



NAITEC

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REPORT Nr: PR180759

Written for: Monsol Electronic, S.L.

Related to: EMC Tests practiced on
“CcM2” 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.

2. GUARANTIES

NAITEC 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.

NAITEC 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.

3. TEST CHARACTERISTICS

3.1. TESTS CARRIED OUT

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

1. Radiated Emission. Electromagnetic radiated disturbance measurement ⁽¹⁾:
 - Standard: EN 61326-1:2013.
 - Limit: EN 61326-1:2013 and UNE-EN 55011:2016, +/A1:2017
(Group 1 Class B device, enclosure port, 3 m distance measurement).
 - Method: UNE-EN 55011:2016, +/A1:2017.

2. Conducted Emission. Electromagnetic conducted disturbance measurement:
 - Standard: EN 61326-1:2013.
 - Limit: EN 61326-1:2013 and UNE-EN 55011:2016, +/A1:2017
(Group 1 Class B device, AC mains power port).
 - Method: UNE-EN 55011:2016, +/A1:2017.

3. 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.

4. Radiated Immunity to RF Field.

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.

5. 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 power port, I/O signal/control ports.

6. 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 power port.

7. 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 power port, I/O signal/control ports.

8. 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.

9. Conducted immunity to voltage dips and short interruptions.

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 power port.

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 NAITEC. 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)
- ETS 3142D BiconiLog Antenna (CM01/62) (Serial Nr 00122391)
- Schwarzbeck STLP9149 Stacked LogPeriodic Antenna (CM01/50) (Serial Nr STLP9149-004)
- 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)
- BONN BLMA 4060-40 amplifier (CM01/72) (Serial Nr 1510518)
- Rohde & Schwarz NRVD RF wattmeter (CM01/07) (Serial Nr 1000105)
- Rohde & Schwarz URV5-Z4 voltage probe (CM01/07-01) (Nº serie 838314/039)
- DARE!! CTR1009B Radicentre test system (CM01/75)
- DARE!! RPR2006C Power Sensor (CM01/73) (Serial Nr 15I00037SN040)
- 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 M3/32A coupling/decoupling network (CM01/08-04) (Serial Nr 9912188C)
 - 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)
- EM Test DPA 503 Harmonics and Flicker meter (CM01/18) (Serial Nr 0604-02)
- Universal Technic Clamp M1.U (CM01/18-02) (Serial Nr 0604-02 L1)
- Isolation Transformer (CM01/15)

4.3. TESTS TIME MAP

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

| TEST | TESTED SAMPLE | TEST DATE | RESULT |
|---|---------------|------------|--------|
| Radiated Emission ⁽¹⁾ | A | 2019/02/26 | P |
| Conducted Emission | A | 2019/02/25 | P |
| Armónicos de corriente | B | 2019/07/26 | P |
| Fluctuaciones de tensión y flicker | B | 2019/07/26 | P |
| Electrostatic Discharge Immunity | B | 2019/07/24 | P |
| Radiated RF Immunity | A | 2019/02/26 | F |
| | B | 2019/07/08 | P |
| EFT / Bursts Immunity | B | 2019/07/24 | P |
| Surge Immunity | B | 2019/07/25 | P |
| Conducted RF Immunity | B | 2019/07/23 | P |
| Magnetic field Immunity | B | 2019/07/24 | P |
| Voltage dips and short interruptions Immunity | B | 2019/07/26 | P |

5. EUT IDENTIFICATION DATA

5.1. TEST PETITIONER AND EUT SUPPLIER

Name: Monsol Electronic, 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: AC Powered device for measurement purposes connected directly to a circuit breaker. CcM2 is able to measure voltage, current, power, energy and harmonic distortion of a single-phase with neutral electrical installation. It provides the data via Modbus RTU RS-485.

Trade mark: EnergyCcM.

Type: CcM2-485.

Hardware version: 1.5 (Sample A and Sample B)

Software version: Unknown (Sample A), 2703 (Sample B)

Manufacturer: Monsol Electronic, S.L.

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

The equipment tested are described in the following tables:

SAMPLE A

| CONTROL NUMBER | RECEPTION DATE | TRADE MARK | SERIAL NUMBER | TYPE | DESCRIPTION |
|----------------|----------------|------------|---------------|------|--|
| A01 | 2019/02/25 | EnergyCcM | --- | CcM2 | AC Powered device for measurement purposes connected directly to a circuit breaker, able to measure voltage, current, power, energy and harmonic distortion of an electrical installation (EUT). |
| A02 | 2019/02/25 | --- | --- | --- | 660 Ω resistive load (AE). |
| A03 | 2019/02/25 | --- | --- | --- | Control and monitorization PC, and RS485 to USB converter (AE). |

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

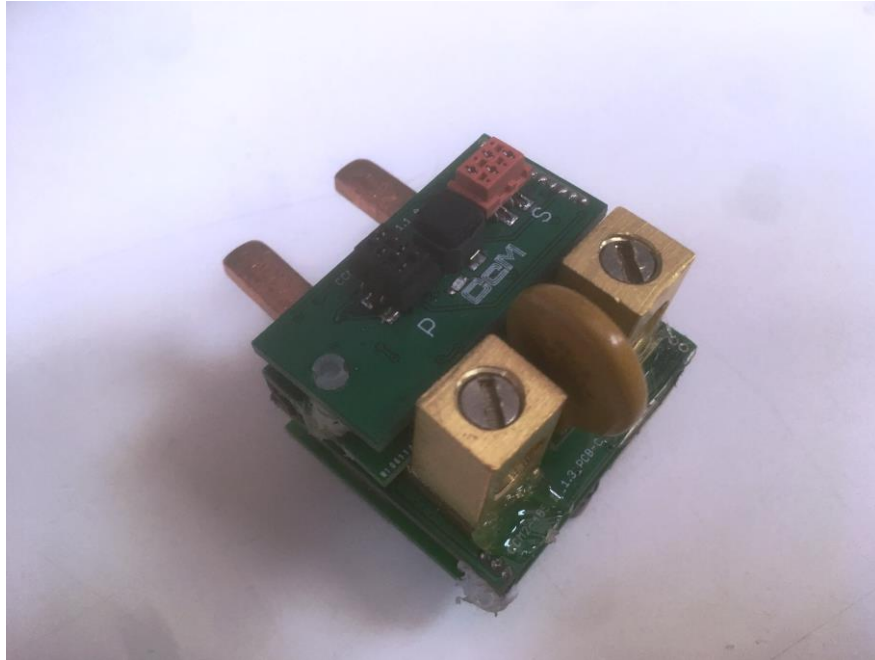
The interfaces corresponding to the tested samples are described below:

| INTERFACE Nr | TYPE/DESCRIPCIÓN | CABLE LENGTH |
|--------------|--|--------------|
| I01 | AC mains power port (220 Vac / 50 Hz) (L1+N) | L > 3 m |
| I02 | AC load port (connected in parallel to L1-N) | L > 3 m |
| I03 | RS485 communications port (modbus). Symmetrical, unshielded line. | L > 30 m |

SAMPLE B

On June the 1st, 2019, a new sample is received with a modified version of the firmware that fixed a “bug”. The hardware version of this new sample is 1.5, and the software version is 2703.

5.3. TESTED SAMPLE IMAGE



NOTE: The electromagnetic environment of the EUT could be either “residential, commercial and light industrial” or “industrial”. For this reason, the most restrictive conditions were applied during the tests, requesting the compliance of the device with residential limits in emission tests (Group 1 Class B as per UNE-EN 55011:2016, +/A1:2017), and industrial levels in immunity tests (test requirements for equipment intended to be used in an industrial electromagnetic environment as per UNE-EN 61326-1:2013).

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 220 Vac and 50 Hz. Blue led on the EUT blinking each ten seconds. Auxiliary resistive load (600 Ω) connected between L and N. Auxiliary PC in continuous communication with the DUT, executing a script and reporting its measurement data on the screen each two seconds (approximated current 0.35 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. A maximum error of $\pm 1\%$ of full scale in the current measurement will be admitted during and after the test, that is ± 2 mA. No communication losses or degradations in the behaviour of the DUT's led will be allowed during or after the tests.
- **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 or unexpected blinkings on the DUT's led, or current measurement errors above $\pm 1\%$ of full scale.
- **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 or unexpected blinkings on the DUT's led, or current measurement errors above $\pm 1\%$ of full scale.

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.

TEST RESULTS

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

| Description | Result |
|--|--------|
| AC mains harmonic current measurement. | P |

| Average harmonic current results | | | | |
|---|----------------------|------------|-----------|--------|
| Hn | I _{eff} [A] | % of Limit | Limit [A] | Result |
| 1 | 356.795E-3 | | | |
| 2 | 363.440E-6 | 0.034 | 1.08 | PASS |
| 3 | 5.891E-3 | 0.256 | 2.30 | PASS |
| 4 | 368.882E-6 | 0.086 | 430.00E-3 | PASS |
| 5 | 5.979E-3 | 0.524 | 1.14 | PASS |
| 6 | 346.196E-6 | 0.115 | 300.00E-3 | PASS |
| 7 | 4.658E-3 | 0.605 | 770.00E-3 | PASS |
| 8 | 386.520E-6 | 0.168 | 230.00E-3 | PASS |
| 9 | 5.081E-3 | 1.270 | 400.00E-3 | PASS |
| 10 | 359.531E-6 | 0.195 | 184.00E-3 | PASS |
| 11 | 4.321E-3 | 1.309 | 330.00E-3 | PASS |
| 12 | 327.562E-6 | 0.214 | 153.33E-3 | PASS |
| 13 | 4.509E-3 | 2.147 | 210.00E-3 | PASS |
| 14 | 323.976E-6 | 0.247 | 131.43E-3 | PASS |
| 15 | 3.907E-3 | 2.604 | 150.00E-3 | PASS |
| 16 | 317.587E-6 | 0.276 | 115.00E-3 | PASS |
| 17 | 3.007E-3 | 2.272 | 132.35E-3 | PASS |
| 18 | 332.940E-6 | 0.326 | 102.22E-3 | PASS |
| 19 | 3.117E-3 | 2.632 | 118.42E-3 | PASS |
| 20 | 335.485E-6 | 0.365 | 92.00E-3 | PASS |
| 21 | 1.925E-3 | 1.198 | 160.71E-3 | PASS |
| 22 | 321.156E-6 | 0.384 | 83.64E-3 | PASS |
| 23 | 1.965E-3 | 1.339 | 146.74E-3 | PASS |
| 24 | 317.700E-6 | 0.414 | 76.66E-3 | PASS |
| 25 | 1.979E-3 | 1.466 | 135.00E-3 | PASS |
| 26 | 310.756E-6 | 0.439 | 70.77E-3 | PASS |
| 27 | 945.557E-6 | 0.756 | 124.99E-3 | PASS |
| 28 | 310.685E-6 | 0.473 | 65.71E-3 | PASS |
| 29 | 1.323E-3 | 1.137 | 116.39E-3 | PASS |
| 30 | 328.857E-6 | 0.536 | 61.33E-3 | PASS |
| 31 | 1.268E-3 | 1.165 | 108.87E-3 | PASS |
| 32 | 327.382E-6 | 0.569 | 57.50E-3 | PASS |
| 33 | 1.169E-3 | 1.143 | 102.27E-3 | PASS |
| 34 | 324.254E-6 | 0.599 | 54.12E-3 | PASS |
| 35 | 1.801E-3 | 1.867 | 96.44E-3 | PASS |
| 36 | 317.577E-6 | 0.621 | 51.11E-3 | PASS |
| 37 | 1.211E-3 | 1.327 | 91.21E-3 | PASS |
| 38 | 326.908E-6 | 0.675 | 48.42E-3 | PASS |
| 39 | 1.555E-3 | 1.797 | 86.53E-3 | PASS |
| 40 | 323.600E-6 | 0.703 | 46.00E-3 | PASS |

Maximum harmonic current results

| Hn | I _{eff} [A] | % of Limit | Limit [A] | Result |
|----|----------------------|------------|-----------|--------|
| 1 | 356.990E-3 | | | |
| 2 | 487.479E-6 | 0.030 | 1.62 | PASS |
| 3 | 5.994E-3 | 0.174 | 3.45 | PASS |
| 4 | 514.567E-6 | 0.080 | 645.00E-3 | PASS |
| 5 | 6.192E-3 | 0.362 | 1.71 | PASS |
| 6 | 478.281E-6 | 0.106 | 450.00E-3 | PASS |
| 7 | 4.789E-3 | 0.415 | 1.15 | PASS |
| 8 | 591.883E-6 | 0.172 | 345.00E-3 | PASS |
| 9 | 5.203E-3 | 0.867 | 600.00E-3 | PASS |
| 10 | 526.983E-6 | 0.191 | 276.00E-3 | PASS |
| 11 | 4.417E-3 | 0.892 | 495.00E-3 | PASS |
| 12 | 415.064E-6 | 0.180 | 229.99E-3 | PASS |
| 13 | 4.612E-3 | 1.464 | 315.00E-3 | PASS |
| 14 | 442.121E-6 | 0.224 | 197.15E-3 | PASS |
| 15 | 4.048E-3 | 1.799 | 225.00E-3 | PASS |
| 16 | 425.476E-6 | 0.247 | 172.50E-3 | PASS |
| 17 | 3.111E-3 | 1.567 | 198.52E-3 | PASS |
| 18 | 483.668E-6 | 0.315 | 153.33E-3 | PASS |
| 19 | 3.253E-3 | 1.831 | 177.63E-3 | PASS |
| 20 | 464.814E-6 | 0.337 | 138.00E-3 | PASS |
| 21 | 2.073E-3 | 1.290 | 160.71E-3 | PASS |
| 22 | 415.906E-6 | 0.332 | 125.46E-3 | PASS |
| 23 | 2.102E-3 | 1.432 | 146.74E-3 | PASS |
| 24 | 416.695E-6 | 0.362 | 114.99E-3 | PASS |
| 25 | 2.083E-3 | 1.543 | 135.00E-3 | PASS |
| 26 | 366.710E-6 | 0.345 | 106.16E-3 | PASS |
| 27 | 1.077E-3 | 0.861 | 124.99E-3 | PASS |
| 28 | 370.256E-6 | 0.376 | 98.57E-3 | PASS |
| 29 | 1.464E-3 | 1.258 | 116.39E-3 | PASS |
| 30 | 459.327E-6 | 0.499 | 92.00E-3 | PASS |
| 31 | 1.376E-3 | 1.264 | 108.87E-3 | PASS |
| 32 | 440.491E-6 | 0.511 | 86.25E-3 | PASS |
| 33 | 1.370E-3 | 1.339 | 102.27E-3 | PASS |
| 34 | 394.842E-6 | 0.486 | 81.18E-3 | PASS |
| 35 | 1.931E-3 | 2.002 | 96.44E-3 | PASS |
| 36 | 390.560E-6 | 0.509 | 76.66E-3 | PASS |
| 37 | 1.336E-3 | 1.465 | 91.21E-3 | PASS |
| 38 | 403.553E-6 | 0.556 | 72.63E-3 | PASS |
| 39 | 1.733E-3 | 2.002 | 86.53E-3 | PASS |
| 40 | 409.988E-6 | 0.594 | 69.00E-3 | PASS |

Maximum harmonic voltage results

| Hn | Ueff [V] | Ueff [%] | Limit [%] | Result |
|----|-----------|----------|-----------|--------|
| 1 | 230.55 | 100.237 | | |
| 2 | 110.54E-3 | 0.048 | 0.2 | PASS |
| 3 | 535.90E-3 | 0.233 | 0.9 | PASS |
| 4 | 97.91E-3 | 0.043 | 0.2 | PASS |
| 5 | 76.20E-3 | 0.033 | 0.4 | PASS |
| 6 | 128.91E-3 | 0.056 | 0.2 | PASS |
| 7 | 50.69E-3 | 0.022 | 0.3 | PASS |
| 8 | 78.64E-3 | 0.034 | 0.2 | PASS |
| 9 | 26.20E-3 | 0.011 | 0.2 | PASS |
| 10 | 34.60E-3 | 0.015 | 0.2 | PASS |
| 11 | 30.83E-3 | 0.013 | 0.1 | PASS |
| 12 | 31.02E-3 | 0.013 | 0.1 | PASS |
| 13 | 22.61E-3 | 0.010 | 0.1 | PASS |
| 14 | 18.91E-3 | 0.008 | 0.1 | PASS |
| 15 | 19.67E-3 | 0.009 | 0.1 | PASS |
| 16 | 22.49E-3 | 0.010 | 0.1 | PASS |
| 17 | 16.85E-3 | 0.007 | 0.1 | PASS |
| 18 | 23.03E-3 | 0.010 | 0.1 | PASS |
| 19 | 12.52E-3 | 0.005 | 0.1 | PASS |
| 20 | 21.30E-3 | 0.009 | 0.1 | PASS |
| 21 | 18.07E-3 | 0.008 | 0.1 | PASS |
| 22 | 14.94E-3 | 0.006 | 0.1 | PASS |
| 23 | 10.89E-3 | 0.005 | 0.1 | PASS |
| 24 | 12.09E-3 | 0.005 | 0.1 | PASS |
| 25 | 16.22E-3 | 0.007 | 0.1 | PASS |
| 26 | 15.89E-3 | 0.007 | 0.1 | PASS |
| 27 | 10.02E-3 | 0.004 | 0.1 | PASS |
| 28 | 13.36E-3 | 0.006 | 0.1 | PASS |
| 29 | 14.58E-3 | 0.006 | 0.1 | PASS |
| 30 | 12.97E-3 | 0.006 | 0.1 | PASS |
| 31 | 9.71E-3 | 0.004 | 0.1 | PASS |
| 32 | 11.04E-3 | 0.005 | 0.1 | PASS |
| 33 | 13.40E-3 | 0.006 | 0.1 | PASS |
| 34 | 10.30E-3 | 0.004 | 0.1 | PASS |
| 35 | 11.10E-3 | 0.005 | 0.1 | PASS |
| 36 | 10.94E-3 | 0.005 | 0.1 | PASS |
| 37 | 10.34E-3 | 0.004 | 0.1 | PASS |
| 38 | 8.88E-3 | 0.004 | 0.1 | PASS |
| 39 | 9.55E-3 | 0.004 | 0.1 | PASS |
| 40 | 11.80E-3 | 0.005 | 0.1 | PASS |

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 |

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 [%] | 0.080 | 4.00 | PASS |
| dt [s] | 0.000 | 0.50 | PASS |

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 55011:2016, +/A1:2017, 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 55011:2016, +/A1:2017, 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.

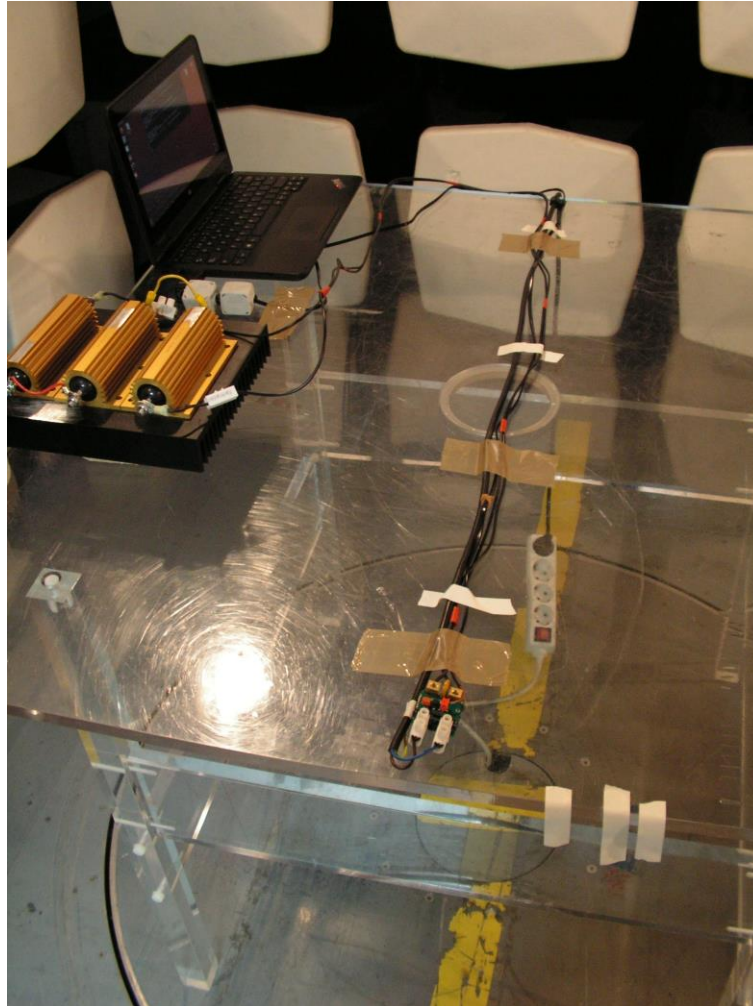
MODES OF OPERATION

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.

TEST SETUP

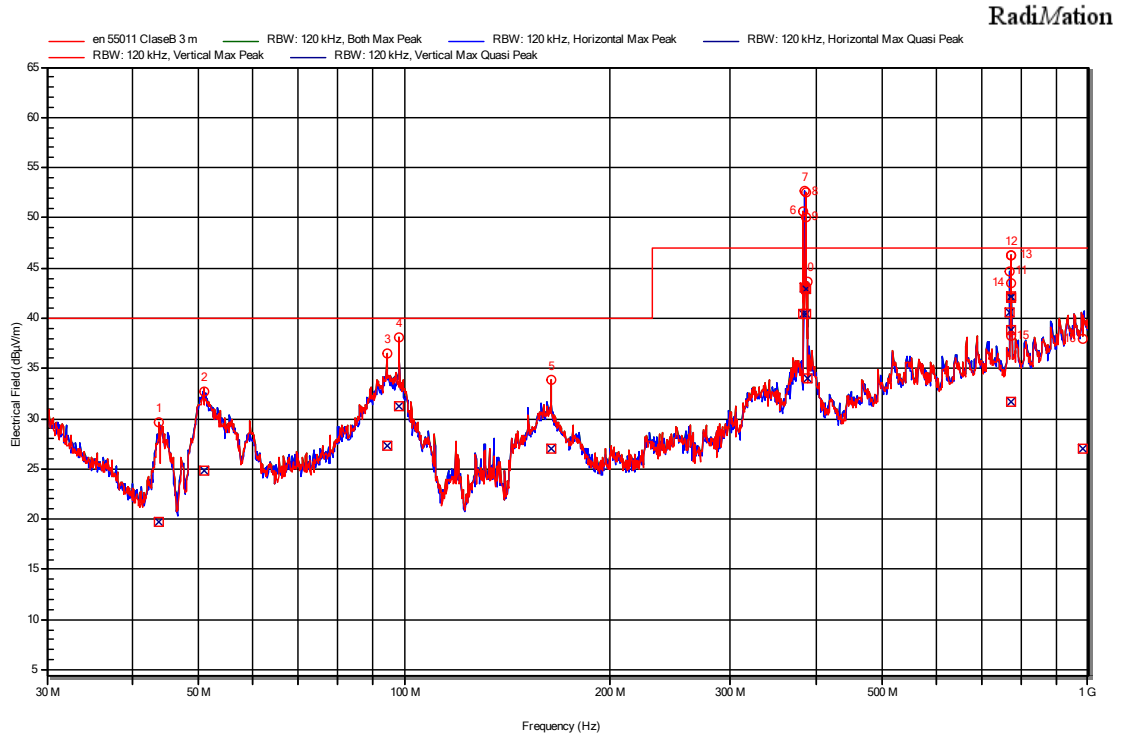


TEST RESULTS

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

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

TABLES AND GRAPHICAL RESULTS



| Peak Number | Frequency | Quasi-Peak | Quasi-Peak Limit | Status | Angle | Height | Polarization |
|-------------|------------|-------------|------------------|--------|-------------|--------|--------------|
| 1 | 43,83 MHz | 19,8 dBµV/m | 40 dBµV/m | Pass | 15 degrees | 1 m | Vertical |
| 2 | 50,91 MHz | 24,8 dBµV/m | 40 dBµV/m | Pass | 25 degrees | 1 m | Vertical |
| 3 | 94,2 MHz | 27,3 dBµV/m | 40 dBµV/m | Pass | 10 degrees | 1,76 m | Vertical |
| 4 | 98,31 MHz | 31,2 dBµV/m | 40 dBµV/m | Pass | 10 degrees | 1,95 m | Vertical |
| 5 | 163,86 MHz | 27,1 dBµV/m | 40 dBµV/m | Pass | 350 degrees | 2 m | Vertical |
| 6 | 384 MHz | 40,4 dBµV/m | 47 dBµV/m | Pass | 315 degrees | 99 cm | Vertical |
| 7 | 385,02 MHz | 43 dBµV/m | 47 dBµV/m | Pass | 315 degrees | 1 m | Horizontal |
| 8 | 386,04 MHz | 43 dBµV/m | 47 dBµV/m | Pass | 315 degrees | 1,04 m | Vertical |
| 9 | 387,06 MHz | 40,5 dBµV/m | 47 dBµV/m | Pass | 315 degrees | 98 cm | Vertical |
| 10 | 388,08 MHz | 34 dBµV/m | 47 dBµV/m | Pass | 315 degrees | 1 m | Vertical |
| 11 | 769,02 MHz | 40,5 dBµV/m | 47 dBµV/m | Pass | 360 degrees | 2 m | Horizontal |
| 12 | 770,04 MHz | 42,2 dBµV/m | 47 dBµV/m | Pass | 360 degrees | 1,95 m | Vertical |
| 13 | 771,06 MHz | 42,1 dBµV/m | 47 dBµV/m | Pass | 360 degrees | 1,8 m | Horizontal |
| 14 | 772,08 MHz | 38,9 dBµV/m | 47 dBµV/m | Pass | 360 degrees | 2 m | Vertical |
| 15 | 773,1 MHz | 31,7 dBµV/m | 47 dBµV/m | Pass | 360 degrees | 1,8 m | Vertical |
| 16 | 980,94 MHz | 27 dBµV/m | 47 dBµV/m | Pass | 5 degrees | 99 cm | Vertical |

6.1.4. CONDUCTED EMISSION. CONDUCTED DISTURBANCE MEASUREMENT

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 55011:2016, +/A1:2017, 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 to 56 | 56 to 46 |
| 500 kHz – 5 MHz | 56 | 46 |
| 5 MHz – 30 MHz | 60 | 50 |

TESTING METHOD

According to the standard UNE-EN 55011:2016, +/A1:2017, 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.

TEST SETUP



TEST RESULTS

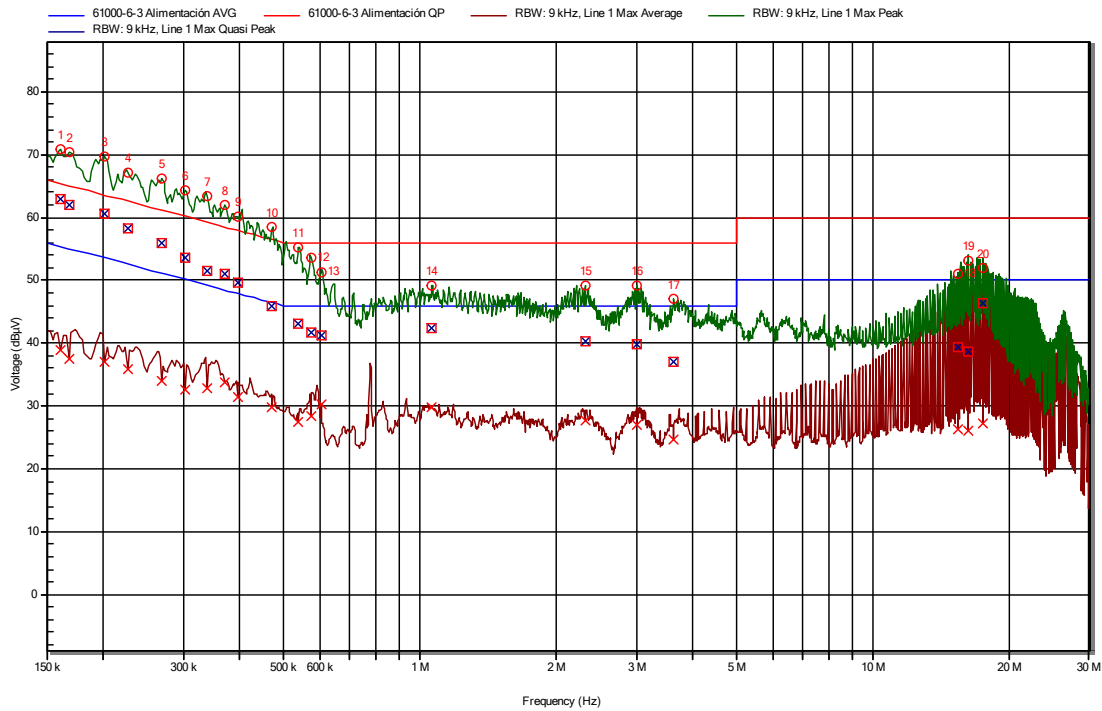
P: Pass, F: Fail, NA:Not Applicable, NM: Not Measured

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

TABLES AND GRAPHICAL RESULTS

Measurement in L1

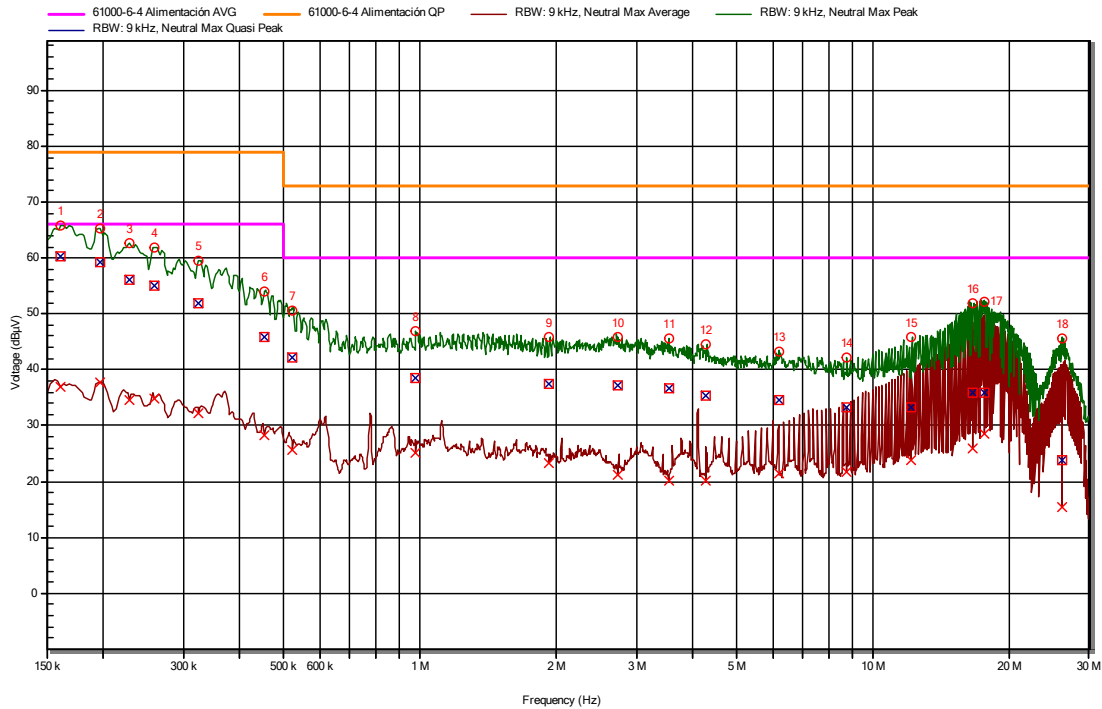
RadiMation



| Peak Number | Frequency | Average | Average Limit | Quasi-Peak | Quasi-Peak Limit | Status |
|-------------|------------|-----------|---------------|------------|------------------|--------|
| 1 | 161,25 kHz | 39 dBµV | 55,4 dBµV | 62,9 dBµV | 65,4 dBµV | Pass |
| 2 | 168 kHz | 37,4 dBµV | 55,1 dBµV | 62 dBµV | 65,1 dBµV | Pass |
| 3 | 201,75 kHz | 37,1 dBµV | 53,5 dBµV | 60,6 dBµV | 63,5 dBµV | Pass |
| 4 | 226,5 kHz | 35,8 dBµV | 52,6 dBµV | 58,3 dBµV | 62,6 dBµV | Pass |
| 5 | 269,25 kHz | 34,1 dBµV | 51,1 dBµV | 56 dBµV | 61,1 dBµV | Pass |
| 6 | 303 kHz | 32,7 dBµV | 50,2 dBµV | 53,6 dBµV | 60,2 dBµV | Pass |
| 7 | 339 kHz | 32,9 dBµV | 49,2 dBµV | 51,4 dBµV | 59,2 dBµV | Pass |
| 8 | 370,5 kHz | 33,7 dBµV | 48,5 dBµV | 51 dBµV | 58,5 dBµV | Pass |
| 9 | 395,25 kHz | 31,5 dBµV | 48 dBµV | 49,7 dBµV | 58 dBµV | Pass |
| 10 | 471,75 kHz | 29,9 dBµV | 46,5 dBµV | 45,9 dBµV | 56,5 dBµV | Pass |
| 11 | 539,25 kHz | 27,5 dBµV | 46 dBµV | 43,2 dBµV | 56 dBµV | Pass |
| 12 | 575,25 kHz | 28,3 dBµV | 46 dBµV | 41,7 dBµV | 56 dBµV | Pass |
| 13 | 604,5 kHz | 30,3 dBµV | 46 dBµV | 41,2 dBµV | 56 dBµV | Pass |
| 14 | 1,063 MHz | 29,9 dBµV | 46 dBµV | 42,3 dBµV | 56 dBµV | Pass |
| 15 | 2,312 MHz | 27,8 dBµV | 46 dBµV | 40,3 dBµV | 56 dBµV | Pass |
| 16 | 3,008 MHz | 27 dBµV | 46 dBµV | 39,9 dBµV | 56 dBµV | Pass |
| 17 | 3,622 MHz | 24,6 dBµV | 46 dBµV | 37,1 dBµV | 56 dBµV | Pass |
| 18 | 15,398 MHz | 26,3 dBµV | 50 dBµV | 39,4 dBµV | 60 dBµV | Pass |
| 19 | 16,242 MHz | 26,1 dBµV | 50 dBµV | 38,7 dBµV | 60 dBµV | Pass |
| 20 | 17,428 MHz | 27,2 dBµV | 50 dBµV | 46,5 dBµV | 60 dBµV | Pass |

Measurement in N

RadiMation



| Peak Number | Frequency | Average | Average Limit | Quasi-Peak | Quasi-Peak Limit | Status |
|-------------|------------|-----------|---------------|------------|------------------|--------|
| 1 | 161,25 kHz | 37,1 dBµV | 66 dBµV | 60,3 dBµV | 79 dBµV | Pass |
| 2 | 197,25 kHz | 37,7 dBµV | 66 dBµV | 59,2 dBµV | 79 dBµV | Pass |
| 3 | 228,75 kHz | 34,7 dBµV | 66 dBµV | 56,1 dBµV | 79 dBµV | Pass |
| 4 | 260,25 kHz | 34,8 dBµV | 66 dBµV | 55 dBµV | 79 dBµV | Pass |
| 5 | 325,5 kHz | 32,3 dBµV | 66 dBµV | 51,8 dBµV | 79 dBµV | Pass |
| 6 | 453,75 kHz | 28,4 dBµV | 66 dBµV | 45,8 dBµV | 79 dBµV | Pass |
| 7 | 523,5 kHz | 25,5 dBµV | 60 dBµV | 42,1 dBµV | 73 dBµV | Pass |
| 8 | 980,25 kHz | 25,1 dBµV | 60 dBµV | 38,5 dBµV | 73 dBµV | Pass |
| 9 | 1,932 MHz | 23,3 dBµV | 60 dBµV | 37,5 dBµV | 73 dBµV | Pass |
| 10 | 2,729 MHz | 21,3 dBµV | 60 dBµV | 37,2 dBµV | 73 dBµV | Pass |
| 11 | 3,536 MHz | 20,2 dBµV | 60 dBµV | 36,7 dBµV | 73 dBµV | Pass |
| 12 | 4,288 MHz | 20,2 dBµV | 60 dBµV | 35,5 dBµV | 73 dBµV | Pass |
| 13 | 6,187 MHz | 21,5 dBµV | 60 dBµV | 34,6 dBµV | 73 dBµV | Pass |
| 14 | 8,745 MHz | 21,8 dBµV | 60 dBµV | 33,3 dBµV | 73 dBµV | Pass |
| 15 | 12,174 MHz | 23,8 dBµV | 60 dBµV | 33,3 dBµV | 73 dBµV | Pass |
| 16 | 16,634 MHz | 26 dBµV | 60 dBµV | 35,8 dBµV | 73 dBµV | Pass |
| 17 | 17,662 MHz | 28,6 dBµV | 60 dBµV | 36 dBµV | 73 dBµV | Pass |
| 18 | 26,063 MHz | 15,5 dBµV | 60 dBµV | 23,9 dBµV | 73 dBµV | Pass |

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 | ± 2 kV, ± 4 kV | 10 per level and polarity |
| Air discharge | ± 2 kV, ± 4 kV, ± 8 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.

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

TEST SETUP



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 |

6.2.2. IMMUNITY TO RF FIELDS

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 samples tested were the sample A and 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, 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.

TEST SETUP



TEST RESULTS

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

| Description | Result |
|--|--------|
| <p>Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. Sample A. Comments: The communication with the device is lost around 95 MHz.</p> | F |
| <p>Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 80 MHz – 1 GHz. Field: 10 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |

| | |
|--|---|
| <p>Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 1.4 GHz – 2 GHz. Field: 3 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 90°. Horizontal Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 0° (EUT's front view). Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |
| <p>Frequency interval: 2 GHz – 2.7 GHz. Field: 1 V/m. AM Modulation 80%, 1 kHz. 90°. Vertical Polarization. Sample B. Comments: No anomalies are observed.</p> | P |

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 ports | 5 kHz | ± 2 kV | 1 minute/polarity |
| I/O signal/control | 5 kHz | ± 1 kV | 1 minute/polarity |

- **Performance Criteria Applied:**

Performance Criterion B.

- **Application Method:**

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

TEST SETUP



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 |

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 | ± 0.5 kV, ± 1 kV, ± 2 kV (common mode) | 5 pulses/polarity |
| | ± 0.5 kV, ± 1 kV (differential mode) | |
| I/O signal/control (long-distance lines) | ± 0.5 kV, ± 1 kV (common mode) | 5 pulses/polarity |

- **Performance Criteria Applied:**

Performance Criterion B.

- **Application Method:**

According to standard UNE-EN 61000-4-5:2015 and internal method ME.CM08. The normal functioning of the EUT cannot be achieved because of the impact of the CDN on it, so following the recommendations of UNE-EN 61000-4-5:2015, no surge tests were applied on this line.

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 and ± 1 kV. Comments: No anomalies are observed. | P |
| Tested interface: I01. (L1-PE) Z_{out} : 12 Ω . Phase coupling: 0°, 90°, 180° and 270°. Level: ± 0.5 kV, ± 1 kV and ± 2 kV. Comments: No anomalies are observed. | P |
| Tested interface: I01. (N-PE) Z_{out} : 12 Ω . Phase coupling: 0°, 90°, 180° and 270°. Level: ± 0.5 kV, ± 1 kV and ± 2 kV. Comments: No anomalies are observed. | P |

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 sample tested was 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 (long-distance lines) | | | |

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

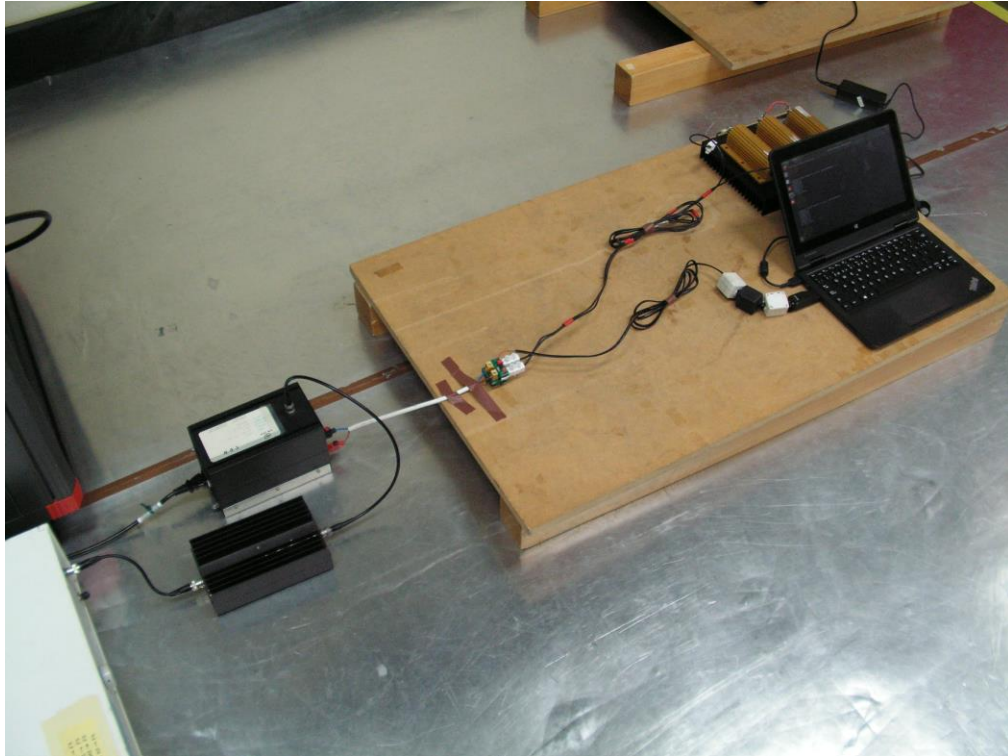
➤ **Performance Criteria Applied:**

Performance Criterion A.

➤ **Application Method:**

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

TEST SETUP



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. Comments: No anomalies are observed. | 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. Comments: No anomalies are observed. | P |
| 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. Comments: No anomalies are observed. | P |

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.

TEST SETUP



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 |

6.2.7. IMMUNITY TO VOLTAGE DIPS AND SHORT INTERRUPTIONS

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.

- **Application Method:**

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

TEST SETUP



TEST RESULTS

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

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

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| <p>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: The DUT turns off during each short interruption and the auxiliary PC reports that the device is not connected. The DUT recovers itself after each interruption.</p> | <p>C</p> |
| | |
| <p>100 % short interruptions. (0 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0°. 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.</p> | <p>C</p> |
| <p>60 % voltage dips. (40 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0°. 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.</p> | <p>C</p> |
| <p>30 % voltage dips. (70 % U_{nom} test level). Nr of repetitions: 3. Phase coupling: 0°. 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.</p> | <p>C</p> |

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| <p>100 % short interruptions. (0 % Unom test level).</p> <p>Nr of repetitions: 3. Phase coupling: 0°.</p> <p>Duration and time between repetitions: 5 s (10 s between repetitions).</p> <p>Tested interface: I01.</p> <p>Frequency: 60 Hz.</p> <p>Performance criteria: C.</p> <p>Comments: The DUT turns off during each short interruption and the application on the auxiliary PC reports that the device is not connected. The DUT recovers itself after each interruption.</p> | <p>C</p> |
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Development date: Noain, August 29th, 2019

Developed by: Iosu Martínez

Approved by: Ana Resano

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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