## 1. OGGETTO DEL TEST REPORT / *ITEM UNDER TEST REPORT*

| | |
|---|---|
| **Descrizione** *Description* | Radiator |
| **Modello** *Model type* | ULISSE |
| **Identificativo interno** *Storage No.* | 200485/2 (Sampled by applicant) |
| **Richiedente** *Applicant* | Caleido S.r.l. |
| **Indirizzo** *Address* | Via Pablo Neruda, 52/A – 25020 Flero (BS) - ITALY |

| | |
|---|---|
| **Prove effettuate presso** *Test carried out by* | TÜV Rheinland Italia Srl<br>Via E. Mattei, 3 – 20010 Pogliano Milanese (Italy) |
| **Norme di riferimento** *Reference Standards* | **EN 61000-3-2:2019; EN 61000-3-3:2013 + A1:2019**<br>**EN 55014-1:2017; EN 55014-2:2015** |
| **Scopo delle prove** *Scope of the tests* | To verify the compliance with the following clauses of reference standards<br>See part *10.TESTS SUMMARY* section |
| **Risultati di prova** *Test Results* | **COMPLIANT** |

| | | | |
|---|---|---|---|
| **Data ricevimento campioni** *Date of samples receiving* | 13/07/2020 | | |
| **Data inizio prove** *Date of tests start* | 14/07/2020 | **Data fine prove** *Date of tests end* | 15/07/2020 |
| **Rapporto composto da** *Test report composed by* | 36 Pages | | |

| **Provato da / Tested by** *(name + signature)* | **Approvato da / Approved by** *(name + signature)* |
|---|---|
| Roberto Radice<br>(*Laboratory Technician*) | Andrea Bortolotti<br>( *Reviewer*) |


TÜV Rheinland Italia – Via Enrico Mattei, 3 – 20010 Pogliano Milanese (MI) – Italy Tel. +39 02 9396871 Fax. +39 02 93968723

| RELEASE CONTROL RECORD | | |
|---|---|---|
| TEST REPORT NUMBER | REASON OF CHANGE | DATE OF ISSUE |
| 28119842 004 | Original release | 07/08/2020 |

## 2. OGGETTO SOTTOPOSTO A PROVE / *ITEM UNDER TEST*

| | |
|---|---|
| **Descrizione** *Description* | Radiator |
| **Marca** *Brand* |  |
| **Costruttore** *Manufacturer* | |
| **Modello** *Model / Type reference* | |
| **Dati di targa** *Ratings* | |
| **Classificazione** *EUT classification* | Category II |
| **Massima frequenza di clock** *Maximum clock frequency* | <15MHz |
| **Installazione** *Standing* | Wall |

| **3. MODELLI DERIVATI / *DERIVED MODELS*** | |
|---|---|
| **Model** | **Differences** |
| None | |

| **4. LISTA COMPONENTI / *COMPONENTS LIST*** | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model Name** | **Technical data** |
| Electronic module | SELMO srl | MUSA PLUS W-CL1-S | 230V 50/60Hz<br>SW Rev. 4.41 |

| **5. COMPONENTI AUSILIARI / *ANCILLARY EQUIPMENTS*** | | |
|---|---|---|
| **Description** | **Manufacturer** | **Model name** |
| None | | |

| **6. SOFTWARE E VERSIONE DEI FIRMWARE / *SOFTWARE AND FIRMWARE VERSIONS*** | | |
|---|---|---|
| **Description** | **Manufacturer** | **Model name** |
| / | | |

| **7. PORTE DI INTERFACCIA / *INTERFACE PORTS*** | | | |
|---|---|---|---|
| **Port** | **Connections** | | |
| | **Description** | **(Un)Shielded** | **Length** |
| Enclosure | Radiator: conductive surface<br>Electronic module: non conductive surface | Closed by screws | --- |
| AC Mains | Input 230Vac 50/60Hz (Phase-Neutral with protective earth) | No | --- |
| DC Port | Port not present | | |
| Signals | Port not present | | |

| **8. MODALITA' DI FUNZIONAMENTO / OPERATING MODES** | | | |
|---|---|---|---|
| **Operation mode** | | **Description** | **Representative parameter** |
| #1 | Working mode | Heating element on (setting temperature 30°C) | Heating element On<br>Display of electronic module |
| #2 | Working mode | Flicker: 1 manual start and 1 manual stop | / |

## 9. CRITERI DI VALUTAZIONE PER I TEST DI IMMUNITA' / *COMPLIANCE CRITERIA FOR IMMUNITY TESTS*

***Performance criterion A:***

*The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

***Performance criterion B:***

*The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

***Performance criterion C:***

*Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.*

| Representative parameter | Acceptable level of performance | Observation mode | | |
|---|---|---|---|---|
| | | Acquisition | Test equipment | Test n. |
| Heating element On | According to performance criteria of Standard EN 55014-2 | By visualization | Operator | All immunity tests |
| Display of electronic module | According to performance criteria of Standard EN 55014-2 | By visualization | Operator | All immunity tests |

| Reference Document | | Title of Document |
|---|---|---|
| EN 55014-1 | 2017 | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus<br>Part 1: Emission |
| EN 55014-2 | 2015 | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus<br>Part 2: Immunity - Product family standard |
| EN 61000-3-2 | 2019 | Electromagnetic compatibility (EMC)<br>Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)" is an international standard concerning the harmonics emitted by electric equipment. |
| EN 61000-3-3<br>A1 | 2013<br>2019 | Electromagnetic compatibility (EMC)<br>Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection |
| EN/IEC 61000-4-2 | 2009* | Electromagnetic compatibility (EMC)<br>Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test |
| EN/IEC 61000-4-3<br>A1<br>A2<br>IS1 | 2006*<br>2008<br>2010<br>2009 | Electromagnetic compatibility (EMC)<br>Part 4-3: Testing and measurement techniques – Radiated, radiofrequency, electromagnetic field immunity test |
| EN/IEC 61000-4-4 | 2012* | Electromagnetic compatibility (EMC)<br>Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test |
| EN/IEC 61000-4-5 | 2006* | Electromagnetic compatibility (EMC)<br>Part 4-5: Testing and measurement techniques – Surge immunity test |
| EN/IEC 61000-4-6 | 2009* | Electromagnetic compatibility (EMC)<br>Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields |
| EN/IEC 61000-4-11 | 2006* | Electromagnetic compatibility (EMC)<br>Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests |

* For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

## 10. SOMMARIO DELLE PROVE / *TESTS SUMMARY*



## DECISION RULE

Statements of conformity (PASS or FAIL) to specifications are made in this report without taking measurement uncertainty into account.

Where statements of conformity are made in this report, the following decision rules are applied:
PASS – Results within limits/specifications

FAIL – Results exceed limits/specifications

(emission test according to CISPR 16-4-2 cl.4.2, immunity tests TRI applies the disturbance level indicated in the product standard)

## 11. ESITO DELLE PROVE DI EMISSIONE / *EMISSION TESTS RESULT*

| Prova / Test | Porta / Port | Esito / Result |
|---|---|---|
| **Emissione condotta /** *Continuous disturbance voltage* | AC mains | PASS |
| **Emissione radiata** / *Radiated disturbance* | Enclosure | N.E.[1] |
| ***Armoniche di corrente*** */ Harmonic current emissions* | AC mains | PASS |
| **Flicker e oscillazioni di tensione** / *Voltage fluctuations and flicker* | AC mains | PASS |
| **Click** / *Click* | AC mains | N.A.[2] |
| ***Potenza Radiata*** */ Disturbance power* | AC mains | PASS |

*N.E.[1] the Laboratory has executed Disturbance power test in Range 30-300MHz; clock frequency <15MHz*

*N.A.2 According to par. 5.4.3.2 Individual switching operations of Standard EN 55014-1: any disturbance caused by individual switching operations shall be disregarded for the purpose of testing the EUT for compliance with the limits of radio disturbance set out in this standard. (Example: the changing of the manual setting of a continuously adjustable control such as a variable speed device for water extraction or electronic thermostats).*

**Legend:**

Pass = Result within the limits N/A = Not Applicable N/R = Not requested by the Client

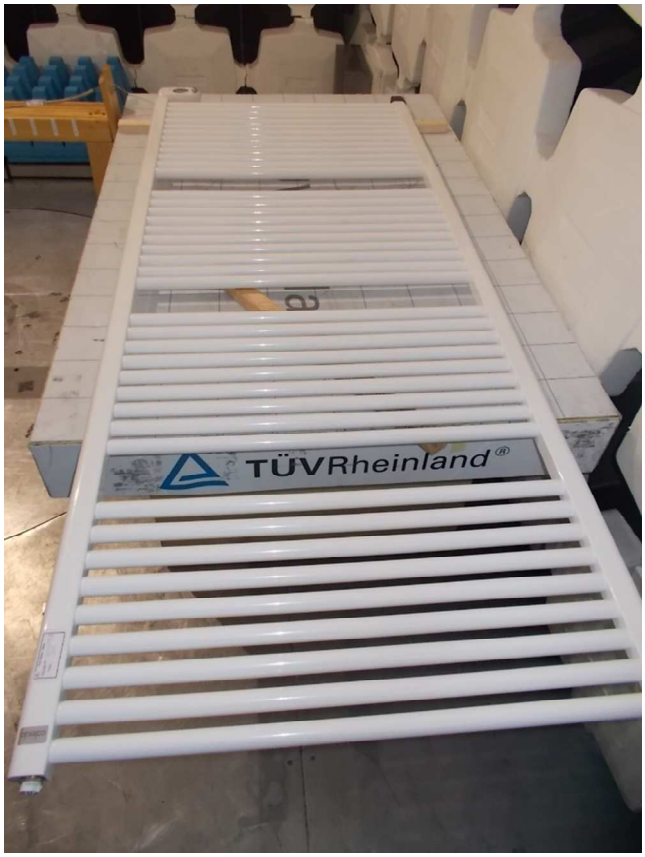
## 12. ESITO DELLE PROVE DI IMMUNITA' / *IMMUNITY TESTS RESULT*

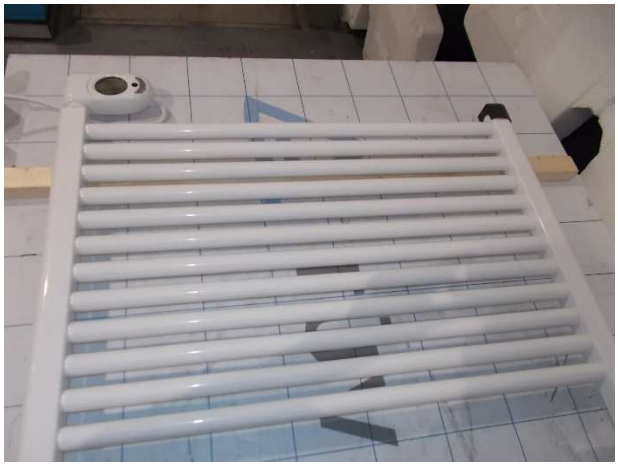
| Prova / Test | Porta / Port | Esito / Result |
|---|---|---|
| **Scariche Elettrostatiche /** *Electrostatic discharges* | Enclosure | PASS |
| **Immunità radiata** / Radiated electromagnetic field | Enclosure | N.A. |
| **Transitori veloci di tensione** */ Electrical Fast Transients* | AC power | PASS |
| **Impulsi** / *Surge* | AC mains | PASS |
| **Immunità condotta** / *Injected currents* | AC power | PASS |
| **Buchi e interruzioni brevi di tensione /** *Dips and Short interruptions* | AC mains | PASS |

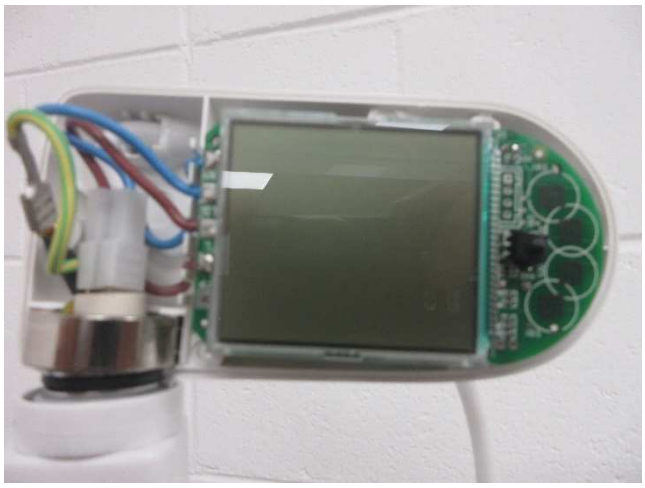
**Legend:**

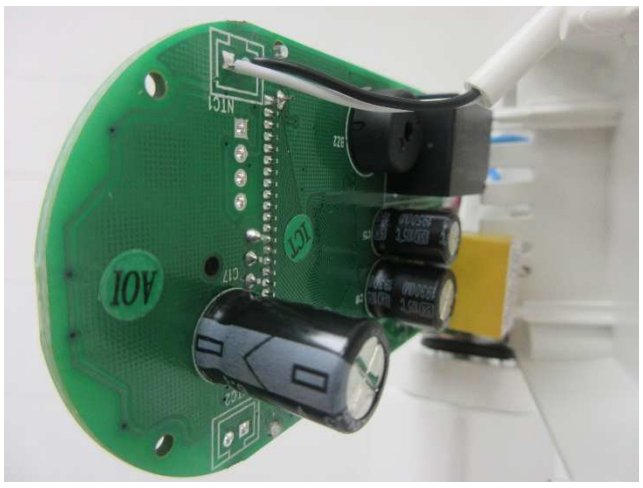
Pass = Result within the limits N/A = Not Applicable N/R = Not requested by the Client

## 13. DOCUMENTAZIONE FOTOGRAFICA / *PHOTOGRAPHIC DOCUMENTATION*






Selimo
TYPE:MUSA PLUS W-CL1-S
Volt 230~50/60Hz
Power max 2000Watt
SW:REV.4.41.
IP44
022092O 00358

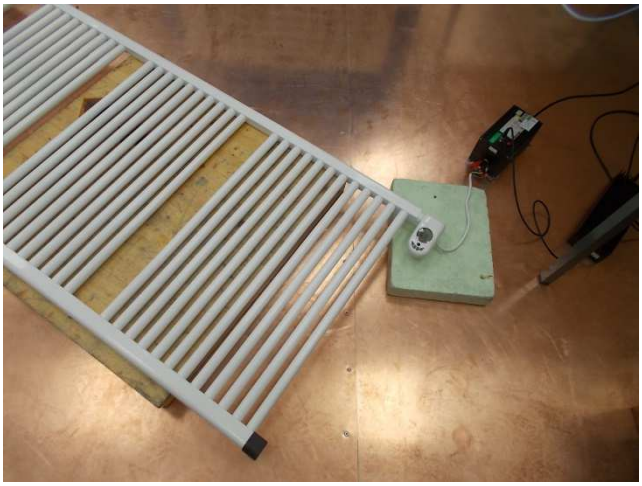
Conducted emission on AC input test set-up

Conducted emission on AC input test set-up

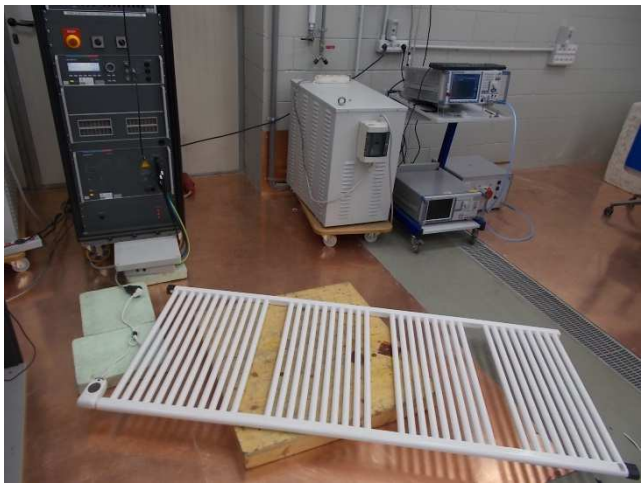
Power disturbance test set-up

Power disturbance test set-up

Conducted immunity on AC input test set-up

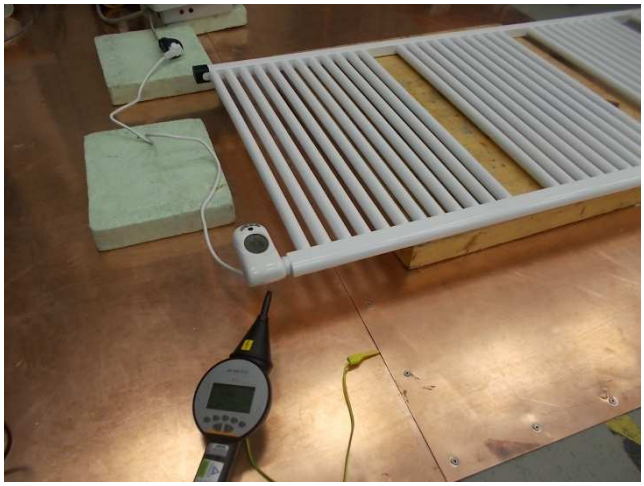


Conducted immunity on AC input test set-up



Burst/surge on AC input test set-up

Burst/surge on AC input test set-up



ESD test set-up


ESD test set-up

Harmonics, Flicker and voltage dips test set-up

Harmonics, Flicker and voltage dips test set-up

| ***Test N.1*** | **HARMONIC CURRENTS –** *ARMONICHE DI CORRENTE* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-3-2 |
| **List of reference equipment** | ➢ Stabilized Power Supply Ametek mod. MX30 (Inv. 2781967)<br>➢ Harmonics Analyzer EM Test mod. DPA503 (Inv. 2781969)<br>➢ Software EM Test NET.control 2.1.5 |
| **Measurement Uncertainty** | Expanded uncertainty: 4,1% of reading<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |

| | |
|---|---|
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (22 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (55 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-3-2 Annex A |
| **Test Procedure** | EN 61000-3-2 par. 6.2 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | Limits are indicated in EN 61000-3-2, Class A |

| Measured values | | | |
|---|---|---|---|
| *Fundamental Current* | | | |
| Line 1: | 6,154 A | | |
| *Active input Power* | | | |
| Line 1: | 1411 W | | |
| *Circuit power factor* | | | |
| Line 1: | 1,00 | | |

| | |
|---|---|
| Standard used: | EN/IEC 61000-3-2 Ed.3 Short cyclic<br>Equipment class A <= 150% of the limit |
| Observation time: | 60s |

## Average harmonic current results

| Hn | Ieff [A] | % of Limit | Limit [A] | Result |
|---|---|---|---|---|
| 1 | 6.116 | | | |
| 2 | 1.689E-3 | | | PASS |
| 3 | 4.373E-3 | | | PASS |
| 4 | 1.956E-3 | | | PASS |
| 5 | 4.150E-3 | | | PASS |
| 6 | 2.268E-3 | | | PASS |
| 7 | 2.988E-3 | | | PASS |
| 8 | 2.027E-3 | | | PASS |
| 9 | 4.054E-3 | | | PASS |
| 10 | 1.843E-3 | | | PASS |
| 11 | 3.369E-3 | | | PASS |
| 12 | 1.849E-3 | | | PASS |
| 13 | 1.931E-3 | | | PASS |
| 14 | 1.777E-3 | | | PASS |
| 15 | 2.753E-3 | | | PASS |
| 16 | 1.811E-3 | | | PASS |
| 17 | 2.017E-3 | | | PASS |
| 18 | 1.750E-3 | | | PASS |
| 19 | 1.967E-3 | | | PASS |
| 20 | 1.650E-3 | | | PASS |
| 21 | 2.241E-3 | | | PASS |
| 22 | 1.609E-3 | | | PASS |
| 23 | 1.924E-3 | | | PASS |
| 24 | 1.710E-3 | | | PASS |
| 25 | 2.045E-3 | | | PASS |
| 26 | 2.017E-3 | | | PASS |
| 27 | 2.331E-3 | | | PASS |
| 28 | 1.881E-3 | | | PASS |
| 29 | 2.239E-3 | | | PASS |
| 30 | 1.804E-3 | | | PASS |
| 31 | 1.745E-3 | | | PASS |
| 32 | 1.629E-3 | | | PASS |
| 33 | 2.093E-3 | | | PASS |
| 34 | 1.650E-3 | | | PASS |
| 35 | 2.058E-3 | | | PASS |
| 36 | 1.734E-3 | | | PASS |
| 37 | 2.487E-3 | | | PASS |
| 38 | 2.154E-3 | | | PASS |
| 39 | 2.597E-3 | | | PASS |
| 40 | 1.956E-3 | | | PASS |

## Maximum harmonic current results

| Hn | Ieff [A] | % of Limit | Limit [A] | Result |
|---|---|---|---|---|
| 1 | 6.154 | | | |
| 2 | 2.563E-3 | | | PASS |
| 3 | 5.639E-3 | | | PASS |
| 4 | 2.477E-3 | | | PASS |
| 5 | 6.115E-3 | | | PASS |
| 6 | 2.773E-3 | | | PASS |
| 7 | 4.524E-3 | | | PASS |
| 8 | 2.260E-3 | | | PASS |
| 9 | 4.823E-3 | | | PASS |
| 10 | 2.255E-3 | | | PASS |
| 11 | 5.102E-3 | | | PASS |
| 12 | 2.238E-3 | | | PASS |
| 13 | 2.437E-3 | | | PASS |
| 14 | 2.083E-3 | | | PASS |
| 15 | 3.496E-3 | | | PASS |
| 16 | 2.038E-3 | | | PASS |
| 17 | 2.531E-3 | | | PASS |
| 18 | 2.017E-3 | | | PASS |
| 19 | 3.087E-3 | | | PASS |
| 20 | 2.084E-3 | | | PASS |
| 21 | 2.771E-3 | | | PASS |
| 22 | 2.036E-3 | | | PASS |
| 23 | 2.152E-3 | | | PASS |
| 24 | 2.326E-3 | | | PASS |
| 25 | 2.635E-3 | | | PASS |
| 26 | 2.437E-3 | | | PASS |
| 27 | 3.072E-3 | | | PASS |
| 28 | 2.292E-3 | | | PASS |
| 29 | 2.925E-3 | | | PASS |
| 30 | 2.159E-3 | | | PASS |
| 31 | 2.347E-3 | | | PASS |
| 32 | 1.858E-3 | | | PASS |
| 33 | 2.576E-3 | | | PASS |
| 34 | 2.076E-3 | | | PASS |
| 35 | 2.907E-3 | | | PASS |
| 36 | 2.252E-3 | | | PASS |
| 37 | 3.245E-3 | | | PASS |
| 38 | 2.650E-3 | | | PASS |
| 39 | 4.546E-3 | | | PASS |
| 40 | 2.695E-3 | | | PASS |

| **Test N.2** | **FLICKER –** *FLUTTUAZIONI DI TENSIONE* |
|---|---|

| | |
|---|---|
| **Reference standard** | EN 61000-3-3 |
| **List of reference equipment** | ➢ Stabilized Power Supply Ametek mod. MX30 (Inv. 2781967)<br>➢ Flicker reference Impedance EM Test mod. AIF503N32 (Inv. 2781970)<br>➢ Software EM Test NET.control 2.1.5 |
| **Measurement Uncertainty** | Expanded uncertainty: 5,6% of reading<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (22 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (55 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-3-3 par. 4 |
| **Test Procedure** | EN 61000-3-3 par. 6 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | Limits are indicated in EN 61000-3-3 par. 5 |

## Test Results – Operating condition #1

| | |
|---|---|
| Standard used: | EN/IEC 61000-3-3 Flicker |
| Short time (Pst): | 10 min |
| Observation time: | 10 min (1 Flicker measurement) |
| Modality of test | Heating element On at 30°C |

| Flicker Measurements | | | | | |
|---|---|---|---|---|---|
| | $P_{lt}$ | Max $P_{st}$ | Max $D_c$ | Max $D_{max}$ | Max $T_{max}$ |
| Line 1: | N.A. | 0,028 | 0,013 | 0,067 | 0 |
| Limits: | *No Limit* | 1 | 3,3 | 4 | 0,5 |
| Results: | | PASS | PASS | PASS | PASS |

## Test Results – Operating condition #2

| | |
|---|---|
| Standard used: | EN/IEC 61000-3-3 Flicker |
| Short time (Pst): | 10 min |
| Observation time: | 10 min (1 Flicker measurement) |
| Modality of test | 1 manual start and 1 manual stop |

| Flicker Measurements | | | | | |
|---|---|---|---|---|---|
| | $P_{lt}$ | Max $P_{st}$ | Max $D_c$ | Max $D_{max}$ | Max $T_{max}$ |
| Line 1: | N.A. | 0,258 | 1,214 | 1,257 | 0 |
| Limits: | *No Limit* | 1 | 3,3 | 4 | 0,5 |
| Results: | | PASS | PASS | PASS | PASS |

| **Test N.3** | ***CONDUCTED EMISSION –*** *EMISSIONE CONDOTTA* |
|---|---|

| | |
|---|---|
| **Reference standard** | EN 55014-1 |
| **List of reference equipment** | ➢ EMI Test Receiver R&S mod. ESR 3 (Inv. 2782868)<br>➢ LISN R&S mod. ENV432 (Inv. 9002822) |
| **Measurement Uncertainty** | Expanded uncertainty (9kHz – 30MHz): 3,3 dB<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |

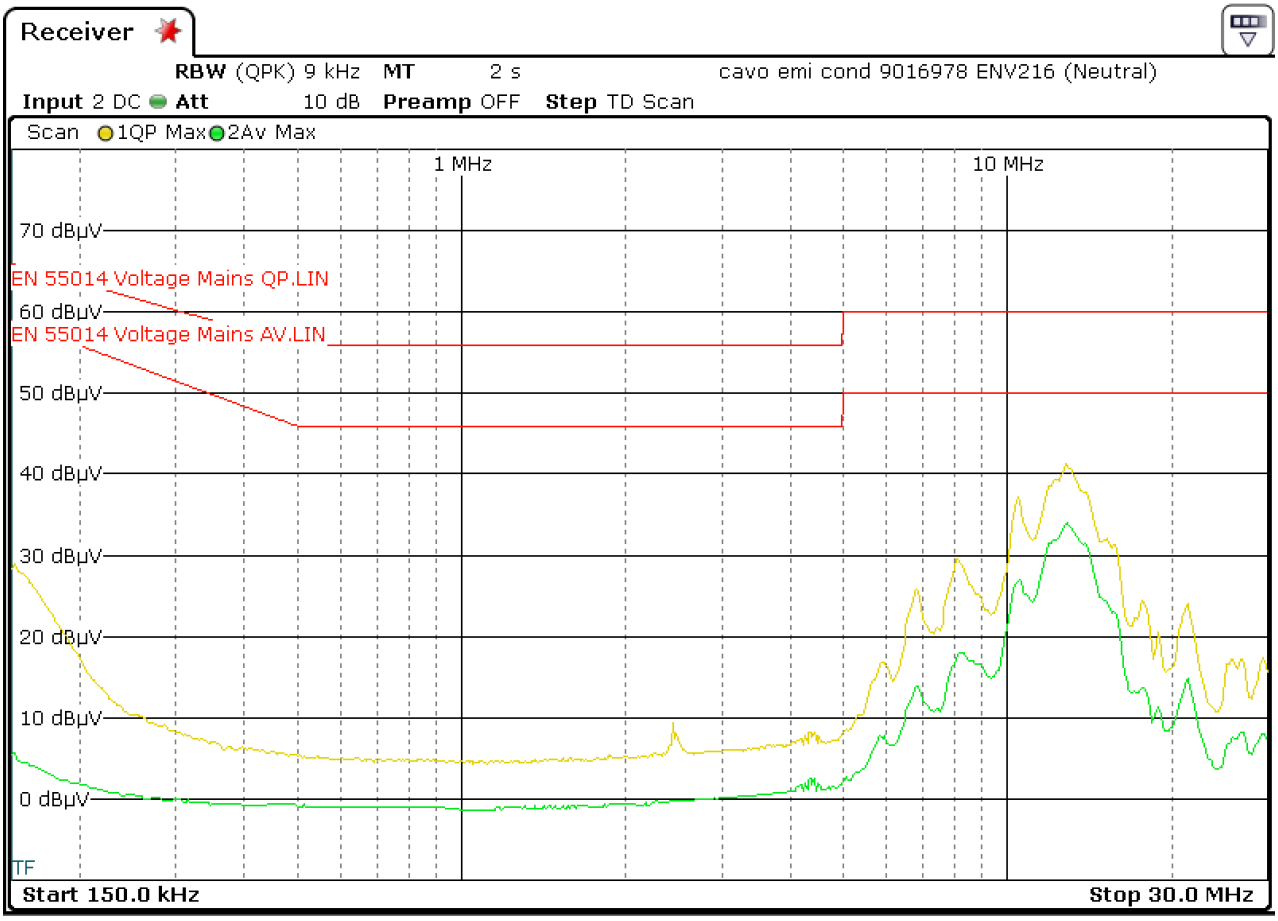
| | |
|---|---|
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (22 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (49 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 55014-1 par. 5.2 |
| **Test Procedure** | EN 55014-1 par. 6 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | Class B EUT: limits are indicated in EN 55014-1 |

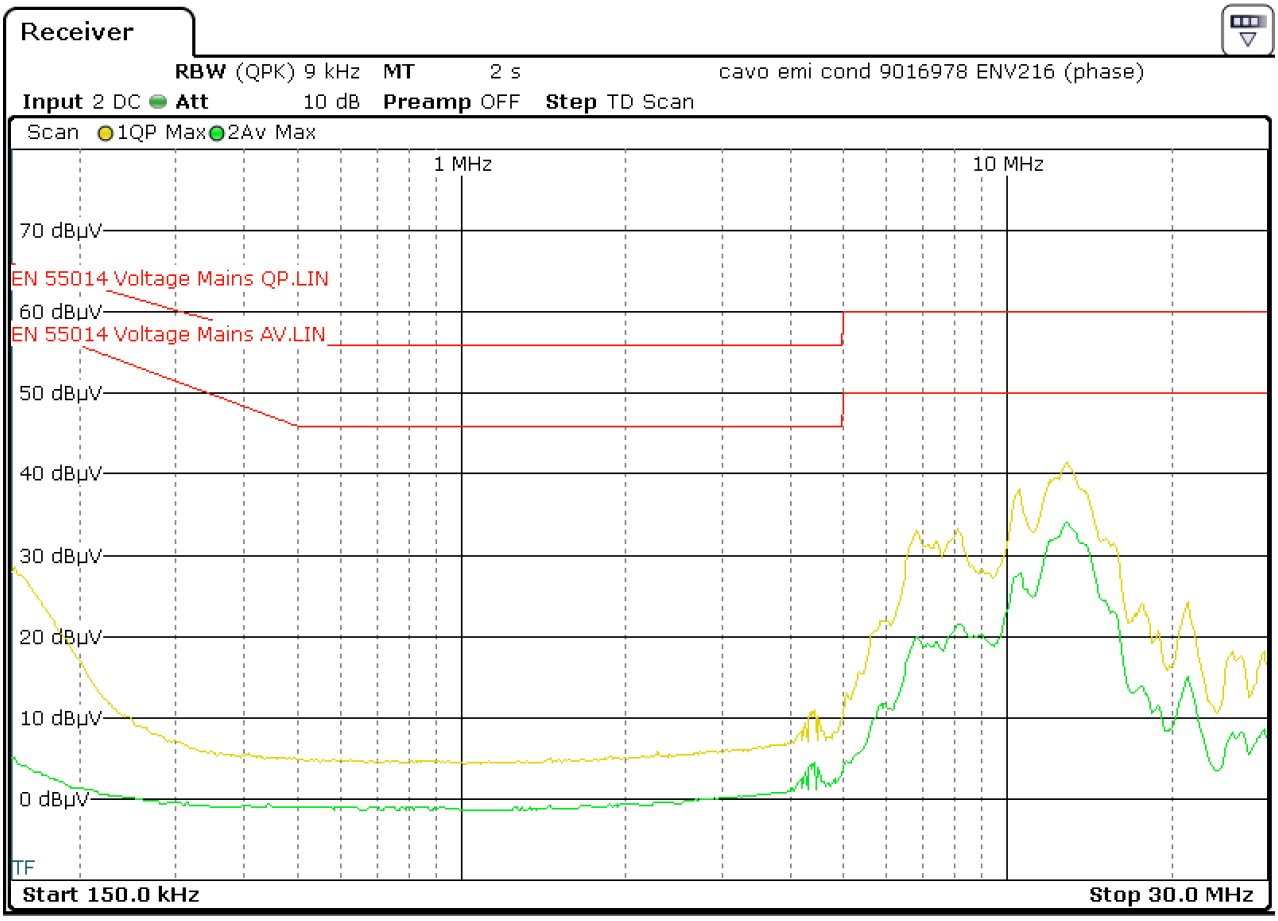
## Test Result

| | |
|---|---|
| **EUT Operating Mode(s)** | #1 |
| **AC Mains Power** | Neutral |
| **Measure time** | Scan time 2 sec. (TD scan) |
| **Detector** | Quasi-Peak trace (yellow trace); Average trace (green trace) |



## Test Result

| | |
|---|---|
| **EUT Operating Mode(s)** | #1 |
| **AC Mains Power** | Phase |
| **Measure time** | Scan time 2 sec. (TD scan) |
| **Detector** | Quasi-Peak trace (yellow trace); Average trace (green trace) |



| ***Test N.4*** | **POWER DISTURBANCE –** *POTENZA DI DISTURBO* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 55014-1 |
| **List of reference equipment** | ➢ Semianechoic Chamber ETS-Lindgren mod.FACT3 (Inv. 2926063)<br>➢ EMI Test Receiver R&S mod. ESW 44 (Inv. 2782867)<br>➢ Schwarzbeck Messelektronik Clamp mod. MDS21 (Inv. 9001930)<br>➢ Huber&Suhner 6dB Attenuator N-N mod. 6806.17.A (Inv. 2782424)<br>➢ Software R&S EMC32 V.10.60.10 |
| **Measurement Uncertainty** | Expanded uncertainty: 4,4 dB<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |
| **Number of samples under test** | 1 |

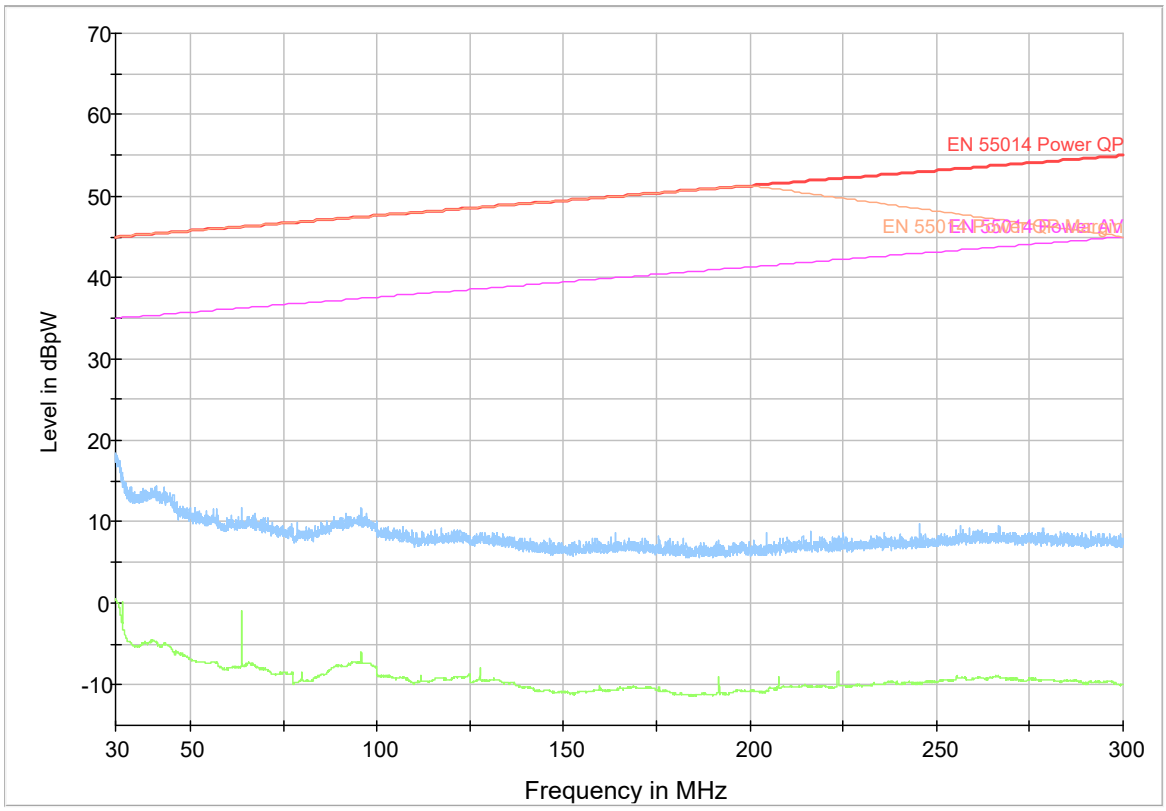
| Test Conditions | Required | Measured |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (20 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (46 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 55014-1 par. 5.2 |
| **Test Procedure** | EN 55014-1 par. A.4.2 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | Limits according to Table 2 of EN 55014-1 |

## Test Results

| | |
|---|---|
| **EUT Operating Mode(s)** | #1 |
| **Measure time** | Scan time 100 msec. |
| **Detector** | Peak trace (blue trace); Average trace (green trace) |

Full Spectrum



| ***Test N.5*** | **ELECTROSTATIC DISCHARGE –** *SCARICHE ELETTROSTATICHE* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-4-2 |
| **List of reference equipment** | ➢ ESD Simulator EM Test mod. DITO (Inv. 9015313) with discharge Impedance EM Test type 330Ω / 150pF |
| **Measurement Uncertainty** | Expanded uncertainty: 10,8% of set voltage<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |
| **Number of samples under test** | 1 |

| Test Conditions | Required | Measured |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (22 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (50 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-4-2 par. 7 |
| **Test Procedure** | EN 61000-4-2 par. 8 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | B (see COMPLIANCE CRITERIA FOR IMMUNITY TESTS) |

## Test Results

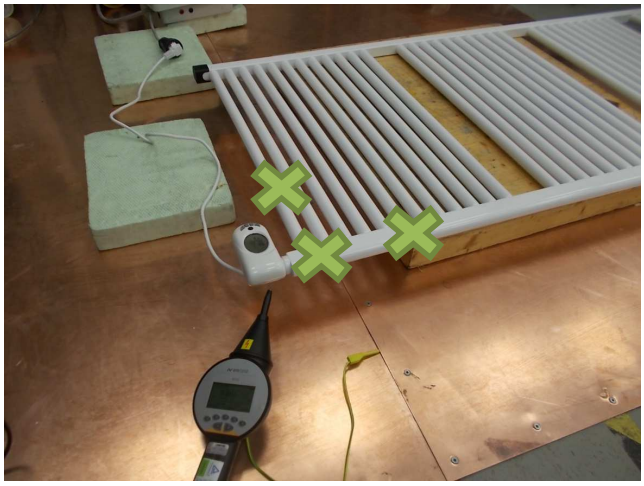
| Discharge Points | Application mode | Level (kV) | Number of applications | Notes | Result Classification | Standard Requir. | Result |
|---|---|---|---|---|---|---|---|
| Point 1 Radiator some points | Contact Discharge | ±4 | 10 | No performance degradation | Crit. A | Crit. B | PASS |
| Point 2 Electronic module front side + display | Air Discharge | ±8 | 10 | No performance degradation | Crit. A | Crit. B | PASS |
| Point 3 Electronic module push buttons | Air Discharge | ±8 | 10 | No performance degradation | Crit. A | Crit. B | PASS |
| Point 4 Electronic module rear side | Air Discharge | ±8 | 10 | No performance degradation | Crit. A | Crit. B | PASS |
| Point 5 Electronic module lateral sides | Air Discharge | ±8 | 10 | No performance degradation | Crit. A | Crit. B | PASS |
| Point 6 Electronic module VCP | Contact Discharge | ±4 | 10 | No performance degradation | Crit. A | Crit. B | PASS |

See next page for points of electrostatic discharge.

 Contact Discharge points;  Air Discharge points.

Note: VCP (Vertical Coupling Plane)

**PUNTI DI SCARICA ELETTROSTATICA / *ELECTROSTATIC DISCHARGE POINTS***



Point 1

Point 2

Point 3

Point 4

Point 4

Point 5

| ***Test N.6*** | **FAST TRANSIENTS -** *TRANSITORI VELOCI* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-4-4 |
| **List of reference equipment** | ➢ Fast Transient/Burst Generator Em Test mod. UCS 500 N7.7 (Inv. 2782326)<br>➢ Three-phase Coupling/Decoupling Network Em Test mod. CNI 503B7.5 (Inv. 2782327)<br>➢ Software IEC.CONTROL version 5.3.1 (Inv. 2782380) |
| **Measurement Uncertainty** | Expanded uncertainty: 10,3% of set voltage<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |
| **Number of samples under test** | 1 |

| Test Conditions | Required | Measured |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (21 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (50 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-4-4 par. 7 |
| **Test Procedure** | EN 61000-4-4 par. 8 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | B (see COMPLIANCE CRITERIA FOR IMMUNITY TESTS) |

## Test Results

| Tested Port | Coupling mode | Burst Characteristics | | Test Duration (s) | Notes | Result Classification | Standard Requirement | Result |
|---|---|---|---|---|---|---|---|---|
| | | Level (Kv) | Frequency (kHz) | | | | | |
| AC mains | L1 | -1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | L1 | +1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | N | -1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | N | +1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | PE | -1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | PE | +1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | L1-N-PE | -1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |
| AC mains | L1-N-PE | +1 | 5 | 120 | No performance degradation | Crit. A | B | COMPLIANT |

| **Test N.7** | **SURGE** - *IMPULSI* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-4-5 |
| **List of reference equipment** | ➢ Surge/Burst Generator Em Test mod. UCS 500 N7.7 (Inv. 2782326)<br>➢ Three-phase Coupling/Decoupling Network Em Test mod. CNI 503B7.5 (Inv. 2782327)<br>➢ Software IEC.CONTROL version 5.3.1 (Inv. 2782380) |
| **Measurement Uncertainty** | Expanded uncertainty: 10,3% of set voltage<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (21 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (50 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-4-5 par. 7 |
| **Test Procedure** | EN 61000-4-5 par. 8 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | B (see COMPLIANCE CRITERIA FOR IMMUNITY TESTS) |

## Test Results

| Tested Port | Coupling mode (coupling impedance) | Surge Characteristics | | | Events | Result Classification | Standard Requirement | Notes |
|---|---|---|---|---|---|---|---|---|
| | | Level (kV) | Phase (°) | Repetition (min) | | | | |
| AC mains | L-N (2Ω) | +1 | 90° | 1 | 5 | Crit. A | B | No performance degradation |
| | | -1 | 270° | | 5 | | | |
| AC mains | L-PE (12Ω) | +2 | 90° | 1 | 5 | Crit. A | B | No performance degradation |
| | | -2 | 270° | | 5 | | | |
| AC mains | N-PE (12Ω) | +2 | 90° | 1 | 5 | Crit. A | B | No performance degradation |
| | | -2 | 270° | | 5 | | | |

| ***Test N.8*** | **INJECTED CURRENTS -** *CORRENTI INIETTATE* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-4-6 |
| **List of reference equipment** | ➢ RF Generator Marconi Instruments mod. Signal 2023 (Inv. 9001705)<br>➢ RF Amplifier Amplifier Research mod. 25A250A (Inv. 9001706)<br>➢ Coupling/Decoupling Network EM Test mod. M3 (Inv. 2782330)<br>➢ 6dB RF Attenuator EM Test mod.ATT6/75 (Inv. 2782376) |
| **Measurement Uncertainty** | Expanded uncertainty: 3,3 dB<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |

| | |
|---|---|
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (22 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (48 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-4-6 par. 7 |
| **Test Procedure** | EN 61000-4-6 par. 8 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | A (see COMPLIANCE CRITERIA FOR IMMUNITY TESTS) |

## Test Results

| Tested Port | Test frequency (MHz) | Disturbance Characteristics | | | Coupling device | Result Classification | Notes |
|---|---|---|---|---|---|---|---|
| | | Level (V) | Dwell time (s) | Modulation Freq. | | | |
| AC Mains | 0,15 - 230 | 3 | 3 | 1kHz 80%AM | CDN M3 | PASS Crit. A | No performance degradation |

| ***Test N.9*** | **VOLTAGE DIPS –** *BUCHI DI TENSIONE* |
|---|---|

| | |
|---|---|
| **Reference Standard** | EN 61000-4-11 |
| **List of reference equipment** | ➢ Stabilized Power Supply Ametek mod. MX30 (Inv. 2781967)<br>➢ Software California Instruments MXGUI Version 2.2.0.9 |
| **Measurement Uncertainty** | Expanded uncertainty: 3,8% of set voltage<br>Coverage probability: 95 %<br>Coverage factor: 2,0 |

| | |
|---|---|
| **Number of samples under test** | 1 |

| **Test Conditions** | **Required** | **Measured** |
|---|---|---|
| **Ambient Temperature** | (15 ÷ 35) °C | (21 ± 2) °C |
| **Ambient Relative Humidity** | (25 ÷ 75) %rH | (47 ± 10) %rH |

| | |
|---|---|
| **Test Setup** | EN 61000-4-11 par. 7 |
| **Test Procedure** | EN 61000-4-11 par. 8 |
| **EUT Operating Mode(s)** | #1 |
| **Acceptance Criteria** | C (see COMPLIANCE CRITERIA FOR IMMUNITY TESTS) |

## Test Results

| Tested Port | Dip to % | Ts (Cycles) | Frequency | Result Classification | Standard Requirement | Notes |
|---|---|---|---|---|---|---|
| AC Mains | 0% | 0 | 50Hz | PASS Crit. A | C | No performance degradation |
| AC Mains | 40% | 10 | 50Hz | PASS Crit. A | C | No performance degradation |
| AC Mains | 70% | 25 | 50Hz | PASS Crit. A | C | No performance degradation |

**END OF TEST REPORT**