



**LABORATORY FOR TESTING OF MACHINERY,
EQUIPMENT AND DEVICES**

CENTER FOR TESTING AND EUROPEAN CERTIFICATION LTD

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TEST REPORT

№ 2emc-i-13-794 / 18.12.2013

OBJECT TO BE TESTED: Group luminaries – Industrial lighting "Bell reflector" fixture with LED lamp ; Model: SENA50 with cat. № 98SENA50120
Representative sample from Bell reflector fixtures group withcat. № 98SENA50120;
98SENA100120; 98ELBA150120; 98ETNA200120

*(name of object to be tested , type, model, quantity,
type – portable, fixed, for walling in and other)*

APPLICANT FOR TEST: "ELMARK INDUSTRIES" SC. 2 Dobrudja Blvd. Dobrich, Bulgaria ,
Tel.: 058 500 055, e-mail: denkov@elmark.bg
Application № 794 / 21.10.2013

(name of the firm – applicant, address, telephone, number and date of the test application)

STANDARD:

- EN 55015:2006+A1:2007+A2:2009 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
- EN 61000-3-2:2006+A1:2009+A2:2009 Electromagnetic compatibility (EMC).
Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
- EN 61000-3-3:2008 Electromagnetic compatibility (EMC).
Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.
- EN 61547:2009 Equipment for general lighting purposes - EMC immunity requirements
- EN 61000-4-2:2009 Electromagnetic compatibility (EMC).
Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
- EN 61000-4-4:2004+A1:2010 Electromagnetic compatibility (EMC).
Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
- EN 61000-4-5:2006 Electromagnetic compatibility (EMC).
Part 4-5: Testing and measurement techniques - Surge immunity test
- EN 61000-4-8:2010 Electromagnetic compatibility (EMC).
Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
- EN 61000-4-11:2004 Electromagnetic compatibility (EMC).
Part 4-11: Testing and measurement techniques–Voltage dips,short interruptions and voltage variations immunity tests
(number and name of the standards)

DATE OF ACCEPTANCE IN THE TEST LABORATORY: 21.10.2013

YEAR OF PRODUCTION : 2013
(identification number)

MANUFACTURER: "ELMARK INDUSTRIES" SC. 2 Dobrudja Blvd. Dobrich, Bulgaria ,
Tel.: 058 500 055, e-mail: denkov@elmark.bg
(firm, trade mark, address)

DECLARED TECHNICAL DATA: Rated voltage – 230 V AC
Rated frequency – 50 Hz
Rated power – 50 W
Class I

ELECTRONIC CONTROLGEAR :ELMARK – LEDLine, type: ECXe 1050.021

DATE OF TEST PERFORMANCE: 09.12.2013 - 13.12.2013

LABORATORY CHIEF:
/ T. Hristov /





I. Emission of Radio disturbance characteristics of electrical lighting and similar equipment

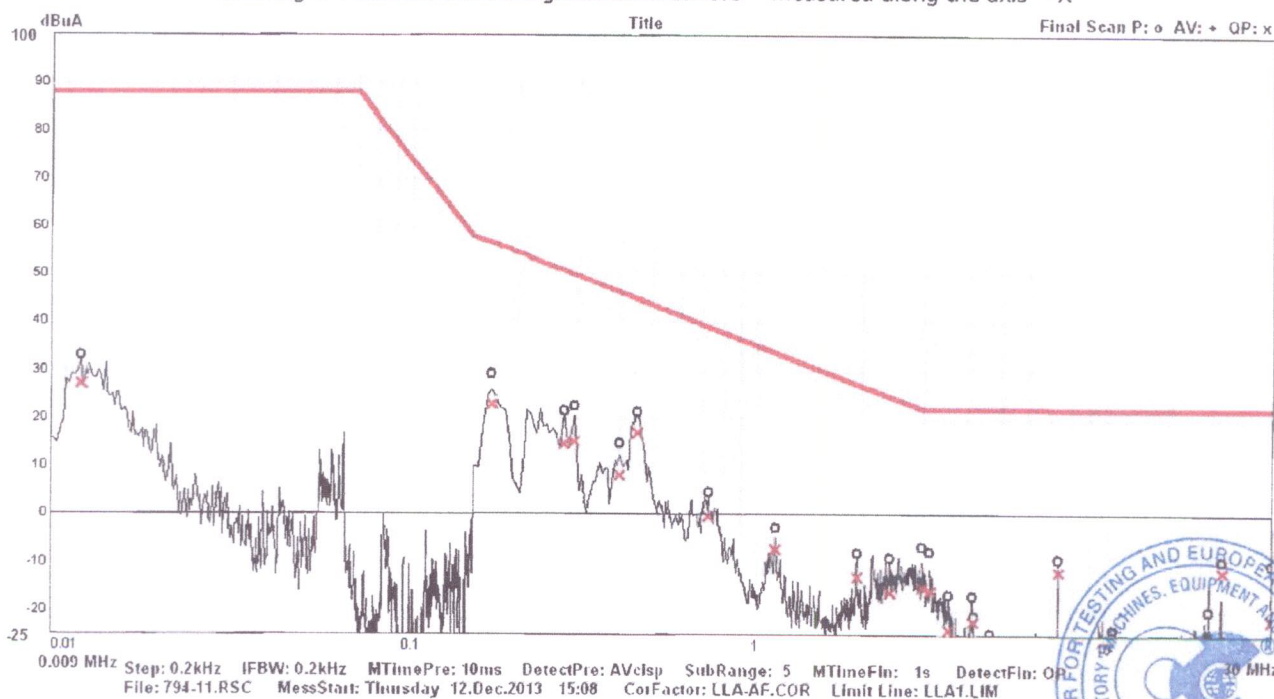
1. Radiated electromagnetic disturbances – 9kHz ÷ 30MHz

EN 55015, cl. 4.4 – Radiated electromagnetic disturbances, limits – Table 3
 EN 55015, cl. 5.2.4 – Other luminaires
 EN 55015, cl. 6 – Operating conditions for lighting equipment
 EN 55015, cl. 6.4 – Ambient temperature: 24 °C ; Relative Humidity: 40 %.
 EN 55015, cl.9.1 – Measuring arrangement and procedure
 EN 55015, cl.9.2 – Indoor and outdoor luminaires
 The test is performed at supply voltage: 230 V

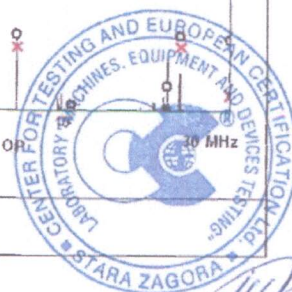
RESULTS OF MEASUREMENT :

Frequency	Radiated electromagnetic disturbances - measured along the axis - X		
	Quasi peak - QP		
	Measuring	Margin	Limit
MHz	dB(µA)	dB(µA)	dB(µA)
0,011	27,21	60,79	88,00
0,170	23,03	33,46	56,49
0,275	14,66	36,05	50,71
0,295	15,20	34,67	49,87
0,400	8,30	37,91	46,21
0,450	17,01	27,78	44,79
0,725	-0,30	39,36	39,06
1,140	-7,29	40,91	33,62
1,945	-13,17	40,37	27,20
2,415	-16,13	40,73	24,60
2,970	-15,09	37,21	22,12
3,125	-15,73	37,73	22,00
4,155	-22,07	44,07	22,00
7,345	-11,77	33,77	22,00
21,540	-11,87	33,87	22,00
30,000	-21,73	43,73	22,00

Drawing of Radiated electromagnetic disturbances - measured along the axis - X



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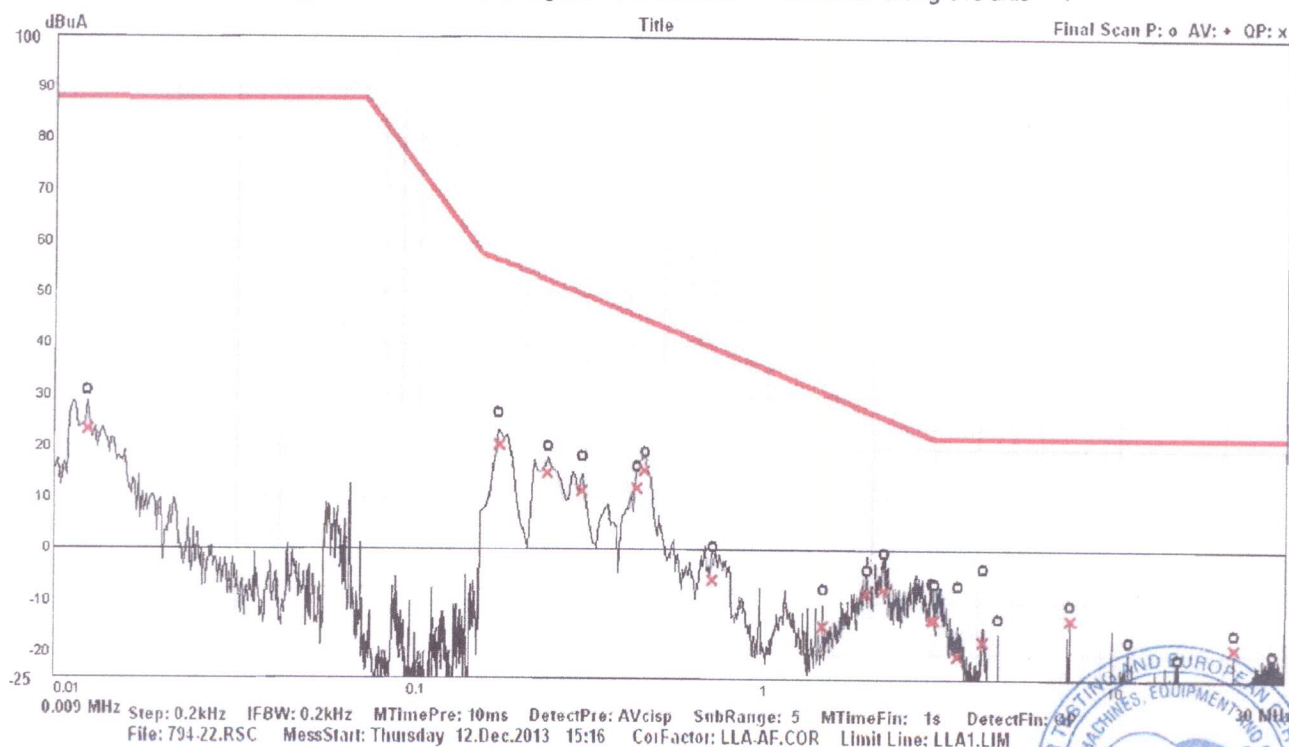


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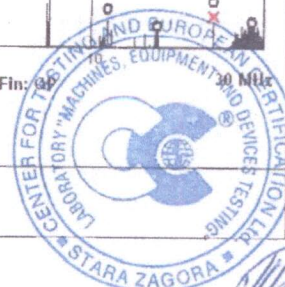


Frequency	Radiated electromagnetic disturbances - measured along the axis - Y		
	Quasi peak - QP		
	Measuring	Margin	Measuring
MHz	dB(μ A)	dB(μ A)	dB(μ A)
0,011	23,53	64,47	88,00
0,170	20,73	35,76	56,49
0,235	15,09	37,51	52,60
0,295	11,58	38,29	49,87
0,425	12,00	33,48	45,48
0,445	15,42	29,51	44,93
0,705	-5,59	44,99	39,40
1,465	-14,61	45,22	30,61
1,945	-8,45	35,65	27,20
2,170	-7,51	33,40	25,89
2,970	-13,35	35,47	22,12
3,030	-13,43	35,43	22,00
3,535	-20,17	42,17	22,00
4,150	-17,58	39,58	22,00
7,345	-13,34	35,34	22,00
21,540	-18,73	40,73	22,00

Drawing of Radiated electromagnetic disturbances - measured along the axis - Y



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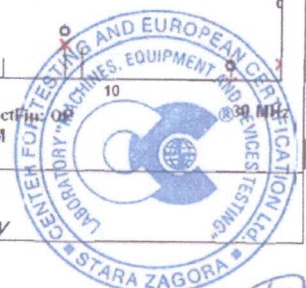
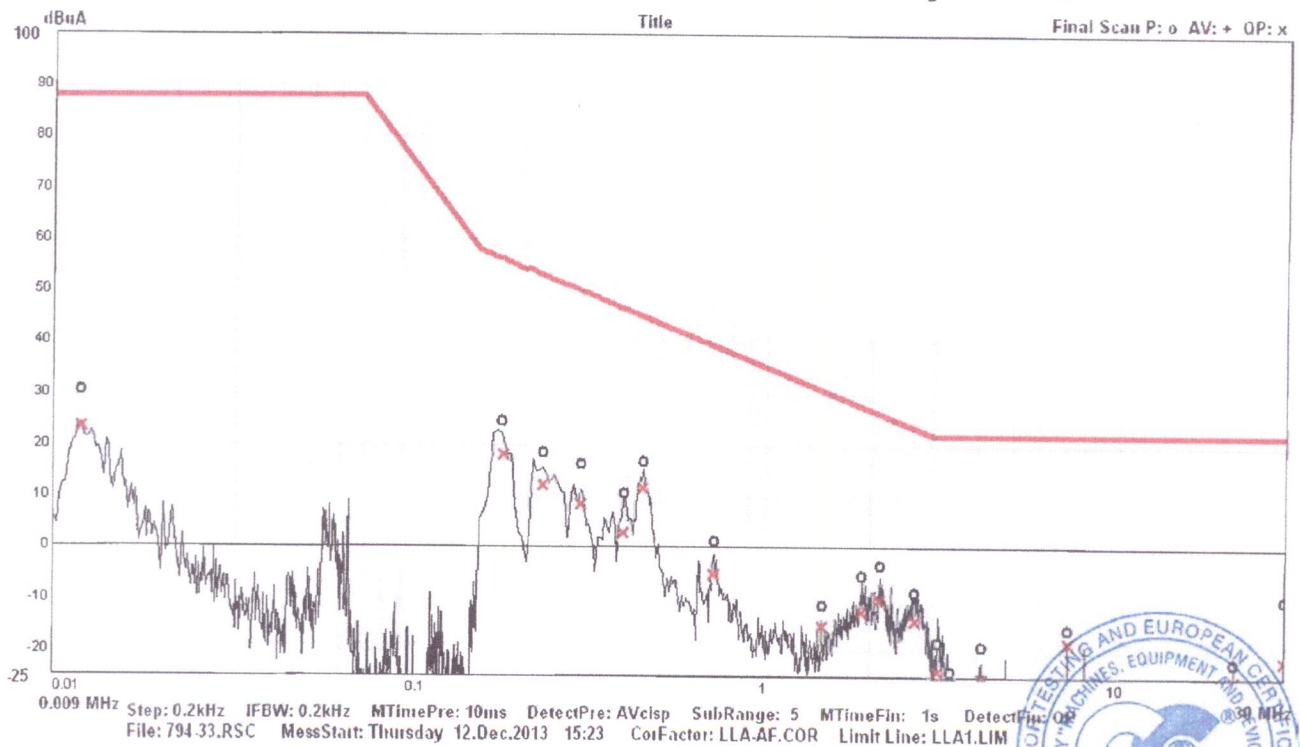
Radiated electromagnetic disturbances - measured along the axis - Z

Frequency

Quasi peak - QP

	Measuring	Margin	Measuring
MHz	dB(μA)	dB(μA)	dB(μA)
0,011	23,39	64,61	88,00
0,175	18,15	37,99	56,14
0,230	12,26	40,60	52,86
0,295	8,53	41,34	49,87
0,395	3,18	43,18	46,36
0,445	11,77	33,16	44,93
0,715	-5,09	44,32	39,23
1,465	-15,32	45,93	30,61
1,910	-12,57	39,99	27,42
2,145	-10,15	36,18	26,03
2,700	-14,19	37,45	23,26
3,140	-23,70	45,70	22,00
4,155	-25,24	47,24	22,00
7,345	-18,39	40,39	22,00
21,540	-25,44	47,44	22,00
30,000	-21,84	43,84	22,00

Drawing of Radiated electromagnetic disturbances - measured along the axis - Z



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2. Radiated electromagnetic disturbances – 30MHz + 300MHz

EN 55015, cl. 4.4.2 – Frequency range 30MHz to 300MHz – Annex B. Limits - Table B.1

EN 55015, cl. 5.2.4 – Other luminaires

EN 55015, cl. 6 – Operating conditions for lighting equipment

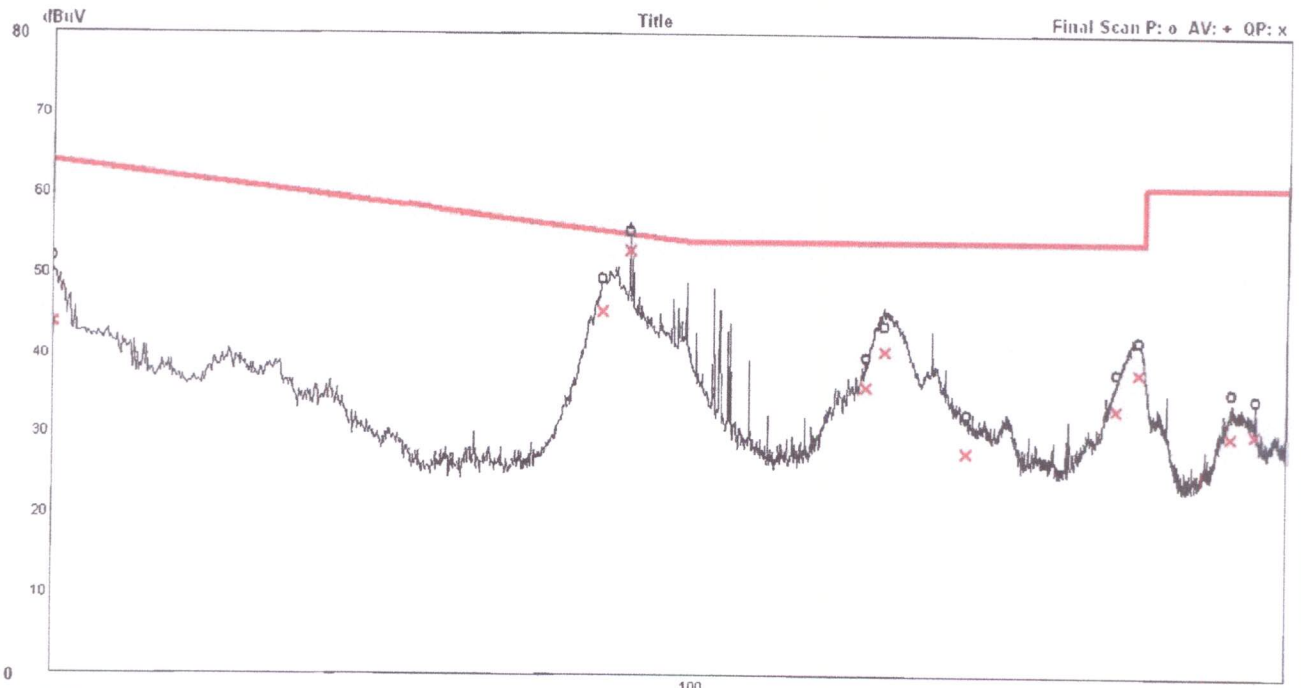
EN 55015, cl. 6.4 – Ambient temperature: 22 °C ; Relative Humidity: 40 %.

EN 55015, cl.9.2 – Measuring arrangement and procedure related to Subclause 4.4.2

RESULTS OF MEASUREMENT :

Frequency MHz	Radiated electromagnetic disturbances		
	Quasi peak - QP		
	Measuring dB(μV)	Margin dB(μV)	Measuring dB(μV)
30,00	43,91	20,09	64,00
83,90	45,43	10,02	55,45
88,30	53,22	1,81	55,03
137,90	36,09	17,91	54,00
142,40	40,55	13,45	54,00
166,20	27,85	26,15	54,00
218,90	33,36	20,64	54,00
228,00	38,06	15,94	54,00
270,50	30,02	30,98	61,00
283,40	30,35	30,65	61,00

Drawing of Radiated electromagnetic disturbances



30 MHz Step: 100kHz IFBW: 120kHz MTimePre: 10ms DetectPre: Peak SubRange: 10 MTimeFin: 1s DetectFin: QP
File: 794-RSC MessStart: Friday 13.Dec.2013 09:53 CorFactor: CDN_M3.COR Limit Line: R_15_B1.LIM 300 MHz



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Page 6 of 16 EN 61000-3-2:2006+A1:2009+A2:2009 Test report: № 2emc-i-13-794/18.12.2013

3. HARMONIC CURRENT MEASUREMENT

Classification of equipment - C

Duration of test - 2,5 min

THC= 0,03285 A	I-THD= 19,38 %	POHC= 0,00231 A	POHC Limit= 0,0161 A
$V_{RMS} = 229,8$ V	$I_{peak} = 0,2629$ A	Frequency = 50 Hz	
$I_{RMS} = 0,1732$ A	$I_F = 0,1697$ A	Power= 37,1 W	
Crest Factor= 1,519	Power Factor = 0,93	K Factor= 1,749	

Harmonic	AVERAGE VALUES			MAX VALUE		
	Measured	100% Limit	% of Limit	Measured	150% Limit	% of Limit
№	, A	, A	%	, A	, A	%
2	0,0002	0,0034	6	0,0003	0,0051	5
3	0,0296	0,0473	62	0,0300	0,0716	42
5	0,0118	0,0170	70	0,0120	0,0257	47
7	0,0060	0,0119	50	0,0060	0,0180	34
9	0,0035	0,0085	41	0,0035	0,0128	28
11	0,0024	0,0051	47	0,0024	0,0077	32
13	0,0016	0,0051	32	0,0017	0,0077	22
15	0,0010	0,0051	19	0,0010	0,0077	13
17	0,0008	0,0051	16	0,0009	0,0077	11
19	0,0007	0,0051	14	0,0008	0,0077	10
21	0,0007	0,0051	14	0,0007	0,0077	9
23	0,0005	0,0051	9	0,0005	0,0077	6
25	0,0007	0,0051	14	0,0008	0,0077	10
27	0,0004	0,0051	8	0,0005	0,0077	6
29	0,0006	0,0051	11	0,0006	0,0077	8
31	0,0013	0,0051	25	0,0013	0,0077	17
33	0,0004	0,0051	8	0,0004	0,0077	6
35	0,0005	0,0051	9	0,0005	0,0077	7
37	0,0006	0,0051	11	0,0006	0,0077	8
39	0,0012	0,0051	23	0,0012	0,0077	16

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Harmonics of power supply source

$V_{RMS} = 229,8 \text{ V}$

$I_{peak} = 0,2629 \text{ A}$

Frequency = 50 Hz

$I_{RMS} = 0,1732 \text{ A}$

$I_F = 0,1697 \text{ A}$

Power = 37,1 W

Power Factor = 0,93

Harmonic	Measured	100% Limit	% of Limit
№	V	V	%
2	0,1167	0,460	25,4
3	0,1145	2,068	5,5
4	0,3037	0,460	66,1
5	0,6211	0,919	67,6
6	0,1844	0,460	40,1
7	0,1378	0,689	20,0
8	0,1611	0,460	35,1
9	0,3669	0,460	79,8
10	0,1381	0,460	30,1
11	0,1375	0,230	59,8
12	0,1156	0,230	50,3
13	0,1375	0,230	59,8
14	0,1138	0,230	49,5
15	0,0233	0,230	10,1
16	0,0919	0,230	40,0
17	0,0919	0,230	40,0
18	0,0689	0,230	30,0
19	0,0919	0,230	40,0
20	0,0700	0,230	30,5
21	0,0459	0,230	20,0
22	0,0689	0,230	30,0
23	0,0250	0,230	10,9
24	0,1389	0,230	60,4
25	0,1149	0,230	50,0
26	0,0689	0,230	30,0
27	0,0234	0,230	10,2
28	0,0689	0,230	30,0
29	0,0674	0,230	29,3
30	0,0689	0,230	30,0
31	0,1838	0,230	80,0
32	0,0685	0,230	29,8
33	0,0478	0,230	20,8
34	0,0689	0,230	30,0
35	0,0233	0,230	10,1
36	0,0689	0,230	30,0
37	0,0459	0,230	20,0
38	0,0847	0,230	36,9
39	0,1378	0,230	60,0
40	0,1149	0,230	50,0

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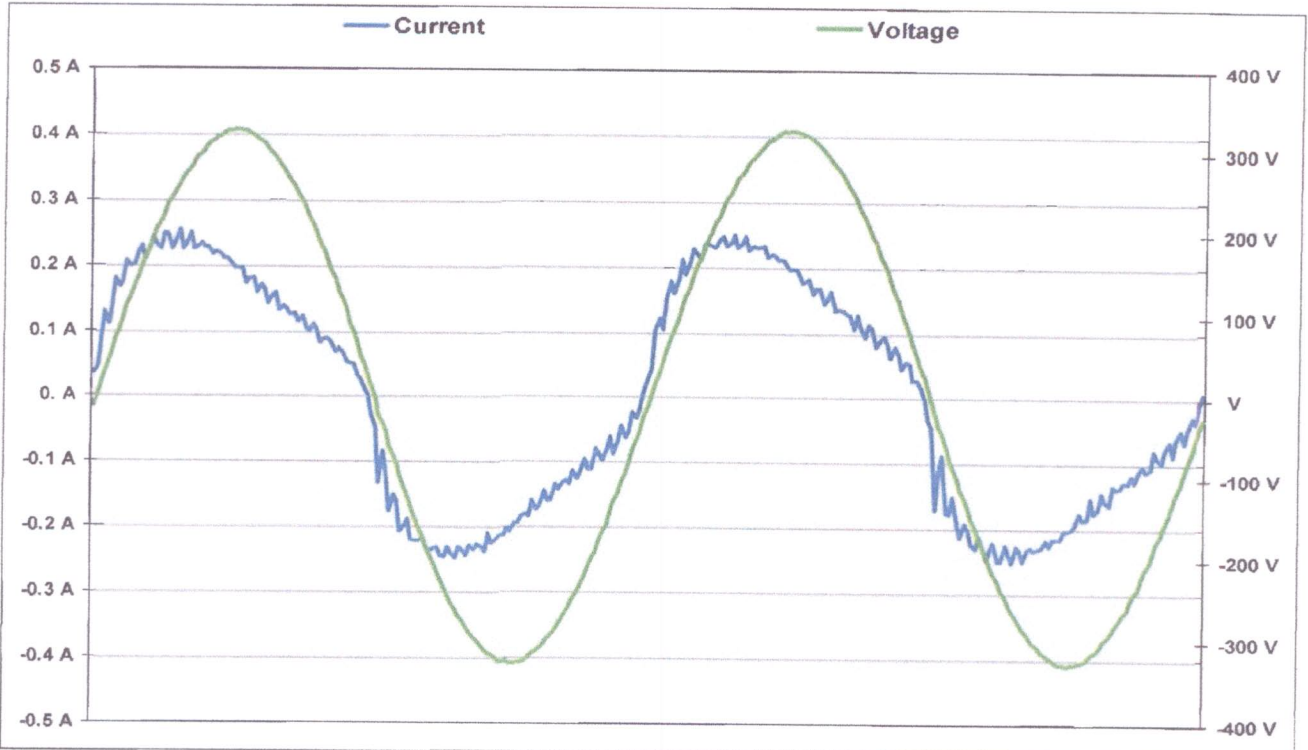
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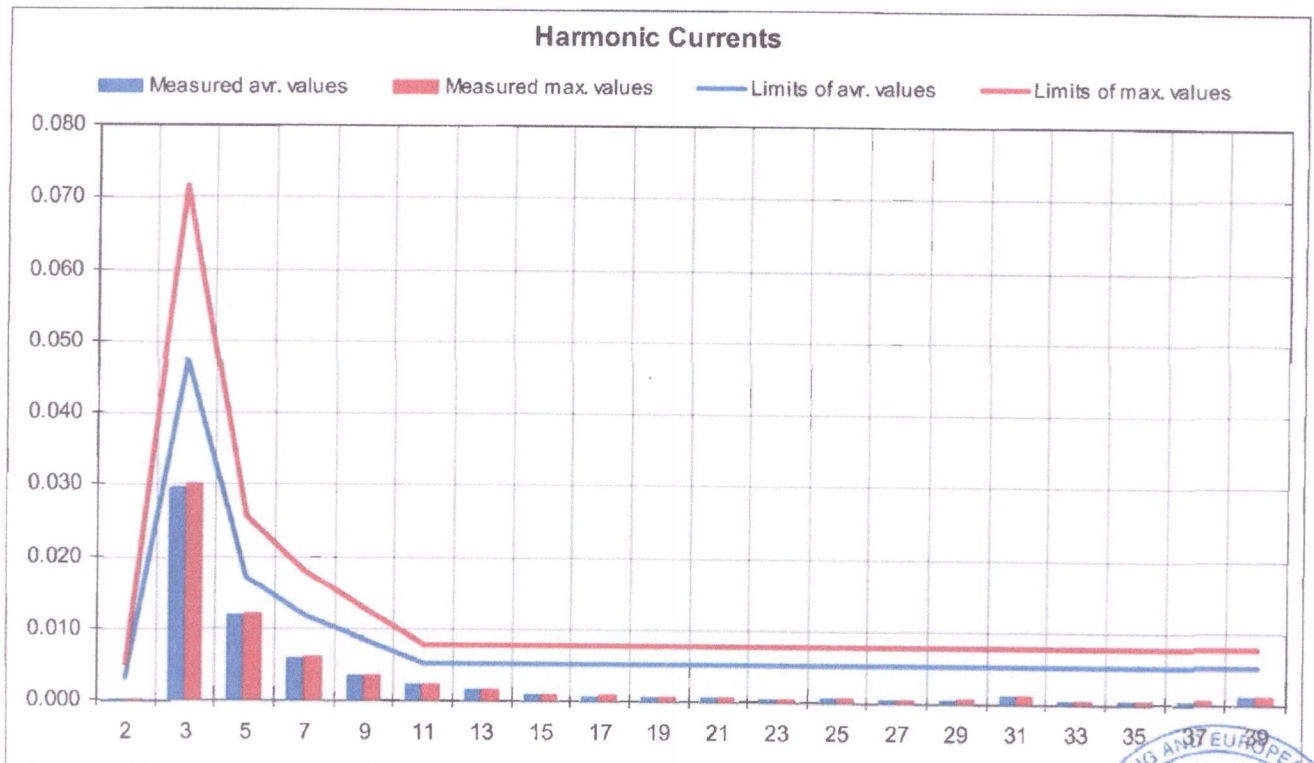
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Current and voltage waveform



Graphics harmonics



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4. Voltage fluctuations and flicker measurement

EN 61000-3-3, cl. 4 – Assessment of voltage changes, voltage fluctuations and flicker

EN 61000-3-3, cl. 5 – Limits

EN 61000-3-3, cl. 6 – Test conditions
Test supply voltage 230 V ; Frequency 50 Hz,

EN 61000-3-3, cl. 6.5 - Observation period - 10 min

	Measured	Limit
Pst (short-term flicker indicator)	0,02	1
Plt (long-term flicker indicator)	0,02 (when the value of Pst is lower of the limit, measurement of Plt is not making, and taking the value of Pst	0,65
dc (relative steady-state voltage change)	0,01 %	3,3 %
dmax (maximum relative voltage change)	0,05 %	4 %
$t \rightarrow d(t) > 3,3 \%$ time for which value of $d(t)$ during a voltage change exceed 3,3%	0 ms	500 ms



II. Immunity of Radio disturbance characteristics for general lighting purposes

EN 61547 cl. 4.2 – Performance criteria for lighting equipment

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 be restored 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 mains 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.

Environment requirements during the test	Ambient temperature	15 to 35 °C
	Relative Humidity	30 to 60 %
	Air pressure	860 to 1060 mbar
Test environment	Ambient temperature	24 °C
	Relative Humidity	42 %
	Air pressure	1010 mbar

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1. IMMUNITY TO ELECTROSTATIC DISCHARGE (ESD)

EN 61547, τ. 5.2 – Electrostatic discharges – Table 1 - Test levels at enclosure port
 EN 61000-4-2, τ. 7 – Test setup
 EN 61000-4-2, τ. 7.2.2 – Table-top equipment , Figure 4
 EN 61000-4-2, τ. 8 – Test procedure

Time interval between discharges	1 s
Discharge impedance	150 pF
Discharge impedance	330 Ω
Performance Criteria according cl.6.3.4 and Table 15 of EN 61547	Criteria B
Number of discharges	10 positive and 10 negative at the selected points

Discharge location	Type of discharge	Level	Test voltage	Polarity	Result
Body of luminaire – X	Contact - Direct	1;2	2;4 kV	+	Pass (criteria A)
				-	
Vertical coupling plane (VCP) – X	Contact - Direct	1;2	2;4 kV	+	Pass (criteria A)
				-	
Horizontal coupling plane (HCP) – X	Contact - Direct	1;2	2;4 kV	+	Pass (criteria A)
				-	

Picture of the object with marked points of discharge locations



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2. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

EN 61547, т. 5.5 – Applicability, Table 6

EN 61000-4-4, т. 7 – Test setup

EN 61000-4-4, т. 8 – Test procedure

Rise time	5 ns ± 30 %
Duration	50 ns ± 30 %
Repetition frequency	5 kHz
Burst duration	15 ms ± 20 % за 5 kHz
Burst period	300 ms ± 20 %
Time of application	1 min for each polarity and coupling
Performance Criteria according to cl.6.3.4 and Table 15 of EN 61547	Criteria B

Pulse Application	Application	Level	Test Voltage V	Polarity	Result
Between L and Ground plane	Coupling network	1	500	+	Pass (criteria A)
				-	Pass (criteria A)
		2	1000	+	Pass (criteria A)
				-	Pass (criteria A)
Between neutral and Ground plane	Coupling network	1	500	+	Pass (criteria A)
				-	Pass (criteria A)
		2	1000	+	Pass (criteria A)
				-	Pass (criteria A)
Between PE and Ground plane	Coupling network	1	500	+	Pass (criteria A)
				-	Pass (criteria A)
		2	1000	+	Pass (criteria A)
				-	Pass (criteria A)
Between L, neutral, PE and Ground plane	Coupling network	1	500	+	Pass (criteria A)
				-	Pass (criteria A)
		2	1000	+	Pass (criteria A)
				-	Pass (criteria A)

Signal lines

Pulse Application	Application	Level	Test Voltage V	Polarity	Result
-	Coupling clamp	1	500	+	-
				-	-
-	Coupling clamp	2	1000	+	-
				-	-

Control lines

Pulse Application	Application	Level	Test Voltage V	Polarity	Result
-	Coupling clamp	1	500	+	-
				-	-
-	Coupling clamp	2	1000	+	-
				-	-

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3. SURGE IMMUNITY TEST

EN 61547, т. 5.7 – Applicability, Table 10
EN 61000-4-5, т. 7 – Test setup
EN 61000-4-2, т. 8 – Test procedure

Front time	1,2 μ s \pm 30 %	
Time to half value	50 μ s \pm 20 %	
Source impedance	Power line symmetrical Power line unsymmetrical	2 Ω + 18 μ F 12 Ω + 9 μ F
Phase angles	90°/ 270°	
Number of surges / polarity / phase angle	5	
Performance Criteria according to cl.6.3.4 and Table 15 of EN 61547	Criteria C	

Power line symmetrical

Pulse Application	Level	Test Voltage V	Polarity	Result
phase L – neutral N	1	500	+	Pass (criteria A)
			-	Pass (criteria A)
	2	1000	+	Pass (criteria A)
			-	Pass (criteria A)

Power line unsymmetrical

Pulse Application	Level	Test Voltage V	Polarity	Result
phase L – protective earth	1	500	+	Pass (criteria A)
			-	Pass (criteria A)
	2	1000	+	Pass (criteria C)
			-	Pass (criteria C)
	3	2000	+	Pass (criteria C)
			-	Pass (criteria C)
neutral N – protective earth	1	500	+	Pass (criteria A)
			-	Pass (criteria A)
	2	1000	+	Pass (criteria C)
			-	Pass (criteria C)
	3	2000	+	Pass (criteria C)
			-	Pass (criteria C)

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4. RATED POWER FREQUENCY MAGNETIC FIELD

EN 61547, T. 5.4 – Applicability ,Table 3

EN 61000-4-8 T. 7 – Test setup

EN 61000-4-8 T. 8 – Test procedure

Performance Criteria according to cl.6.3.4
and Table 15 of EN 61547

Criteria A

Standard inductive coil	Orientation of standard inductive coil	Level	Field strength in the centre for all other inductive coils	Current in the coil (a coil with 10 windings)	Result
1 m x 1 m	X	2	3 A/m	3,45 A	Pass (criteria A)
1 m x 1 m	Y	2	3 A/m	3,45 A	Pass (criteria A)
1 m x 1 m	Z	2	3 A/m	3,45 A	Pass (criteria A)

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5. Voltage dips, short interruptions and voltage variations immunity tests

5.1 Voltage dips immunity tests

EN 61547, τ. 5.8 – Applicability ,Table 11

EN 61000-4-11 τ. 7 – Test setup

EN 61000-4-11 τ. 8 – Test procedure

EN 61000-4-11 τ. 8.2.1 – Testing for each selected combination of test level and duration with a sequence of three dips with intervals of 10 s minimum (between each test event)

Performance Criteria according to cl.6.3.4 and Table 15 of EN 61547

Criteria C

Voltage test levels (% of rated voltage)	Duration (cycles)	Phase angle synchronization	Result
70 %	10 cycles	0°	Pass (criteria B)

5.2 Short interruptions immunity tests

EN 61547, τ. 5.8 – Applicability ,Table 12

EN 61000-4-11 τ. 7 – Test setup

EN 61000-4-11 τ. 8 – Test procedure

EN 61000-4-11 τ. 8.2.1 – Testing for each selected combination of test level and duration with a sequence of three interruptions with intervals of 10 s minimum (between each test event)

Performance Criteria according to cl.6.3.4 and Table 15 of EN 61547

Criteria B

Voltage test levels (% of rated voltage)	Duration (cycles)	Phase angle synchronization	Result
0 %	0,5 cycles	0°	Pass (criteria B)

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USED TECHNICAL EQUIPMENTS:

	Appliance	Type	Manufacturer	Identity №	Last calibration date
1.	ESD - Generator	NSG438	TESEQ Switzerland	988	14.03.2012
2.	EFT/B - Generator	NSG 2050 INA 2050 PNW 2225 CDN 133	Schaffner Electrotest GmbH, Germany	200902-653LU 200906-578LU 200838-570LU 34460	14.03.2012
3.	Surge - Generator	NSG 2050 INA 2050 PNW 2050 CDN 133	Schaffner Electrotest GmbH, Germany	200902-653LU 200906-578LU 200911-636LU 34460	16.03.2012
4.	Digital multimeter	UNIGOR 390	LEM Austria	PI 3288	08.07.2011
5.	Voltage Generator	GL 01-16-230	Neosvet Bulgaria	0001	-
6.	Power Quality Analyzer	435	Fluke Netherlands	DM 9881064	08.11.2011
7.	Thermometer-higrometer	177-H1	TESTO Germany	01320300/902	19.04.2012
8.	EMI – receiver 9 kHz ÷ 1000 MHz	SCR 3501	Schaffner Electrotest GmbH, Germany	522	07.07.2011
9.	Large loop antenna 2m	RF300	Laplace Instruments LTD U.K.	9123	12.03.2013
10.	Coupling/Decoupling network	CDN M2+M3	Frankonia EMC Test - Systems	A2210229	18.04.2013

TEST PERFORMER: 1.

/ T. Hristov /



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*The results showed in present test report concern tested sample only
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