



**LABORATORY FOR TESTING OF MACHINERY,
EQUIPMENT AND DEVICES
CENTER FOR TESTING AND EUROPEAN CERTIFICATION LTD**



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Accredited certificate
№ 101 ЛИ / 24.11.2014
Valid until: 24.11.2018
of EA BAS, according
EN ISO/IEC 17025

TEST REPORT

№ 2emc-15-039/17.03.2015

OBJECT TO BE TESTED: Compact fluorescent lamp - CFL Model: Full Spiral D2 -11W, cat. No: 99210050
Model representative of: Spiral 5W cat.№ 99211418 cat.№99211152; Spiral 7W cat.№ 99211419 и cat.№99211153;
Spiral 9W cat.№ 99211420 и cat.№99211154; Spiral 11W cat.№ 99211421 и cat.№99211155;
Spiral 5W cat.№ 99212422 и cat.№99212156; Spiral 9W cat.№ 99212423 и cat.№99212157;
Spiral 11W cat.№ 99212424 и cat.№99212158; 3U/T2 - 7W cat.№ 99216166; 3U/T2 -11W cat.№ 99216168;
4U/T2 -15W cat.№ 99216170; Full Spiral D2 - 5W cat.№ 99210046; Full Spiral D2- 9W cat.№ 99210048;
Full Spiral D2 -11W cat.№ 99210050; Full Spiral D2 -11W cat.№ 99210051; Half Spiral/T2- 9W cat.№ 992100145;
Half Spiral/T2-11W cat.№ 992100147; Half Spiral/T2-15W cat.№ 992100149; 3U/T2 -7W cat.№ 99216165;
3U/T2 -11W cat.№ 99216167; 4U/T2 -15W cat.№ 99216169; Full Spiral D2 -5W cat.№ 99210047;
Full Spiral D2-9W cat.№ 99210049; Full Spiral D2 -11W cat.№ 99210052; Full Spiral D2 -11W cat.№ 99210053;
Full Spiral D2 -15W cat.№ 99210054; Full Spiral D2 -15W cat.№ 99210055; Full Spiral D2 -20W cat.№ 99210056;
Full Spiral D2 -20W cat.№ 99210057; Full Spiral D2 -24W cat.№ 99210058; Full Spiral D2 -24W cat.№ 99210059;
Full Spiral D2 -28W cat.№ 99210060; Full Spiral D2 -32W cat.№ 99210061; Full Spiral D2 -36W cat.№ 99210062;
Half Spiral/T2 -9W cat.№ 992100144; Half Spiral/T2 -11W cat.№ 992100146; Half Spiral/T2 -15W cat.№ 992100148;
*(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 № 039/ 11.02.2015
(name of the firm – applicant, address, telephone, number and date of the test application)

METHOD OF TEST :

BDS EN 55015:2006+A1:2007+A2:2009 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
BDS 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).
BDS EN 61000-3-3:2013 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.
BDS EN 61547:2009 Equipment for general lighting purposes - EMC immunity requirements
BDS EN 61000-4-2:2009 Electromagnetic compatibility (EMC).
Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
BDS EN 61000-4-4:2004+A1:2010 Electromagnetic compatibility (EMC).
Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
BDS EN 61000-4-5:2006 Electromagnetic compatibility (EMC).
Part 4-5: Testing and measurement techniques - Surge immunity test
BDS EN 61000-4-8:2010 Electromagnetic compatibility (EMC).
Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
BDS 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)

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
Rated frequency – 50 Hz
Rated power – 11 W
Cab – E14

DATE OF TEST PERFORMANCE: 04.03.2015 - 05.03.2015

LABORATORY CHIEF:

/ T. Hristov /



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

1. Mains terminal disturbance voltage – 9kHz ÷ 30MHz

BDS EN 55015, cl. 4.3 – Disturbance voltage limits at mains terminals – Table 2a

BDS EN 55015, cl. 5.4 – Self-ballasted lamps

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

BDS EN 55015, cl. 6.4 – Ambient temperature: 24 °C; Relative Humidity: 48 %.

BDS EN 55015, cl.8.1 – Measuring arrangement and procedure

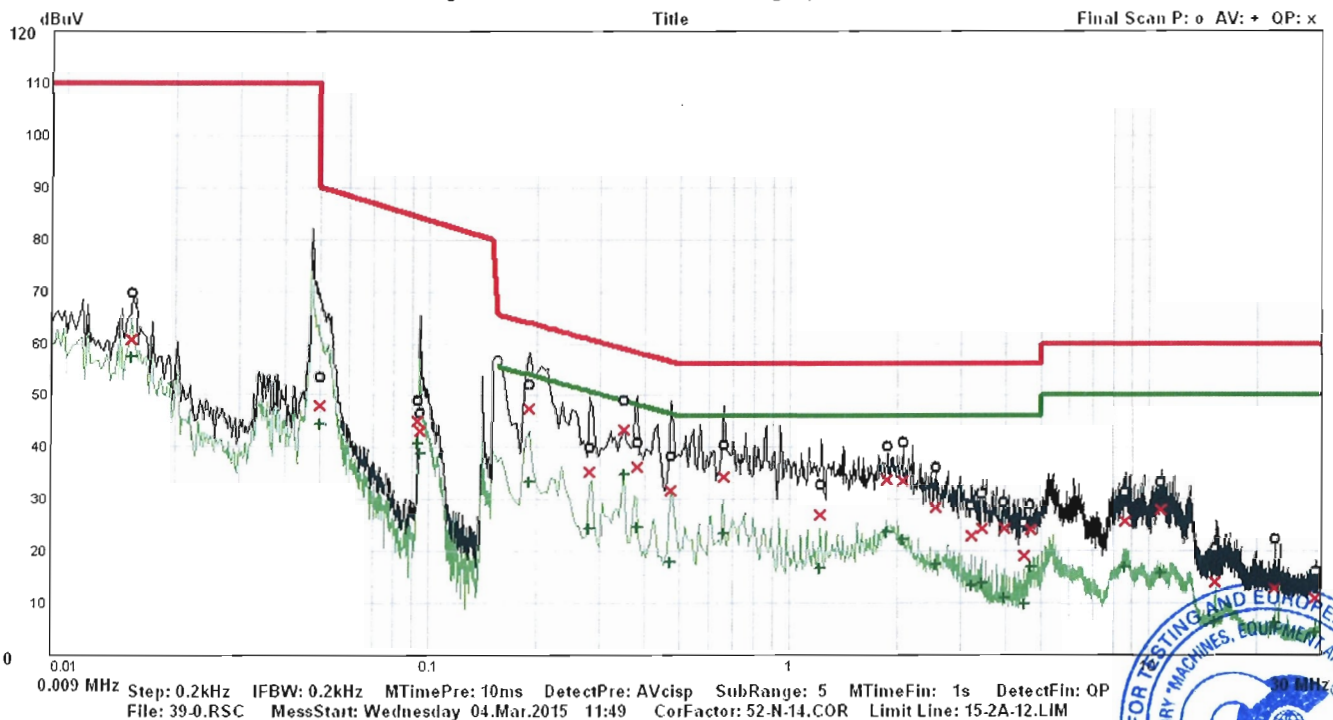
BDS EN 55015, cl.8.6 – Self-ballasted lamps and semi-luminaires – fig.6c

The test is performed at supply voltage: 230 V

RESULTS OF MEASUREMENT :

Frequency	Terminal disturbance voltages, mains line – N					
	Quasi peak - QP			Average - AV		
	Measuring	Margin	Limit	Measuring	Margin	Limit
MHz	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)
0,093	45,17	39,14	84,31	40,81	-	-
0,190	47,39	16,65	64,04	33,29	20,75	54,04
0,280	35,31	25,50	60,81	24,31	26,50	50,81
0,350	43,52	15,44	58,96	34,77	14,19	48,96
0,380	36,38	21,90	58,28	24,49	23,79	48,28
0,470	31,69	24,82	56,51	17,94	28,57	46,51
0,660	34,38	21,62	56,00	23,30	22,70	46,00
1,220	26,88	29,12	56,00	16,80	29,20	46,00
1,870	33,81	22,19	56,00	23,71	22,29	46,00
2,070	33,62	22,38	56,00	22,12	23,88	46,00
2,555	28,43	27,57	56,00	17,32	28,68	46,00
3,210	22,88	33,12	56,00	13,34	32,66	46,00
3,430	24,34	31,66	56,00	13,75	32,25	46,00
3,955	24,28	31,72	56,00	11,09	34,91	46,00
4,695	24,21	31,79	56,00	16,84	29,16	46,00
10,850	27,90	32,10	60,00	15,67	34,33	50,00

Drawing of terminal disturbance voltages, mains line – N



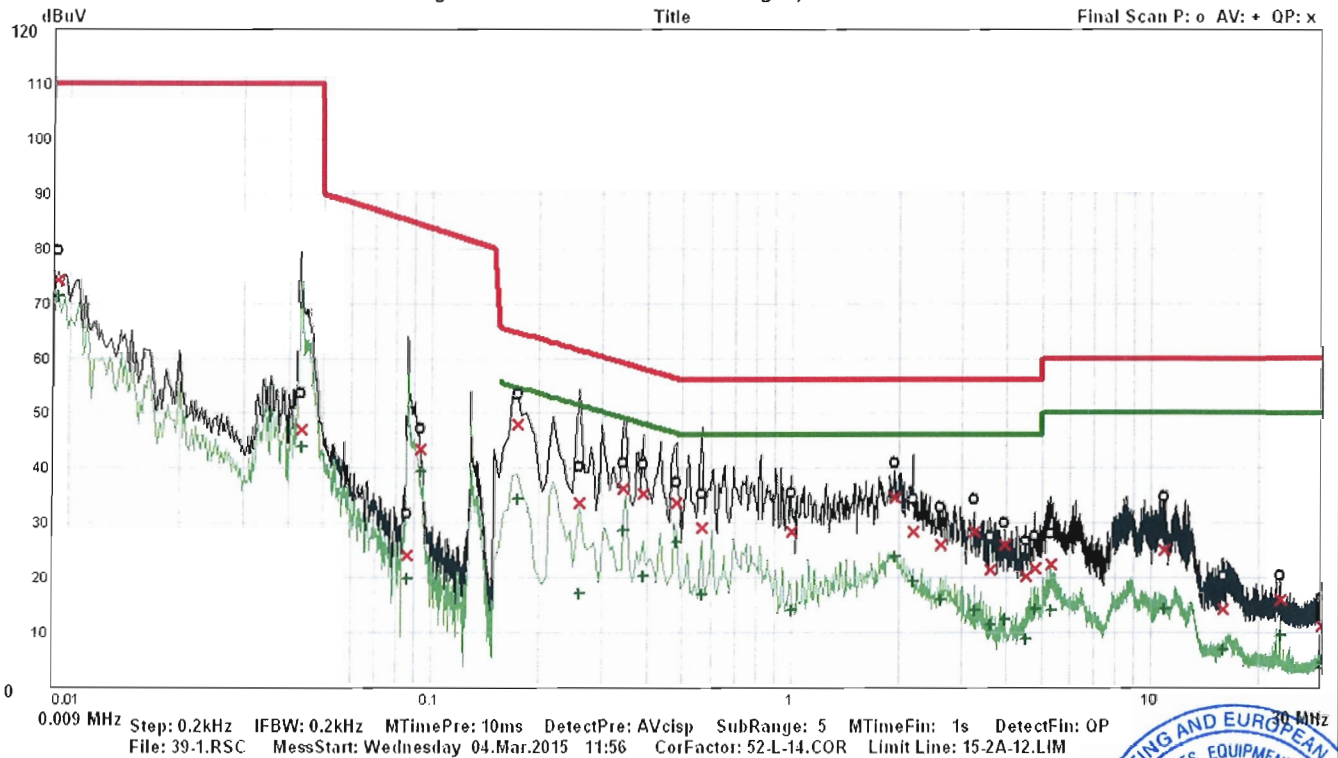
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Frequency	Terminal disturbance voltages, mains line - L					
	Quasi peak - QP			Average - AV		
	Measuring	Margin	Limit	Measuring	Margin	Limit
MHz	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)
0,009	74,15	35,85	110,00	71,39	-	-
0,175	47,94	16,78	64,72	34,41	20,31	54,72
0,260	33,72	27,71	61,43	17,27	34,16	51,43
0,345	36,38	22,70	59,08	28,59	20,49	49,08
0,390	35,22	22,84	58,06	20,20	27,86	48,06
0,480	33,59	22,74	56,33	26,58	19,75	46,33
0,565	29,10	26,90	56,00	16,84	29,16	46,00
1,000	28,42	27,58	56,00	14,07	31,93	46,00
1,950	34,69	21,31	56,00	23,82	22,18	46,00
2,195	28,33	27,67	56,00	19,26	26,74	46,00
2,625	26,01	29,99	56,00	15,98	30,02	46,00
3,270	28,31	27,69	56,00	14,02	31,98	46,00
3,620	21,53	34,47	56,00	11,35	34,65	46,00
3,970	25,99	30,01	56,00	12,33	33,67	46,00
4,525	20,34	35,66	56,00	8,90	37,10	46,00
4,825	21,73	34,27	56,00	14,43	31,57	46,00

Drawing of terminal disturbance voltages, mains line – L



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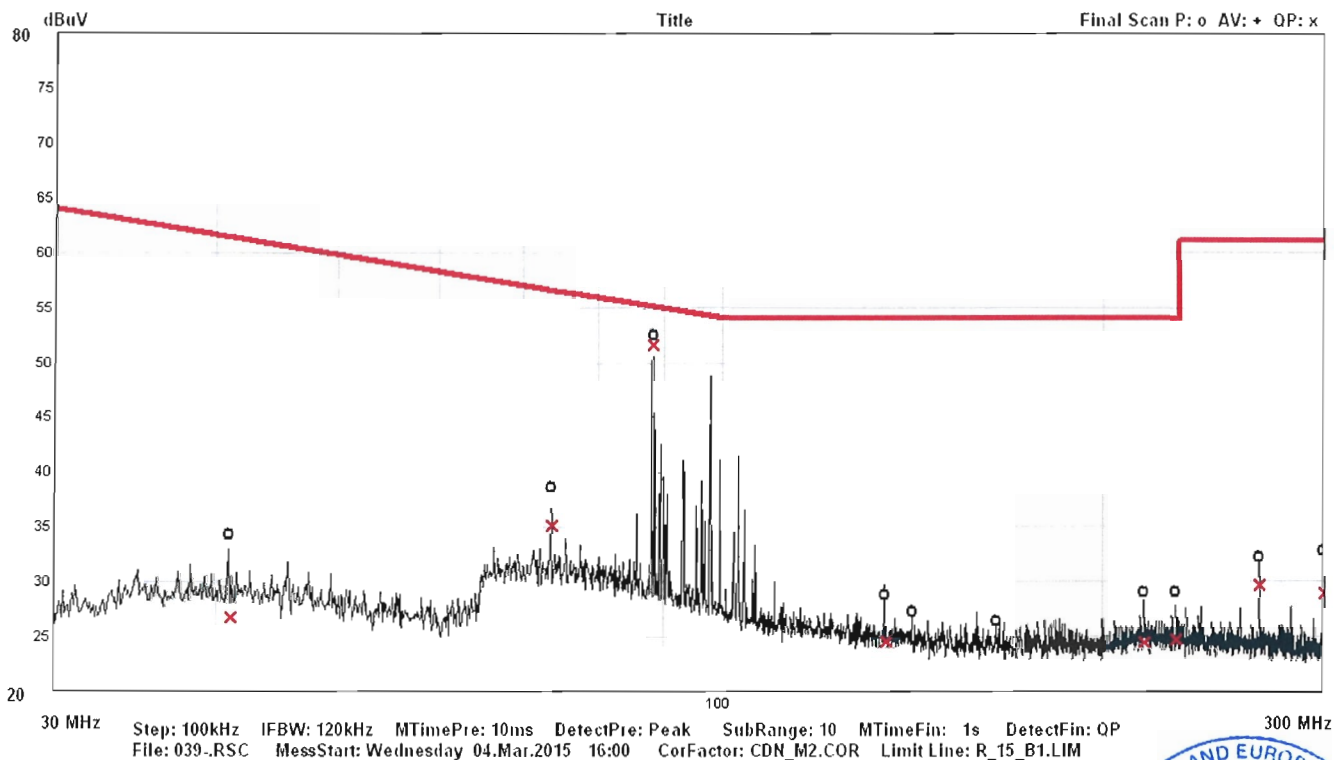


2. Radiated electromagnetic disturbances – 30MHz ÷ 300MHz
 BDS EN 55015, cl. 4.4.2 – Frequency range 30MHz to 300MHz – Annex B. Limits - Table B.1
 BDS EN 55015, cl. 5.2.4 – Other luminaires
 BDS EN 55015, cl. 6 – Operating conditions for lighting equipment
 BDS EN 55015, cl. 6.4 – Ambient temperature: 24 °C ; Relative Humidity: 48 %.
 BDS EN 55015, cl.9.2 – Measuring arrangement and procedure related to Subclause 4.4.2

RESULTS OF MEASUREMENT :

Frequency	Radiated electromagnetic disturbances		
	Quasi peak - QP		
	Measuring	Margin	Measuring
MHz	dB(μV)	dB(μV)	dB(μV)
41,00	26,84	34,56	61,40
73,70	35,20	21,33	56,53
88,30	51,58	3,45	55,03
135,20	24,51	29,49	54,00
142,10	18,78	35,22	54,00
165,70	17,27	36,73	54,00
216,00	24,39	29,61	54,00
229,10	24,62	29,38	54,00
266,70	29,65	31,35	61,00
300,00	29,00	32,00	61,00

Drawing of Radiated electromagnetic disturbances



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3. HARMONIC CURRENT MEASUREMENT

Classification of equipment - C (< 25 W)

Duration of test - 2,5 min

THC= 0,047217 A	I-THD= 107,349 %	POHC= 0,009831 A	POHC Limit= 0,004174 A
$V_{RMS} = 229,9 \text{ V}$	$I_{peak} = 0,22 \text{ A}$	Frequency = 50 Hz	
$I_{RMS} = 0,0647 \text{ A}$	$I_F = 0,044 \text{ A}$	Power= 9 W	
Crest Factor= 3,4	Power Factor = 0,60	K Factor= 36,757	

Harmonic	AVERAGE VALUES			MAX VALUE		
	Measured	100% Limit	% of Limit	Measured	150% Limit	% of Limit
№	, A	, A	%	, A	, A	%
2	0,0004	0,0009	45	0,0004	0,0014	32
3	0,0352	0,0079	445	0,0361	0,0122	297
5	0,0226	0,0044	513	0,0231	0,0068	342
7	0,0112	0,0031	363	0,0115	0,0047	243
9	0,0079	0,0022	360	0,0081	0,0034	241
11	0,0087	0,0013	657	0,0089	0,0020	439
13	0,0071	0,0013	539	0,0073	0,0020	360
15	0,0050	0,0013	379	0,0051	0,0020	253
17	0,0047	0,0013	359	0,0049	0,0020	241
19	0,0046	0,0013	352	0,0048	0,0020	235
21	0,0038	0,0013	288	0,0039	0,0020	193
23	0,0032	0,0013	246	0,0034	0,0020	166
25	0,0032	0,0013	246	0,0034	0,0020	168
27	0,0033	0,0013	246	0,0034	0,0020	169
29	0,0035	0,0013	269	0,0037	0,0020	184
31	0,0039	0,0013	298	0,0041	0,0020	200
33	0,0037	0,0013	277	0,0038	0,0020	187
35	0,0025	0,0013	192	0,0027	0,0020	132
37	0,0012	0,0013	92	0,0013	0,0020	64
39	0,0011	0,0013	82	0,0014	0,0020	

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**LABORATORY FOR TESTING OF MACHINERY, EQUIPMENT AND DEVICES
CENTER FOR TESTING AND EUROPEAN CERTIFICATION LTD – STARA ZAGORA**

Page 6 of 15 EN 61000-3-2:2006+A1:2009+A2:2009 Test report: № 2emc-15-039/17.03.2015

Harmonics of power supply source

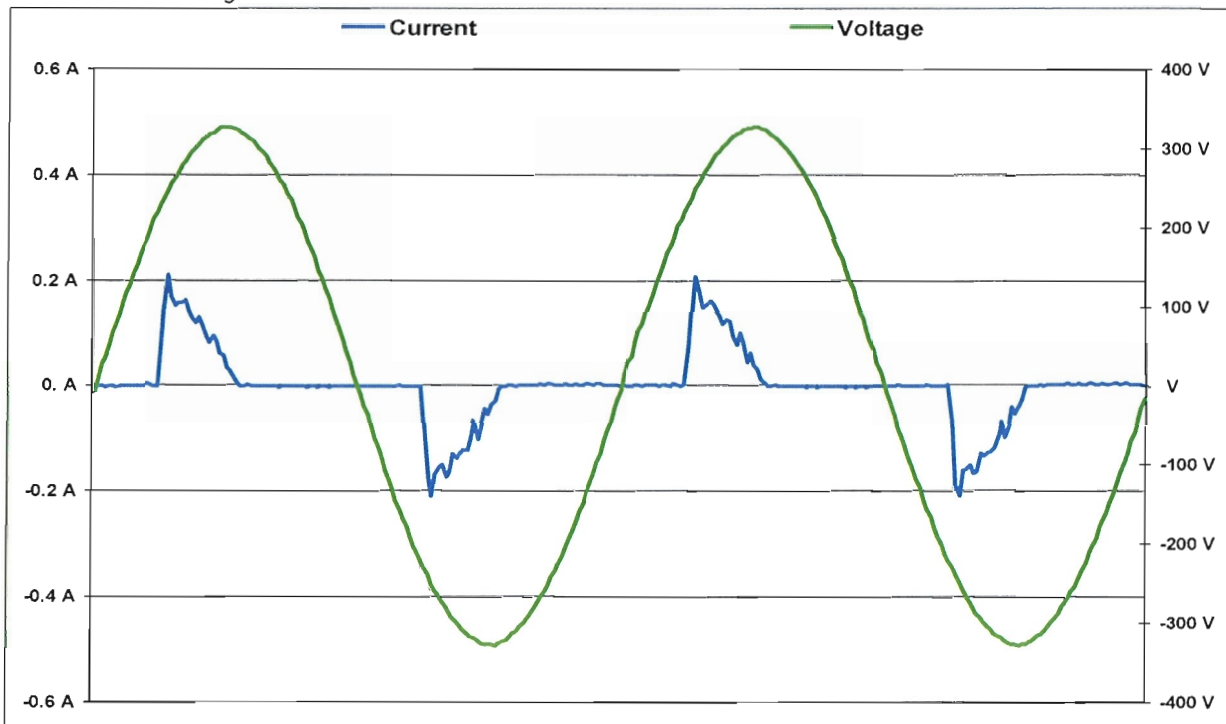
$V_{RMS} = 229,9 \text{ V}$	$I_{peak} = 0,22 \text{ A}$	Frequency = 50 Hz
$I_{RMS} = 0,0647 \text{ A}$	$I_F = 0,044 \text{ A}$	Power = 9 W
	Power Factor = 0,60	

Harmonic	Measured	100% Limit	% of Limit
№	V	V	%
2	0,1322	0,460	28,8
3	0,2361	2,069	11,4
4	0,3218	0,460	70,0
5	0,7378	0,920	80,2
6	0,1839	0,460	40,0
7	0,1152	0,690	16,7
8	0,1609	0,460	35,0
9	0,3218	0,460	70,0
10	0,1381	0,460	30,0
11	0,1378	0,230	59,9
12	0,1152	0,230	50,1
13	0,1609	0,230	70,0
14	0,0919	0,230	40,0
15	0,0460	0,230	20,0
16	0,0919	0,230	40,0
17	0,0461	0,230	20,1
18	0,0690	0,230	30,0
19	0,0919	0,230	40,0
20	0,0690	0,230	30,0
21	0,0919	0,230	40,0
22	0,0694	0,230	30,2
23	0,0483	0,230	21,0
24	0,0691	0,230	30,1
25	0,0530	0,230	23,1
26	0,1381	0,230	60,1
27	0,0690	0,230	30,0
28	0,0690	0,230	30,0
29	0,1154	0,230	50,2
30	0,0688	0,230	29,9
31	0,1839	0,230	80,0
32	0,0460	0,230	20,0
33	0,1379	0,230	60,0
34	0,0690	0,230	30,0
35	0,0919	0,230	40,0
36	0,0690	0,230	30,0
37	0,0725	0,230	31,5
38	0,0690	0,230	30,0
39	0,1109	0,230	48,2
40	0,0919	0,230	40,0

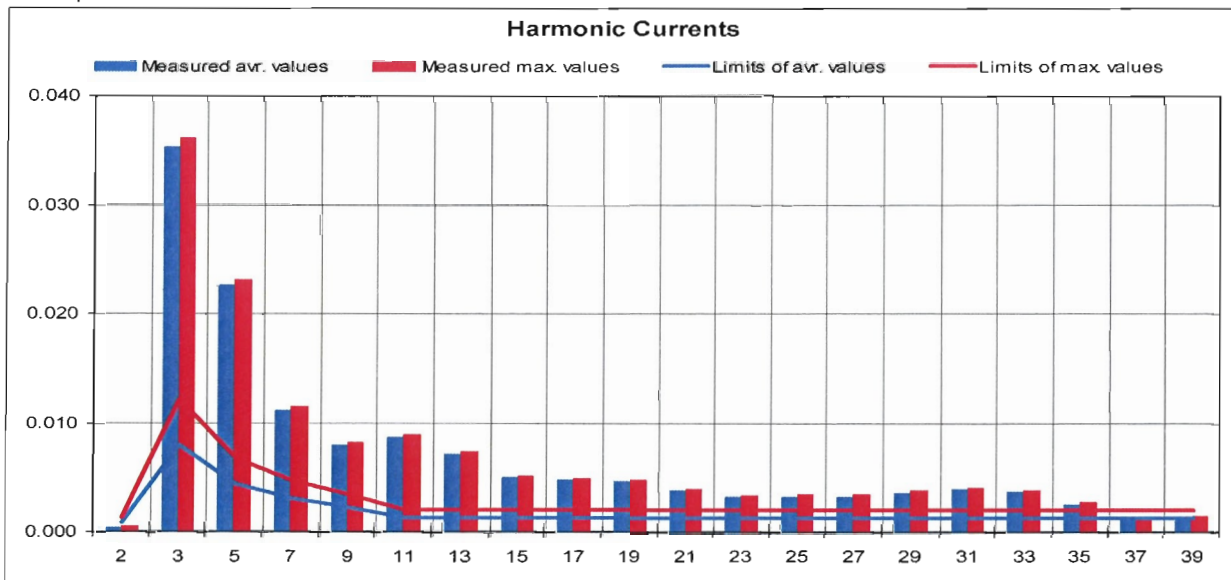
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Current and voltage waveform



Graphics harmonics



According to BS EN 61000-3-2 cl.7.3 b) second indent:

The limit for the third harmonic current - 86% from 0,044 A is 0,03784 A , which is greater than 0,0352 A.

The limit for the fifth harmonic current - 61% from 0,044 A is 0,02684 A , which is greater than 0,0226 A.

The waveform of the input current shall be such that it begins to flow before or at 60°, has its last peak (if there are several peaks per half period) before or at 65° and does not stop flowing before 90°, where the zero crossing of the fundamental supply voltage is assumed to be at 0°.

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4. Voltage fluctuations and flicker measurement

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

BDS EN 61000-3-3, cl. 5 – Limits

BDS EN 61000-3-3, cl. 6 – Test conditions

Power supply: 230 V ; Frequency: 50 Hz,

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

According to BDS EN 61000-3-3:2013 – Annex A, clause A.2 – LED luminaire with power less or equal to 200 W, comly with the limit values of d_{max} in this standard and does not need to be tested.

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II. Immunity of Radio disturbance characteristics for general lighting purposes

BDS 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	48 %
	Air pressure	1010 mbar

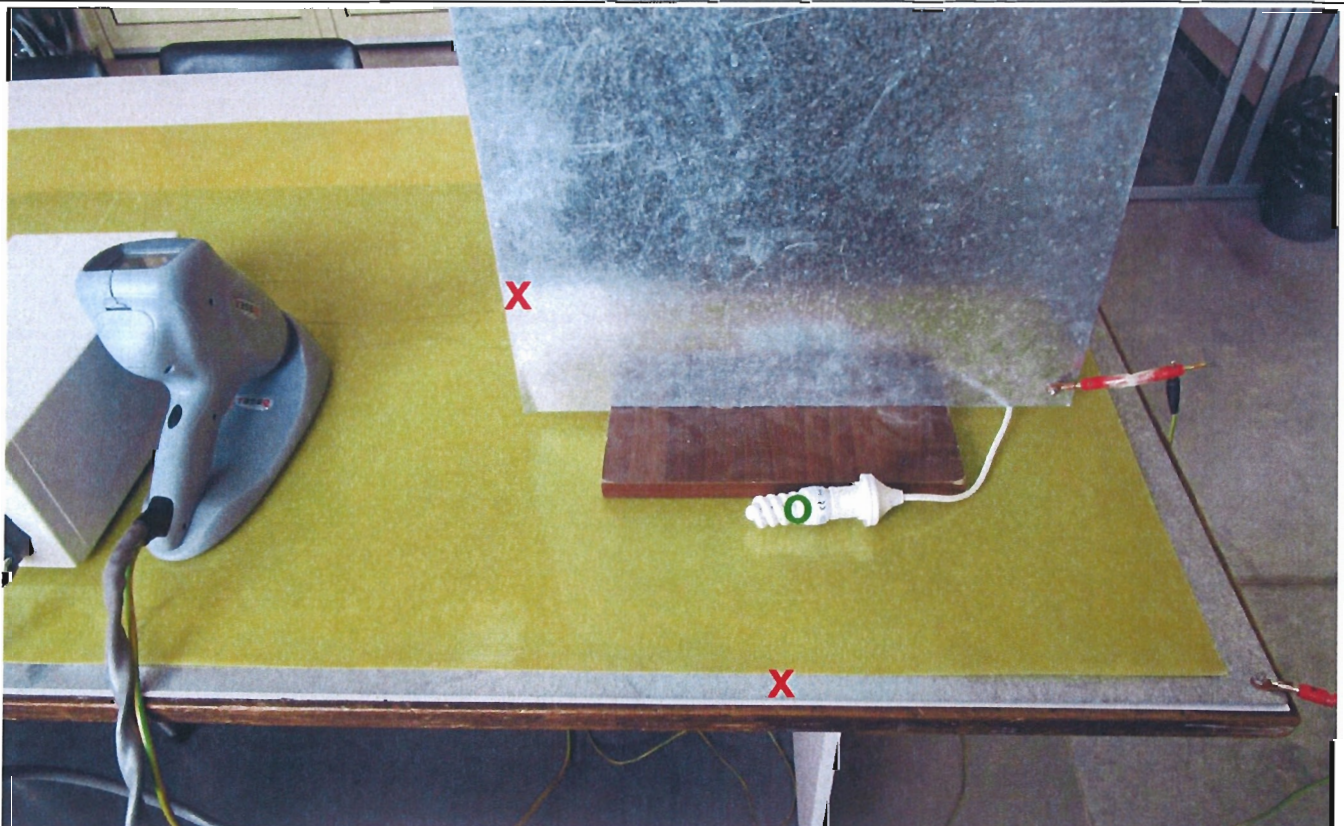
1. IMMUNITY TO ELECTROSTATIC DISCHARGE (ESD)

BDS EN 61547, τ. 5.2 – Electrostatic discharges – Table 1 - Test levels at enclosure port
 BDS EN 61000-4-2, τ. 7 – Test setup
 BDS EN 61000-4-2, τ. 7.2.2 – Table-top equipment , Figure 4
 BDS 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.6.3.2 and Table 13 of BDS 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 lamp - ○	Air - Direct	1;2;3	2;4;8 kV	+ -	Criteria A
Vertical coupling plane (VCP) - X	Contact - Direct	1;2	2;4 kV	+ -	Criteria A
Horizontal coupling plane (HCP) - X	Contact - Direct	1;2	2;4 kV	+ -	Criteria A

Picture of the object with marked points of discharge locations



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2. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

BDS EN 61547, т. 5.5 – Applicability, Table 6

BDS EN 61000-4-4, т. 7 – Test setup

BDS 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.6.3.2 and Table 13 of BDS EN 61547	Criteria B

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

BDS EN 61547, т. 5.7 – Applicability ,Table 10
 BDS EN 61000-4-5, т. 7 – Test setup
 BDS 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.6.3.2 and Table 13 of BDS EN 61547	Criteria C

Power line symmetrical

Pulse Application	Level	Test Voltage V	Polarity	Result
phase L – neutral N	1	500	+	Criteria B
			-	Criteria B
	2	1000	+	-
			-	-

Power line unsymmetrical

Pulse Application	Level	Test Voltage V	Polarity	Result
phase L – protective earth	1	500	+	-
			-	-
	2	1000	+	-
			-	-
	3	2000	+	-
			-	-
neutral N - protective earth	1	500	+	-
			-	-
	2	1000	+	-
			-	-
	3	2000	+	-
			-	-

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4. RATED POWER FREQUENCY MAGNETIC FIELD

BDS EN 61547, т. 5.4 – Applicability ,Table 3

BDS EN 61000-4-8 т. 7 – Test setup

BDS EN 61000-4-8 т. 8 – Test procedure

Performance Criteria according to cl.6.3.2
and Table 13 of BDS 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	Criteria A
1 m x 1 m	Y	2	3 A/m	3,45 A	Criteria A
1 m x 1 m	Z	2	3 A/m	3,45 A	Criteria A

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

5.1 Voltage dips immunity tests

BDS EN 61547, τ. 5.8 – Applicability ,Table 11

BDS EN 61000-4-11 τ. 7 – Test setup

BDS EN 61000-4-11 τ. 8 – Test procedure

BDS 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.6.3.2 and Table 13 of BDS EN 61547

Criteria C

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

5.2 Short interruptions immunity tests

BDS EN 61547, τ. 5.8 – Applicability ,Table 12

BDS EN 61000-4-11 τ. 7 – Test setup

BDS EN 61000-4-11 τ. 8 – Test procedure

BDS 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.6.3.2 and Table 13 of BDS EN 61547

Criteria B

Voltage test levels (% of rated voltage)	Duration (cycles)	Phase angle synchronization	Result
0 %	0,5 cycles	0°	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	19.03.2014
5.	Voltage Generator	GL 01-16-230	Neosvet Bulgaria	0001	-
6.	Power Quality Analyzer	435	Fluke Netherlands	DM 9881064	20.10.2014
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	26.06.2014
9.	Line impedance stabilisation networks	NNB 52	TESEQ Switzerland	26326	02.07.2014
10.	Coupling/Decoupling network	CDN M2+M3	Frankonia EMC Test - Systems	A2210229	18.04.2013

TEST PERFORMER: 1.

/ T. Hristov /



2.

/D. Chavalinov /

CHIEF LABORATORY :

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