



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



2, Industrialna Str., Stara Zagora, Bulgaria,
Tel.: +359 42 620 368 Fax: +359 42 602 377 ctec@ctec-sz.com

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

TEST REPORT

№ 2emc-15-068 / 06.04.2015

OBJECT TO BE TESTED: Electrical and electronic equipment – Luminaire
Luminaire - LED lighting fixtures, „PANEL” Model: LED PANEL, cat.№ 92LEDPANEL014
Representative sample from fixtures group LED PANEL with cat. №: 92LEDPANEL012;
92LEDPANEL013; 92LEDPANEL015

*(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 № 068 / 11.03.2015
(name of the firm – applicant, address, telephone, number and date of the test application)

METHOD OF TEST: EN 55015:2006+A1:2007+A2:2009 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
EN 61000-3-2:2014 Electromagnetic compatibility (EMC).
Part 3-2: Limits – Limits for harmonic current emissions (equipment input current <= 16 A per phase).
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.
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: 11.03.2015

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

DECLARED DATA: Declared voltage 230 V
Declared frequency 50-60 Hz
Declared power 48 W
Class II

ELECTRONIC CONTROLGEAR: LCM-60 ELMARK

DATE OF TEST PERFORMANCE: 11.03.2015 - 19.03.2015

LABORATORY CHIEF:
/ T. Hristov /





Emission of Radio disturbance characteristics of electrical lighting and similar equipment

Mains terminal disturbance voltage – 9kHz ÷ 30MHz

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

EN 55015, cl. 5.2.4 – Application of the limits for other luminaires

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

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

EN 55015, cl.8.1 – Measuring arrangement and procedure

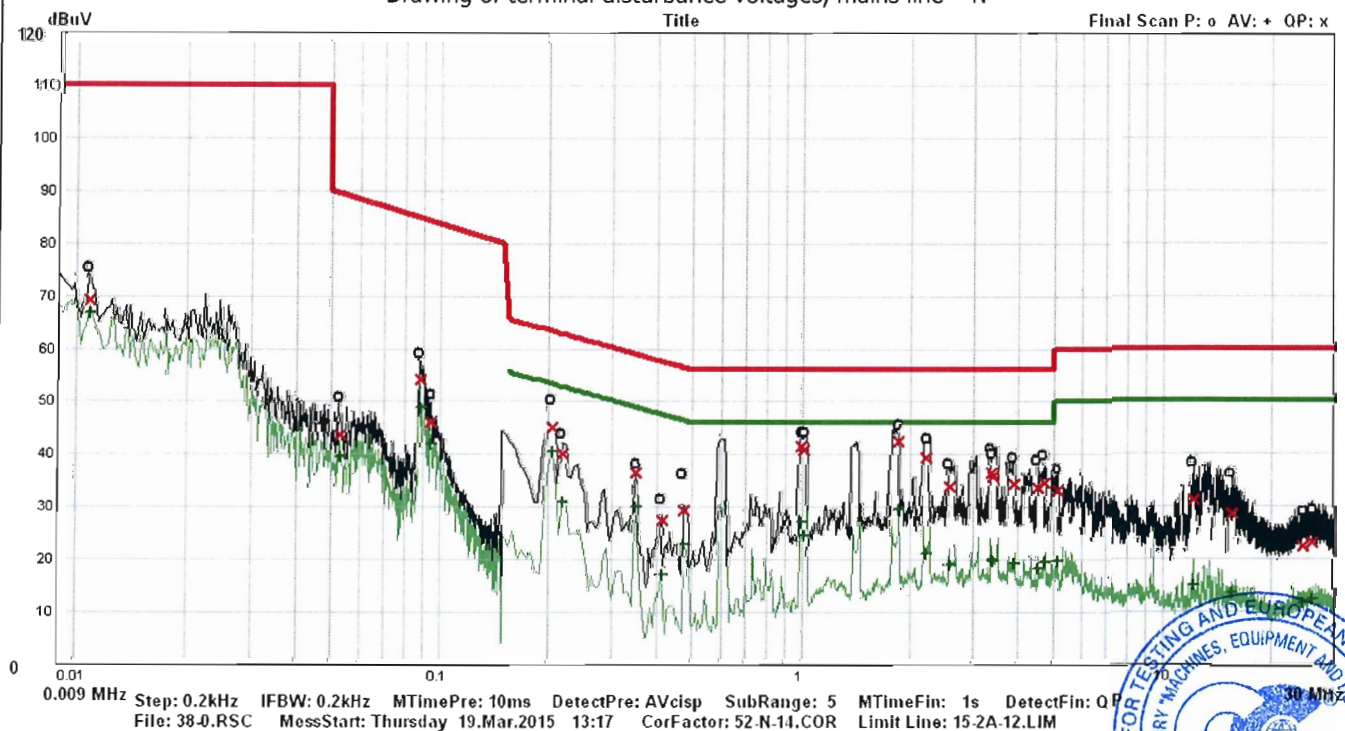
EN 55015, cl.8.2 – Measurement of disturbance voltages, at the mains terminals of indoor and outdoor luminaires – Figure 6a.

The test is performed at supply voltage: 230 V

RESULTS OF MEASUREMENT :

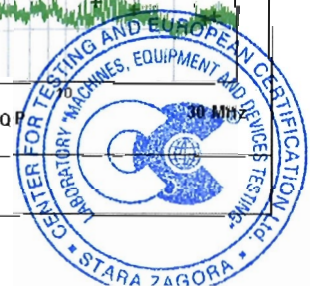
Frequency MHz	Terminal disturbance voltages, mains line – N					
	Quasi peak - QP			Average - AV		
	Measuring dB(μV)	Margin dB(μV)	Limit dB(μV)	Measuring dB(μV)	Margin dB(μV)	Limit dB(μV)
0,011	69,23	40,77	110,00	66,78	-	-
0,089	54,20	30,59	84,79	48,85	-	-
0,205	45,00	18,40	63,40	40,49	12,91	53,40
0,220	40,09	22,73	62,82	30,92	21,90	52,82
0,350	36,57	22,39	58,96	30,10	18,86	48,96
0,475	29,28	27,14	56,42	22,82	23,60	46,42
0,995	41,57	14,43	56,00	27,17	18,83	46,00
1,010	40,86	15,14	56,00	24,59	21,41	46,00
1,855	42,48	13,52	56,00	29,64	16,36	46,00
2,220	39,45	16,55	56,00	21,29	24,71	46,00
2,585	33,77	22,23	56,00	19,16	26,84	46,00
3,375	36,56	19,44	56,00	20,02	25,98	46,00
3,410	35,83	20,17	56,00	19,90	26,10	46,00
3,915	34,36	21,64	56,00	19,29	26,71	46,00
4,550	33,66	22,34	56,00	18,29	27,71	46,00
4,740	34,52	21,48	56,00	19,68	26,32	46,00

Drawing of terminal disturbance voltages, mains line – N



The results showed in present test report concern tested sample only

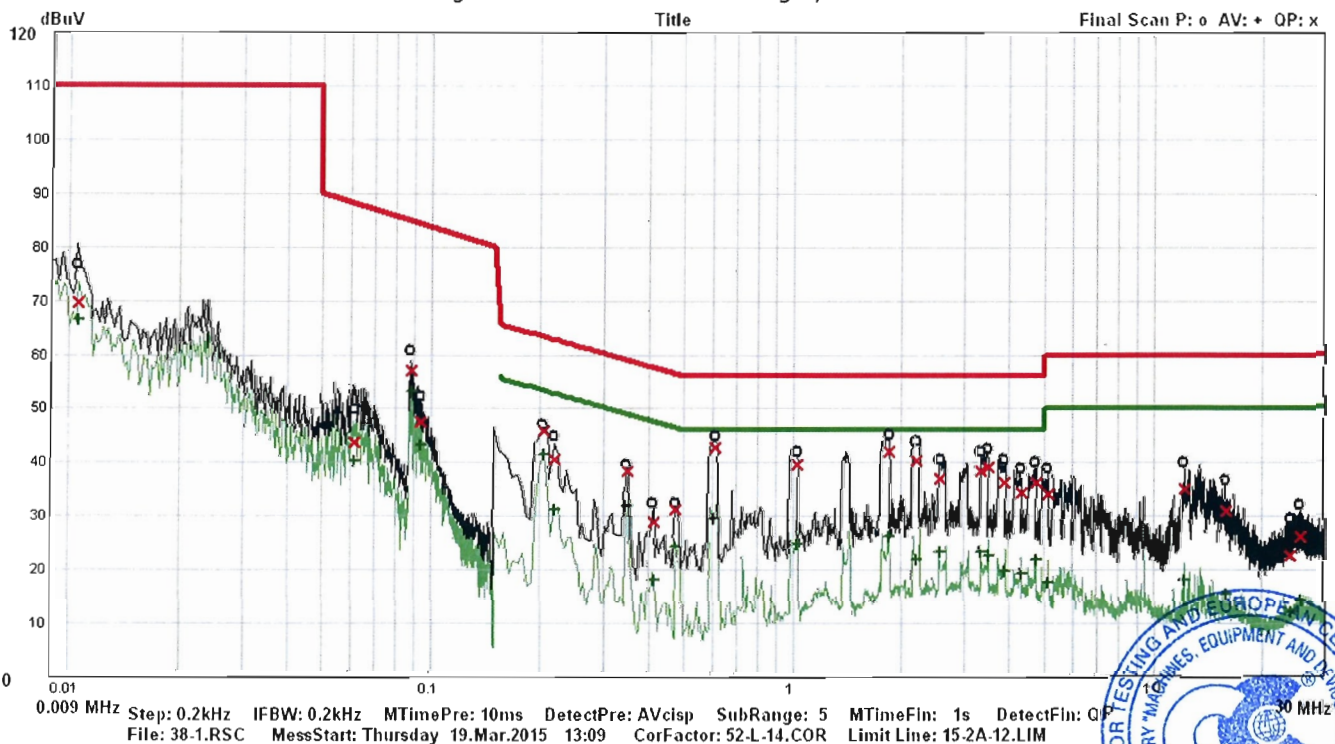
The test report could be reproduced as a whole only and after written permission of the laboratory



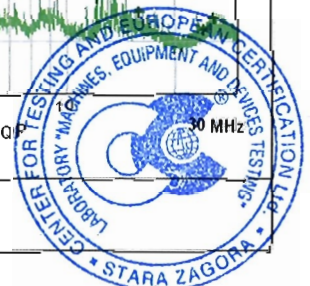


Frequency	Terminal disturbance voltages, mains line - L					
	Quasi peak - QP			Average - AV		
	Measuring	Margin	Limit	Measuring	Margin	Limit
MHz	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)	dB(μV)
0,011	69,74	40,26	110,00	66,67	-	-
0,089	57,03	27,76	84,79	53,19	-	-
0,205	45,73	17,67	63,40	41,51	11,89	53,40
0,220	40,50	22,32	62,82	31,34	21,48	52,82
0,350	38,49	20,47	58,96	31,86	17,10	48,96
0,415	28,89	28,65	57,54	18,23	29,31	47,54
0,475	31,22	25,20	56,42	24,38	22,04	46,42
0,610	42,74	13,26	56,00	29,53	16,47	46,00
1,025	39,61	16,39	56,00	24,85	21,15	46,00
1,855	42,01	13,99	56,00	26,31	19,69	46,00
2,225	40,37	15,63	56,00	21,83	24,17	46,00
2,570	36,86	19,14	56,00	23,31	22,69	46,00
3,360	38,50	17,50	56,00	23,35	22,65	46,00
3,510	39,10	16,90	56,00	22,76	23,24	46,00
3,915	36,19	19,81	56,00	19,71	26,29	46,00
4,335	34,43	21,57	56,00	19,33	26,67	46,00
4,755	36,36	19,64	56,00	21,86	24,14	46,00
5,160	34,17	25,83	60,00	17,76	32,24	50,00
12,195	35,02	24,98	60,00	18,14	31,86	50,00

Drawing of terminal disturbance voltages, mains line – L



*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





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)
56,90	39,77	18,91	58,68
82,50	43,42	12,17	55,59
103,40	52,85	1,15	54,00
123,50	53,52	0,48	54,00
138,10	47,79	6,21	54,00
170,00	32,01	21,99	54,00
200,00	31,37	22,63	54,00
219,00	27,47	26,53	54,00
259,90	22,66	38,34	61,00
300,00	31,26	29,74	61,00

Drawing of Radiated electromagnetic disturbances



*The results showed in present test report concern tested sample only
 The test report could be reproduced as a whole only and after written permission of the laboratory*





3. HARMONIC CURRENT MEASUREMENT

Classification of equipment - C

Duration of test - 2,5 min

THC= 0,02588 A

I-THD= 12,697 %

POHC= 0,0043 A

POHC Limit= 0,01949 A

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

$I_{peak} = 0,3457 \text{ A}$

Frequency = 50 Hz

$I_{RMS} = 0,2073 \text{ A}$

$I_F = 0,2054 \text{ A}$

Power= 45,9 W

Crest Factor= 1,669

Power Factor = 0,96

K Factor= 1,697

Harmonic	AVERAGE VALUES			MAX VALUE		
	Measured	100% Limit	% of Limit	Measured	150% Limit	% of Limit
№	, A	, A	%	, A	, A	%
2	0,0004	0,0041	11	0,0006	0,0062	9
3	0,0244	0,0592	41	0,0247	0,0894	28
5	0,0047	0,0205	23	0,0048	0,0311	15
7	0,0005	0,0144	4	0,0010	0,0217	5
9	0,0023	0,0103	22	0,0023	0,0155	15
11	0,0037	0,0062	60	0,0037	0,0093	40
13	0,0028	0,0062	46	0,0029	0,0093	31
15	0,0020	0,0062	32	0,0020	0,0093	22
17	0,0018	0,0062	29	0,0018	0,0093	19
19	0,0014	0,0062	23	0,0015	0,0093	16
21	0,0018	0,0062	28	0,0018	0,0093	19
23	0,0015	0,0062	25	0,0016	0,0093	17
25	0,0011	0,0062	18	0,0012	0,0093	13
27	0,0014	0,0062	23	0,0015	0,0093	16
29	0,0012	0,0062	19	0,0012	0,0093	13
31	0,0007	0,0062	11	0,0007	0,0093	7
33	0,0018	0,0062	30	0,0019	0,0093	20
35	0,0014	0,0062	22	0,0014	0,0093	15
37	0,0011	0,0062	18	0,0012	0,0093	13
39	0,0012	0,0062	20	0,0013	0,0093	14

*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





Harmonics of power supply source

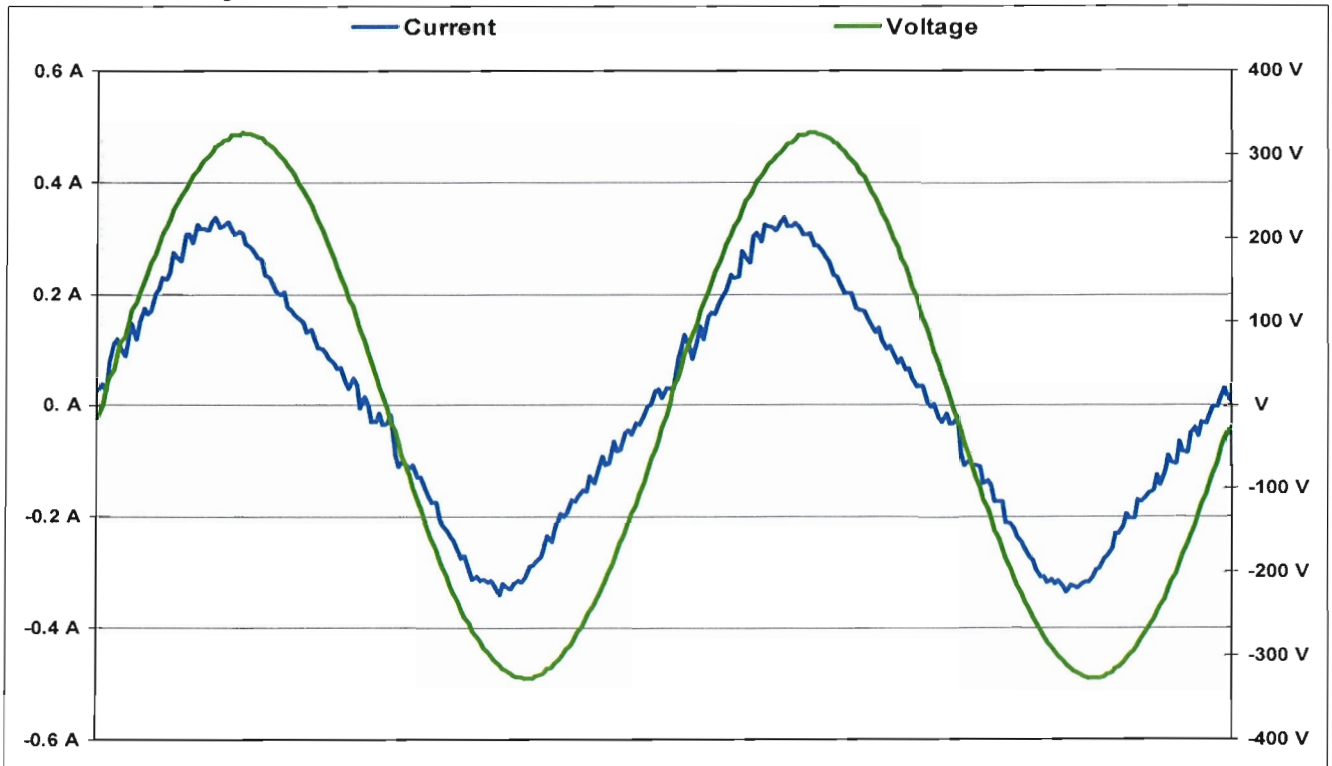
$V_{RMS} = 229,8 \text{ V}$	$I_{peak} = 0,3457 \text{ A}$	Frequency = 50 Hz
$I_{RMS} = 0,2073 \text{ A}$	$I_F = 0,2054 \text{ A}$	Power = 45,9 W
	Power Factor = 0,96	

Harmonic	Measured	100% Limit	% of Limit
№	V	V	%
2	0,1198	0,460	26,1
3	0,2936	2,068	14,2
4	0,3018	0,460	65,7
5	0,6241	0,919	67,9
6	0,1842	0,460	40,1
7	0,0925	0,689	13,4
8	0,1610	0,460	35,0
9	0,3452	0,460	75,1
10	0,1382	0,460	30,1
11	0,1154	0,230	50,2
12	0,1152	0,230	50,1
13	0,1151	0,230	50,1
14	0,0933	0,230	40,6
15	0,0234	0,230	10,2
16	0,0919	0,230	40,0
17	0,0708	0,230	30,8
18	0,0689	0,230	30,0
19	0,0689	0,230	30,0
20	0,0689	0,230	30,0
21	0,0233	0,230	10,1
22	0,0689	0,230	30,0
23	0,0231	0,230	10,1
24	0,0686	0,230	29,9
25	0,0919	0,230	40,0
26	0,0683	0,230	29,7
27	0,0237	0,230	10,3
28	0,1276	0,230	55,5
29	0,0654	0,230	28,5
30	0,0691	0,230	30,1
31	0,1839	0,230	80,0
32	0,0679	0,230	29,5
33	0,0919	0,230	40,0
34	0,0689	0,230	30,0
35	0,0460	0,230	20,0
36	0,0689	0,230	30,0
37	0,0689	0,230	30,0
38	0,0797	0,230	34,7
39	0,1609	0,230	70,0
40	0,1146	0,230	49,8

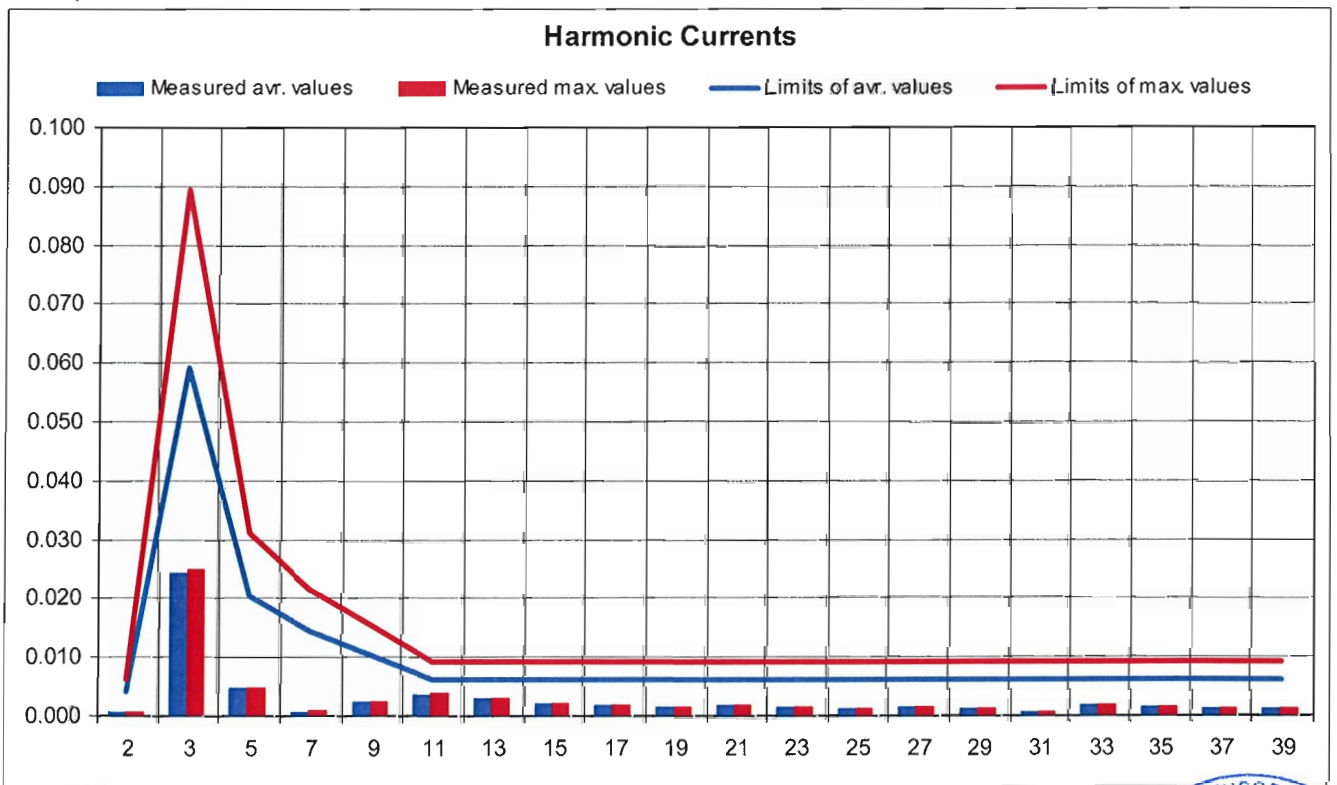
The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory



Current and voltage waveform



Graphics harmonics



*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





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

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

According to EN 61000-3-3:2013 – Annex A, clause A.2 luminaire is deemed to satisfy the requirements of the standard without testing of the EUT



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	48 %
	Air pressure	1010 mbar

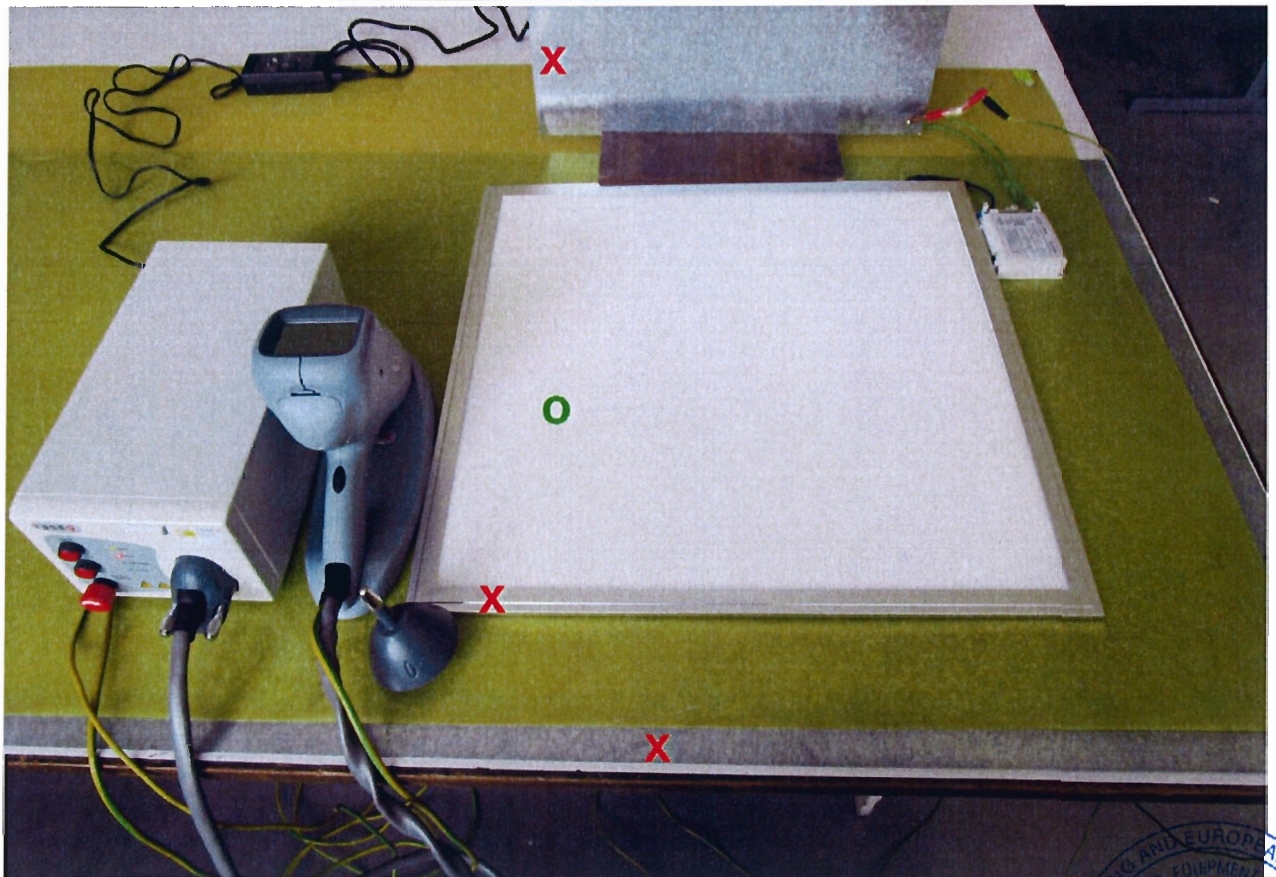
1. IMMUNITY TO ELECTROSTATIC DISCHARGE (ESD)

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 - O	Air - Direct	1;2;3	2;4;8 kV	+ -	Pass (criteria A)
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



*The results showed in present test report concern tested sample only
 The test report could be reproduced as a whole only and after written permission of the laboratory*



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 L, neutral 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	+	-
				-	-

The results showed in present test report concern tested sample only

The test report could be reproduced as a whole only and after written permission of the laboratory





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	+	-
			-	-
	2	1000	+	-
			-	-
	3	2000	+	-
			-	-
neutral N - protective earth	1	500	+	-
			-	-
	2	1000	+	-
			-	-
	3	2000	+	-
			-	-

*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





4. RATED POWER FREQUENCY MAGNETIC FIELD

EN 61547, т. 5.4 – Applicability ,Table 3

EN 61000-4-8 т. 7 – Test setup

EN 61000-4-8 т. 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)

*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





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 A)

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 A)

*The results showed in present test report concern tested sample only
The test report could be reproduced as a whole only and after written permission of the laboratory*





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 :

/ T. Hristov /

The results showed in present test report concern tested sample only

The test report could be reproduced as a whole only and after written permission of the laboratory