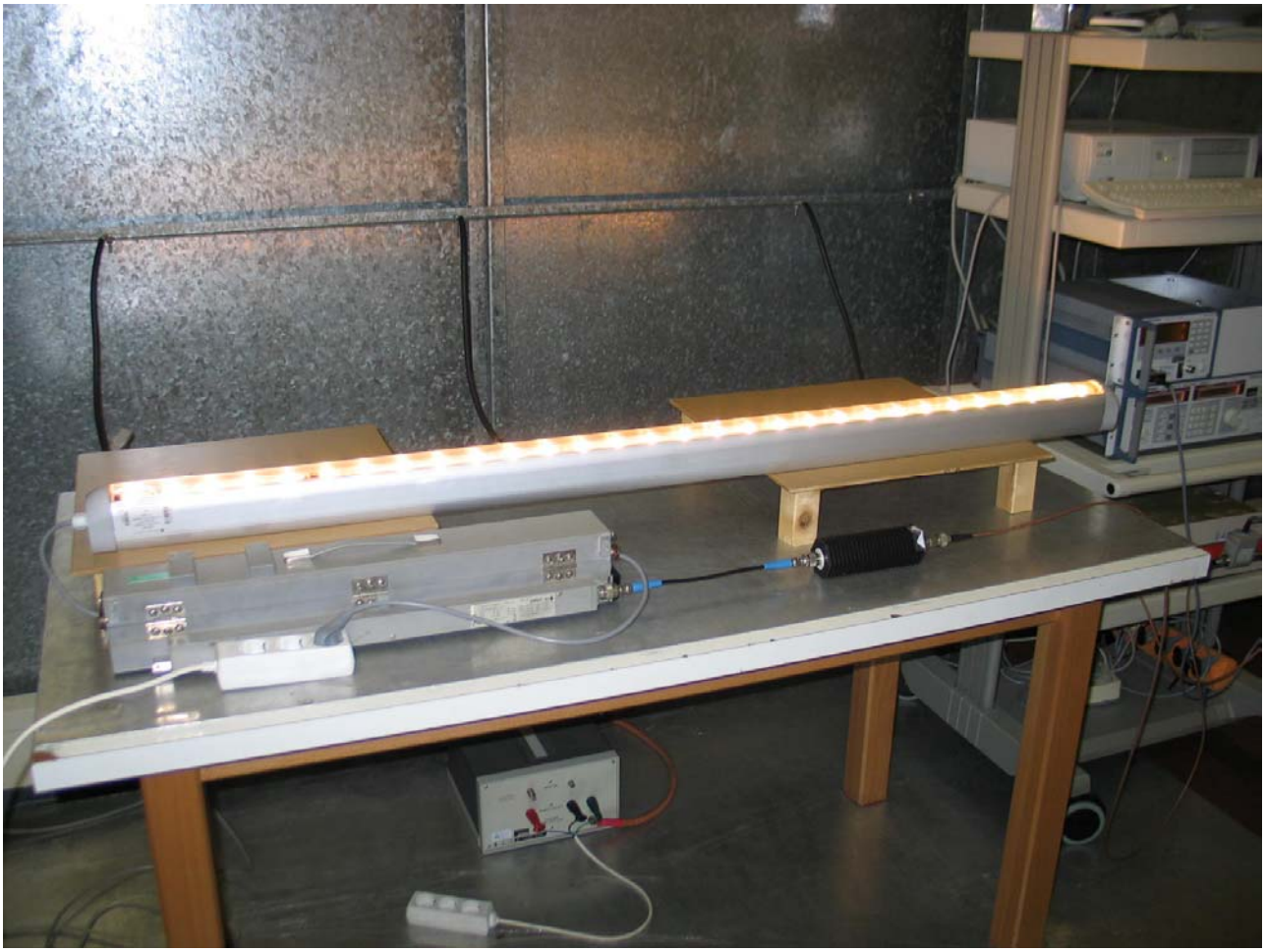


Photo 5 EUT during the test.

4.4.2 Surges.

The susceptibility of the EUT to surges[1)] has been tested based upon the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-5: 2007
Test level 1	:	±0.5 kV, ±1.0 kV
Test level 2	:	±2 kV
Tr/Th	:	1.2/50 (8/20) μs
Number of pulses	:	5
Performance criterion	:	B

Note[1)] : Applicable only to input ports

Result of the tests concerning the susceptibility of the EUT to surges (AC input and AC output power ports)	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **During and after testing no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15108	Surge simulator syst. mainframe 25A	Schaffner	NSG 2050
15111	Pulse network 1.2/50 μs 6.6 kV 3.3 kA	Schaffner	PNW 2050
99004	3-phase coupling network 25A	Schaffner	CDN 133
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99008	Blind cover	Schaffner	-
99010	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99029	Software control package	Schaffner	WIN 2050

Photo 6. EUT during the surge test.

4.4.3 Fast transients (common mode).

The susceptibility of the EUT to fast transients (common mode) has been tested based upon the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-4: 2007
Test level	:	± 2 kV
Tr/Th	:	5/50 ns
Repetition frequency	:	5 kHz
Performance criterion	:	B

Result of the tests concerning the susceptibility of the EUT to fast transients (common mode, AC input and AC output power ports)	**PASS / ~~FAIL~~ / ~~NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **During and after testing no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15110	Three phase burst simulator system	Schaffner	NSG 2025-4
99001	IEC 1000-4-4 capacitive coupling clamp	Schaffner	CDN 126
99005	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99007	Blind cover	Schaffner	-
99014	Attenuator 30 dB for burst verification	Schaffner	INA 265
99015	Software control package	Schaffner	WIN 2025

Photo 7. Basic setup for EFT Immunity Testing

4.4.4 Voltage dips and interruptions.

The susceptibility of the EUT to voltage dips and interruptions[1)] to be tested in conformity with- and according to the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61547: 2009
Test set-up	:	EN 61000-4-11: 2004
Test level (a)	:	Residual of the supply voltage of 70% for 25 periods [2)]
Performance criterion	:	B
Test level (b)	:	Residual of the supply voltage of 40% for 10 periods [2)]
Performance criterion	:	C
Test level (c)	:	Residual of the supply voltage of 0% for 1 period [2)]
Performance criterion	:	B
Test level (d)	:	Residual of the supply voltage of 0% for 250 periods [2)]
Performance criterion	:	C

Note [1)]	:	Applicable only to input ports
Note [2)]	:	Voltage shift at zero crossing

Result of the tests concerning the susceptibility of the EUT to voltage dips and interruptions (AC input and AC output power ports at 50Hz)	**PASS ~~/ FAIL / NOT APPLICABLE~~**
Name of test engineer: Signature: Date:	A.J.K. Hut  April 29, 2010
REMARKS: **During and after testing no loss of performance.**	

Utilized test equipment:

Inventory number	Description	Brand	Type
15354	Profline interface	Schaffner	CCN2000-3P/5
99009	Blind cover	Schaffner	-
99030	Universal power analyzer/flicker meter	Voltech	PM 3000A
99031	Profline AC switching unit	Schaffner	888-0165-V2.30
99032	AC power source	Schaffner	3120-AMX
99033	AC power source	Schaffner	3120-AMX
99034	Magnetic module	Schaffner	134350
99035	Magnetic module	Schaffner	134350
99036	Personal computer	Dell	Dimension 133
99037	System cabinet	Schaffner	30U/He
99038	System cabinet	Schaffner	30U/He

5 Conclusion.

The Led lightning tube, brand LedLighting b.v., as described in this report in paragraph 2.1.1, complies with the standards:

EN 55015: 2007 including A1: 2007 and A2: 2009. Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

EN 61547: 2009 Equipment for general lighting purposes – EMC immunity requirements.

EN 61000-3-2: 2006 including A1: 2009 and A2: 2009. Limits for harmonic current emissions.

EN61000-3-3: 2008. Limits of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16A per phase and not subject to conditional connection.

Test Report issued under the responsibility of:

TÜVRheinland®
Electronic Products and Services (EPS) B.V.

TEST REPORT
IEC/EN 60598-1
Luminaires
Part 1: General requirements and tests

Report Reference No. .....:	10041204.s01
Date of issue.....:	July 01, 2010
Total number of pages.....	31
Testing Laboratory .....:	TÜV Rheinland EPS B.V.
Address .....:	Smidshornerweg 18, 9822TL Niekerk, the Netherlands
Applicant's name.....:	TÜV Rheinland Quality B.V.
Address .....:	Postbus 6235, 5600HE Eindhoven, the Netherlands
Test specification:	
Standard.....:	☐ IEC 60598-1:2003+A1:2006 ☒ EN 60598-1:2004+A1:2006
Test procedure .....:	TSD's EN60598-1, EVT, EVM, EVE
Non-standard test method……..:	N/A
Test Report Form No. .....:	IECEN60598-1
Test item description.....:	Stand alone LED lighting tube
Trade Mark .....:	LedLighting
Manufacturer .....:	LedLighting b.v.
Model/Type reference.....:	LedTube Color W2 / L=150cm, art.EE-2176
Ratings .....:	170-250VAC 50/60Hz 17-30W

Testing procedure and testing location:			
☒	**Testing Laboratory**:	TÜV Rheinland EPS B.V.	
Testing location/ address ..... :		Smidshornerweg 18, 9822TL Niekerk, the Netherlands	
☒	Testing procedure: All		
	Tested by (name + signature).....:	A.W. Kars	
	Approved by (+ signature) ..... :	L. van Kesteren	

Summary of testing:

The stand alone LED lighting tube, brand LEDLighting, model LedTube Color W2 / L=150cm, art.EE-2176, meets the requirements of the standard EN 60598-1:2004+A1:2006	**Testing location:** **TÜV Rheinland EPS B.V., Niekerk**

Summary of compliance with National Differences: -

Copy of marking plate

Photo's of the EUT

Luminaire

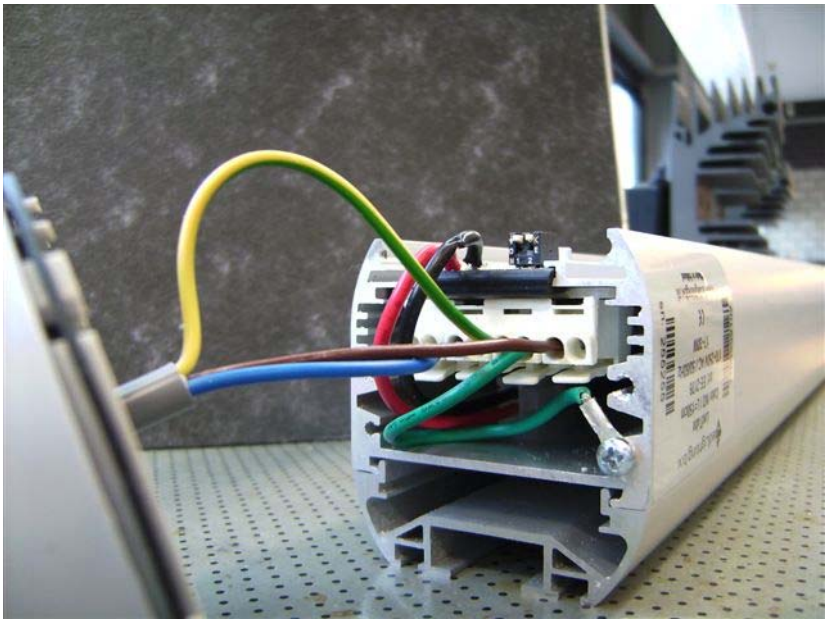
LED power supply

Photo's of the EUT

PCB IO3551

PCB IO3552

Photo's of the EUT



Cable input

Test item particulars.....:	
Classification of installation and use .....:	Class I, normal fixed general purpose luminaire
Supply Connection.....:	230VAC 50/60Hz
.....:	
.....:	
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	April 12, 2010
Date (s) of performance of tests .....:	June 24, 2010

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

General product information:

The LED luminaire has a TL shape and consist of 30 LED's powered by a certified LED power supply.

The LED's (6x) are mounted to a PCB mentioned IO3551; 24 LED's are mounted to three PCB's mentioned IO3552.

The housing is metal with a decorative cap.

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

0	**GENERAL TEST REQUIREMENTS**		
0.1	Information for luminaire design considered	Standard Yes ☒ No ☐	—
0.3	More sections applicable..... :	Yes ☐ No ☒	—

2	**CLASSIFICATION**		
2.2	Type of protection.....:	Class I	—
2.3	Degree of protection (Requirement: Ordinary).....:	IP67 (only for the built-in power supply)	—
2.4	Luminaire only suitable for non-combustible surfaces .....:	Yes ☒ No ☐	—
	Luminaire suitable for normally flammable surfaces.....:	Yes ☐ No ☒	—
	Luminaire suitable to be covered by insulating material .....:	Yes ☐ No ☒	—
2.5	Luminaire for normal use .....:	Yes ☒ No ☐	—
	Luminaire for rough service .....:	Yes ☐ No ☒	—

3	**MARKING**		**P**
3.2	Mandatory markings	Manufacturer, model, voltage, power	P
	Position of the marking		P
	Format of symbols/text		P
3.3	Additional information	See “Montage handleiding”	P
	Language of instructions	Dutch language	P
3.3.1	Combination luminaires		N/A
3.3.2	Nominal frequency in Hz	50/60Hz	P
3.3.3	Operating temperature		N/A
3.3.4	Symbol or warning notice		N/A
3.3.5	Wiring diagram	See “Montage handleiding”	P
3.3.6	Special conditions		N/A
3.3.7	Metal halide lamp luminaire – warning		N/A
3.3.8	Limitation for semi-luminaires		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
3.3.9	Power factor and supply current		N/A
3.3.10	Suitability for use indoors		P
3.3.11	Luminaires with remote control		N/A
3.3.12	Clip-mounted luminaire – warning		N/A
3.3.13	Specifications of protective shields	Metal shield	P
3.3.14	Symbol for nature of supply	Installed by manufacturer	P
3.3.15	Rated current of socket outlet	No socket outlets to the luminaire	N/A
3.3.16	Rough service luminaire		N/A
3.3.17	Mounting instruction for type Y, type Z and some type X attachments	Ordinary cord is mounted	N/A
3.3.18	Non-ordinary luminaires with PVC cable		N/A
3.4	Test with water		P
	Test with hexane		P
	Legible after test		P
	Label attached	Not easily to remove	P
4	**CONSTRUCTION**		
4.2	Components replaceable without difficulty	No replaceable components	N/A
4.3	Wireways smooth and free from sharp edges		P
4.4	Lampholders		N/A
4.4.1	Integral lampholder	No lampholders used in this luminaire	N/A
4.4.2	Wiring connection		N/A
4.4.3	Lampholder for end-to-end mounting		N/A
4.4.4	Positioning		N/A
	- pressure test (N) ..... :		N/A
	- bending test (N) ..... :		N/A
4.4.5	Peak pulse voltage		N/A
4.4.6	Centre contact		N/A
4.4.7	Parts in rough service luminaires resistant to tracking		N/A
4.4.8	Lamp connectors		N/A
4.4.9	Caps and bases correctly used		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.5	Starter holders		N/A
	Starter holder in luminaires other than class II	No starters used in this luminaire	N/A
	Starter holder class II construction		N/A
4.6	Terminal blocks		P
	Tails		P
	Unsecured blocks		N/A
4.7	Terminals and supply connections		P
4.7.1	Contact to metal parts		P
4.7.2	Test 8 mm live conductor		P
	Test 8 mm earth conductor		P
4.7.3	Terminals for supply conductors	Installed by manufacturer	P
4.7.3.1	Welded connections:		N/A
	- stranded or solid conductor	No welded conductor used	N/A
	- spot welding		N/A
	- welding between wires		N/A
	- Type Z attachment		N/A
	- mechanical test according to 15.8.2		N/A
	- electrical test according to 15.9		N/A
	- heat test according to 15.9.2.3 and 15.9.2.4		N/A
4.7.4	Terminals other than supply connection	Only secondary used	P
4.7.5	Heat-resistant wiring/sleeves	External cable suitable for that temperatures	N/A
4.7.6	Multi-pole plug	No multi-pole plug used	N/A
	- test at 30 N		N/A
4.8	Switches:		N/A
	- adequate rating	No switches used to this luminaire	N/A
	- adequate fixing		N/A
	- polarized supply		N/A
	- compliance with 61058-1 for electronic switches		N/A
4.9	Insulating lining and sleeves		N/A
4.9.1	Retainement	No such lining and sleeves used	N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Method of fixing ..... :		N/A
4.9.2	Insulated linings and sleeves		N/A
	a) & c) Insulation resistance and electric strength		N/A
	b) Ageing test. Temperature (°C)..... :		N/A
4.10	Insulation of Class II luminaires		N/A
4.10.1	No contact, mounting surface – accessible metal parts – wiring of basic insulation	Luminaire is Class I	N/A
	Safe installation fixed luminaires		N/A
	Capacitors and switches		N/A
	Interference suppression capacitors according to IEC 60384-14		N/A
4.10.2	Assembly gaps:		N/A
	- not coincidental		N/A
	- no straight access with test probe		N/A
4.10.3	Retainment of insulation:		N/A
	- fixed		N/A
	- unable to be replaced; luminaire inoperative		N/A
	- sleeves retained in position		N/A
	- lining in lampholder		N/A
4.11	Electrical connections		P
4.11.1	Contact pressure		P
4.11.2	Screws:		N/A
	- self-tapping screws	No such screws used for connection of current-carrying parts	N/A
	- thread-cutting screws		N/A
	- at least two self-tapping screws		N/A
4.11.3	Screw locking:		P
	- spring washer		P
	- rivets		N/A
4.11.4	Material of current-carrying parts		P
4.11.5	No contact to wood	No wood available	N/A
4.11.6	Electro-mechanical contact systems	No electro-mechanical contacts in this luminaire	N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.12	Mechanical connections and glands		P
4.12.1	Screws not made of soft metal		P
	Screws of insulating material		N/A
	Torque test: torque (Nm); part ..... :	Earthing continuity screw	P
	Torque test: torque (Nm); part ..... :		-
	Torque test: torque (Nm); part ..... :		-
4.12.2	Screws with diameter < 3 mm screwed into metal		P
4.12.4	Locked connections:		N/A
	- fixed arms; torque (Nm)..... :	No such connections	N/A
	- lampholder; torque (Nm)..... :		N/A
	- push-button switches; torque 0,8 Nm ..... :		N/A
4.12.5	Screwed glands; force (N) ..... :	No glands are used	N/A
4.13	Mechanical strength		P
4.13.1	Impact tests:		P
	- fragile parts; energy (Nm)..... :	0.2 Nm at cap	P
	- other parts; energy (Nm) ..... :	0.35 Nm at metal cover	P
	1) live parts	No damage	P
	2) linings	No damage	P
	3) protection	No damage	P
	4) covers	No damage	P
4.13.3	Straight test finger		P
4.13.4	Rough service luminaires		N/A
	- IP54 or higher	Luminaire is for normal use	N/A
	a) fixed		N/A
	b) hand-held		N/A
	c) delivered with a stand		N/A
	d) for temporary installations and suitable for mounting on a stand		N/A
4.13.6	Tumbling barrel		N/A
4.14	Suspensions and adjusting devices	Instruction see “”Handleiding”	N/A
4.14.1	Mechanical load:		N/A
	A) four times the weight		N/A
	B) torque 2,5 Nm		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	C) bracket arm; bending moment (Nm) ..... :		N/A
	D) load track-mounted luminaires		N/A
	E) clip-mounted luminaires, glass-shelve. Thickness (mm) ..... :		N/A
	Metal rod. diameter (mm) ..... :		N/A
	Fixed luminaire or independent control gear without fixing devices		N/A
4.14.2	Load to flexible cables		N/A
	Mass (kg) ..... :		N/A
	Stress in conductors (N/mm²) ..... :		N/A
	Mass (kg) of semi-luminaire ..... :		N/A
	Bending moment (Nm) of semi-luminaire ..... :		N/A
4.14.3	Adjusting devices:		N/A
	- flexing test; number of cycles ..... :	No adjusting device to this luminaire	N/A
	- strands broken		N/A
	- electric strength test afterwards		N/A
4.14.4	Telescopic tubes: cords not fixed to tube; no strain on conductors	No telescopic tubes used	N/A
4.14.5	Guide pulleys		N/A
4.14.6	Strain on socket-outlets		N/A
4.15	Flammable materials:		P
	- glow-wire test 650 °C	No heated parts in normal use	N/A
	- spacing ≥ 30 mm		N/A
	- screen withstanding test of 13.3.1		N/A
	- screen dimensions		N/A
	- no fiercely burning material		P
	- thermal protection	No thermal protection	N/A
	- electronic circuits exempted		N/A
4.15.2	Luminaires made of thermoplastic material with lamp control gear		N/A
	a) construction	No such luminaire	N/A
	b) temperature sensing control		N/A
	c) surface temperature		N/A
4.16	Luminaires marked with F-symbol	Luminaire not marked	N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	No lamp control gear	(compliance with Section 12)	N/A
4.16.1	Lamp control gear spacing:		N/A
	- spacing 35 mm		N/A
	- spacing 10 mm		N/A
4.16.2	Thermal protection:		N/A
	- in lamp control gear		N/A
	- external		N/A
	- fixed position		N/A
	- temperature marked lamp control gear		N/A
4.16.3	“F” curve measured	(see 12.6)	N/A
4.17	Drain holes	Luminaire not water protected	N/A
	Clearance at least 5 mm		N/A
4.18	Resistance to corrosion:		N/A
4.18.1	- rust-resistance	Luminaire not water protected	N/A
4.18.2	- season cracking in copper		N/A
4.18.3	- corrosion of aluminium		N/A
4.19	Ignitors compatible with ballast	No ignitors used	N/A
4.20	Rough service vibration	No rough service luminaire	N/A
4.21	Protective shield:		N/A
4.21.1	Shield fitted	No tungsten halogen lamps to this luminaire	N/A
4.21.2	Particles from a shattering lamp not impair safety		N/A
4.21.3	No direct path		N/A
4.21.4	Impact test on shield		N/A
	Glow-wire test on lamp compartment		N/A
4.22	Attachments to lamps		N/A
4.23	Semi-luminaires comply Class II		N/A
4.24	UV radiation, metal halide lamps		N/A
4.25	No sharp point or edges	No sharp points	P
4.26	Short-circuit protection:		N/A
4.26.1	Uninsulated accessible SELV parts	No accessible SELV parts	N/A
4.26.2	Short-circuit test		N/A
4.26.3	Test chain according to Figure 29		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

5	**EXTERNAL AND INTERNAL WIRING**		**P**
5.2	**Supply connection and external wiring**		**P**
5.2.1	Means of connection ..... :	Non-detachable cord	P
5.2.2	Type of cable ..... :	H05VV	P
	Nominal cross-sectional area (mm²) ..... :	3 x 0.75mm²	P
	Cables equal to IEC 60227 or IEC 60245		P
5.2.3	Type of attachment, X, Y or Z	Type X	P
5.2.5	Type Z not connected to screws		N/A
5.2.6	Cable entries:		P
	- suitable for introduction		P
	- adequate degree of protection		P
5.2.7	Cable entries through rigid material have rounded edges		P
5.2.8	Insulating bushings:		N/A
	- suitably fixed	No bushings used	N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- tubes or guards made of insulating material		N/A
5.2.9	Locking of screwed bushings		N/A
5.2.10	Cord anchorage:		P
	- covering protected from abrasion		P
	- clear how to be effective		P
	- no mechanical or thermal stress		P
	- no tying of cables into knots etc.		P
	- insulating material or lining		P
5.2.10.1	Cord anchorage for type X attachment:		P
	a) at least one part fixed		P
	b) types of cable	Suitable for different types of cable	P
	c) no damaging of the cable		P
	d) whole cable can be mounted		P
	e) no touching of clamping screws		P

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	f) metal screw not directly on cable		P
	g) replacement without special tool		P
	Glands not used as anchorage	No glands used	N/A
	Labyrinth type anchorages		N/A
5.2.10.2	Adequate cord anchorage for type Y and type Z attachment	Type X attachment used	N/A
5.2.10.3	Tests:		N/A
	- impossible to push cable; unsafe		N/A
	- pull test: 25 times; pull (N) ..... :		N/A
	- torque test: torque (Nm) ..... :		N/A
	- displacement ≤ 2 mm		N/A
	- no movement of conductors		N/A
	- no damage of cable or cord		N/A
5.2.11	External wiring passing into luminaire		P
5.2.12	Looping-in terminals		N/A
5.2.13	Wire ends not tinned		P
	Wire ends tinned: no cold flow		N/A
5.2.14	Mains plug same protection		P
	Class III luminaire plug	Class I luminaire	N/A
5.2.16	Appliance inlets (IEC 60320)	No appliance inlet used	N/A
	Appliance couplers of class II type		N/A
5.2.17	No standardized interconnecting cables properly assembled		N/A
5.2.18	Used plug in accordance with		P
	- IEC 60083		P
	- other standard		N/A
5.3	Internal wiring		P
5.3.1	Internal wiring of suitable size and type		P
	Through wiring		P
	- not delivered/ mounting instruction		N/A
	- factory assembled		P
	- socket outlet loaded (A)..... :		P
	- temperatures ..... :	(see Annex 2)	P

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Green-yellow for earth only		P
5.3.1.1	Internal wiring connected directly to fixed wiring		P
	Cross-sectional area (mm²) ..... :	0.75 mm²	P
	Insulation thickness		P
	Extra insulation added where necessary		N/A
5.3.1.2	Internal wiring connected to fixed wiring via internal current-limiting device		N/A
	Adequate cross-sectional area and insulation thickness	No internal current-limiting device used	N/A
5.3.1.3	Double or reinforced insulation for class II	Class I luminaire	N/A
5.3.1.4	Conductors without insulation	Such conductors not used	N/A
5.3.1.5	SELV current-carrying parts	24V circuit	P
5.3.1.6	Insulation thickness other than PVC or rubber		N/A
5.3.2	Sharp edges etc.	Sleeve is using to protect wires	P
	No moving parts of switches etc.		N/A
	Joints, raising/lowering devices		N/A
	Telescopic tubes etc.		N/A
	No twisting over 360°		P
5.3.3	Insulating bushings:		N/A
	- suitable fixed	Luminaire is fixed	N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- cables with protective sheath		N/A
5.3.4	Joints and junctions effectively insulated		N/A
5.3.5	Strain on internal wiring	No strain on wiring	P
5.3.6	Wire carriers		N/A
5.3.7	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A

7	**PROVISION FOR EARTHING**		**P**
7.2.1 + 7.2.3	Accessible metal parts		P
	Metal parts in contact with supporting surface		P
	Resistance < 0,5 Ω	At 10A: 8 mΩ	P

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Two self-tapping screws used		N/A
	Thread-forming screws		P
	Thread-forming screw used in a grove		P
	Earth makes contact first	Earth wire longest wire	P
7.2.2 + 7.2.3	Earth continuity in joints etc.		P
7.2.4	Locking of clamping means		P
	Compliance with 4.7.3	Screwless terminal	P
7.2.5	Earth terminal integral part of connector socket		N/A
7.2.6	Earth terminal adjacent to mains terminals		P
7.2.7	Electrolytic corrosion of the earth terminal	Ordinary luminaire	N/A
7.2.8	Material of earth terminal		P
	Contact surface bare metal		P
7.2.10	Class II luminaire for looping-in	Class I luminaire	N/A
	Double or reinforced insulation to functional earth		N/A
7.2.11	Earthing core coloured green-yellow		P
	Length of earth conductor		P

8	**PROTECTION AGAINST ELECTRIC SHOCK**		**P**
8.2.1	Live parts not accessible		P
	Basic insulated parts not used on the outer surface without appropriate protection		N/A
	Protection in any position		P
	Double-ended tungsten filament lamp		N/A
	Insulation lacquer not reliable		N/A
	Double-ended high pressure discharge lamp		N/A
	Relevant warning according to 3.2.18 fitted to the luminaire		N/A
8.2.2	Portable luminaire adjusted in most unfavourable position	Fixed luminaire	N/A
8.2.3	Class II luminaire:		N/A
	- basic insulated metal parts not accessible during starter or lamp replacement	Class I luminaire	N/A
	- basic insulation not accessible other than during starter or lamp replacement		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- glass protective shields not used as supplementary insulation		N/A
	Class I luminaire with BC lampholder		N/A
8.2.4	Portable luminaire:		N/A
	- protection independent of supporting surface	Fixed luminaire	N/A
	- terminal block completely covered		N/A
8.2.5	Compliance with the standard test finger or relevant probe		P
8.2.6	Covers reliably secured		P
8.2.7	Discharging of capacitors ≥ 0,5 μF	Certified power is used	N/A
	Portable plug connected luminaire with capacitor		N/A
	Other plug connected luminaire with capacitor		N/A
	Discharge device on or within capacitor		N/A
	Discharge device mounted separately		N/A
9	**RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE**		**N/A**
9.2	Tests for ingress of dust, solid objects and moisture:		N/A
	- classification according to IP ..... :	Luminaire does not have IP classification	—
	- mounting position during test..... :		—
	- fixing screws tightened; torque (Nm) ..... :		—
	- tests according to clauses ..... :		—
	- electric strength test afterwards		N/A
	a) no deposit in dust-proof luminaire		N/A
	b) no talcum in dust-tight luminaire		N/A
	c) no trace of water on current-carrying parts or where it could become a hazard		N/A
	d) i) For luminaires without drain holes – no water entry		N/A
	d) ii) For luminaires with drain holes – no hazardous water entry		N/A
	e) no water in watertight luminaire		N/A
	f) no contact with live parts (IP 2X)		N/A
	f) no entry into enclosure (IP 3X and IP 4X)		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	f) no contact with live parts (IP3X and IP4X)		N/A
9.3	Humidity test 48 h		P
10	**INSULATION RESISTANCE AND ELECTRIC STRENGTH**		**P**
10.2.1	Insulation resistance test		P
	Cable or cord covered by metal foil or replaced by a metal rod of mm Ø ..... :		—
	Insulation resistance (MΩ)		—
	SELV:		P
	- between current-carrying parts of different polarity..... :	a= >2 MΩ	P
	- between current-carrying parts and mounting surface..... :	a=>2 MΩ	P
	- between current-carrying parts and metal parts of the luminaire..... :	a=>2 MΩ	P
	Other than SELV:		P
	- between live parts of different polarity ..... :		N/A
	- between live parts and mounting surface ..... :	b= 10 MΩ	P
	- between live parts and metal parts..... :	b= 10 MΩ	P
	- between live parts of different polarity through action of a switch..... :		N/A
10.2.2	Electric strength test		P
	Dummy lamp		N/A
	Luminaires with ignitors after 24 h test		N/A
	Luminaires with manual ignitors		N/A
	Test voltage (V):	500 and 1460	P
	SELV:		P
	- between current-carrying parts of different polarity..... :	a= >500V	P
	- between current-carrying parts and mounting surface..... :	a= >500V	P
	- between current-carrying parts and metal parts of the luminaire..... :	a= >500V	P
	Other than SELV:		P
	- between live parts of different polarity ..... :		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- between live parts and mounting surface ..... :	b= >1500V	P
	- between live parts and metal parts ..... :	b= >1500V	P
	- between live parts of different polarity through action of a switch ..... :		N/A
10.3	Leakage current (mA)..... :	0.4 mA	P

11	CREEPAGE DISTANCES AND CLEARANCES		
	Working voltage (V) ..... :	24V circuit	—
	Voltage form	Sinusoidal ☐ Non-sinusoidal ☒	—
	PTI	< 600 ☐ > 600 ☒	—
	Rated pulse voltage (kV) ..... :		—
	(1) Current-carrying parts of different polarity: cr (mm); cl (mm) ..... :	Cr 0.7mm Cl 2mm	P
	(2) Current-carrying parts and accessible parts: cr (mm); cl (mm) ..... :	Cr.2.5mm Cl.2mm	P
	(3) Parts becoming live due to breakdown of basic insulation and metal parts: cr (mm); cl (mm) ..... :	Certified power	N/A
	(4) Outer surface of cable where it is clamped and metal parts: cr (mm); cl (mm)..... :	> 20mm	P
	(5) Not used		—
	(6) Current-carrying parts and supporting surface: cr (mm); cl (mm) ..... :	7mm	P

12	ENDURANCE TEST AND THERMAL TEST		N/A
12.3	Endurance test:		N/A
	- mounting-position ..... :	No unsafe luminaire: certified power and a SELV circuit	—
	- test temperature (°C)..... :		—
	- total duration (h) ..... :		—
	- supply voltage: Un factor; calculated voltage (V):		—
	- lamp used..... :		—
12.3.2	After endurance test:		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- no part unserviceable		N/A
	- luminaire not unsafe		N/A
	- no damage to track system		N/A
	- marking legible		N/A
	- no cracks, deformation etc.		N/A
12.4	Thermal test (normal operation)	(see Annex 2)	P
12.5	Thermal test (abnormal operation)	(see Annex 2)	P
12.6	Thermal test (failed lamp control gear condition):		N/A
12.6.1	Through wiring or looping-in wiring loaded by a current of (A) ..... :	Ordinary luminaire with LED	—
	- case of abnormal conditions ..... :		—
	- electronic lamp control gear		N/A
	- measured winding temperature (°C): at 1,1 Un :		—
	- measured mounting surface temperature (°C) at 1,1 Un..... :		N/A
	- calculated mounting surface temperature (°C) . :		N/A
	- track-mounted luminaires		N/A
12.6.2	Temperature sensing control		N/A
	- case of abnormal conditions ..... :	No F marking	—
	- thermal link		N/A
	- manual reset cut-out		N/A
	- auto reset cut-out		N/A
	- measured mounting surface temperature (°C)... :		N/A
	- track-mounted luminaires		N/A
12.7	Thermal test (failed lamp control gear in plastic luminaires): No plastic housing		N/A
12.7.1	Luminaire without temperature sensing control		N/A
12.7.1.1	Luminaire with fluorescent lamp ≤ 70W		N/A
	Test method 12.7.1.1 or Annex V ..... :		—
	Test according to 12.7.1.1:		N/A
	- case of abnormal conditions		—
	- Ballast failure at supply voltage (V) ..... :		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Test according to Annex V:		N/A
	- case of abnormal conditions		—
	- measured winding temperature (°C): at 1,1 Un . :		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un ..... :		—
	- calculated temperature of fixing point/exposed part (°C)..... :		—
	Ball-pressure test:		N/A
	- part tested; temperature (°C)..... :		N/A
	- part tested; temperature (°C)..... :		N/A
12.7.1.2	Luminaire with discharge lamp, fluorescent lamp > 70W, transformer > 10 VA		N/A
	- case of abnormal conditions	No discharge lamp used	—
	- measured winding temperature (°C): at 1,1 Un . :		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un ..... :		—
	- calculated temperature of fixing point/exposed part (°C)..... :		—
	Ball-pressure test:		N/A
	- part tested; temperature (°C)..... :		N/A
	- part tested; temperature (°C)..... :		N/A
12.7.1.3	Luminaire with short circuit proof transformers ≤ 10 VA		N/A
	- case of abnormal conditions		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
12.7.2	Luminaire with temperature sensing control	No temperature sensing	N/A
	- thermal link	Yes ☐ No ☐	—
	- manual reset cut-out	Yes ☐ No ☐	—
	- auto reset cut-out	Yes ☐ No ☐	—
	- case of abnormal conditions		—
	- highest measured temperature of fixing point/exposed part (°C):..... :		—
	Ball-pressure test:		N/A
	- part tested; temperature (°C)..... :		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- part tested; temperature (°C)..... :		N/A
13	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**P**
13.2.1	Ball-pressure test:		P
	- part tested; temperature (°C)..... :	Side caps are tested	P
	- part tested; temperature (°C)..... :		-
13.3.1	Needle flame test (10 s):		N/A
	- part tested ..... :		-
	- part tested ..... :		-
13.3.2	Glow-wire test (650°C):		P
	- part tested ..... :	Side caps are tested	P
	- part tested ..... :		-
13.4.1	Tracking test: part tested ..... :		N/A
14	**SCREW TERMINALS**	No screw terminals used	**N/A**
	Separately approved; component list	(see Annex 1)	N/A
	Part of the luminaire	(see Annex 3)	N/A
15	**SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS**		**P**
	Separately approved; component list	(see Annex 1)	N/A
	Part of the luminaire	(see Annex 4)	P

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 1: components	P

object/part No.	code	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity
Power cord	A			H05VV		<HAR>
LED power supply	C	Shenzhen Soaring Digital Technology	SVF-30-24	24V 30W		CE, RohS
Screwless luminaire power supply connector	A	Tridonic.Atco	SLK3	450V 24A		VDE ENEC

The codes above have the following meaning:

A - The component is replaceable with another one, also certified, with equivalent characteristics

B - The component is replaceable if authorised by the test house

C - Integrated component tested together with the appliance

D - Alternative component

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 2: temperature measurements, thermal tests of Section 12	P

	Type reference.....:	LedTube Color W2 / L=150cm, art.EE-2176	—
	Lamp used .....:	LED's 30x	—
	Lamp control gear used .....:	no	—
	Mounting position of luminaire.....:	standard	—
	Supply wattage (W).....:	27.1	—
	Supply current (A) .....:	0.14	—
	Calculated power factor .....:	0.85	—
	Table: measured temperatures corrected for ta = 25 °C:		
	- abnormal operating mode .....:	N/A	—
	- test 1: rated voltage .....:	230V	—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage .....:	244V	—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage .....:	N/A	—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage .....:	253V	—
	Through wiring or looping-in wiring loaded by a current of A during the test .....:	N/A	—

temperature (°C) of part	Clause 12.4 – normal				Clause 12.5 – abnormal	
	test 1	test 2	test 3	limit	test 4	limit
PCB IO 3551 max.	36	36	-	200	36	200
PCB IO 3552 max.	35	35	-	200	35	200
Frame max.	32	33	-	60	33	60
Power module max.	42	44	-	90	45	90

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 3: screw terminals (part of the luminaire)	N/A

14	**SCREW TERMINALS**		N/A
14.2	Type of terminal .....:	No screw terminals used	—
	Rated current (A) .....:		—
14.3.2.1	One or more conductors		N/A
14.3.2.2	Special preparation		N/A
14.3.2.3	Terminal size		N/A
	Cross-sectional area (mm²).....:		N/A
14.3.3	Conductor space (mm).....:		N/A
14.4	Mechanical tests		N/A
14.4.1	Minimum distance		N/A
14.4.2	Cannot slip out		N/A
14.4.3	Special preparation		N/A
14.4.4	Nominal diameter of thread (metric ISO thread)..:	M	N/A
	External wiring		N/A
	No soft metal		N/A
14.4.5	Corrosion		N/A
14.4.6	Nominal diameter of thread (mm).....:		N/A
	Torque (Nm).....:		N/A
14.4.7	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N).....:		N/A
14.4.8	Without undue damage		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 4: screwless terminals (part of the luminaire)	

15)	**SCREWLESS TERMINALS**		P
15.2	Type of terminal .....:	SLK3 certified	—
	Rated current (A) .....:	24A	—
15.3.1	Material	See documentation	P
15.3.2	Clamping		N/A
15.3.3	Stop		N/A
15.3.4	Unprepared conductors		N/A
15.3.5	Pressure on insulating material		N/A
15.3.6	Clear connection method		N/A
15.3.7	Clamping independently		N/A
15.3.8	Fixed in position		N/A
15.3.10	Conductor size		N/A
	Type of conductor		N/A
15.5.1	Terminals internal wiring		N/A
15.5.1.1	Pull test spring-type terminals (4 N, 4 samples)….:		N/A
15.5.1.2	Pull test pin or tab terminals (4 N, 4 samples)……:		N/A
	Insertion force not exceeding 50 N		N/A
15.5.2	Permanent connections: pull-off test (20 N)		N/A
15.6	Electrical tests		N/A
	Voltage drop (mV) after 1 h (4 samples) .....:		N/A
	Voltage drop of two inseparable joints		N/A
	Number of cycles .....:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples) .....:		N/A
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples) .....:		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples) .....:		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples) .....:		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

15.7	Terminals external wiring		N/A
	Terminal size and rating		N/A
15.8.1	Pull test spring-type terminals or welded connections (4 samples); pull (N) .....:		N/A
	Pull test pin or tab terminals (4 samples); pull (N) .....:		N/A
15.9	Contact resistance test		N/A
	Voltage drop (mV) after 1 h		N/A

terminal	1	2	3	4	5	6	7	8	9	10
voltage drop (mV)										

	Voltage drop of two inseparable joints	
	Voltage drop after 10th alt. 25th cycle	
	Max. allowed voltage drop (mV) .....:	—

terminal	1	2	3	4	5	6	7	8	9	10
voltage drop (mV)										

	Voltage drop after 50th alt. 100th cycle	
	Max. allowed voltage drop (mV) .....:	—

terminal	1	2	3	4	5	6	7	8	9	10
voltage drop (mV)										

	Continued ageing: voltage drop after 10th alt. 25th cycle	
	Max. allowed voltage drop (mV) .....:	—

terminal	1	2	3	4	5	6	7	8	9	10
voltage drop (mV)										

	Continued ageing: voltage drop after 50th alt. 100th cycle	
	Max. allowed voltage drop (mV) .....:	—

terminal	1	2	3	4	5	6	7	8	9	10
voltage drop (mV)										

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 5: National Differences for (country name) or Group Differences	

	CENELEC COMMON MODIFICATIONS (EN)		**P**
3	**MARKING**		N/A
3.3.101	Adequate warning on the package	No packaging available	N/A
5	**EXTERNAL AND INTERNAL WIRING**		**P**
5.2.1	Connecting leads	Only power lead/cable	P
	- without a means for connection to the supply		N/A
	- terminal block specified		P
	- relevant information provided		P
	- compliance with 4.6, 4.7.1, 4.7.2, 4.10.1, 11.2, 12 and 13.2 of Part 1		P
5.2.2	Cables equal to HD21 S2 or HD22 S2	Nom.300V Test 2000V	P

ZB	**ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)**		**N/A**
3.3	DK: power supply cord with label	Only dutch version	N/A
	IT: warning label on Class 0 luminaire		N/A
4.5.1	DK: socket-outlets		N/A
5.2.1	CY, DK, FI, SE, GB: type of plug		N/A

ZC	**ANNEX ZC, NATIONAL DEVIATIONS (EN)**		**N/A**
4 & 5	FR: Shuttered socket-outlets 10/16A	Only dutch version	N/A
13.3	DK: Needle flame test during 30 s		N/A
13.3	GB: Requirements according to United Kingdom Building Regulation		N//A
13.3.2	FR: Glow-wire test 850°C alt. 750°C for luminaires in premises open to public or 960°C for luminaires in emergency exits		N/A

IEC/EN 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
	Dimension	99659, Digital calliper, Gedore	mm's	03-2011
	Voltages	99788, Digital Multimeter, Fluke 8846A	V, A, Ohms	07-2010
	Temperatures	15738, Hybride recorder, Yokogawa	Degrees Celsius	07-2010
	Force	14835, GlobTek	Up to 250 N	07-2010
	High Voltage AC	14836, Clare	V	08-2010
	High voltage DC	99400, Baur	V	08-2010
	Discharge test	99415, Oscilloscope, Tektronix 2214	Several	01-2011
	Weight	70000, Kern, DE36K10NL		03-2011