TEST REPORT

Electromagnetic compatibility and Radio spectrum Matters (ERM)

Report Reference No. ..... :	350845-1TRFEMC	
Tested by (name, function and signature) ..... :	D. Guarnone	(project handler)
Approved by (name, function and signature) ..... :	P. Barbieri	(verifier)
Date of issue ..... :	2018-04-05	
Testing Laboratory ..... :	**Nemko Spa**	
Address ..... :	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Testing location	Nemko Spa	
Address ..... :	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Applicant's name ..... :	**Energy Team Spa**	
Address ..... :	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy	
Test specification:		
	EN 301 489-1 V2.2.0	
Standard ..... :	EN 301 489-52 V1.1.0	
	EN 301 489-17 V3.2.0	
	Full application of the standards	☒
	Partial application of the standards	☐
Test procedure ..... :	Nemko WM L0077, WM L0177 and WM L1002	
Test Report Form No. ..... :	301489TRFEMC	
TRF Originator ..... :	Nemko Spa	
Master TRF ..... :	2015-07	

Test item description ..... :	Gateway to acquire, store and send data
Trade Mark ..... :	Energy Team Spa
Manufacturer ..... :	**Energy Team Spa**
Address of manufacturer ..... :	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy
Model ..... :	NG-Gateway
Ratings ..... :	10 W / 48-120 VDC / 100-240 VAC 50-60 Hz

Test Report No. : 350845-1TRFEMC	2018-04-05 Date of issue

Short description of the EuT	Copy of marking plate
Gateway to acquire, store and send data	

Number of tested samples:	1
Serial number:	171220IG161258
Electromagnetic environment:	Telecommunication centre (Class A)
Equipment type:	Transfer of messages (digital or analogue signals)
Equipment classification:	Industrial
Accessories and detachable parts included:	Antenna

Testing

Date of receipt of test sample:	2018-01-29
Testing commenced on:	2018-01-29
Testing concluded on:	2018-04-05

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

Throughout this report point is used as decimal separator.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards on page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
350845-1TRFEMCFAIL	First release	2018-02-02
350845-1TRFEMC	Second release: repeated radiated and conducted emissions	2018-04-05
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

Contents

1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

EN 301 489-1 V2.2.0
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

EN 301 489-52 V1.1.0
Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

Draft ETSI EN 301 489-17 V3.2.0 (2017-03)
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article3.1(b) of Directive 2014/53/EU

Draft ETSI EN 301 489-19 V2.1.0 (2017-03)
ElectroMagnetic Compatibility (EMC)standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

The main standard(s) above contains references to other standards, which are listed below.

EN 55032 (2015)
Electromagnetic compatibility of multimedia equipment - Emission Requirements

EN 61000-4-2 (2009)
Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.

EN 61000-4-3 (2006) + A1 (2008) + A2 (2010)
Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.

EN 61000-4-4 (2012)
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.

EN 61000-4-5 (2006)
Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.

EN 61000-4-6 (2009)
Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

EN 61000-4-11 (2004)
Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

ISO 7637-2 (2004)
Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only.

EN 61000-3-3 (2013)
Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection".

CISPR 25 (2nd Edition 2002) and COR1 (2004):
Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices - Limits and methods of measurement

EN 50561-3 (2016)
Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 3: Apparatus operating above 30 MHz

EN 50561-1 (2013)
Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 1: Apparatus for in-home use

EN 61000-3-2 (2014)
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

2 SUMMARY OF TEST RESULTS

	Harmonized Standard EN 301 489-52				
Requirement			Requirement Conditionally		Verdict
No.	Description	Reference: Clause No	U/C	Condition	
1	Enclosure of ancillary equipment measured on a stand-alone basis	7.1.1.2 and 7.2.2.2	U	Only applicable to ancillary equipment not incorporated in the radio equipment and intended to be measured on a stand-alone basis	P
2	DC power input/output ports	8.3 of ETSI EN 301 489-1 [1]	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply	N
3	AC mains power input/output ports	8.4 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input and/or output ports	P
4	Harmonic current emission (AC mains input port)	8.5 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports	P
5	Voltage fluctuations and flicker (AC mains input ports)	8.6 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports	P
6	Wired network ports	8.7 of ETSI EN 301 489-1 [1]	C	Only where equipment has wired network ports	P
7a	Radio frequency electromagnetic field (80 MHz to 6 000 MHz) GSM and DCS	7.1.2	U	For GSM and DCS	P
7b	Radio frequency electromagnetic field (80 MHz to 6 000 MHz) UTRA and E-UTRA	7.2.2	U	For UTRA and E-UTRA	P
8	Electrostatic discharge	9.3 of ETSI EN 301 489-1 [1]	U		P
9	Fast transients common mode	9.4 of ETSI EN 301 489-1 [1]	U		P
10a	Radio frequency common mode GSM and DCS	7.1.2	U		P

	Harmonized Standard EN 301 489-52				
Requirement			**Requirement Conditionally**		**Verdict**
No.	**Description**	**Reference: Clause No**	**U/C**	**Condition**	
11a	Transients and surges in the vehicular environment GSM and DCS	7.1.2	U		N
11b	Transients and surges in the vehicular environment UTRA and E-UTRA	7.2.2	U		N
12a	Voltage dips and interruptions GSM and DCS	7.1.2	U		P
12b	Voltage dips and interruptions UTRA and E-UTRA	9.7 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports	P
13	Surges, line to line and line to ground	9.8 of ETSI EN 301 489-1 [1	C	Only where equipment has AC mains power input ports and/or wired network ports	P

Symbols: U/C indicates whether the requirement is to be unconditionally applicable (U) or is conditional upon the suppliers claimed functionality of the equipment (C).

	Harmonized Standard EN 301 489-17				
Requirement			**Requirement Conditionally**		**Verdict**
No.	**Description**	**Reference: Clause No**	**U/C**	**Condition**	
1	Enclosure of ancillary equipment measured on a stand-alone basis	7.1.1.2 and 7.2.2.2	U	Only applicable to ancillary equipment not incorporated in the radio equipment and intended to be measured on a stand-alone basis	P
2	DC power input/output ports	8.3 of ETSI EN 301 489-1 [1]	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply	N
3	AC mains power input/output ports	8.4 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input and/or output ports	P
4	Harmonic current emission (AC mains input port)	8.5 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports	P
5	Voltage fluctuations and flicker (AC mains input ports)	8.6 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports	P
6	Wired network ports	8.7 of ETSI EN 301 489-1 [1]	C	Only where equipment has wired network ports	P
7	Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	Clause 7.2 and ETSI EN 301 489-1 [1] clause 9.2	U		P
8	Electrostatic discharge	9.3 of ETSI EN 301 489-1 [1]	U		P
9	Fast transients common mode	9.4 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m	P
10	Radio frequency common mode	Clause 7.2 and ETSI EN 301 489-1 [1] clause 9.5	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m	P
11	Transients and surges in the vehicular environment	Clause 7.2 and ETSI EN 301 489-1 [1] clause 9.6	C	Only where equipment is fitted to a vehicle power supply	N
12	Voltage dips and interruptions	Clause 7.2 and ETSI EN 301 489-1 [1] clause 9.7	C	Only where equipment has AC mains power input ports	P
13	Surges, line to line and line to ground	Clause 7.2 and ETSI EN 301 489-1 [1] clause 9.8	C	Only where equipment has AC mains power input ports and/or wired network ports	P

Symbols: U/C indicates whether the requirement is to be unconditionally applicable (U) or is conditional upon the suppliers claimed functionality of the equipment (C).

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Battery voltage:	☒	230 Vac, 50 Hz	☐	24 VDC (27 VDC)

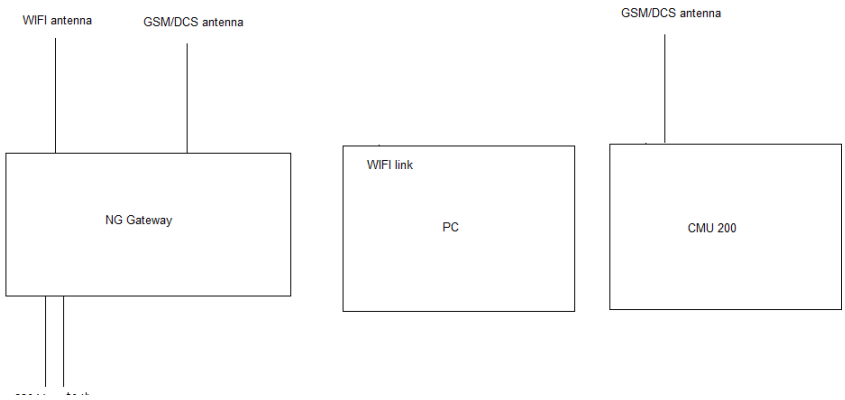
3.2 EuT operation modes

Mode	Description
1	The E.U.T. has been tested linked to GSM/DCS simulator The PC has been connected to E.U.T wifi.

3.3 EuT configuration modes

Emission: the EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Immunity: the EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	E.U.T. has been connected as in the following figure: 

3.4 Input/Output Ports

Port	Name	Type*	Cable Shielded	Description
0	Enclosure	N/E	—	—
1	Power input	AC/DC	☐	Two wires
2	Power output	AC/DC	☐	Two wires
3	RS485	I/O	☐	Three wires
3	RS485	I/O	☐	Three wires
2	Ethernet	TP	☐	Standard
2	USB	I/O	☐	Standard
5	GSM/GPRS	ANT	☐	Sma cable
7	WIFI	ANT	☐	Sma cable

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Port TP = Telecommunication Port ANT = Antenna Port

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	Radiocommunication tester	R&S	CMU200	
AE	PC	--	--	

Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

3.6 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

☒	based on the used product standard
☐	based on the declaration of the manufacturer, requestor or purchaser

GSM and DCS Performance Criteria:

The equipment shall meet the performance criteria specified in this clause and clauses 6.1.1 to 6.1.4, as appropriate.
Portable equipment intended for use whilst powered by the main battery of a vehicle shall additionally fulfil the applicable requirements set out in ETSI EN 301 489-1 [1], clauses 7.1 and 7.2 for mobile equipment.
Portable or mobile equipment powered by the AC mains shall additionally fulfil the applicable requirements of ETSI EN 301 489-1 [1], clauses 7.1 and 7.2 for radio and ancillary equipment for fixed use.
The establishment and maintenance of a communications link, the assessment of RXQUAL, and the assessment of the audio breakthrough by monitoring the speech output signal level, are used as performance criteria to ensure that all primary functions of the transmitter and receiver are evaluated during the immunity tests. In addition, the test shall also be performed in idle mode to ensure the transmitter does not unintentionally operate.
The maintenance of a communications link shall be assessed using an indicator which may be part of the test system or the EUT.
If an equipment is of a specialized nature, such that the performance criteria described in the following clauses are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.
The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in the following clauses.

Performance criterion for ETSI EN 301 489-17:

The performance criteria are:

• performance criteria A for immunity tests with phenomena of a continuous nature;

• performance criteria B for immunity tests with phenomena of a transient nature;

• performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following table.

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

GSM link with CMU200 and ping with PC.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) – Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized under Nemko Spa testing engineer

4.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature:	18÷33 °C
Relative Humidity:	30÷60 %
Atmospheric pressure:	980÷1060 hPa

4.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Thermohygrometer data loggers	Testo	175-H2	38203337/703
Barometer	MSR	MSR145B	330080

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)

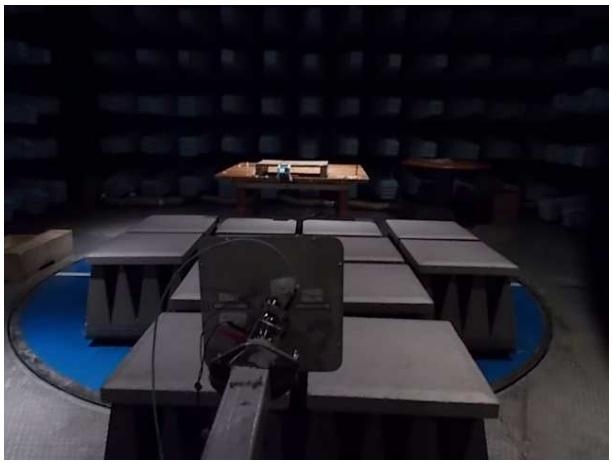
Test	Range	Measurement Uncertainty	Notes
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(1)
Clicks	9 kHz ÷ 150 kHz	3.8 dB	(1)
	150 kHz ÷ 30 MHz	3.4 dB	(1)
Disturbance Power	30 MHz ÷300 MHz	4.5 dB	(1)
Frequency	10 Hz ÷ 1 kHz	0.2%	(1)
	1kHz ÷ 40GHz	10-6	(1)
Harmonic Current Emission	50 Hz ÷ 2 kHz	2%	(1)
Voltage Fluctuation Emission	--	2%	(1)
Radiated Immunity 10m, 3m chambers	20 MHz ÷ 6 GHz	3.4 dB	(1)
Radiated Immunity TEM Cell	(0.01÷200) MHz	3.0 dB	(1)
Bulk Current	(1÷200) MHz	3.0 dB	(1)
Conducted RF Immunity	9 kHz ÷ 230 MHz	3.0 dB	(1)
ESD Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Burst Immunity	Voltage, frequency, burst period and duration, rise time and pulse width	(2)	(1)
Surge Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Dips Immunity	Amplitude	5%	(1)
	Duration	5%	
Magnetic Field Immunity	50 Hz	2.0dB	(1)
Damped Magnetic Field Immunity	100 kHz, 1 MHz	3 dB ampl. 10% freq.	(1)
Oscillatory Wave Immunity	Voltage, front time, frequency 100 kHz, 1 MHz	(2)	(1)
Low Frequency Immunity	15 Hz ÷ 150 kHz	2.2 dB	(1)
Automotive transients Immunity	Voltage, rise time, duration time Impulses 1, 2a, 2b, 3a, 3b and 4	(2)	(1)
Automotive transients Emission	Amplitude	10%	(1)
	Time	10%	
EMF	Lighting Equipment	26%	(1)
	Other Equipment	20%	

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;
(2) The instruments used for this immunity test is according to the tolerances requested by the applicable standard.

5 TEST CONDITIONS AND RESULTS

5.1 Radiated emission in the frequency range 30 MHz to 6000 MHz

5.1.1 Photo documentation of the test set-up



5.1.2 Test method according to EN 55016

Measurements were made on a semi anechoic chamber that complies with EN 55011. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 meters with the receiving antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receiving antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.1.3 Limits

Frequency (MHz)	Limit (dBµV/m) - Quasi-Peak
30 TO 230	40
230 TO 1000	47

Frequency (MHz)	Limit (dBµV/m) – Average	Limit (dBµV/m) – Peak
1000 TO 3000	56	76
3000 TO 6000	60	80

5.1.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	30 MHz – 6 000 MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	10 m and 3 m
Remarks: • If the highest internal frequency of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. • If the highest internal frequency of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. • If the highest internal frequency of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. • If the highest internal frequency of the EUT is above 1 GHz, the measurement shall be made up to 6 GHz. • Where the highest internal frequency is not known, tests shall be performed up to 6 GHz.	
Remarks:	

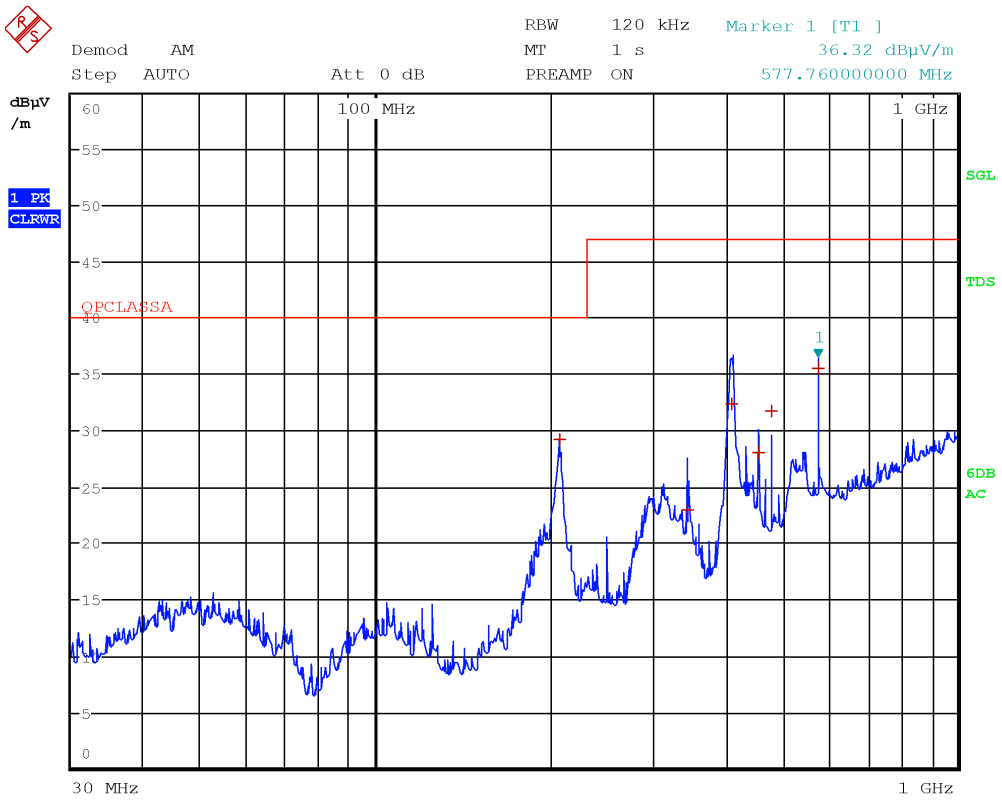
5.1.5 Test equipment used

Equipment	Manufacturer	Model	Serial No.
Trilog Broad Band Antenna	Schwarzbeck	VULB 9162	VULB 9162-025
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Hydraulic rounding table	Nemko	RTPL 01	4.233
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.1.7 Test protocol

Antenna polarization: Horizontal
Operation mode: 1
Configuration mode: 1
Remarks:

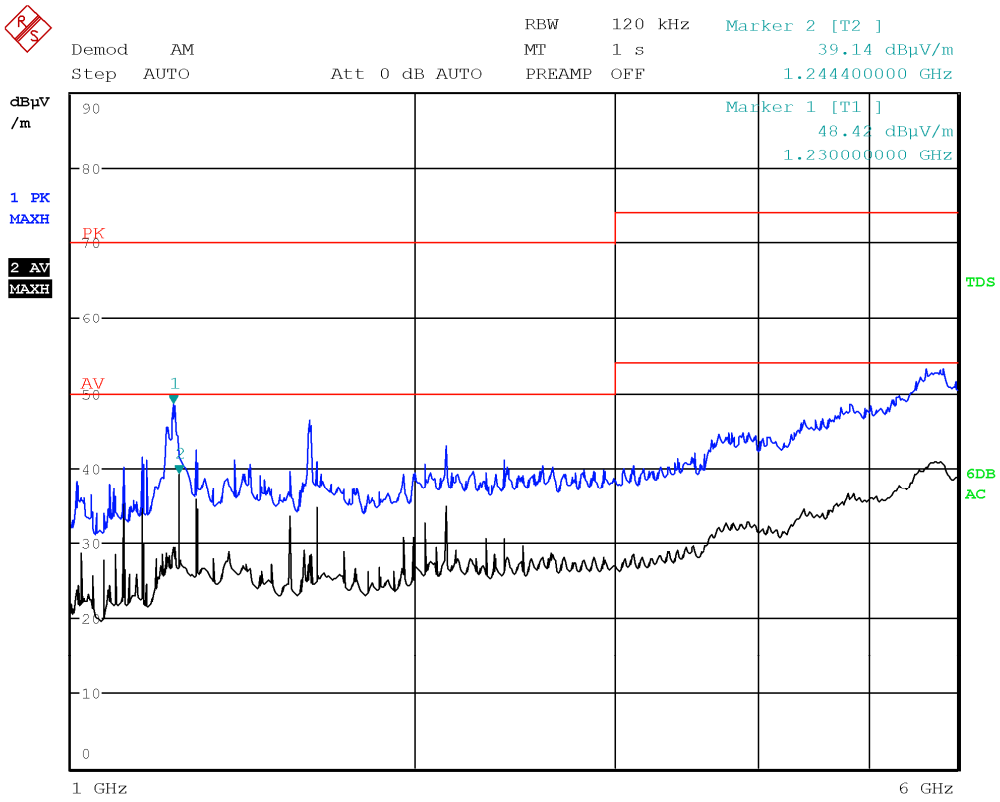
Verdict: Pass



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
207.3600	29.2	40.0	-10.8	QP
344.0000	23.0	47.0	-24.0	QP
410.2400	32.4	47.0	-14.6	QP
456.0000	28.1	47.0	-18.9	QP
480.0000	31.8	47.0	-15.2	QP
577.7600	35.5	47.0	-11.5	QP

Antenna polarization: Horizontal
Operation mode: 1
Configuration mode: 1
Remarks:

Verdict: Pass



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
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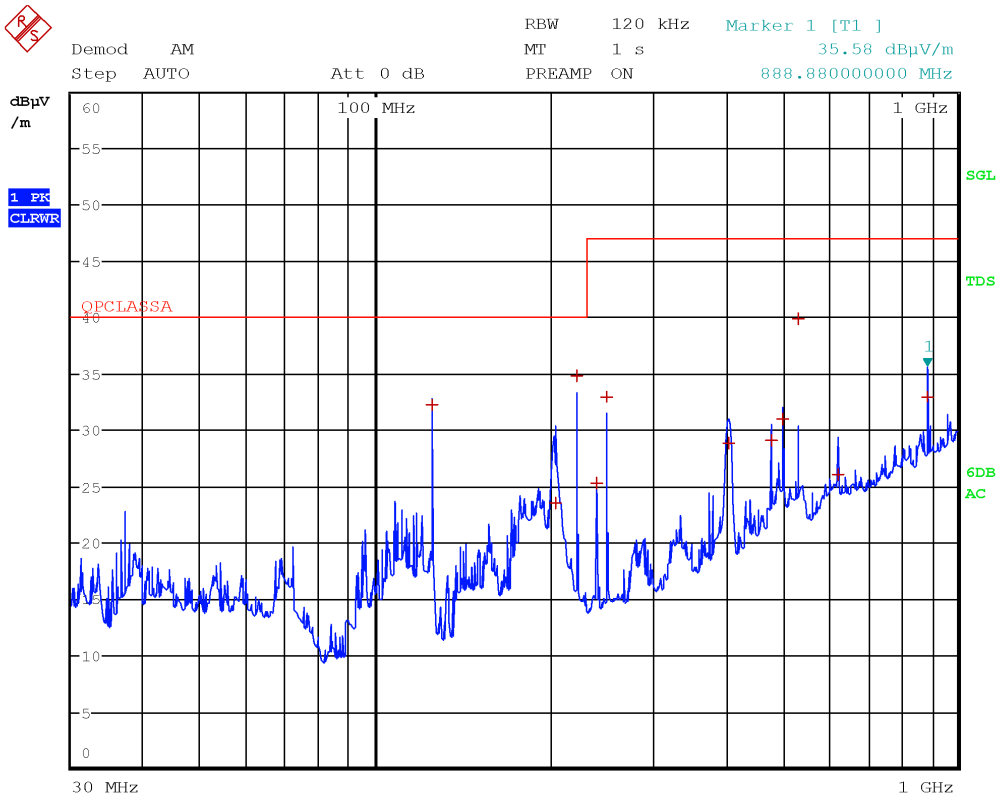
Antenna polarization: Vertical
Operation mode: 1
Configuration mode: 1
Remarks:

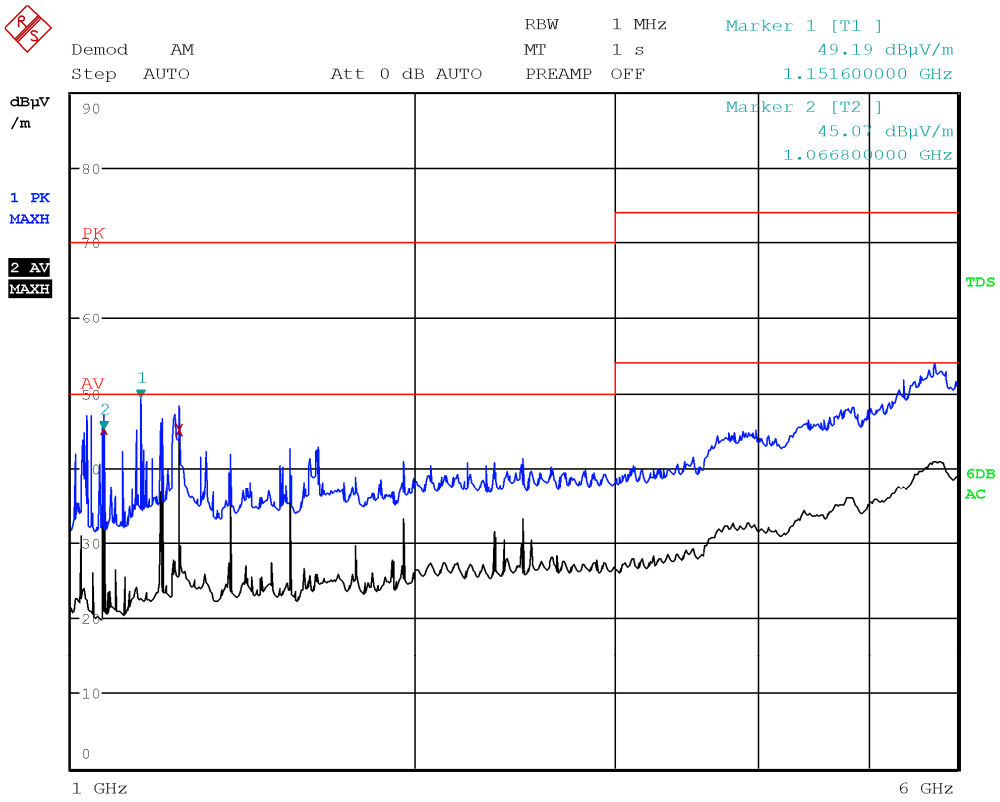
Verdict: Pass



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
124.9600	32.3	40.0	-7.7	QP
203.4400	23.5	40.0	-16.5	QP
222.2400	34.9	40.0	-5.1	QP
240.0000	25.3	47.0	-21.7	QP
249.9600	33.0	47.0	-14.0	QP
405.2800	28.9	47.0	-18.1	QP
480.0000	29.2	47.0	-17.8	QP
499.9200	31.0	47.0	-16.0	QP
533.3200	40.0	47.0	-7.0	QP
624.8800	26.1	47.0	-20.9	QP
888.8800	33.0	47.0	-14.0	QP

Antenna polarization: Vertical
Operation mode: 1
Configuration mode: 1
Remarks:

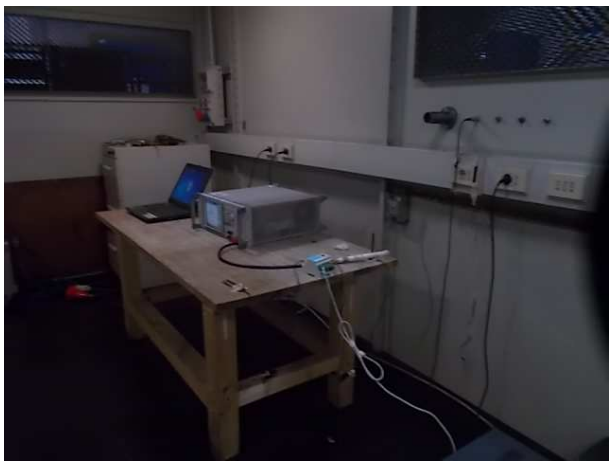
Verdict: Pass

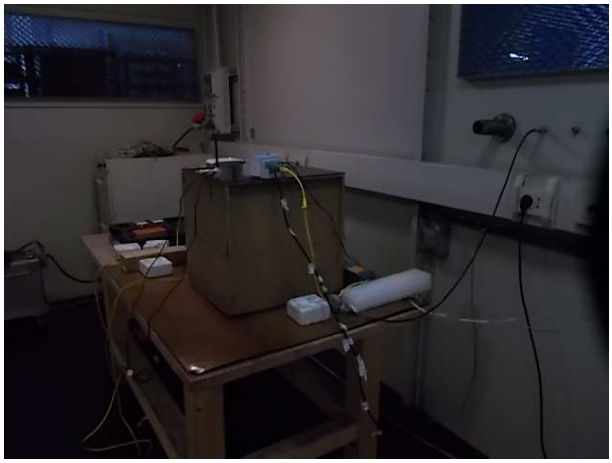


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1066.8000	45.3	50.0	-4.7	Av
1244.4000	45.2	50.0	-4.8	Av

5.2 Conducted emission in the frequency range 150 kHz to 30 MHz

5.2.1 Photo documentation of the test set-up





5.2.2 Test method according to EN 55016 and EN 55032

Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN. All tested process measurement and control ports were connected to an Impedance Stabilization Network (ISN) and conducted voltage measurements were made at the output of the ISN. Where an ISN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

5.2.3 Limits for low voltage AC mains port

Frequency (MHz)	Limit (dBµV) – Quasi-Peak	Limit (dBµV) – Average
0.15 TO 0.50	79	66
0.50 TO 30	73	60

5.2.4 Limits for wired port

Frequency (MHz)	Limit (dBµV) – Quasi-Peak	Limit (dBµV) – Average
0.15 TO 0.50	97 to 87*	84 to 74*
0.50 TO 30	87	74

*The limits decrease linearly with the logarithm of the frequency

Frequency (MHz)	Limit (dBµV) – Quasi-Peak	Limit (dBµV) – Average
0.15 TO 0.50	53 to 43*	40 to 30*
0.50 TO 30	43	30

*The limits decrease linearly with the logarithm of the frequency

5.2.5 Test result

Verdict for AC mains port:	☒ P ☐ F ☐ N
Verdict for wired port:	☐ P ☒ F ☐ N
Frequency range:	0.15MHz - 30MHz
Kind of test site:	Shielded room
Remarks:	

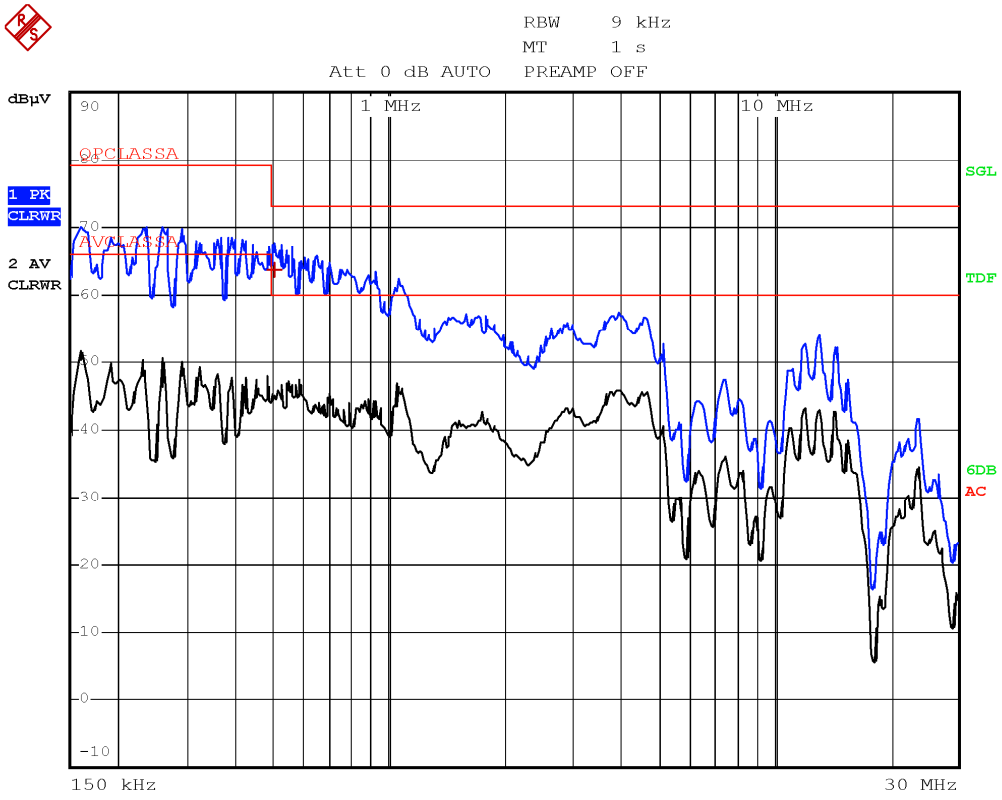
5.2.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.2.6 Test protocol

Test point: Phase
Operation mode: 1
Configuration mode: 1
Remarks: -

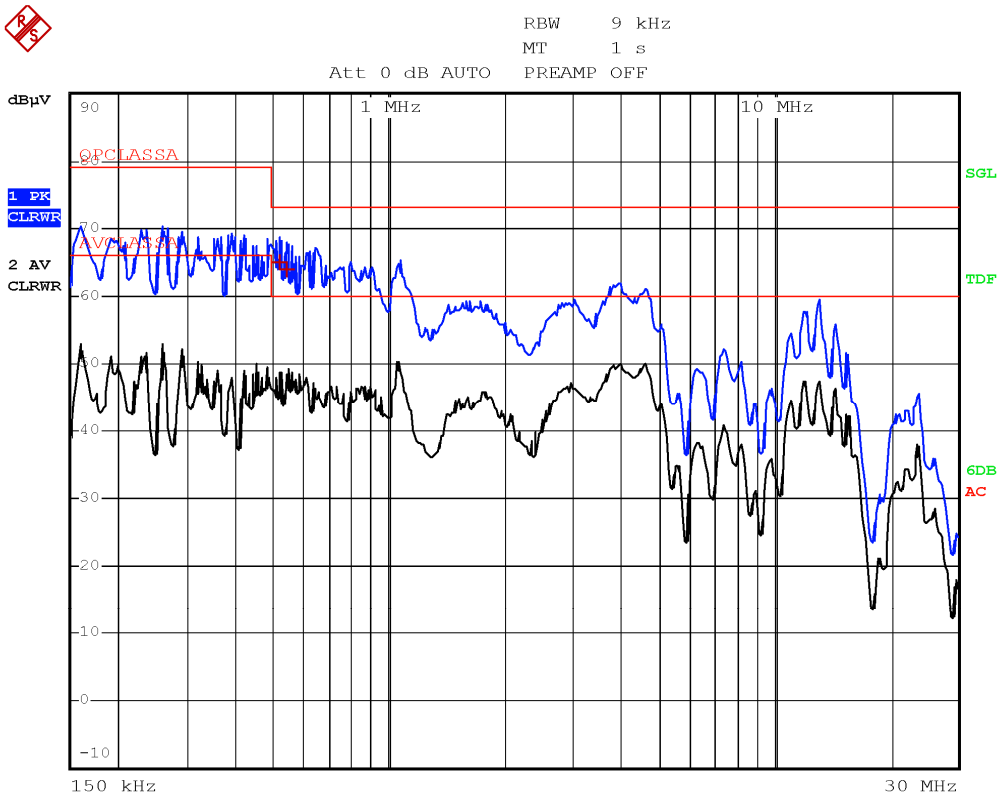
Verdict: Pass



Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.5060	63.7	73.0	-9.3	QP

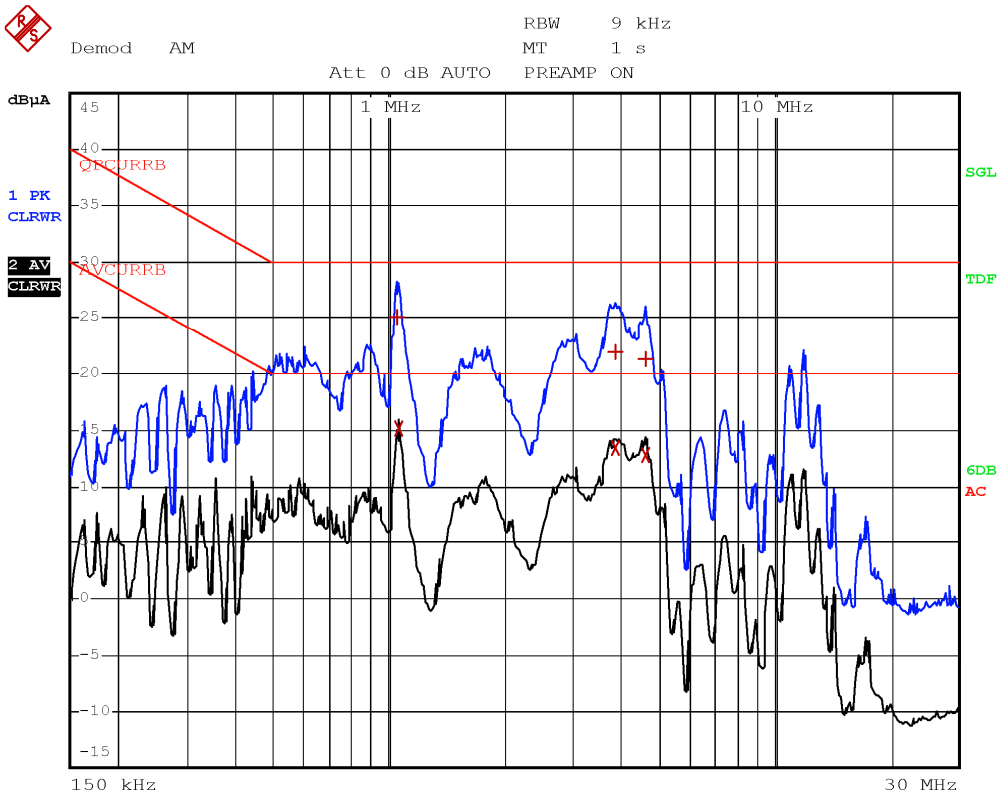
Test point: neutral
Operation mode: 1
Configuration mode: 1
Remarks: -

Verdict: Pass



Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.5180	64.9	73.0	-8.1	QP
0.5420	63.9	73.0	-9.1	QP

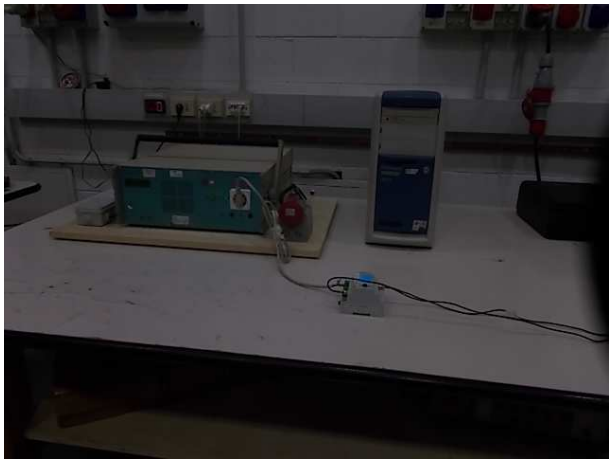
Test point: Wired port Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: -



Frequency (MHz)	Level (dBµA)	Limit (dBµA)	Margin (dB)	Detector
1.0500	25.1	30.0	-4.9	QP
1.0580	15.3	20.0	-4.7	Av
3.8660	22.0	30.0	-8.0	QP
3.8820	13.5	20.0	-6.5	Av
4.6420	12.8	20.0	-7.2	Av
4.6500	21.4	30.0	-8.6	QP

5.3 Harmonics of current

5.3.1 Photo documentation of the test set-up



5.3.2 Test method according to EN 61000-3-2

This test consists on the measurement of harmonics components of the input current which may be produced by equipment having an input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.3.3 Limits for AC mains input port- Class A equipment

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

5.3.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	0 kHz – 2 kHz
Kind of test site:	Laboratory
Class:	☒ A
Remarks: Test not required because the power consumption is less than 75 W but performed.	

5.3.5 Test protocol

Operation mode: 1 Verdict: Pass
Configuration mode: 1
Remarks:

Date : 02/02/2018 19:09:04 V4.22
Urms = 230.3V Freq = 50.000 Range: 0.5 A
Irms = 0.047A Ipk = 0.186A cf = 3.938
P = 5.424W S = 10.85VA pf = 0.500
THDi = 165 % THDu = 0.10 % Class A

Test - Time : 1min (100 %)

Test completed, Result: PASSED

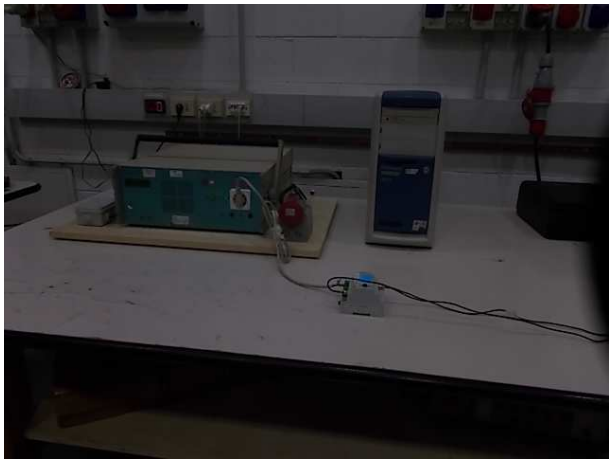
Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Limit [A]	Status	Vrms [V]
1	50	0.0250	0.0251	53.174		0.0252			230.28
2	100	0.0000	0.0005	1.1010	0.0480	0.0007	1.0800		0.2209
3	150	0.0205	0.0205	43.588	0.8930	0.0208	2.3000		0.0982
4	200	0.0000	0.0005	1.1010	0.1207	0.0007	0.4300		0.0491
5	250	0.0197	0.0197	41.839	1.7293	0.0199	1.1400		0.0491
6	300	0.0000	0.0005	1.1658	0.1831	0.0006	0.3000		0.0491
7	350	0.0175	0.0175	37.111	2.2710	0.0177	0.7700		0.0245
8	400	0.0000	0.0005	1.1010	0.2256	0.0006	0.2300		0.0245
9	450	0.0152	0.0152	32.189	3.7918	0.0153	0.4000		0.0245
10	500	0.0000	0.0005	1.1010	0.2820	0.0005	0.1840		0.0245
11	550	0.0125	0.0125	26.554	3.7916	0.0126	0.3300		0.0245
12	600	0.0000	0.0005	1.0363	0.3184	0.0005	0.1533		0.0245
13	650	0.0097	0.0097	20.661	4.6358	0.0098	0.2100		0.0245
14	700	0.0000	0.0004	0.9067	0.3251	0.0004	0.1314		0.0245
15	750	0.0071	0.0071	15.155	4.7607	0.0072	0.1500		0.0245
16	800	0.0000	0.0004	0.7772	0.3184	0.0004	0.1150		0.0000
17	850	0.0000	0.0047	10.039	3.5739	0.0048	0.1324		0.0245
18	900	0.0000	0.0003	0.5829	0.2687	0.0003	0.1022		0.0000
19	950	0.0000	0.0028	5.8938	2.3451	0.0028	0.1184		0.0245
20	1000	0.0000	0.0002	0.4534	0.2322	0.0003	0.0920		0.0000
21	1050	0.0000	0.0014	2.9793	1.3102	0.0014	0.1071		0.0000
22	1100	0.0000	0.0002	0.3886	0.2189	0.0002	0.0836		0.0245
23	1150	0.0000	0.0012	2.4611	1.1854	0.0012	0.0978		0.0000
24	1200	0.0000	0.0002	0.3238	0.1990	0.0002	0.0767		0.0000
25	1250	0.0000	0.0016	3.3679	1.7632	0.0016	0.0900		0.0000
26	1300	0.0000	0.0001	0.2591	0.1725	0.0002	0.0708		0.0000
27	1350	0.0000	0.0018	3.8860	2.1973	0.0019	0.0833		0.0000
28	1400	0.0000	0.0001	0.2591	0.1858	0.0002	0.0657		0.0000
29	1450	0.0000	0.0018	3.8860	2.3600	0.0019	0.0776		0.0000
30	1500	0.0000	0.0001	0.2591	0.1990	0.0001	0.0613		0.0245
31	1550	0.0000	0.0016	3.3679	2.1864	0.0016	0.0726		0.0000
32	1600	0.0000	0.0001	0.2591	0.2123	0.0001	0.0575		0.0000
33	1650	0.0000	0.0012	2.5259	1.7456	0.0012	0.0682		0.0000
34	1700	0.0000	0.0001	0.2591	0.2256	0.0001	0.0541		0.0245
35	1750	0.0000	0.0008	1.6192	1.1868	0.0008	0.0643		0.0000
36	1800	0.0000	0.0001	0.1943	0.1791	0.0001	0.0511		0.0000
37	1850	0.0000	0.0004	0.9067	0.7026	0.0005	0.0608		0.0245
38	1900	0.0000	0.0001	0.1943	0.1891	0.0001	0.0484		0.0245
39	1950	0.0000	0.0004	0.9067	0.7406	0.0005	0.0577		0.0245
40	2000	0.0000	0.0001	0.1943	0.1990	0.0001	0.0460		0.0245

5.3.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyser	EMC Partner	Harmonics 1000	016

5.4 Voltage changes, voltage fluctuations and flicker

5.4.1 Photo documentation of the test set-up



5.4.2 Test method according to EN 61000-3-3

This test consists on the measurement of voltage changes, voltage fluctuations and flicker which may be produced by equipment having an input current ≤ 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.4.3 Limits for low voltage AC mains port – Class A equipment

The value of Pst shall be not greater than 1.0.
The value of Plt shall be not greater than 0.65.
The value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms.
The relative steady-state voltage change, dc shall not exceed 3.3 %.
The maximum relative voltage change dmax shall not exceed:

a) 4 % without additional conditions
b) 6 % for equipment which is switched manually, or switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption
c) 7 % for equipment which is attended whilst in use (for example : hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as mowers, portable tools such as electric drills), or switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

5.4.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency:	50 Hz
Kind of test site:	Laboratory
Remarks:	

5.4.5 Test protocol

Operation mode: 1 Verdict: Pass
Configuration mode: 1
Remarks:

Date : 02/02/2018 19:09:04 V4.22

Urms = 230.3V Freq = 50.000 Range: 0.5 A
Irms = 0.047A Ipk = 0.186A cf = 3.938
P = 5.424W S = 10.85VA pf = 0.500
THDi = 165 % THDu = 0.10 % Class A

Test - Time : 1 x 10min = 10min (100 %)

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00
dmax : 4.00 % dc : 3.00 %
dtLim: 3.00 % dt>Lim: 200ms

Test complete, Measurement within Limits

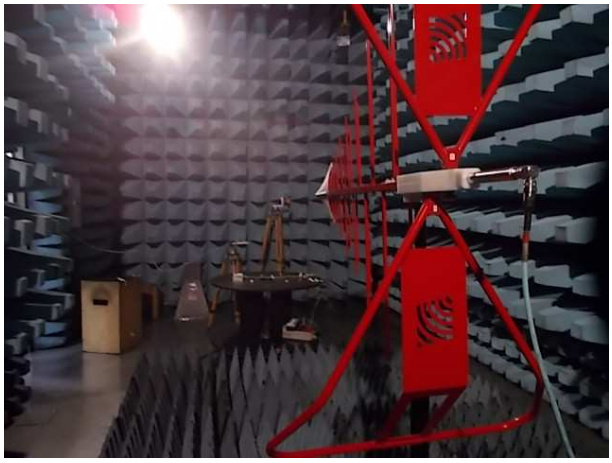
	Pst	dmax [%]	dc [%]	dt>Lim [ms]
0	0.072	0.000	0.000	0.000

5.4.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyzer	EMC Partner	Harmonics 1000	016

5.5 Radio frequency electromagnetic field immunity test

5.5.1 Photo documentation of the test set-up



5.5.2 Test method according to EN 61000-4-3

The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80 MHz to 6000 MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas. Measurements are made in a fully anechoic chamber and the indicated field strength is pre-calibrated prior to placement of the system under test.

5.5.3 Test specification

Frequency range:	80 to 6000 MHz			
Field strength:	3 V/m			
EuT - antenna separation:	2.5 m			
Modulation:	AM with 80 % in depth and 1 KHz sine wave			
Frequency step:	1%			
Antenna polarisation:	horizontal		vertical	
Antenna position:	front	rear	left	right

5.5.4 Test result

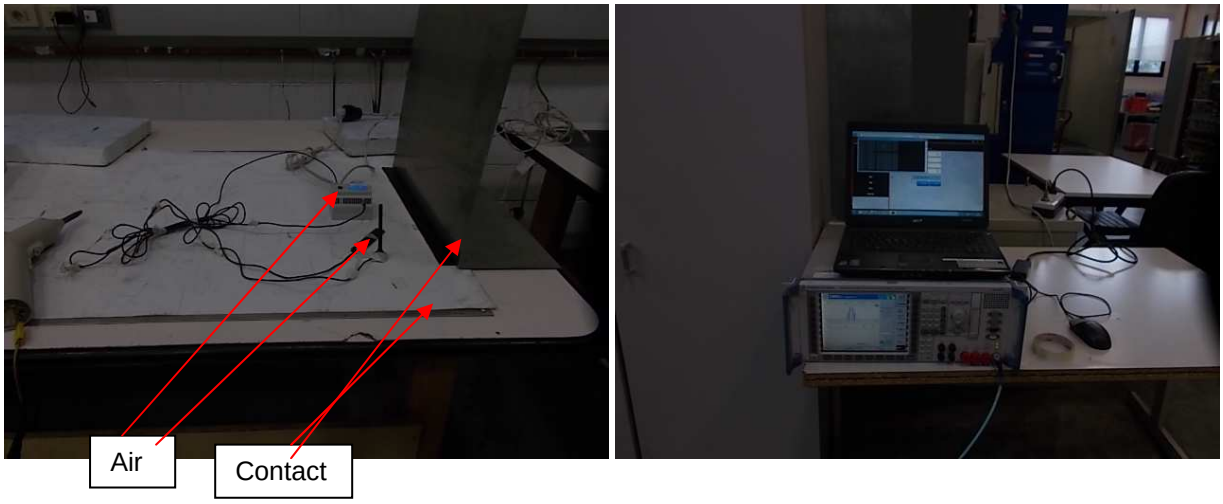
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	CT/CR
Operation mode:	1
Configuration mode:	1
Kind of test site:	Anechoic chamber
Remarks:	

5.5.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
RF generator (10 ÷ 20000 MHz)	R&S	SMP22	839 762/107
Broadband amplifier (80 ÷ 1000 MHz)	R&S	BBA100	101163
Broadband amplifier (1000÷ 6000 MHz)	R&S	BBA150	102626
Broadband antenna (80 MHz ÷ 6 GHz)	ETS Lingren	3142E	00213107
Broadband amplifier (4.2 ÷ 18 GHz)	AR	20T4G18	300792
Power meter	R&S	NRVD	833697/026
Power sensor	R&S	NRV-Z4	100577
Bidirectional Coaxial coupler	AR	DC7144	301249
Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70
Shielded room	Siemens	3m control room	3

5.6 Electrostatic discharges immunity test

5.6.1 Photo documentation of the test set-up



C = Contact discharge – A = Air discharge

5.6.2 Test method according to EN 61000-4-2

The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table-top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP) is placed on the table. The EUT and the cables are isolated f isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT. Air discharges are applied to non-metallic parts of the system. Contact discharges are applied to all accessible metallic parts. Discharges are also applied to the Horizontal and Vertical Coupling Planes.

5.6.3 Test specification

Contact discharge voltage:	4 kV	
Air discharge voltage:	8 kV	
Discharge impedance:	330 Ω / 150 pF	
Time between successive discharges:	≥ 1 sec	
Number of discharges:	≥ 10	
Type of direct discharge:	air discharge	contact discharge
Type of indirect discharge:	contact discharge	
Polarity:	positive	negative

5.6.4 Test result

Discharge location	Type of discharge
Horizontal coupling plane (HCP)	Contact
Vertical coupling plane (VCP)	Contact
Display	Air
Button	Air

Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	TT/TR
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
ESD Test system	EMC Partner	ESD3000	252

5.7 Immunity to fast transient

5.7.1 Photo documentation of the test set-up

5.7.2 Test method according to EN 61000-4-4

The test is intended to demonstrate the immunity of equipment subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce….). The bursts are applied on the mains supply port by using a coupling decoupling network and on signal and control lines ports by using a capacitive clamp. Measurements are made on a ground plane.

5.7.3 Test specification

Voltage level for AC power ports:	1 kV	
Voltage level for DC power ports:	0.5 kV	
Voltage level for signal ports, wired, and control ports:	0.5 kV	
Burst frequency:	5.0 kHz	
Coupling duration:	≥ 60 s	
Polarity:	positive	negative

5.7.4 Test result

Coupling point	Level	Coupling devices	Verdict
AC	1 kV	Network	P
I/O	0.5 kV	Clamp	P

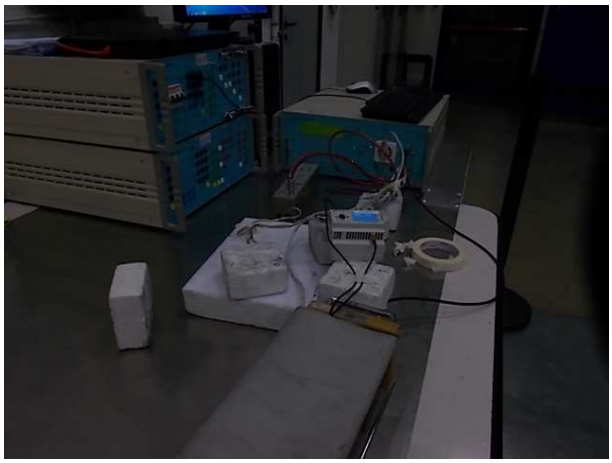
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.7.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849
Coupling clamp	EMC partner	CDN	CNEFT1000-120
Coupling clamp	Schaffner	CDN 125	245 9219

5.8 Immunity to surge

5.8.1 Photo documentation of the test set-up




5.8.3 Test specification for AC mains power input ports

Pulse amplitude for line to line surge:	1 kV with a source impedance of 2 Ω + 18µF			
Pulse amplitude for line to earth surge:	2 kV with a source impedance of 12 Ω + 9µF			
Number of surges:	5 Surges/Phase angle			
Phase angle:	0°	90°	180°	270°
Repetition rate:	60 s			
Rise time:	1.2 µs			
Time to half value:	50 µs			
Polarity:	positive		negative	

5.8.4 Test specification for wired ports directly connected to outdoor cables

Pulse amplitude for line to ground surge:	1 kV with a source impedance of 42 Ω + 0.5µF	
Pulse amplitude for shield to ground surge:	1 kV direct on the shield of the cable	
Number of surges:	5 Surges/Polarity	
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	negative

5.8.5 Test specification for wired ports connected to indoor cables

Pulse amplitude for line to ground surge:	0.5 kV with a source impedance of 42 Ω + 0.5µF	
Pulse amplitude for shield to ground surge:	0.5 kV direct on the shield of the cable	
Number of surges:	5 Surges/Polarity	
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	negative

5.8.6 Test result

Coupling point	Level	Coupling network	Verdict
AC mains power input ports – line to line	1 kV	2 Ω + 18µF	P
AC mains power input ports – line to earth	2 kV	12 Ω + 9µF	P
Wired port – line to ground	1 kV	42 Ω + 0.5µF	N
Wired port – shield to ground	1 kV	Direct	P

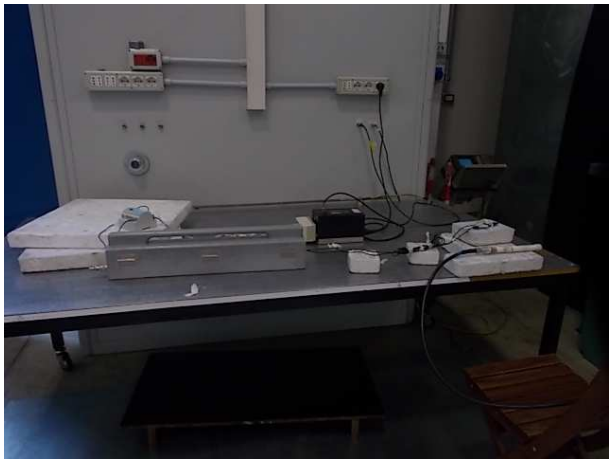
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	TT
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.8.7 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849

5.9 Immunity to RF common mode

5.9.1 Photo documentation of the test set-up



5.9.2 Test method according to EN 61000-4-6

The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 80 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp. Measurements are made on a ground plane. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT are located between 30mm and 50mm above the ground plane. The indicated field is pre-calibrated prior to placement of the system under test.

5.9.3 Test specification

Test voltage:	3 V
Frequency range:	0.15 MHz to 80 MHz
Modulation:	AM with 80 % in depth and 1 KHz sine wave
Frequency step:	1 % with 3 s dwell time max

5.9.4 Test result

Coupling point	Coupling and decoupling devices	Verdict
AC	CDN	P
I/O	EM-CLAMP	P

Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	CT/CR
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks	

5.9.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
EM injection clamp	FCC	F203I-23mm	121239
RF Conducted immunity test equipment	EM Test	CWS500 CSI	V0710102305
Attenuator 6dB	EM Test	ATT6/75	0206-18
Shielded room	Siemens	Conducted immunity test room	68

5.10 Voltage dips and interruptions immunity test

5.10.1 Photo documentation of the test set-up

5.10.2 Test method according to EN 61000-4-11

The test allows estimating of the conducted immunity of electrical and electronic equipment connected to low-voltage power supply networks for voltage dips and short interruptions. Testing is performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described.

5.10.3 Test specification

Nominal Mains Voltage	230 Vac
Rated frequency	50/60 Hz
Number of voltage dips and interruptions	3
Sync Angle	0°

5.10.4 Test result

	Level of reduction	Residual voltage	Duration	Performance criterion	Verdict
1	100%	0%	0.5 cycle	TT	P
2	100%	0%	1 cycle	TT	P
3	30%	70%	500 ms	TT	P
4	100%	0%	5 sec	See remark	P

Verdict:	☒ P ☐ F ☐ N
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: In the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena for transmitters or for receivers shall apply. In the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator. No unintentional responses shall occur at the end of the test.	

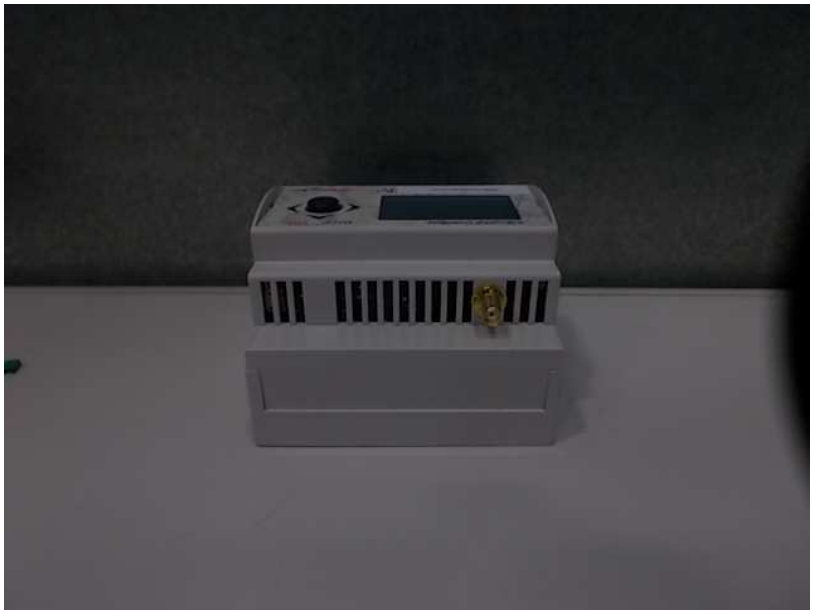
5.9.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849

6 EUT PHOTOS


Industrial Gateway


TOP
TOP
EnergyTeam S.p.A.
NG-Gateway
serial
171220IG161258
MAC address
40-D8-55-82-24-D0




EnergyTeam S.p.A.


PASS
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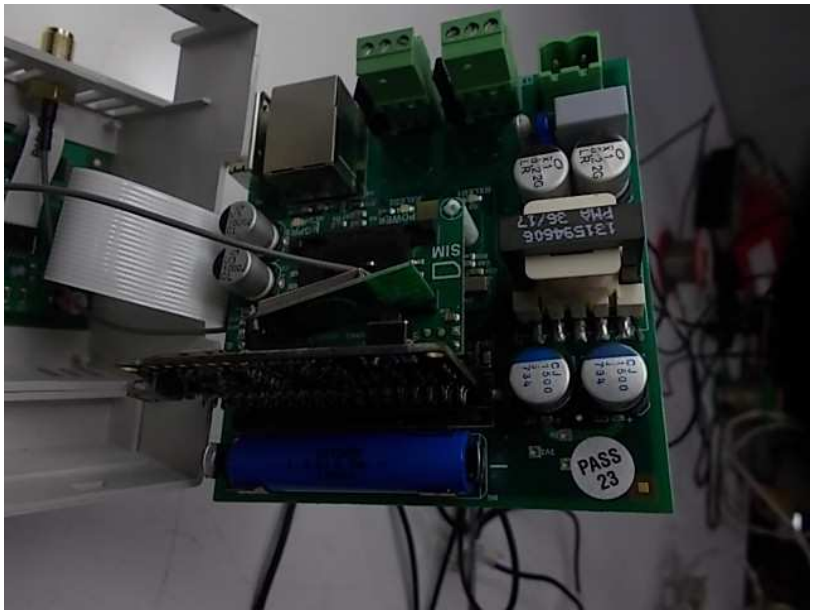

End of report