


CENTER FOR TESTING AND EUROPEAN CERTIFICATION LTD

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LABORATORY FOR TESTING OF MACHINERY, EQUIPMENT AND DEVICES

Certificate of accreditation № 101 ЛИ / 26.11.2018, valid until: 26.11.2022
Issued by EA BAS, in accordance with the requirements of BDS EN ISO/IEC 17025:2006



TEST REPORT

№ 2emc-19-131/30.10.2019

OBJECT TO BE TESTED: Electric and electronic equipment, appliances, devices. Luminaries.
Lighting fixture type Tri-Proof, Model: LED Tri-Proof 50 W 4000K; ref.№ 983050140040044;
(name of object to be tested, type, model, quantity, type and other)

APPLICANT FOR TEST: "Electrostart" JSCo. 3540 Varshets, 2 Republika Blvd.,
Tel.: +359 2 400 7011, fax: + 359 2 400 7012;
Application № 131/ 03.07.2019
(name of the firm – applicant, address, telephone, number and date of the test application)

METHOD OF TEST :

BDS EN 55015:2013+A1:2015 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
BDS EN 61000-3-2:2014 Electromagnetic compatibility (EMC).
Part 3-2: Limits – Limits for harmonic current emissions (equipment input current \leq 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 \leq 16 A per phase and not subject to conditional connection.
BDS EN 61547:2010 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 61000-4-8:2010 Electromagnetic compatibility (EMC).
Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
BDS EN 61000-4-11:2006 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: 03.07.2019

MANUFACTURER: "Electrostart" JSCo. 3540 Varshets, 2 Republika Blvd.,
Tel.: +359 2 400 7011, fax: + 359 2 400 7012;
(firm, trade mark, address)

DECLARED TECHNICAL DATA: Rated voltage – 200-240 V AC
Rated frequency – 50-60 Hz
Rated power – 50 W
Class I

ELECTRONIC CONTROLGEAR: Electrostart LED-450-54PWNI, ref.№ 980054045003404 ;

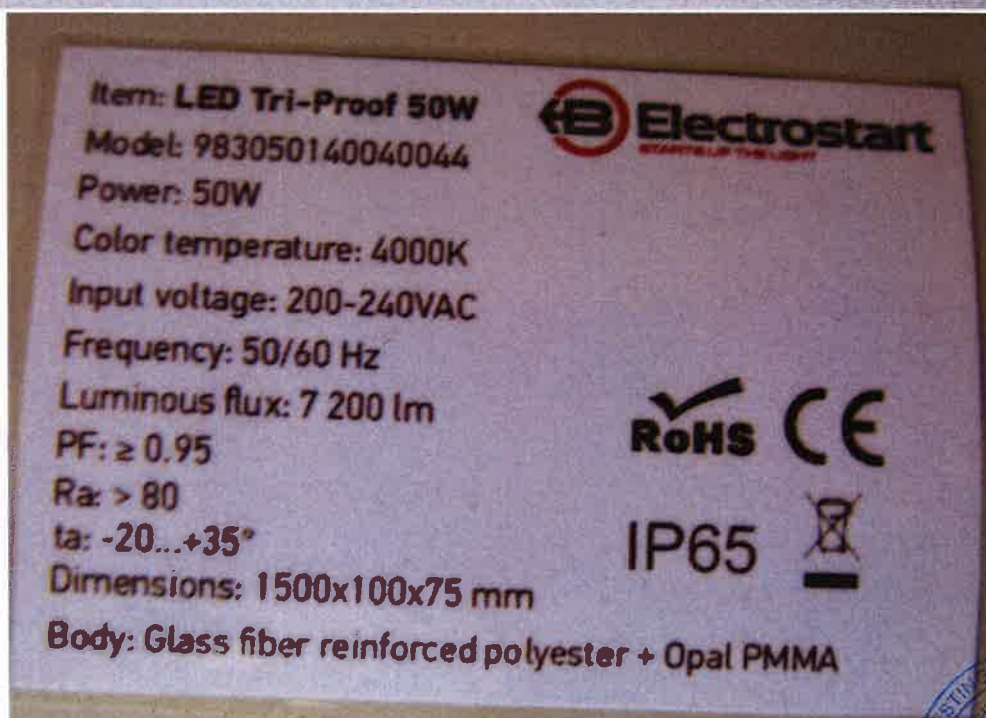
DATE OF TEST PERFORMANCE: 24.07.2019

THE HEAD OF LABORATORY:
/ T. Hristov /





Copy of identification table and/or photo of tested object



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BDS EN 55015:2013+A1:2015

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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 – Other luminaires

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

BDS EN 55015, cl. 6.4 – Ambient temperature: 25 °C; Relative Humidity: 42 %.

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

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

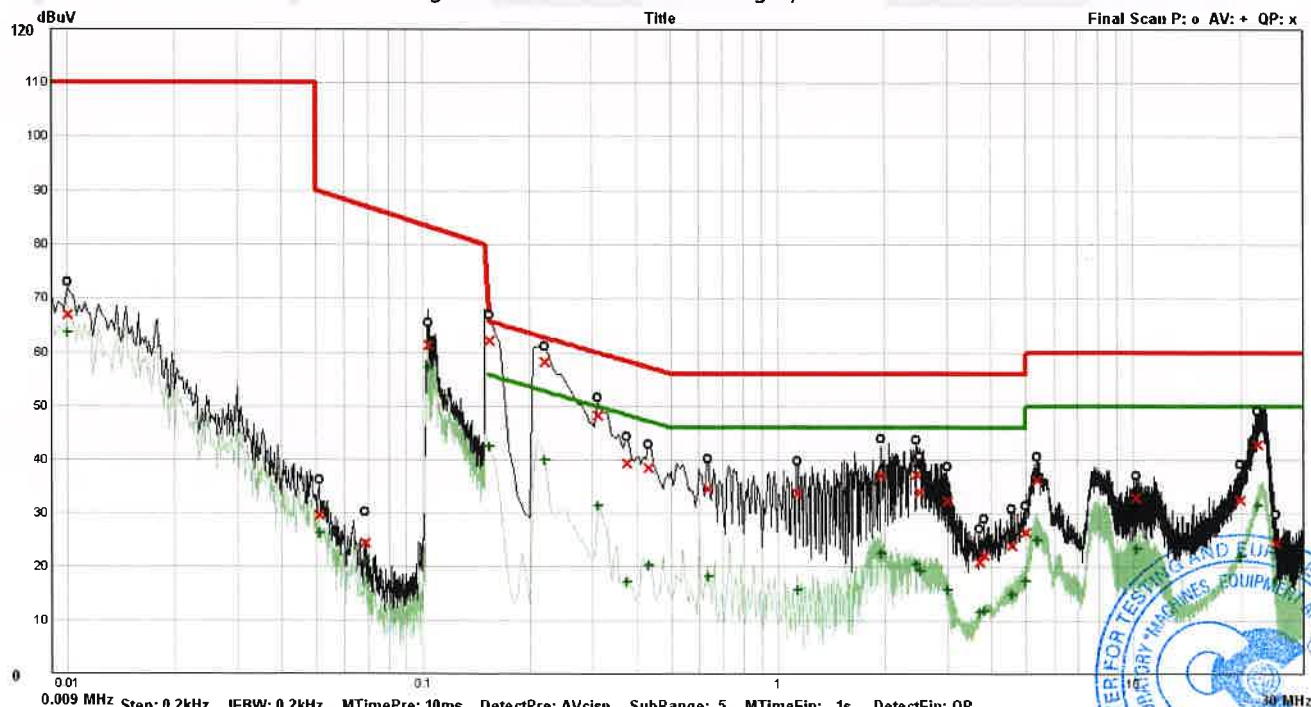
The test is performed at supply voltage: 230 V

Measurement uncertainty: 2,75 dB(µV)

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)
0,010	66,98	43,02	110,00	63,67	-	-
0,104	61,27	22,08	83,35	57,11	-	-
0,155	62,11	3,62	65,73	42,59	13,14	55,73
0,220	58,14	4,68	62,82	39,97	12,85	52,82
0,310	48,25	11,72	59,97	31,45	18,52	49,97
0,375	39,45	18,94	58,39	17,20	31,19	48,39
0,430	38,54	18,71	57,25	20,32	26,93	47,25
0,635	34,67	21,33	56,00	18,30	27,70	46,00
1,135	33,83	22,17	56,00	15,81	30,19	46,00
1,950	37,15	18,85	56,00	22,64	23,36	46,00
2,470	37,27	18,73	56,00	20,51	25,49	46,00
2,525	33,92	22,08	56,00	19,22	26,78	46,00
3,000	32,32	23,68	56,00	15,78	30,22	46,00
5,380	36,18	23,82	60,00	25,05	24,95	50,00
10,180	33,03	26,97	60,00	23,43	26,57	50,00
22,325	42,85	17,15	60,00	31,56	18,44	50,00

Drawing of terminal disturbance voltages, mains line – N



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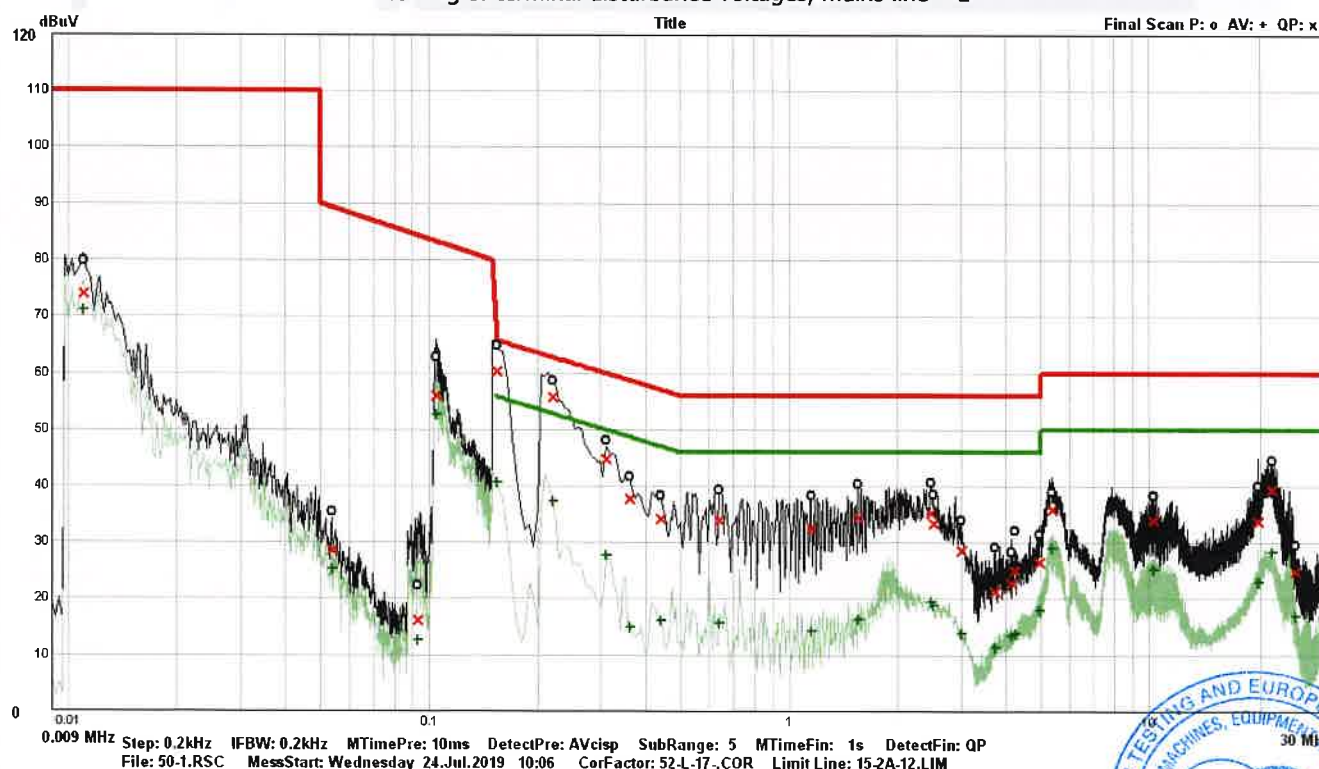
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BDS EN 55015:2013+A1:2015

Test report: № 2emc-19-131/30.10.2019

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	73,90	36,10	110,00	71,00	29,00	100,00
0,105	55,91	27,31	83,22	52,67	47,33	100,00
0,155	60,21	5,52	65,73	40,65	15,08	55,73
0,220	55,82	7,00	62,82	37,37	15,45	52,82
0,310	44,85	15,12	59,97	27,73	22,24	49,97
0,360	37,65	21,08	58,73	15,01	33,72	48,73
0,440	34,12	22,94	57,06	16,10	30,96	47,06
0,640	34,06	21,94	56,00	15,85	30,15	46,00
1,150	32,55	23,45	56,00	14,29	31,71	46,00
1,550	34,50	21,50	56,00	16,44	29,56	46,00
2,485	35,18	20,82	56,00	19,47	26,53	46,00
2,510	33,47	22,53	56,00	18,87	27,13	46,00
3,000	28,70	27,30	56,00	13,85	32,15	46,00
3,725	21,32	34,68	56,00	11,50	34,50	46,00
4,135	22,81	33,19	56,00	13,56	32,44	46,00
4,225	25,02	30,98	56,00	13,86	32,14	46,00
4,970	26,43	29,57	56,00	18,03	27,97	46,00
5,395	35,94	24,06	60,00	29,00	21,00	50,00
10,245	34,05	25,95	60,00	25,23	24,77	50,00
19,790	33,71	26,29	60,00	23,06	26,94	50,00
21,625	39,45	20,55	60,00	28,38	21,62	50,00
25,100	24,83	35,17	60,00	16,92	33,08	50,00

Drawing of terminal disturbance voltages, mains line – L



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BDS EN 55015:2013+A1:2015

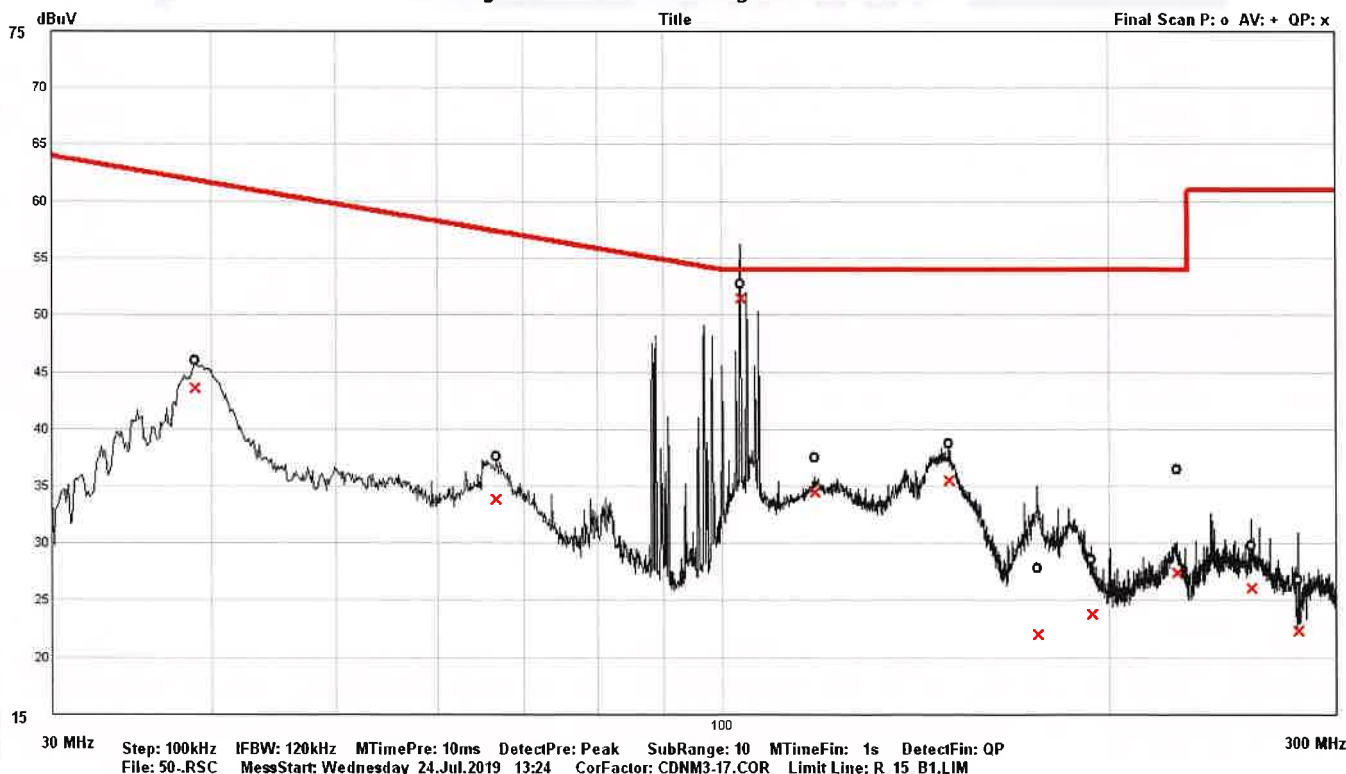
Test report: № 2emc-19-131/30.10.2019

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: 25 °C ; Relative Humidity: 42 %
 BDS EN 55015, cl.9.2 – Measuring arrangement and procedure related to Subclause 4.4.2
 Measurement uncertainty: 3,05 dB(μV)

RESULTS OF MEASUREMENT :

Frequency	Radiated electromagnetic disturbances		
	Quasi peak - QP		
	Measuring	Margin	Measuring
MHz	dB(μV)	dB(μV)	dB(μV)
38,80	43,56	18,30	61,86
66,70	33,78	23,58	57,36
103,40	51,51	2,49	54,00
118,20	34,52	19,48	54,00
150,00	35,48	18,52	54,00
175,90	22,05	31,95	54,00
193,70	23,80	30,20	54,00
225,50	27,42	26,58	54,00
257,80	26,09	34,91	61,00
280,60	22,36	38,64	61,00

Drawing of Radiated electromagnetic disturbances



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BDS EN 61000-3-2:2014

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2. HARMONIC CURRENT MEASUREMENT

Classification of equipment - C

Duration of test - 2,5 min; Measurement uncertainty: $\pm 7,1\%$

THC= 0,02183 A

I-THD= 9,965 %

POHC= 0,003042 A

POHC Limit= 0,020909 A

 $V_{RMS} = 230,0$ V $I_{peak} = 0,3251$ A

Frequency = 50 Hz

 $I_{RMS} = 0,2217$ A $I_F = 0,2204$ A

Power= 48,9 W

Crest Factor= 1,466

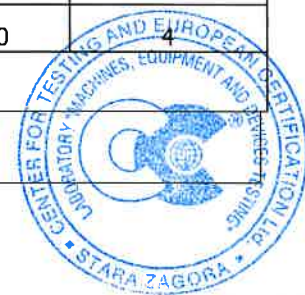
Power Factor = 0,96

K Factor= 1,447

Harmonic	AVERAGE VALUES			MAX VALUE		
	Measured	100% Limit	% of Limit	Measured	150% Limit	% of Limit
№	, A	, A	%	, A	, A	%
2	0,0001	0,0044	3	0,0002	0,0067	3
3	0,0194	0,0635	31	0,0196	0,0959	20
5	0,0052	0,0220	24	0,0054	0,0333	16
7	0,0059	0,0154	38	0,0061	0,0233	26
9	0,0020	0,0110	18	0,0020	0,0167	12
11	0,0020	0,0066	31	0,0021	0,0100	21
13	0,0014	0,0066	22	0,0015	0,0100	15
15	0,0022	0,0066	33	0,0023	0,0100	23
17	0,0030	0,0066	45	0,0030	0,0100	30
19	0,0018	0,0066	27	0,0019	0,0100	19
21	0,0006	0,0066	10	0,0007	0,0100	7
23	0,0015	0,0066	23	0,0016	0,0100	16
25	0,0015	0,0066	22	0,0015	0,0100	15
27	0,0007	0,0066	11	0,0008	0,0100	8
29	0,0013	0,0066	20	0,0014	0,0100	14
31	0,0003	0,0066	4	0,0003	0,0100	3
33	0,0003	0,0066	4	0,0003	0,0100	3
35	0,0012	0,0066	18	0,0012	0,0100	12
37	0,0007	0,0066	11	0,0008	0,0100	8
39	0,0003	0,0066	4	0,0004	0,0100	4

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BDS EN 61000-3-2:2014

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Harmonics of power supply source

$V_{RMS} = 230,0 \text{ V}$	$I_{peak} = 0,3251 \text{ A}$	Frequency = 50 Hz
$I_{RMS} = 0,2217 \text{ A}$	$I_F = 0,2204 \text{ A}$	Power = 48,9 W
	Power Factor = 0,96	

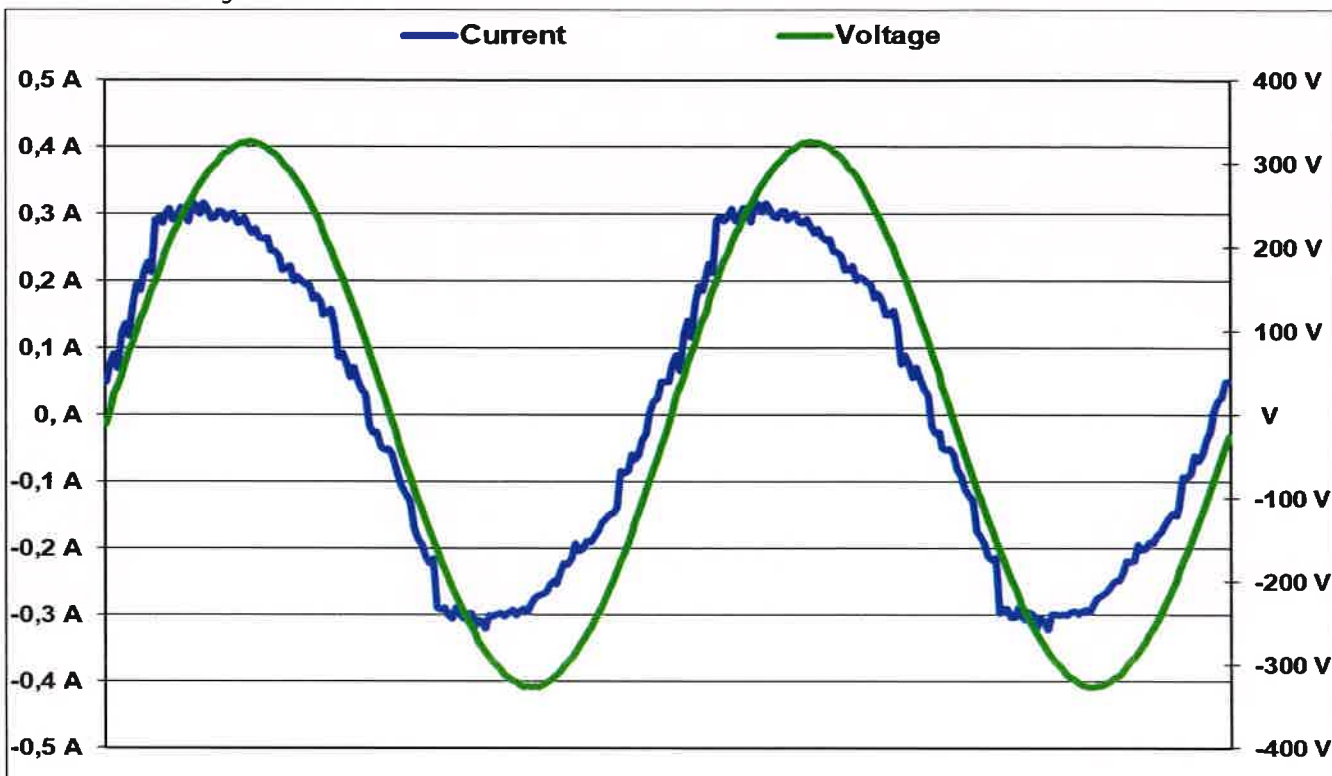
Harmonic	Measured	100% Limit	% of Limit
№	V	V	%
2	0,1388	0,460	30,2
3	0,1828	2,070	8,8
4	0,3076	0,460	66,9
5	0,6176	0,920	67,1
6	0,1863	0,460	40,5
7	0,0923	0,690	13,4
8	0,1610	0,460	35,0
9	0,3674	0,460	79,9
10	0,1382	0,460	30,0
11	0,1345	0,230	58,5
12	0,1150	0,230	50,0
13	0,1150	0,230	50,0
14	0,0992	0,230	43,1
15	0,0460	0,230	20,0
16	0,0920	0,230	40,0
17	0,0690	0,230	30,0
18	0,0690	0,230	30,0
19	0,0920	0,230	40,0
20	0,0690	0,230	30,0
21	0,0462	0,230	20,1
22	0,0799	0,230	34,7
23	0,1262	0,230	54,9
24	0,0690	0,230	30,0
25	0,1150	0,230	50,0
26	0,0690	0,230	30,0
27	0,0230	0,230	10,0
28	0,0690	0,230	30,0
29	0,0230	0,230	10,0
30	0,0690	0,230	30,0
31	0,1610	0,230	70,0
32	0,0690	0,230	30,0
33	0,0460	0,230	20,0
34	0,0894	0,230	38,9
35	0,0688	0,230	29,9
36	0,0705	0,230	30,7
37	0,0638	0,230	27,7
38	0,0920	0,230	40,0
39	0,1116	0,230	48,5
40	0,1150	0,230	50,0

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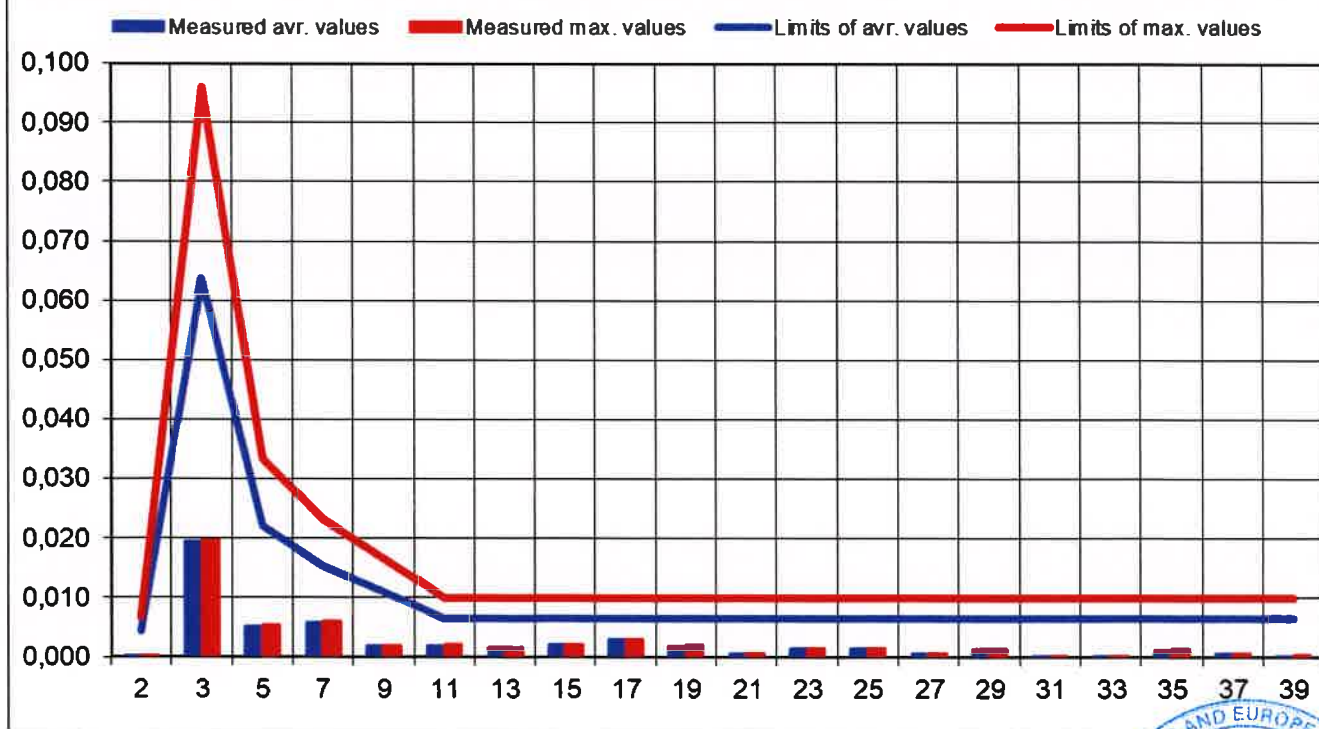


Current and voltage waveform



Graphics harmonics

Harmonic Currents



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BDS EN 61000-3-3:2013

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3. 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 BDS EN 61000-3-3:2013 – Annex A, clause A.2

LED luminaires with ratings less than or equal to 200 W, are deemed to comply of limits in this standard and are not required 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	25 °C
	Relative Humidity	42 %
	Air pressure	1010 mbar

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1. IMMUNITY TO ELECTROSTATIC DISCHARGE (ESD)

BDS EN 61547, cl. 5.2 – Electrostatic discharges – Table 1 - Test levels at enclosure port

BDS EN 61000-4-2, cl. 7 – Test setup

BDS EN 61000-4-2, cl. 7.2.2 – Table-top equipment , Figure 4

BDS EN 61000-4-2, cl. 8 – Test procedure

Measurement uncertainty: Tolerance of output voltage: $\pm 5\%$; Tolerance of the first peak of discharge current: $\pm 15\%$

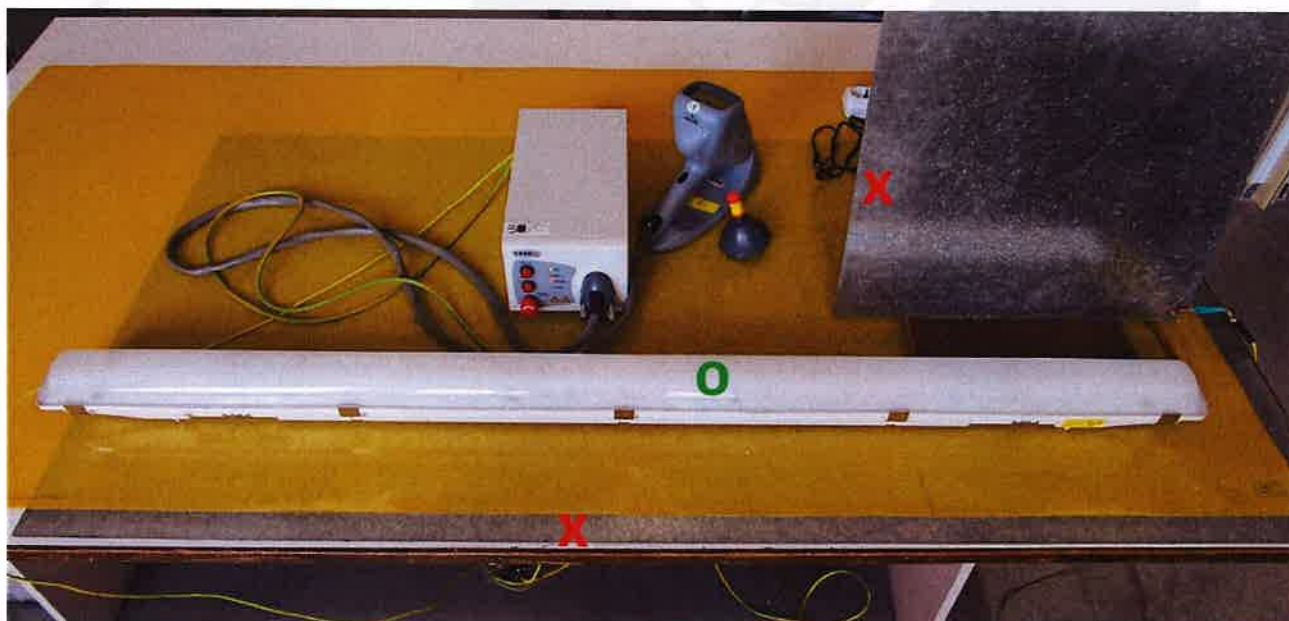
Deviation of current rise time: $\pm 25\%$ (0,6ns – 1ns); Current deviation measured at 30ns : $\pm 30\%$

Current deviation measured at 60ns : $\pm 30\%$

Time interval between discharges	1 s
Discharge impedance	150 pF
Discharge impedance	330 Ω
Performance Criteria according to cl.6.3.4 and Table 15 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 luminaire - O	Air - Direct	1;2;3	2;4;8 kV	+ -	Criteria A
Body of luminaire - X	Contact - Direct	1;2	2;4 kV	+ -	Criteria A
Vertical coupling plane (VCP) - X	Contact - Indirect	1;2	2;4 kV	+ -	Criteria A
Horizontal coupling plane (HCP) - X	Contact - Indirect	1;2	2;4 kV	+ -	Criteria A

Picture of the object with marked points of discharge locations



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2. RATED POWER FREQUENCY MAGNETIC FIELD

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

BDS EN 61000-4-8 cl. 7 – Test setup

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

Measurement uncertainty: Value of output current : $\leq 1\%$

Performance Criteria according to cl.6.3.4
and Table 15 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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3. Voltage dips, short interruptions and voltage variations immunity tests

3.1 Voltage dips immunity tests

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

BDS EN 61000-4-11 cl. 7 – Test setup

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

BDS EN 61000-4-11 cl. 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)

Measurement uncertainty: Deviation of output voltage : ±5%

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

Criteria C

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

3.2 Short interruptions immunity tests

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

BDS EN 61000-4-11 cl. 7 – Test setup

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

BDS EN 61000-4-11 cl. 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)

Measurement uncertainty: Deviation of output voltage : ±5%

Performance Criteria according to cl.6.3.4 and Table 15 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.	Digital multimeter	UNIGOR 390	LEM Austria	PI 3288	20.03.2017
2.	Voltage Generator	GL 01-16-230	Neosvet Bulgaria	0001	-
3.	Power Quality Analyzer	435	Fluke Netherlands	DM 9881064	20.10.2017
4.	Thermometer-higrometer	177-H1	TESTO Germany	01320300/902	17.04.2018
5.	EMI – receiver 9 kHz ÷ 1000 MHz	SCR 3501	Schaffner Electrotest GmbH, Germany	522	21.08.2017
6.	Line impedance stabilisation networks	NNB 52	TESEQ Switzerland	26326	15.08.2017
7.	ESD - Generator	NSG438	TESEQ Switzerland	988	12.04.2018

TEST PERFORMER: 1.

/ D. Chavalinov /

2.

/ T. Hristov /

THE HEAD OF LABORATORY :

/ T. Hristov /



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