



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

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TEST REPORT

Nº 2emc-i-14-808/09.10.2014

OBJECT TO BE TESTED: LED tube 18W, Cat.№: 99LED355;
Model representative from LED tube with cat.№ : 99LED351; 99LED352; 99LED353;
99LED354; 99LED355; 99LED356;

*(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 Nº 808/ 28.10.2013

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

STANDARD:

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 \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 61547:2009 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)

DATE OF ACCEPTANCE IN THE TEST LABORATORY: 01.10.2014

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 – 230-240 VAC
Rated frequency – 50-60 Hz
Rated power – 18 W
Cap – G 13

DATE OF TEST PERFORMANCE: 08.10.2014

LABORATORY CHIEF:
/ T. Hristov /





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

1. Radiated electromagnetic disturbances – 9kHz ÷ 30MHz

BDS EN 55015, cl. 4.4 – Radiated electromagnetic disturbances, limits – Table 3

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.9.1 – Measuring arrangement and procedure

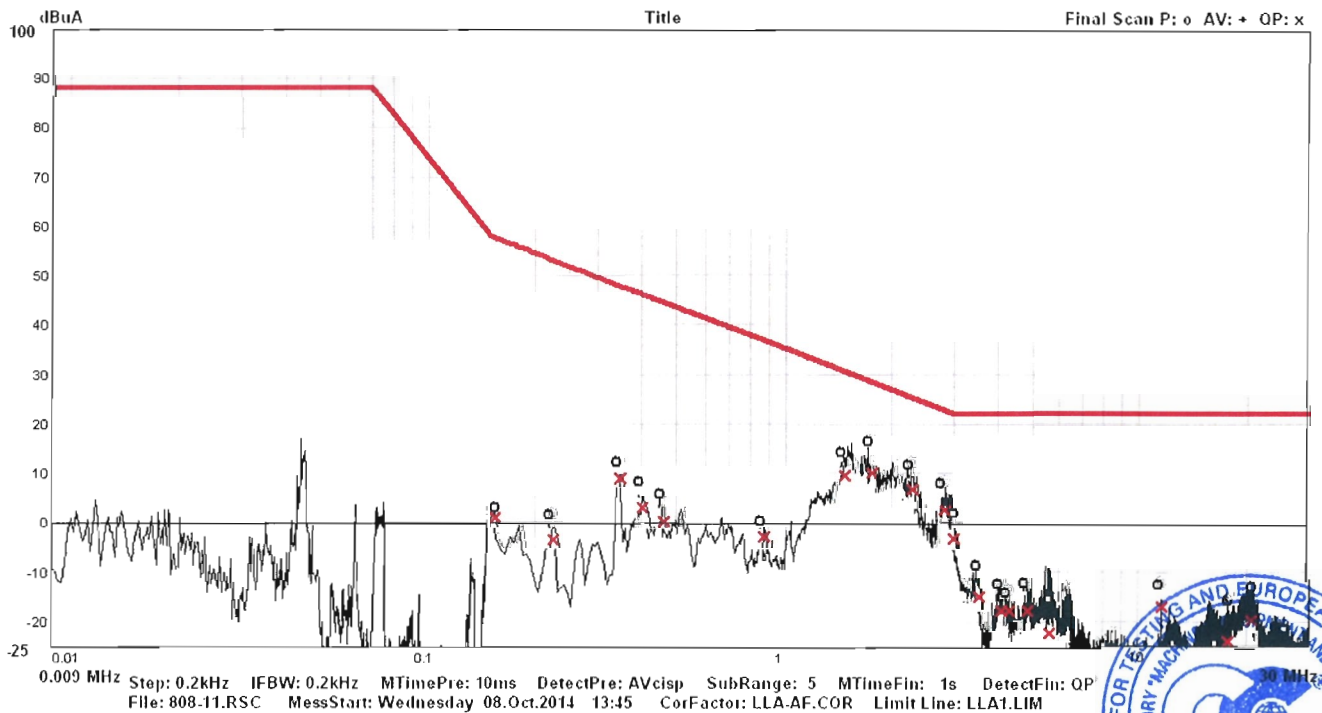
BDS EN 55015, cl.9.5 – Self-ballasted lamps and semi-luminares

The test is performed at supply voltage: 230 V

RESULTS OF MEASUREMENT :

Frequency MHz	Radiated electromagnetic disturbances - measured along the axis - X		
	Quasi peak - QP		
	Measuring dB(μA)	Margin dB(μA)	Limit dB(μA)
0,155	1,02	56,58	57,60
0,225	-3,26	56,38	53,12
0,350	9,03	38,78	47,81
0,405	3,14	42,92	46,06
0,460	0,23	44,30	44,53
0,880	-2,98	39,71	36,73
1,480	9,63	20,86	30,49
1,760	9,95	18,45	28,40
2,285	6,82	18,45	25,27
2,835	2,66	20,01	22,67
3,010	-3,25	25,25	22,00
3,580	-15,14	37,14	22,00
4,150	-17,70	39,70	22,00
4,355	-17,86	39,86	22,00
4,910	-17,82	39,82	22,00
11,650	-17,17	39,17	22,00

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



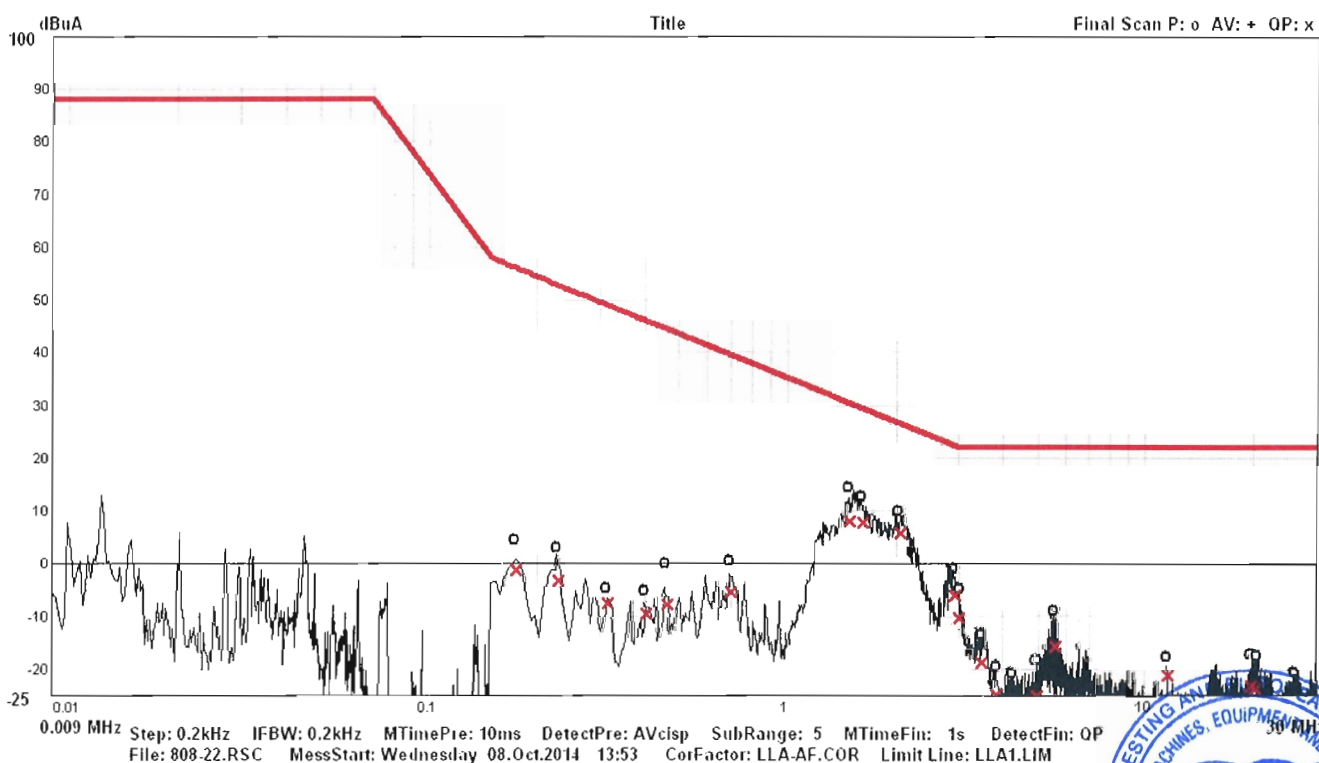
*The results showed in present test report concern tested sample only
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Frequency	Radiated electromagnetic disturbances - measured along the axis - Y		
	Quasi peak - QP		
	Measuring	Margin	Measuring
MHz	dB(μA)	dB(μA)	dB(μA)
0,175	-1,15	57,29	56,14
0,230	-3,11	55,97	52,86
0,315	-7,52	56,60	49,08
0,405	-9,68	55,74	46,06
0,460	-7,97	52,50	44,53
0,700	-5,42	44,90	39,48
1,495	8,11	22,25	30,36
1,620	7,78	21,62	29,40
2,055	5,89	20,65	26,54
2,915	-6,17	28,51	22,34
3,000	-10,32	32,32	22,00
3,505	-18,69	40,69	22,00
5,580	-15,90	37,90	22,00
11,650	-21,37	43,37	22,00
19,925	-23,26	45,26	22,00
20,315	-23,87	45,87	22,00

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



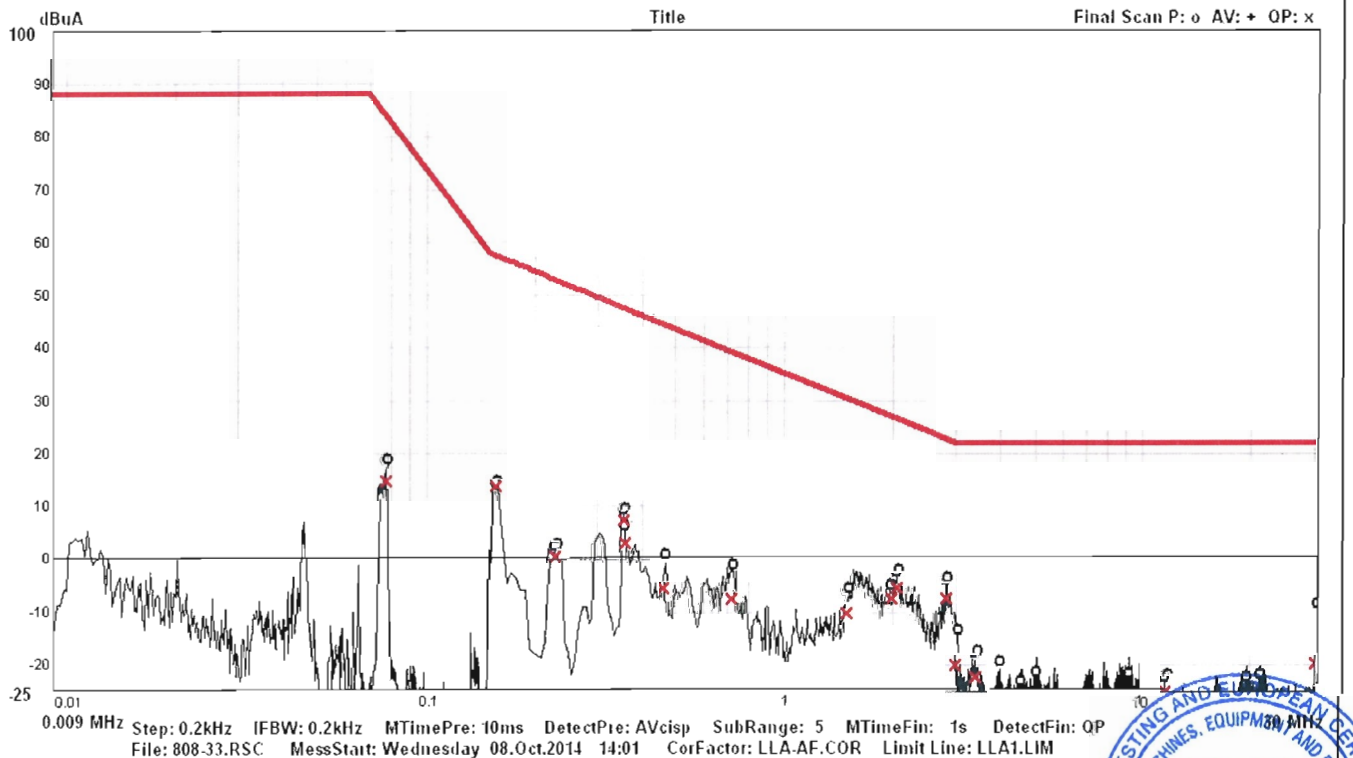
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Frequency	Radiated electromagnetic disturbances - measured along the axis - Z		
	Quasi peak - QP		
	Measuring	Margin	Measuring
MHz	dB(μA)	dB(μA)	dB(μA)
0,077	14,87	69,37	84,24
0,155	13,78	43,82	57,60
0,230	0,67	52,19	52,86
0,355	7,33	40,31	47,64
0,360	3,00	44,47	47,47
0,460	-5,50	50,03	44,53
0,715	-7,52	46,75	39,23
1,490	-10,07	40,47	30,40
1,985	-7,24	34,20	26,96
2,050	-5,38	31,95	26,57
2,805	-7,41	30,21	22,80
3,000	-20,10	42,10	22,00
3,415	-22,25	44,25	22,00
9,045	-27,88	49,88	22,00
11,650	-24,95	46,95	22,00
30,000	-19,90	41,90	22,00

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



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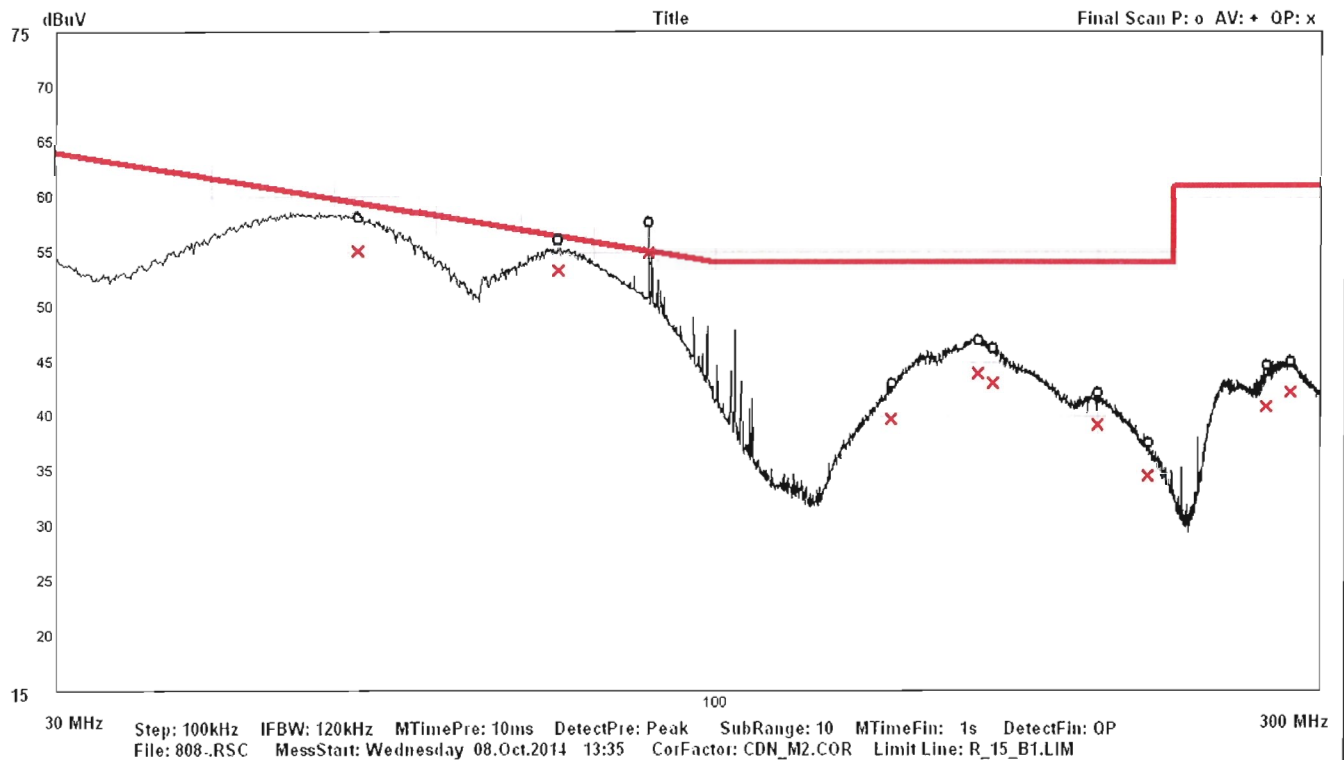


2. Radiated electromagnetic disturbances – 30MHz ÷ 300MHz
BDS EN 55015, cl. 4.4.2 – Frequency range 30MHz to 300MHz – Annex B. Limits - Table B.1
BDS EN 55015, cl. 5.4 – Self-ballasted lamps
BDS EN 55015, cl. 6 – Operating conditions for lighting equipment
BDS EN 55015, cl. 6.4 – Ambient temperature: 24 °C ; Relative Humidity: 48 %.
BDS EN 55015, cl.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)
52,20	55,04	4,35	59,39
75,10	53,30	3,07	56,37
88,30	55,00	0,03	55,03
137,80	39,76	14,24	54,00
161,20	43,98	10,02	54,00
165,40	43,12	10,88	54,00
200,00	39,29	14,71	54,00
219,60	34,64	19,36	54,00
272,50	40,99	20,01	61,00
284,60	42,29	18,71	61,00

Drawing of Radiated electromagnetic disturbances



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3. HARMONIC CURRENT MEASUREMENT

Classification of equipment

According to BDS EN 61000-3-2 cl.7.3 - b) limits apply to discharge equipment / devices.

For diode equipment / devices with active input power less than or equal to 25 W as shown in Figure 1 is considered to comply the standard BDS EN 61000-3-2.

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

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

According to BDS EN 61000-3-3:2013 – Annex A, clause A.2 – LED luminaire with power less or equal to 200 W, comply 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



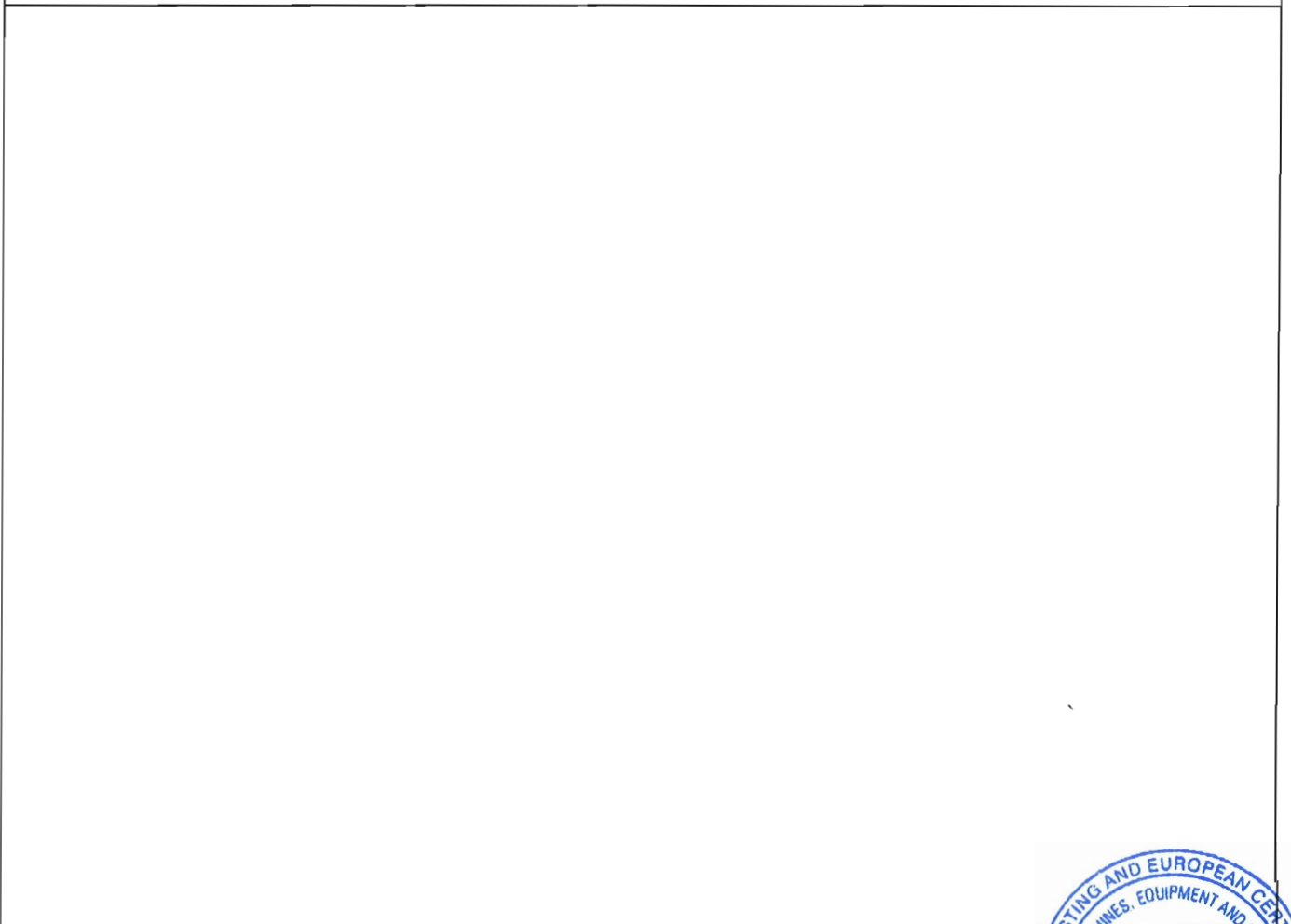
1. IMMUNITY TO ELECTROSTATIC DISCHARGE (ESD)

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.6.3.4 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
LED tube - O	Air - Direct	1;2;3	2;4;8 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

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.6.3.4 and Table 15 of BDS 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

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

Front time	1,2 μs ± 30 %
Time to half value	50 μs ± 20 %
Source impedance	Power line symmetrical Power line unsymmetrical
	2 Ω + 18 μF 12 Ω + 9 μF
Phase angles	90°/ 270°
Number of surges / polarity /phase angle	5
Performance Criteria according to cl.6.3.4 and Table 15 of BDS 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	+	-
			-	-

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.6.3.3
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	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

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.6.3.4 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°	Pass (criteria A)

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.6.3.4 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°	Pass (criteria A)

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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	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	26.06.2014
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 /

2.

/D. Chavalinov /

CHIEF LABORATORY :

/ T. Hristov /

