



Compatibilidad Electromagnética y Seguridad Eléctrica

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REPORT Nr: PR-18-0758

Written for: Zero Point Energy, S.L.

Related to: EMC Tests practiced on
“Monsol CcM1” AC measurement device

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1. GENERAL CONDITIONS

This report refers only and exclusively to the objects and equipments that have undergone the test.

This report does not represent or prove to be the Certification of the Product. This must be expedited by the Certification Bodies or competent Authorities.



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2. GUARANTIES

CEMITEC guaranties professional discretion by all its personnel in relation with the accomplishment of the works it carries out. All the data regarding the testing as well as the equipment itself will be treated confidentially.

CEMITEC guaranties the results and conclusions contained in this report; the data presented is the result of the tests and measurements carried out with the equipment. These tests are referred to the moment and conditions indicated in this report.



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3. TEST CHARACTERISTICS

3.1. TESTS CARRIED OUT

The following services were requested to the EMC division in CEMITEC:

1. Conducted Emission. Harmonic currents emission measurement:

Standard: EN 61326-1:2013.
Limit: UNE-EN 61000-3-2:2014, Class A equipment.
Method: UNE-EN 55011:2011, +/A1:2011.

2. Conducted Emission. Voltage fluctuation and flicker measurement:

Standard: EN 61326-1:2013.
Limit: UNE-EN 61000-3-3:2013, equipment without any supplementary condition.
Method: UNE-EN 55011:2011, +/A1:2011.

3. Radiated Emission. Electromagnetic radiated disturbance measurement ⁽¹⁾:

Standard: EN 61326-1:2013.
Limit: EN 61326-1:2013 and UNE-EN 55011:2011, +/A1:2011 (Group 1 Class B device, enclosure port, 3 m distance measurement).
Method: UNE-EN 55011:2011, +/A1:2011.

4. Conducted Emission. Electromagnetic conducted disturbance measurement:

Standard: EN 61326-1:2013.
Limit: EN 61326-1:2013 and UNE-EN 55011:2011, +/A1:2011 (Group 1 Class B device, AC mains input port).
Method: UNE-EN 55011:2011, +/A1:2011.



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5. Immunity to Electrostatic Discharges:

Standard: EN 61326-1:2013.
Failure Criterion: B.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM04 and UNE-EN 61000-4-2:2010.
Applied to: EUT's enclosure port.

6. Radiated Immunity to RF Field ⁽¹⁾.

Standard: EN 61326-1:2013.
Failure Criterion: A.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM06, and UNE-EN 61000-4-3:2007, +/A1:2008, +/A2:2011.
Applied to: EUT's enclosure port.

7. Conducted Immunity to EFT/Bursts.

Standard: EN 61326-1:2013.
Failure Criterion: B.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM03 and UNE-EN 61000-4-4:2013.
Applied to: AC mains input and output port, DC power and I/O signal/control port.

8. Conducted Immunity to Surges.

Standard: EN 61326-1:2013.
Failure Criterion: B.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM08 and UNE-EN 61000-4-5:2015.
Applied to: AC mains input port.



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9. Conducted immunity to RF Field.

Standard: EN 61326-1:2013.
Failure Criterion: A.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM01 and UNE-EN 61000-4-6:2014.
Applied to: AC mains input and output port port, DC power and I/O signal/control ports.

10. Radiated immunity to Industrial Frequency Magnetic Field.

Standard: EN 61326-1:2013.
Failure Criterion: A.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM02 and UNE-EN 61000-4-8:2011.
Applied to: EUT's enclosure port.

11. Conducted immunity to voltage dips and short interruptions ⁽¹⁾.

Standard: EN 61326-1:2013.
Failure Criterion: B and C.
Severity Level: EN 61326-1:2013 (industrial electromagnetic environment).
Method: ME.CM07 and UNE-EN 61000-4-11:2005.
Applied to: AC mains input port.



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4. TESTING CONDITIONS

4.1. ENVIRONMENTAL CONDITIONS

The environmental conditions that apply to the tests described in this report were measured in the EMC laboratory of CEMITEC. The temperature, humidity and pressure levels present, were always in the most restrictive range applicable to the EMC tests practiced in the laboratory, that is represented in the following table:

Temperature	Min = 15 °C Max = 30 °C
Relative Humidity	Min = 45 % Max = 60 %
Atmospheric Pressure	Min = 860 mbar Max = 1060 mbar

4.2. EQUIPMENT USED

- Space Saver 26 H Semianechoic Chamber (CM01/14) (Serial Nr 2176)
- Rohde & Schwarz ESR26 EMI Test Receiver (CM01/10) (Serial Nr 1316.3003K26/101302)
- Rohde & Schwarz ESH3-Z5 LISN (CM01/04) (Serial Nr 827246/002)
- Rohde & Schwarz ESH3-Z2 Pulse Limiter (CM01/03-01) (Serial Nr 357.8810.52)
- ETS 3142D BiconiLog Antenna (CM01/62) (Serial Nr 00122391)
- Schwarzbeck STLP9149 Stacked LogPeriodic Antenna (CM01/50) (Serial Nr STLP9149-004)
- EM Test DPA 503 Flickermeter (CM01/18) (Serial Nr 0604-02)
- Universal Technic Clamp M1.U (CM01/18-02) (Serial Nr 0604-02 L1)
- California Instruments 5001 iX-400 (CM01/19) (Serial Nr 56081)
- Agilent N5181A signal generator (CM01/06) (Serial Nr MY47071030)
- ar 150W1000 amplifier (CM01/09) (Serial Nr 300665)
- BONN BDC 0810-40/200 bidirectional coupler (CM01/76) (Serial Nr 1610792)
- ar 50S1G4A amplifier (CM01/51) (Serial Nr 0322437)



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- BONN BLMA 4060-40 amplifier (CM01/72) (Serial Nr 1510518)
- DARE!! CTR1009B Radicentre test system (CM01/75)
- DARE!! RPR2006C Power Sensor (CM01/73) (Serial Nr 15100037SN040)
- ETS-Lindgren HI-6105 electric field probe (CM01/44) (Serial Nr 00061400)
- PPM Mini Scout Video Monitoring System (CM01/12)
- DARE!! Radimation EMC tests software (CM01/56)
- Schaffner NSG 438 ESD simulator system (CM01/33) (Serial Nr 378)
- Schaffner NSG 2050 module (CM01/26) (Serial Nr 200449-521LU)
- Schaffner PNW 2225 Burst module (CM01/30) (Serial Nr 200448-529LU)
- Schaffner CDN 3425 coupling clamp (CM01/32) (Serial Nr 1943)
- Schaffner PNW 2050 pulse network (CM01/27) (Serial No. 200445-549LU)
- Schaffner CDN 133 coupling/decoupling network (CM01/59) (Serial Nr 34446)
- EM TEST CWS500C Perturbation simulator (CM01/08) (Serial Nr 1001-04)
 - EM Test 6 dB / 75W attenuator (CM01/08-01) (Serial Nr 0002143A)
 - EM Test CDN M2 coupling/decoupling network (CM01/08-08) (Serial Nr 9803067C)
 - EM Test F2031 EM Clamp (CM01/08-02)
 - EM Test ICD V2.36 Test Software (CM01/08-09) (Serial Nr 002024)
- Schaffner MFO 6501 Magnetic field generator (CM01/21) (Serial Nr 34278)
- Schaffner INA 702 Magnetic field Antenna (CM01/22) (Serial Nr 131)
- FLUKE 179 multimeter (CM01/47) (Serial Nr 86500139)
- Narda-STS EHP-50D magnetic field probe (CM01/69) (Serial Nr 120WX20743)
- Schaffner WIN 2050 Test Software (CM01/37) (Serial Nr 690-814A)
- SPS EMV D 15000/PAS power system (CM01/78) (Serial Nr A5887 00/1 0417 and A5887 00/2 0417)
- Isolation Transformer (CM01/15)



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4.3. TESTS TIME MAP

The tests described in this report were carried out at CEMITEC's facilities.

TEST	TESTED SAMPLE	TEST DATE	RESULT
Harmonic Current Emission	B	2018/07/18	P
Flicker Emission	B	2018/07/18	P
Radiated Emission ⁽¹⁾	A	2018/06/07	P
Conducted Emission ⁽¹⁾	A	2018/06/07	P
Electrostatic Discharge Immunity	B	2018/07/17	P
Radiated RF Immunity ⁽¹⁾	A	2018/06/06	P
EFT / Bursts Immunity	B	2018/07/16	P
Surge Immunity	B	2018/07/18	P
Conducted RF Immunity	A	2018/06/07	F
	B	2018/07/16	P
Magnetic field Immunity	B	2018/07/17	P
Voltage dips and short interruptions Immunity	B	2018/07/17	P

4.4. UNCERTAINTY

The Uncertainty of the test that apply to the measurement of perturbing continuous voltage on AC mains is below ± 3.6 dB with K=2 according to the standard UNE-EN 55016-4-2:2007.

The Uncertainty of the test that apply to the Harmonic current measurement is $I=5.8\%$ with K=2 and the uncertainty of the test that apply to the Fluctuating voltage and Flicker measurement is $I=5.8\%$ with k=2.



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5. EUT IDENTIFICATION DATA

5.1. TEST PETITIONER AND EUT SUPPLIER

Name: Zero Point Energy, S.L.
Address: Calle La Gitanilla, 17, Nave 01, portón A.
29004 Málaga (Spain).
Phone: 952 02 05 80.
Contact person: José Luis Vilches.

5.2. TESTED EQUIPMENT IDENTIFICATION

Product: DC powered device for measurement purposes connected directly to a circuit breaker. CcM1 is able to measure RMS current of a phase in an electrical installation, and provides the data via Modbus RTU RS-485 to a master device.

Trade mark: CcM.

Type: CcM1.

Hardware version: 3.3.

Software version: 70927 (Sample A) and 0371 (Sample B).

Manufacturer: Monsol Electronic, S.L.

Address: Calle La Gitanilla, 17, Nave 01, portón A.
29004 Málaga (Spain).



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The equipments tested are described in the following tables:

SAMPLE A

CONTROL NUMBER	RECEPTION DATE	TRADE MARK	SERIAL NUMBER	TYPE	DESCRIPTION
A01	2018/05/25	CcM	0106180009	CcM1	DC Powered device for measurement purposes connected directly to a circuit breaker. HW version 3.3 and SW version 70927. (EUT).
A02	2018/03/22	---	---	---	168 Ω resistive load (AE).
A03	2018/03/22	---	---	---	Control and monitorization PC, and RS485 to USB converter (AE).

EUT: Equipment Under Test. AE: Auxiliary Equipment, not under test

The interfaces corresponding to the tested samples are described below:

INTERFACE Nr	TYPE/DESCRIPCIÓN	CABLE LENGTH
I01	AC mains input port (230 Vac / 50 Hz) (L1)	3 m < L < 30 m
I02	AC mains output port (230 Vac / 50 Hz) (L1)	3 m < L < 30 m
I03	DC power port and RS485 communications port (modbus). Symmetrical, unshielded line, with twisted pair cable and a Würth 742 711 12 ferrite (one turn) on the EUT's side.	3 m < L < 30 m

SAMPLE B

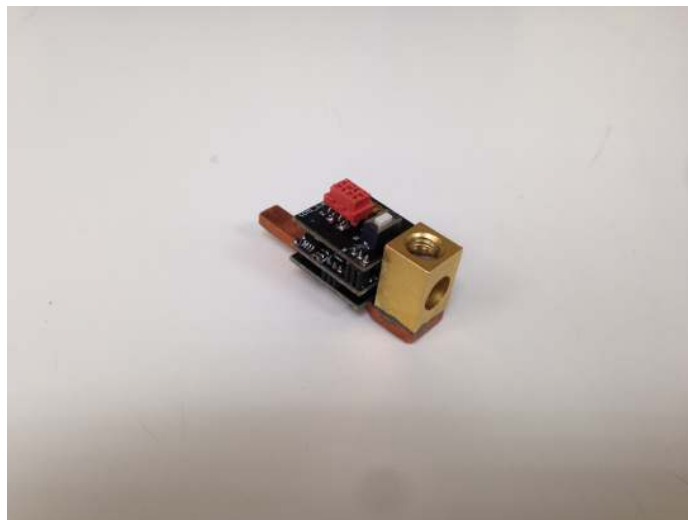
Sample B was received on 2018/07/02. It did not include any hardware changes, but its calibration for the current measurement was adjusted, and new electronic components (the same references as in Sample A) were mounted. It also included a new software version. HW version 3.3 and SW version 70927.

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5.3. TESTED SAMPLE IMAGES



Sample A



Sample B



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5.4. TESTED EQUIPMENT MODES OF OPERATION

During the tests execution, the samples remained on the following operating modes:

- M01 mode of operation:

EUT ON, powered at 24 Vdc. Blue led blinking. Auxiliary resistive load (168 Ω) connected between EUT's mains output (L1) and N. Auxiliary PC in continuous communication with the DUT, reporting its measurement data (RMS current) on the screen. The acceptable measurement error was 1% of full scale (63 A)

5.5. TESTED EQUIPMENT MONITORING CONDITIONS

The properly functioning of the EUT was checked before and after the tests.

During the immunity tests the behaviour of the DUT's led was visually checked. In addition, the information about the measurement data obtained by the DUT and provided by the auxiliary PC, was checked. Any other possible failures like communication losses, were also monitored with the PC.

5.6. PERFORMANCE CRITERIA APPLIED

- **Performance criterion A:** The DUT will work as expected during the tests. No communication losses or degradations in the behaviour of the DUT's led will be allowed during or after the tests. An error of 1% of full scale in the current measurement, or ± 630 mA, will be considered valid.
- **Performance criterion B:** The DUT will work as expected after the tests. Certain degradation or loss of function will be admitted during them, provided that the EUT recovers itself after the application of the interference, returning to its original operation mode without any help from the user. The allowed degradation or loss of function would include events such as communication losses, unexpected blinkings on the DUT's led or measurement errors beyond ± 630 mA.



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- **Performance criterion C:** The DUT will work as expected after the tests. Certain degradation or loss of function will be admitted during them, provided that the EUT recovers its functioning mode after the application of the interference, either by itself or with the help of the user. The allowed degradation or loss of function would include events such as communication losses, unexpected blinkings on the DUT's led or measurement errors beyond ± 630 mA.



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6. TEST RESULTS

6.1. EMISSION RESULTS

6.1.1. CONDUCTED EMISSION. HARMONIC CURRENT MEASUREMENT

LIMITS OF PERMISSIBLE HARMONIC CURRENT

The applicable limits for the measurement of perturbing harmonic current on the AC mains port, according to the standard UNE-EN 61000-3-2:2014, for Class A equipment, are as follow:

Odd harmonics		Even harmonics	
Harmonic order	Maximum current (A)	Harmonic order	Maximum current (A)
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	$8 \leq n \leq 40$	0.23 8/n
11	0.33		
13	0.21		
$15 \leq n \leq 39$	0.15 15/n		

TESTING METHOD

According to the standard UNE-EN 61000-3-2:2014 and internal method ME.CM10.

MODES OF OPERATION

The sample tested was ON, and remained in the mode of operation M01 during the test.

The tested sample was the Sample B.



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TEST RESULTS

P: Pass, F: Fail, NA: Not Applicable, NM: Not Measured

Description	Result
AC mains harmonic current measurement.	P



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Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	1.380			
2	586.404E-6	0.054	1.08	PASS
3	3.297E-3	0.143	2.30	PASS
4	365.252E-6	0.085	430.00E-3	PASS
5	318.049E-6	0.028	1.14	PASS
6	338.366E-6	0.113	300.00E-3	PASS
7	443.545E-6	0.058	770.00E-3	PASS
8	294.569E-6	0.128	230.00E-3	PASS
9	678.404E-6	0.170	400.00E-3	PASS
10	363.905E-6	0.198	184.00E-3	PASS
11	334.908E-6	0.101	330.00E-3	PASS
12	401.741E-6	0.262	153.33E-3	PASS
13	372.648E-6	0.177	210.00E-3	PASS
14	320.244E-6	0.244	131.43E-3	PASS
15	249.326E-6	0.166	150.00E-3	PASS
16	220.281E-6	0.192	115.00E-3	PASS
17	298.508E-6	0.226	132.35E-3	PASS
18	281.435E-6	0.275	102.22E-3	PASS
19	366.438E-6	0.309	118.42E-3	PASS
20	307.066E-6	0.334	92.00E-3	PASS
21	532.028E-6	0.331	160.71E-3	PASS
22	295.802E-6	0.354	83.64E-3	PASS
23	231.939E-6	0.158	146.74E-3	PASS
24	219.568E-6	0.286	76.66E-3	PASS
25	676.555E-6	0.501	135.00E-3	PASS
26	261.816E-6	0.370	70.77E-3	PASS
27	409.745E-6	0.328	124.99E-3	PASS
28	291.342E-6	0.443	65.71E-3	PASS
29	249.665E-6	0.215	116.39E-3	PASS
30	427.123E-6	0.696	61.33E-3	PASS
31	575.972E-6	0.529	108.87E-3	PASS
32	222.463E-6	0.387	57.50E-3	PASS
33	592.539E-6	0.579	102.27E-3	PASS
34	319.139E-6	0.590	54.12E-3	PASS
35	227.393E-6	0.236	96.44E-3	PASS
36	247.535E-6	0.484	51.11E-3	PASS
37	389.151E-6	0.427	91.21E-3	PASS
38	297.271E-6	0.614	48.42E-3	PASS
39	475.121E-6	0.549	86.53E-3	PASS
40	288.878E-6	0.628	46.00E-3	PASS



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(1) The marked tests/activities are not supported by ENAC accreditation.

Maximum harmonic current results				
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	1.380			
2	763.645E-6	0.047	1.62	PASS
3	3.436E-3	0.100	3.45	PASS
4	520.515E-6	0.081	645.00E-3	PASS
5	455.917E-6	0.027	1.71	PASS
6	500.562E-6	0.111	450.00E-3	PASS
7	556.048E-6	0.048	1.15	PASS
8	411.762E-6	0.119	345.00E-3	PASS
9	818.044E-6	0.136	600.00E-3	PASS
10	470.242E-6	0.170	276.00E-3	PASS
11	461.926E-6	0.093	495.00E-3	PASS
12	494.765E-6	0.215	229.99E-3	PASS
13	480.755E-6	0.153	315.00E-3	PASS
14	463.783E-6	0.235	197.15E-3	PASS
15	339.017E-6	0.151	225.00E-3	PASS
16	276.980E-6	0.161	172.50E-3	PASS
17	450.635E-6	0.227	198.52E-3	PASS
18	366.925E-6	0.239	153.33E-3	PASS
19	456.396E-6	0.257	177.63E-3	PASS
20	439.891E-6	0.319	138.00E-3	PASS
21	627.306E-6	0.390	160.71E-3	PASS
22	397.265E-6	0.317	125.46E-3	PASS
23	335.665E-6	0.229	146.74E-3	PASS
24	278.188E-6	0.242	114.99E-3	PASS
25	763.278E-6	0.565	135.00E-3	PASS
26	344.211E-6	0.324	106.16E-3	PASS
27	520.342E-6	0.416	124.99E-3	PASS
28	382.408E-6	0.388	98.57E-3	PASS
29	332.694E-6	0.286	116.39E-3	PASS
30	497.381E-6	0.541	92.00E-3	PASS
31	682.604E-6	0.627	108.87E-3	PASS
32	321.819E-6	0.373	86.25E-3	PASS
33	694.507E-6	0.679	102.27E-3	PASS
34	429.043E-6	0.529	81.18E-3	PASS
35	318.453E-6	0.330	96.44E-3	PASS
36	339.265E-6	0.443	76.66E-3	PASS
37	485.782E-6	0.533	91.21E-3	PASS
38	365.122E-6	0.503	72.63E-3	PASS
39	524.310E-6	0.606	86.53E-3	PASS
40	400.703E-6	0.581	69.00E-3	PASS



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(1) The marked tests/activities are not supported
by ENAC accreditation.

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.60	100.262		
2	123.47E-3	0.054	0.2	PASS
3	540.40E-3	0.235	0.9	PASS
4	76.06E-3	0.033	0.2	PASS
5	86.11E-3	0.037	0.4	PASS
6	98.93E-3	0.043	0.2	PASS
7	45.15E-3	0.020	0.3	PASS
8	67.31E-3	0.029	0.2	PASS
9	26.61E-3	0.012	0.2	PASS
10	36.62E-3	0.016	0.2	PASS
11	21.14E-3	0.009	0.1	PASS
12	28.95E-3	0.013	0.1	PASS
13	24.46E-3	0.011	0.1	PASS
14	16.47E-3	0.007	0.1	PASS
15	14.19E-3	0.006	0.1	PASS
16	23.55E-3	0.010	0.1	PASS
17	16.92E-3	0.007	0.1	PASS
18	22.86E-3	0.010	0.1	PASS
19	12.47E-3	0.005	0.1	PASS
20	21.48E-3	0.009	0.1	PASS
21	12.42E-3	0.005	0.1	PASS
22	12.97E-3	0.006	0.1	PASS
23	12.02E-3	0.005	0.1	PASS
24	11.57E-3	0.005	0.1	PASS
25	11.82E-3	0.005	0.1	PASS
26	13.79E-3	0.006	0.1	PASS
27	9.35E-3	0.004	0.1	PASS
28	15.70E-3	0.007	0.1	PASS
29	11.42E-3	0.005	0.1	PASS
30	13.85E-3	0.006	0.1	PASS
31	10.01E-3	0.004	0.1	PASS
32	10.88E-3	0.005	0.1	PASS
33	12.41E-3	0.005	0.1	PASS
34	9.22E-3	0.004	0.1	PASS
35	7.88E-3	0.003	0.1	PASS
36	8.85E-3	0.004	0.1	PASS
37	10.23E-3	0.004	0.1	PASS
38	8.01E-3	0.003	0.1	PASS
39	11.34E-3	0.005	0.1	PASS
40	13.07E-3	0.006	0.1	PASS



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(1) The marked tests/activities are not supported by ENAC accreditation.

6.1.2. CONDUCTED EMISSION. VOLTAGE FLUCTUATIONS AND FLICKER

LIMITS OF FLUCTUATING VOLTAGE AND FLICKER

The limits are established for the voltage fluctuations and flicker that may occur on the AC mains port of the EUT. The applicable limits according to the standard UNE-EN 61000-3-3:2013 for equipment without any supplementary condition, are as follow:

- The P_{st} value cannot be above 1.0;
- The relative voltage variation in steady state d_c , cannot exceed the value of 3.3 %;
- The maximum relative value of the voltage variation d_{max} , cannot exceed the value of 4 %;
- The value $d(t)$ during a voltage variation cannot exceed 3,3 % for a time greater than 500 ms;

TESTING METHOD

According to the standard UNE-EN 61000-3-3:2013 and internal method ME.CM11.

MODES OF OPERATION

The sample tested was ON, and remained in the mode of operation M01 during the test.

The tested sample was the Sample B.

TEST RESULTS

P: Pass, F: Fail, NA:Not Applicable, NM: Not Measured

Description	Result
AC mains flicker evaluation	P



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Maximum Flicker Results:

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.293	4.00	PASS
dt [s]	0.000	0.50	PASS



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(1) The marked tests/activities are not supported by ENAC accreditation.

6.1.3. RADIATED EMISSION. DISTURBING RADIATED FIELD ⁽¹⁾

LIMITS OF PERMISSIBLE DISRUPTION

The applicable limit for the measurement of electromagnetic radiated disturbance on the surroundings port of the EUT, according to the standard EN 61326-1:2013 and UNE-EN 55011:2011, +/A1:2011, for Group 1 Class B devices, in the frequency range between 30 MHz and 1 GHz, and at a distance of three metres, is as follows:

Frequency range	Limits (dB μ V/m)
30 MHz – 230 MHz	40 (QP)
230 MHz – 1000 MHz	47 (QP)

TESTING METHOD

According to the standard UNE-EN 55011:2011, +/A1:2011, for table standing equipment and 3 m distance measurement, with the exception that the antenna reached a maximum height of 2 m during the test. The measurement was carried out inside of an anechoic screened chamber.

MODES OF OPERATION

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

The sample tested was the sample A.

(1) The marked tests/activities are not supported by ENAC accreditation.

TEST SETUP



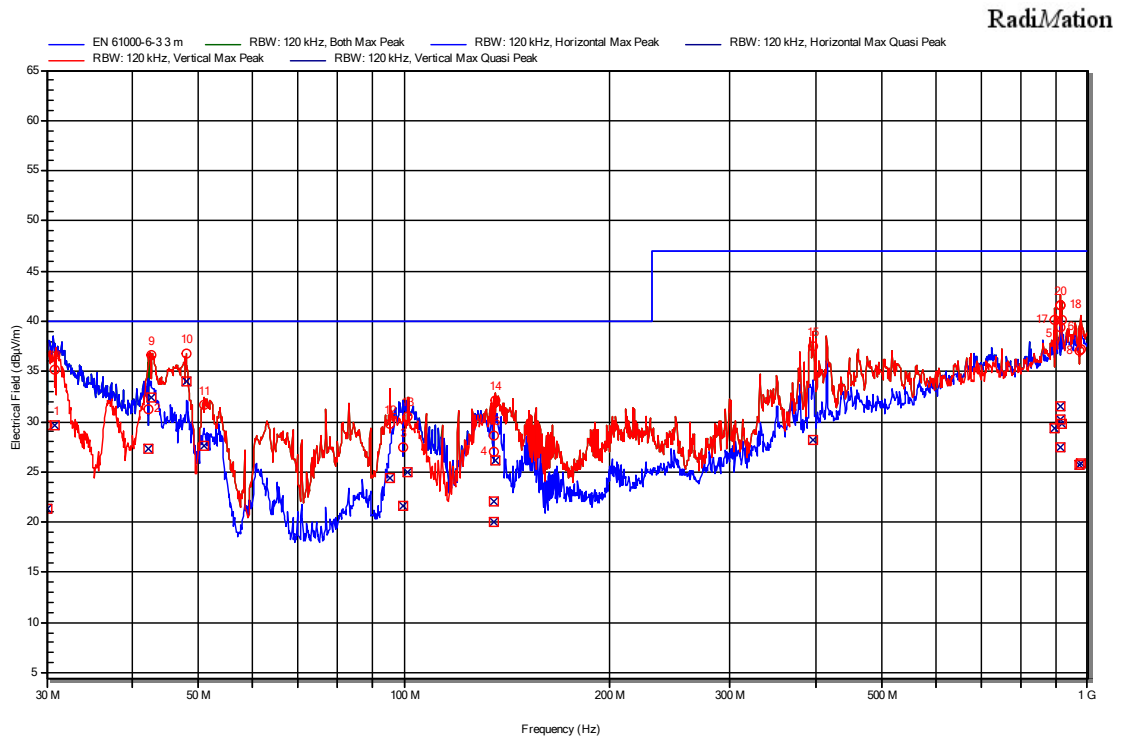
TEST RESULTS

P: Pass, F: Fail, NA: Not Applicable, NM: Not Measured

Description	Result
Radiated Emission. 30 MHz to 1 GHz.	P

(1) The marked tests/activities are not supported by ENAC accreditation.

TABLES AND GRAPHICAL RESULTS



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Status	Angle	Height	Polarization
1	30 MHz	21,3 dBµV/m	40 dBµV/m	Pass	345 degrees	1,02 m	Horizontal
19	30,9 MHz	29,6 dBµV/m	40 dBµV/m	Pass	293 degrees	1,05 m	Vertical
2	42,27 MHz	27,3 dBµV/m	40 dBµV/m	Pass	23 degrees	1 m	Horizontal
9	42,66 MHz	32,4 dBµV/m	40 dBµV/m	Pass	68 degrees	1,05 m	Vertical
10	47,97 MHz	34,1 dBµV/m	40 dBµV/m	Pass	68 degrees	1,01 m	Vertical
11	51,09 MHz	27,6 dBµV/m	40 dBµV/m	Pass	90 degrees	1 m	Vertical
12	95,22 MHz	24,4 dBµV/m	40 dBµV/m	Pass	95 degrees	99 cm	Vertical
3	99,54 MHz	21,6 dBµV/m	40 dBµV/m	Pass	345 degrees	1,75 m	Horizontal
13	101,37 MHz	25 dBµV/m	40 dBµV/m	Pass	95 degrees	1,26 m	Vertical
4	135,03 MHz	20 dBµV/m	40 dBµV/m	Pass	158 degrees	1,85 m	Horizontal
16	135,54 MHz	22 dBµV/m	40 dBµV/m	Pass	158 degrees	1,25 m	Vertical
14	136,14 MHz	26,1 dBµV/m	40 dBµV/m	Pass	85 degrees	1,01 m	Vertical
15	396,69 MHz	28,3 dBµV/m	47 dBµV/m	Pass	105 degrees	1,01 m	Vertical
17	896,1 MHz	29,3 dBµV/m	47 dBµV/m	Pass	203 degrees	1,75 m	Vertical
20	913,17 MHz	31,6 dBµV/m	47 dBµV/m	Pass	260 degrees	1 m	Vertical
18	913,77 MHz	30,3 dBµV/m	47 dBµV/m	Pass	260 degrees	2,01 m	Vertical
6	914,46 MHz	27,5 dBµV/m	47 dBµV/m	Pass	250 degrees	99 cm	Horizontal
5	915,09 MHz	29,7 dBµV/m	47 dBµV/m	Pass	250 degrees	1,74 m	Horizontal
8	974,37 MHz	25,6 dBµV/m	47 dBµV/m	Pass	340 degrees	1,5 m	Vertical
7	978,87 MHz	25,8 dBµV/m	47 dBµV/m	Pass	10 degrees	1,08 m	Vertical



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(1) The marked tests/activities are not supported by ENAC accreditation.

6.1.4. CONDUCTED EMISSION. CONDUCTED DISTURBANCE MEASUREMENT⁽¹⁾

LIMITS OF PERMISSIBLE DISRUPTION

The applicable limit for the measurement of electromagnetic conducted disturbance on the AC mains port of the EUT, according to the standard EN 61326-1:2013 and UNE-EN 55011:2011, +/A1:2011, for Group 1 Class B devices, in the frequency range between 150 kHz and 30 MHz, is as follows:

Frequency range	QP Limits (dB μ V/m)	AVG Limits (dB μ V/m)
150 kHz – 500 kHz	66	56
500 kHz – 5 MHz	56	46
5 MHz – 30 MHz	60	50

TESTING METHOD

According to the standard UNE-EN 55011:2011, +/A1:2011, for table standing equipment. The measurement was carried out inside of an anechoic screened chamber.

MODES OF OPERATION

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

The sample tested was the sample A.

(1) The marked tests/activities are not supported by ENAC accreditation.

TEST SETUP



TEST RESULTS

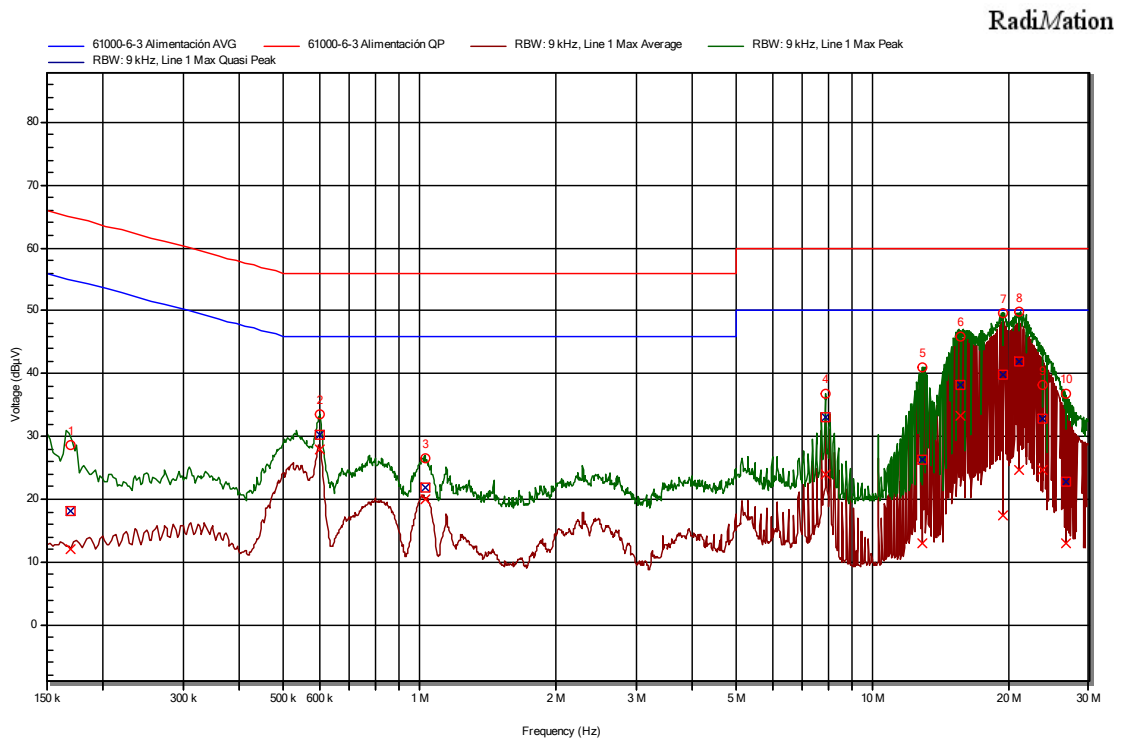
P: Pass, F: Fail, NA: Not Applicable, NM: Not Measured

Description	Result
Conducted Emission. 150 kHz to 30 MHz.	P

(1) The marked tests/activities are not supported by ENAC accreditation.

TABLES AND GRAPHICAL RESULTS

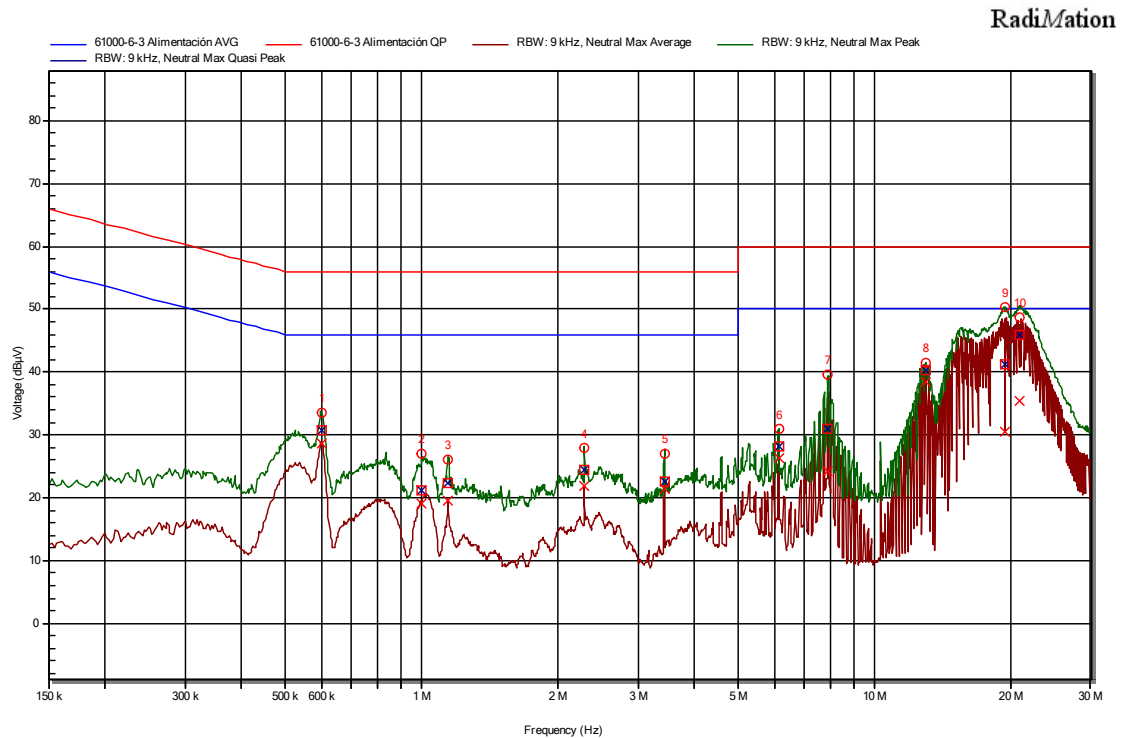
Measurement in L1 (EUT's AC input port)



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	170,25 kHz	12 dBµV	54,9 dBµV	18,2 dBµV	64,9 dBµV	Pass
2	602,25 kHz	28 dBµV	46 dBµV	30,3 dBµV	56 dBµV	Pass
3	1,027 MHz	20 dBµV	46 dBµV	21,9 dBµV	56 dBµV	Pass
4	7,877 MHz	23,9 dBµV	50 dBµV	33 dBµV	60 dBµV	Pass
5	12,858 MHz	13,1 dBµV	50 dBµV	26,2 dBµV	60 dBµV	Pass
6	15,594 MHz	33,3 dBµV	50 dBµV	38,3 dBµV	60 dBµV	Pass
7	19,37 MHz	17,4 dBµV	50 dBµV	39,8 dBµV	60 dBµV	Pass
8	21,082 MHz	24,7 dBµV	50 dBµV	41,8 dBµV	60 dBµV	Pass
9	23,645 MHz	24,7 dBµV	50 dBµV	32,9 dBµV	60 dBµV	Pass
10	26,727 MHz	13 dBµV	50 dBµV	22,7 dBµV	60 dBµV	Pass

(1) The marked tests/activities are not supported by ENAC accreditation.

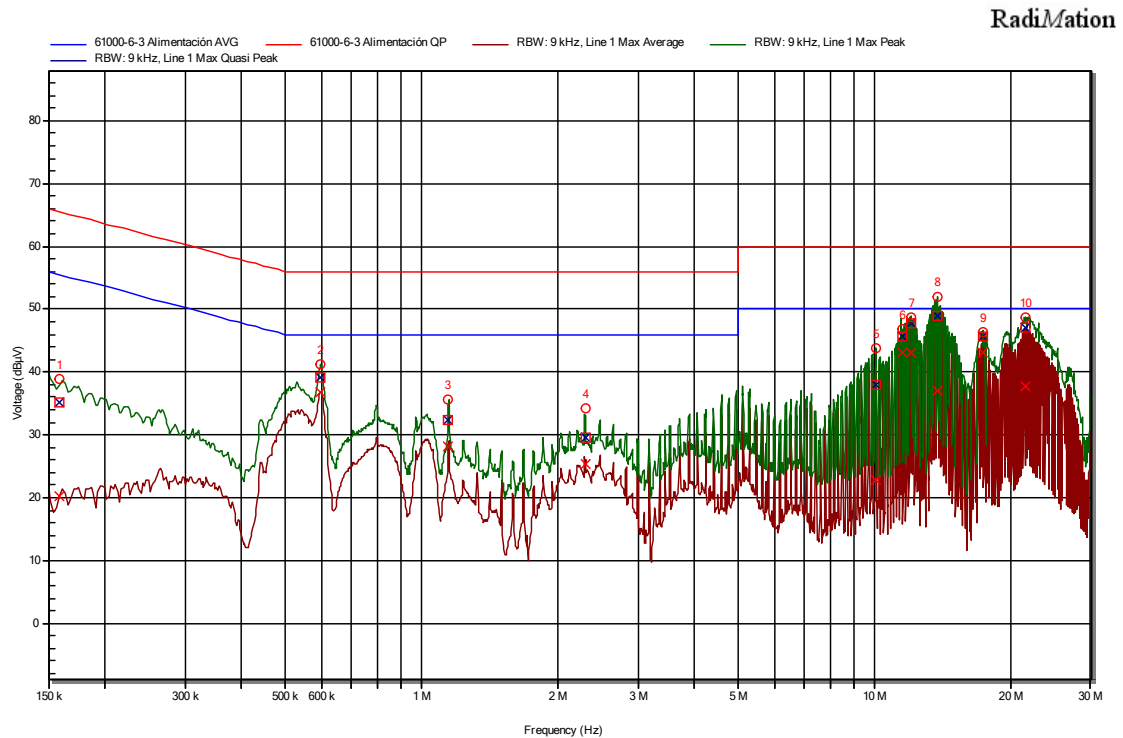
Measurement in N (EUT's AC input port)



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	600 kHz	28,6 dBµV	46 dBµV	30,7 dBµV	56 dBµV	Pass
2	1 MHz	19,2 dBµV	46 dBµV	21,1 dBµV	56 dBµV	Pass
3	1,144 MHz	19,6 dBµV	46 dBµV	22,4 dBµV	56 dBµV	Pass
4	2,288 MHz	22 dBµV	46 dBµV	24,4 dBµV	56 dBµV	Pass
5	3,431 MHz	21,5 dBµV	46 dBµV	22,7 dBµV	56 dBµV	Pass
6	6,146 MHz	26,3 dBµV	50 dBµV	28,1 dBµV	60 dBµV	Pass
7	7,872 MHz	24,2 dBµV	50 dBµV	31 dBµV	60 dBµV	Pass
8	12,998 MHz	38,5 dBµV	50 dBµV	40,3 dBµV	60 dBµV	Pass
9	19,334 MHz	30,6 dBµV	50 dBµV	41,2 dBµV	60 dBµV	Pass
10	20,915 MHz	35,5 dBµV	50 dBµV	45,9 dBµV	60 dBµV	Pass

(1) The marked tests/activities are not supported by ENAC accreditation.

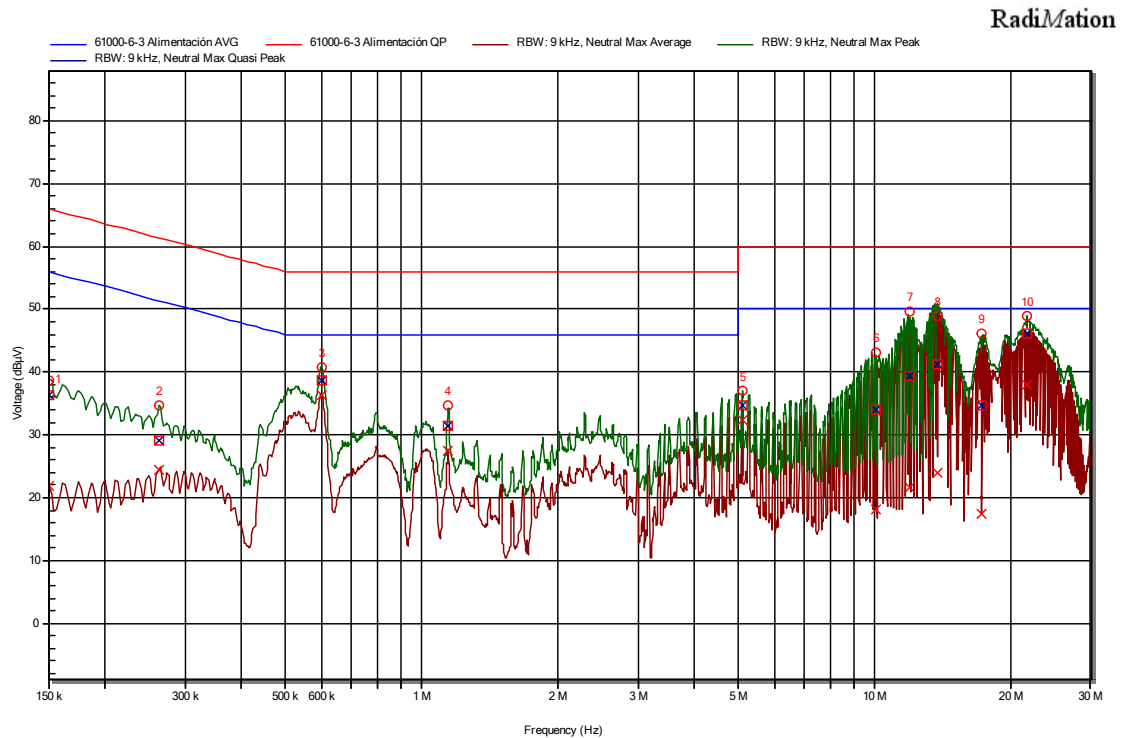
Measurement in L1 (AC input port of AC-DC auxiliary power source)



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	159 kHz	20,3 dBµV	55,5 dBµV	35,1 dBµV	65,5 dBµV	Pass
2	597,75 kHz	36,8 dBµV	46 dBµV	39,2 dBµV	56 dBµV	Pass
3	1,147 MHz	28,2 dBµV	46 dBµV	32,4 dBµV	56 dBµV	Pass
4	2,294 MHz	25,4 dBµV	46 dBµV	29,6 dBµV	56 dBµV	Pass
5	10,052 MHz	22,8 dBµV	50 dBµV	37,9 dBµV	60 dBµV	Pass
6	11,474 MHz	43 dBµV	50 dBµV	45,7 dBµV	60 dBµV	Pass
7	12,001 MHz	43 dBµV	50 dBµV	47,7 dBµV	60 dBµV	Pass
8	13,76 MHz	37,1 dBµV	50 dBµV	49 dBµV	60 dBµV	Pass
9	17,297 MHz	43 dBµV	50 dBµV	45,6 dBµV	60 dBµV	Pass
10	21,525 MHz	37,7 dBµV	50 dBµV	47,1 dBµV	60 dBµV	Pass

(1) The marked tests/activities are not supported by ENAC accreditation.

Measurement in N (AC input port of AC-DC auxiliary power source)



Peak Number	Frequency	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
1	150 kHz	21,8 dBµV	56 dBµV	36,4 dBµV	66 dBµV	Pass
2	262,5 kHz	24,4 dBµV	51,4 dBµV	29,1 dBµV	61,4 dBµV	Pass
3	600 kHz	36,3 dBµV	46 dBµV	38,7 dBµV	56 dBµV	Pass
4	1,144 MHz	27,6 dBµV	46 dBµV	31,3 dBµV	56 dBµV	Pass
5	5,118 MHz	32,4 dBµV	50 dBµV	34,8 dBµV	60 dBµV	Pass
6	10,046 MHz	18,1 dBµV	50 dBµV	34 dBµV	60 dBµV	Pass
7	11,985 MHz	21,7 dBµV	50 dBµV	39,4 dBµV	60 dBµV	Pass
8	13,754 MHz	23,9 dBµV	50 dBµV	41,1 dBµV	60 dBµV	Pass
9	17,277 MHz	17,4 dBµV	50 dBµV	34,7 dBµV	60 dBµV	Pass
10	21,73 MHz	38 dBµV	50 dBµV	46,2 dBµV	60 dBµV	Pass



(1) The marked tests/activities are not supported by ENAC accreditation.

6.2. IMMUNITY RESULTS

6.2.1. IMMUNITY TO ELECTROSTATIC DISCHARGES

TEST PLAN

➤ **MODES OF OPERATION**

The sample remained in the mode of operation M01 during the test..

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ **SAMPLE'S CONFIGURATION**

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted as a table standing equipment, being this setup the most similar to a real EUT's installation.

The sample tested was the sample B.

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment:

Discharge type	Level	Nr of discharges
Contact discharge	$\pm 2 \text{ kV}, \pm 4 \text{ kV}$	10 per level and polarity
Air discharge	$\pm 2 \text{ kV}, \pm 4 \text{ kV}, \pm 8 \text{ kV}$	10 per level and polarity

➤ **Performance Criteria Applied:**

Performance Criterion B.

➤ **Application Method:**

According to the standard UNE-EN 61000-4-2:2010 and internal method ME.CM04.

Ten discharges were applied for each test level and polarity, with 1 second interval between them.

(1) The marked tests/activities are not supported by ENAC accreditation.

NOTE: Only indirect contact discharges were applied to the EUT, as the device is not accesible to the user during operation.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured

Description	Result
Indirect Discharge. Contact discharge. Applied on the Vertical Coupling Plane, placed on the four sides of the EUT. Voltage applied: ± 2 kV and ± 4 kV. Comments: No anomalies are observed.	P
Indirect Discharge. Contact discharge. Applied on the Horizontal Coupling Plane, under the EUT. Voltage applied: ± 2 kV and ± 4 kV. Comments: No anomalies are observed	P



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(1) The marked tests/activities are not supported by ENAC accreditation.

6.2.2. IMMUNITY TO RF FIELDS ⁽¹⁾

TEST PLAN

➤ MODES OF OPERATION

The sample remained in the mode of operation M01 during the test..

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ SAMPLE'S CONFIGURATION

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test.

The test was carried out inside of a semianechoic screened chamber.

The sample tested was the sample A.

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment, exposing the EUT to a radiated field with the following characteristics:

Frequency Ranges	Modulation	Test Voltage
80 MHz – 1000 MHz	AM 80% 1 kHz	10 V/m
1.4 GHz – 2 GHz	AM 80% 1 kHz	3 V/m
2 GHz – 2.7 GHz	AM 80% 1 kHz	1 V/m

In this test the frequency sweep was incremented by 1%, and the dwell time was 3 seconds. The delay time was 0 seconds.

➤ Performance Criteria Applied:

Performance Criterion A.

➤ Application Method:

According to standard 61000-4-3:2007, +/A1:2008, +/A2:2011 and internal method ME.CM06.

(1) The marked tests/activities are not supported by ENAC accreditation.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, reaching a maximum value of 1.72 A. These variations are included in the tests' petitionary acceptance criteria.	P
Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, reaching a maximum value of 1.8 A. These variations are included in the tests' petitionary acceptance criteria.	P
Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, reaching a maximum value of 1.62 A and a minimum value of 0.8 A. These variations are included in the tests' petitionary acceptance criteria.	P
Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, reaching a maximum value of 1.66 A and a minimum value of 0.82 A. These variations are included in the tests' petitionary acceptance criteria.	P



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(1) The marked tests/activities are not supported by ENAC accreditation.

Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P



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(1) The marked tests/activities are not supported by ENAC accreditation.

Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. NOTE: RMS current measurement without interference: 1 A – 1.5 A. Comments: No anomalies are observed.	P
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6.2.3. IMMUNITY TO EFT/BURSTS

TEST PLAN

➤ MODES OF OPERATION

The sample remained in the mode of operation M01 during the test..

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ SAMPLE'S CONFIGURATION

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted as a table standing equipment, being this setup the most similar to a real EUT's installation.

The sample tested was the sample B.

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment:

Port	Repetition frequency	Level (kV)	Duration
AC power	5 kHz	± 2 kV	1 minute/polarity
I/O signal/control	5 kHz	± 1 kV	1 minute/polarity

NOTE: The EUT's DC power port was treated as an I/O signal/control port as it is not connected to any d.c. distribution network.

(1) The marked tests/activities are not supported by ENAC accreditation.

➤ Performance Criteria Applied:

Performance Criterion B.

➤ Application Method:

According to standard UNE-EN 61000-4-4:2013 and internal method ME.CM03.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
Tested interface: I01 (L1, N). Direct coupling. Level: ± 2 kV. Comments: No anomalies are observed.	P
Tested interface: I02. Capacitive coupling. Level: ± 2 kV. Comments: No anomalies are observed.	P
Tested interface: I03. Capacitive coupling. Level: ± 1 kV. Comments: No anomalies are observed.	P



(1) The marked tests/activities are not supported by ENAC accreditation.

6.2.4. **IMMUNITY TO SURGES**

TEST PLAN

➤ **MODES OF OPERATION**

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ **SAMPLE'S CONFIGURATION**

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted on a 10 cm isolating platform, over the earth reference plane.

The sample tested was the sample B

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment:

Port	Level (kV)	Nr of pulses
AC power ports	$\pm 0.5 \text{ kV}, \pm 1 \text{ kV}, \pm 2 \text{ kV}$ (common mode)	5 pulses/polarity
	$\pm 0.5 \text{ kV}, \pm 1 \text{ kV}$ (differential mode)	

NOTE: The EUT's DC power port was treated as an I/O signal/control port as it is not connected to any d.c. distribution network, and due to its length no surge test was needed.

- **Performance Criteria Applied:**

Performance Criterion B.

- **Application Method:**

According to standard UNE-EN 61000-4-5:2015 and internal method ME.CM08.

(1) The marked tests/activities are not supported by ENAC accreditation.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
Tested interface: I01. (L1-N). Z_{out} : 2 Ω . Phase coupling: 0°, 90°, 180° and 270°. Level: ± 0.5 kV. Comments: No anomalies are observed.	P
Tested interface: I01. (L1-N). Z_{out} : 2 Ω . Phase coupling: 0°, 90°, 180° and 270°. Level: ± 1 kV. Comments: No anomalies are observed.	P

(1) The marked tests/activities are not supported by ENAC accreditation.

6.2.5. IMMUNITY TO COMMON MODE RF FIELD

TEST PLAN

➤ MODES OF OPERATION

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ SAMPLE'S CONFIGURATION

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted on a 10 cm isolating platform, over the earth reference plane.

The samples tested were the sample A and the sample B.

➤ The EUT was tested as a simple unit.

➤ The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment, exposing the EUT to an induced voltage with the following characteristics:

Port	Frequency Ranges	Modulation	Test Voltage
AC power ports	0,15 MHz – 80 MHz	AM 80% 1 kHz	3 Vrms
I/O signal/control			

In this test the frequency sweep was incremented by 1%, and the dwell time was 3 seconds. The delay time was 0 seconds.

NOTE: The EUT's DC power port was treated as an I/O signal/control port as it is not connected to any d.c. distribution network.

➤ Performance Criteria Applied:

Performance Criterion A.

(1) The marked tests/activities are not supported by ENAC accreditation.

➤ Application Method:

According to the standard UNE-EN 61000-4-6:2014 and internal method ME.CM01.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
Frequency range: 0,15 MHz – 80 MHz. Field level: 3 Vrms over 150 Ω . AM modulation, 80% with 1 kHz. Tested interface: I01. Coupling through CDN. Sample A. NOTE: RMS current measurement without interference: 0.95 A – 0.97 A. Comments: The current measurement is affected by the interference at 4 MHz and 7.4 MHz, reporting a minimum value of 0.0 A and a maximum value of 3.15 A.	F
Frequency range: 0,15 MHz – 80 MHz. Field level: 3 Vrms over 150 Ω . AM modulation, 80% with 1 kHz. Tested interface: I01. Coupling through CDN. Sample B. NOTE: RMS current measurement without interference: 0.95 A – 0.97 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, with a minimum value of 0.44 A at 9.7 MHz. These variations are included in the tests' petitionary acceptance criteria.	P
Frequency range: 0,15 MHz – 80 MHz. Field level: 3 Vrms over 150 Ω . AM modulation, 80% with 1 kHz. Tested interface: I02. Coupling through EM Clamp. Sample B. NOTE: RMS current measurement without interference: 0.89 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, with a minimum value of 0.62 A at 15 MHz. These variations are included in the tests' petitionary acceptance criteria.	P



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(1) The marked tests/activities are not supported by ENAC accreditation.

Frequency range: 0,15 MHz – 80 MHz. Field level: 3 Vrms over 150 Ω . AM modulation, 80% with 1 kHz. Tested interface: I03. Coupling through EM Clamp. Sample B. NOTE: RMS current measurement without interference: 0.88 A. Comments: Some variations in the measurement of RMS current are observed at different frequency ranges, with a minimum value of 0.33 A at 16.5 MHz. These variations are included in the tests' petitionary acceptance criteria.	P
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6.2.6. IMMUNITY TO INDUSTRIAL FREQUENCY MAGNETIC FIELD

TEST PLAN

➤ MODES OF OPERATION

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ SAMPLE'S CONFIGURATION

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted as a table standing equipment, being this setup the most similar to a real EUT's installation.

The sample tested was the sample B.

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment:

Frequency	Level	Duration
50 Hz	30 A/m	1 minute/axis
60 Hz	30 A/m	1 minute/axis

➤ Performance Criteria Applied:

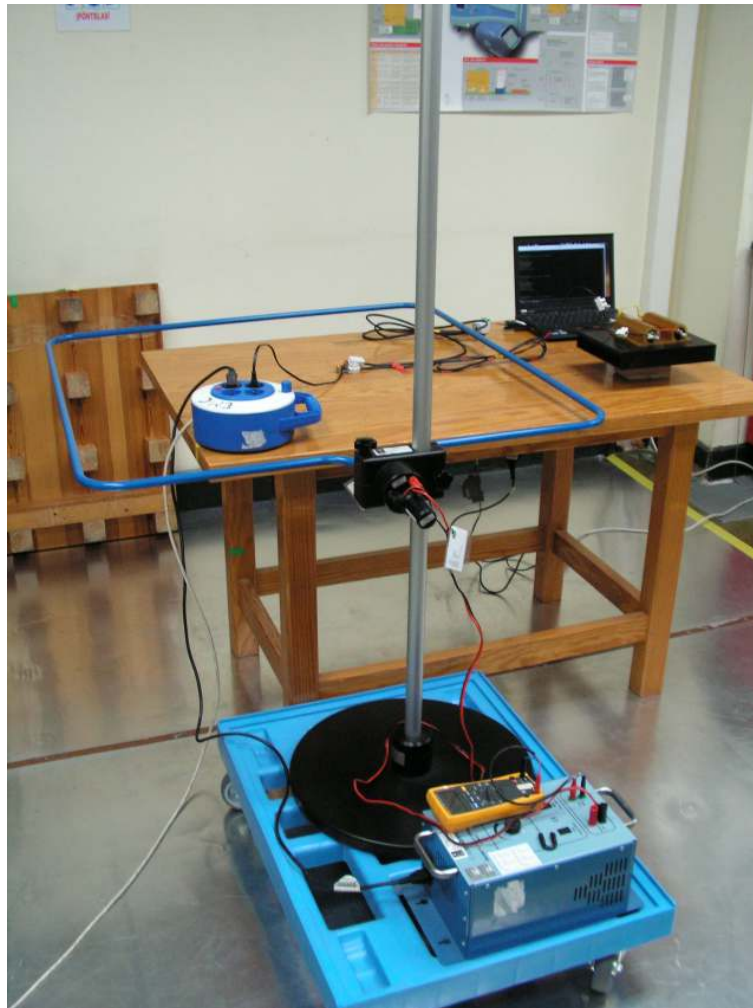
Performance Criterion A.

➤ Application Method:

According to standard UNE-EN 61000-4-8:2011 and internal method ME.CM02.

(1) The marked tests/activities are not supported by ENAC accreditation.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
Frequency: 50 Hz. Level: 30 A/m. H field orientation: X axis. Comments: No anomalies are observed.	P
Frequency: 50 Hz. Level: 30 A/m. H field orientation: Y axis. Comments: No anomalies are observed.	P
Frequency: 50 Hz. Level: 30 A/m. H field orientation: Z axis. Comments: No anomalies are observed.	P
Frequency: 60 Hz. Level: 30 A/m. H field orientation: X axis. Comments: No anomalies are observed.	P
Frequency: 60 Hz. Level: 30 A/m. H field orientation: Y axis. Comments: No anomalies are observed.	P
Frequency: 60 Hz. Level: 30 A/m. H field orientation: Z axis. Comments: No anomalies are observed.	P

(1) The marked tests/activities are not supported by ENAC accreditation.

6.2.7. **IMMUNITY TO VOLTAGE DIPS AND SHORT INTERRUPTIONS** ⁽¹⁾

TEST PLAN

➤ MODES OF OPERATION

The sample remained in the mode of operation M01 during the test.

Once the equipment was turned on, approximately 5 minutes were waited until its warming up and stabilization.

➤ SAMPLE'S CONFIGURATION

The EUT was mounted according to the specifications given by the manufacturer for the mode of operation used in the test. The sample was mounted as a table standing equipment, being this setup the most similar to a real EUT's installation.

The sample tested was the sample B.

- The severity level applied was according to the standard EN 61326-1:2013 for equipment intended to be used in an industrial electromagnetic environment:

Phenomena	Severity level	Performance criteria
Short interruptions	0% U_{nom} during 1 period (50 Hz and 60 Hz)	B
	0% U_{nom} during 250/300 periods (50/60 Hz)	C
Voltage dips	40% U_{nom} during 10/12 periods (50/60 Hz)	C
	70% U_{nom} during 25/30 periods (50/60 Hz)	C

- Performance Criteria Applied:

Performance Criterion B and C.

(1) The marked tests/activities are not supported by ENAC accreditation.

➤ Application Method:

According to standard UNE-EN 61000-4-11:2005 and internal method ME.CM07.

TEST SETUP





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(1) The marked tests/activities are not supported by ENAC accreditation.

TEST RESULTS

P: Pass, F: Fail, NA: Not applicable, NM: Not measured.

Description	Result
100 % short interruptions. (0 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 20 ms (10 s between repetitions). Tested interface: I01. Frequency: 50 Hz. Performance criteria: B. Comments: No anomalies are observed.	C
60 % voltage dips. (40 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 200 ms (10 s between repetitions). Tested interface: I01. Frequency: 50 Hz. Performance criteria: C. Comments: No anomalies are observed.	C
30 % voltage dips. (70 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 500 ms (10 s between repetitions). Tested interface: I01. Frequency: 50 Hz. Performance criteria: C. Comments: No anomalies are observed.	C



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100 % short interruptions. (0 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0°. Duration and time between repetitions: 5 s (10 s between repetitions). Tested interface: I01. Frequency: 50 Hz. Performance criteria: C. Comments: No anomalies are observed.	C
100 % short interruptions. (0 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 20 ms (10 s between repetitions). Tested interface: I01. Frequency: 60 Hz. Performance criteria: B. Comments: No anomalies are observed.	C
60 % voltage dips. (40 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 200 ms (10 s between repetitions). Tested interface: I01. Frequency: 60 Hz. Performance criteria: C. Comments: No anomalies are observed.	C



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30 % voltage dips. (70 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0° and 180°. Duration and time between repetitions: 500 ms (10 s between repetitions). Tested interface: I01. Frequency: 60 Hz. Performance criteria: C. Comments: No anomalies are observed.	C
100 % short interruptions. (0 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0°. Duration and time between repetitions: 5 s (10 s between repetitions). Tested interface: I01. Frequency: 60 Hz. Performance criteria: C. Comments: No anomalies are observed.	C



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Development date: Noain, July 24th, 2018

Developed by: Iosu Martínez (EMC Technician)

Approved by: Ana Resano (EMC Responsible)

The indicated results exclusively refer to the sample, product or material handed over to the Laboratory, as mentioned in the corresponding section, and tested under the conditions mentioned in the procedures and norms quoted in this document.

The Laboratory keeps record of the uncertainties of the quantitative tests that require doing so.

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