This report complies with the accreditation requirements of Cgcre/Inmetro, the Brazilian national institute for industrial quality that evaluated the laboratory performance.

Ensaios NBR ISO/IEC 17025

CRL 0147

Test Report
PD.33.GS.E1A.3313A/RE-07-AA

Electromagnetic Compatibility Tests on Temperature Sensor with Cable Communication

Model: ZST/M/7/300/24

Manufacturer: Varixx

Quotation: 28808/11 SO: 64746

Customer: Varixx Indústria Eletrônica Ltda
Contact: Leonardo Lopes **Email:** leonardo@varixx.com.br
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Table of Contents

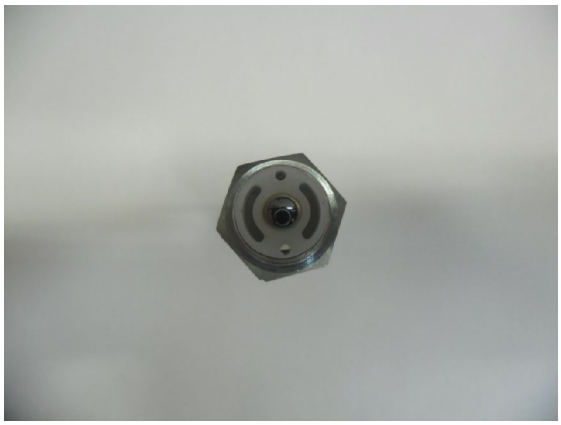
1 Scope

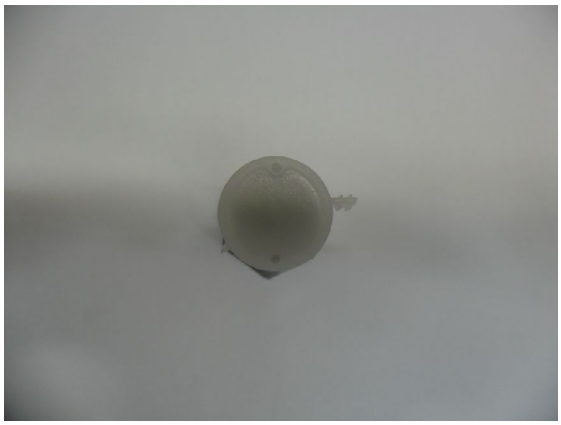
The objective of this report is to present electromagnetic compatibility tests on the equipment identified in Item 2, based on the regulations presented in Section 5 of this report.

2 Identification of Equipment Under Test

The equipment is showed in photos 1 to 10:

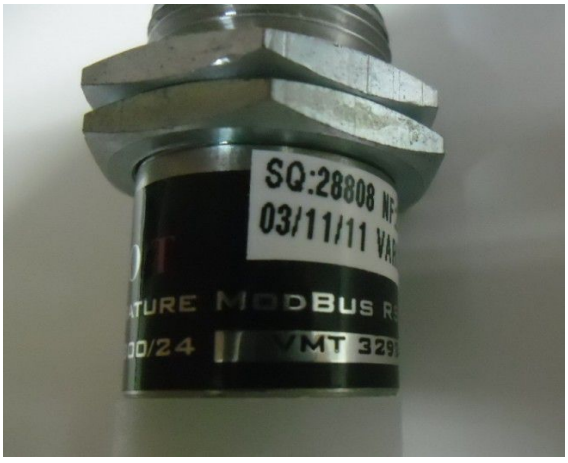
Photos 1 and 2 Equipment Under Test (EUT) – Sample 5286





Photos 3 and 4 Equipment Under Test (EUT) – Sample 5286


Photos 5 and 6 Equipment Under Test (EUT) – Sample 5286

Photos 7 and 8 Equipment Under Test (EUT) – Sample 5286


Photos 9 and 10 Equipment Under Test (EUT) – Sample 5286

2.1 Changes made to the sample during tests

No changes were made to the samples under test.

3 General Information

Received on	Samples	Tests start date	Tests end date
03/Nov/11	5286	07/Nov/11	10/Nov/11

4 Technical Documentation Provided

No technical documentation was provided.

5 Test Methods and References

a) CISPR 11 (2010 – Ed. 5.1) – Industrial, scientific and medical equipment – Radio-Frequency disturbance characteristics – Limits and methods of measurement.
b) IEC 61000-4-2 (2001) – Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques. Section 2: Electrostatic discharge immunity test.
c) IEC 61000-4-3 (2008) – Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques. Section 3: Radiated electromagnetic field requirements.
d) IEC 61000-4-4 (2004) – Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques. Section 4: Electrical fast transient.
e) IEC 61000-4-5 (2005) – Electromagnetic Compatibility (EMC) – Part 4: Test and Measurement Techniques. Section 5: Surge immunity test.
f) IEC 61000-4-6 (2006) – Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques. Section 6: Immunity to conducted disturbances induced by radio-frequency fields.
g) IEC 61000-4-8 (2001) – Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques. Section 8: Power frequency magnetic field immunity test.

6 Test Laboratory

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7 Summary of the Tests Performed

Test	Reference document	Specification	Configuration	Sample
Radiated Emission	CISPR 11 (2010)	Group 1 Class A	Default	Sample 5286
Conducted Emission in Electric Power Terminals	CISPR 11 (2010)	Group 1 Class A	Default	Sample 5286
Radiated Disturbance Immunity	IEC 61000-4-3 (2008)	10 V/m, from 80 MHz to 3 GHz	Default	Sample 5286
Immunity to Conducted RF Disturbances in Telecommunications and Electric Power Terminals	IEC 61000-4-6 (2006)	10 V from 150 kHz to 80 MHz	Default	Sample 5286
Immunity to Electrical Fast Transient/Burst in Telecommunications and Electric Power Terminals	IEC 61000-4-4 (2004)	Telecommunications: 2 kV Electric Power: 2 kV	Default	Sample 5286
Immunity to Electrostatic Discharges	IEC 61000-4-2 (2001)	6 kV for contact discharge 8 kV for air discharge	Default	Sample 5286
Surge Immunity in Electric Power Terminals	IEC 61000-4-5 (2005)	Electric Power a.c.: 1 kV line-to-line 2 kV line-to-ground	Default	Sample 5286
Immunity to Magnetic Fields	IEC 61000-4-8 (2001)	Severity 4	Default	Sample 5286

8 Terminology

The following terms and definitions are used in this document:

AE – Auxiliary Equipment

EUT – Equipment Under Test

LISN – Line Impedance Stabilization Network

EMC – Electromagnetic Compatibility

EMI – Electromagnetic Interference

ESD – Electrostatic Discharge

DC – Direct Current

9 EUT Operating Conditions

During the tests, the equipment was set up in typical conditions, this procedure is the responsibility of the manufacturer:

Configuration (default)

Tests were run on equipment under typical use conditions. The converter-relay + Source VPS12024 was used to constantly monitor its correct operation.

Figure 1 illustrates the configuration.

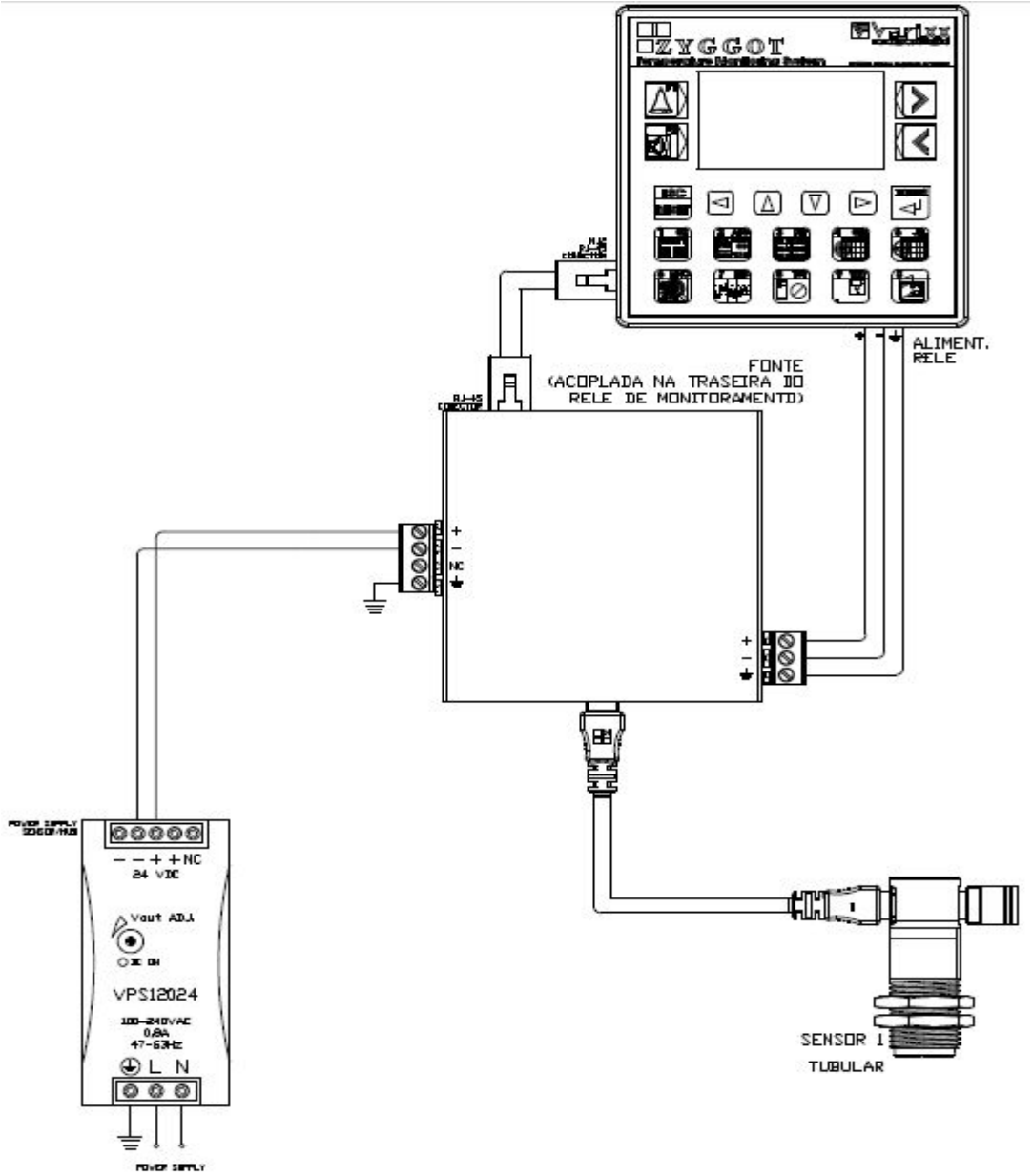


Figure 1 Configuration

Table 1 List of auxiliary equipment used with the EUT operation

Equipment	Manufacturer	Model	Identification	Owner	Validity of calibration/verification – Traceability
Source	Varixx	VPS 12024	S/N VMT54895	Varixx	Calibration not required
Relay	Varixx	VZX/B1/U	S/N 33265	Varixx	Calibration not required
Relay Source	Varixx	ZXT-2	S/N VMT33393	Varixx	Calibration not required

10 Radiated Emission

10.1 Instruments Used

Table 2 List of equipment used in the Radiated Emission Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SEMI-ANECHOIC CHAMBER	ETS	3m	CSA pr-12	Site Attenuation: July 2014 – CPqD
EMI TEST RECEIVER	R&S	ESI26	S/N 835336/007	December 2011 – CPqD
RELAY SWITCH UNIT	R&S	331.1601.31	S/N 338969/001	Calibration not required
MULTI-DEVICE CONTROLLER	ETS	2090	S/N 0005-1517	Calibration not required
MICROCOMPUTER	COMPAQ	PENTIUM III	—	Calibration not required
ELECTRIC TURNTABLE SYSTEM	ETS	2087	—	Calibration not required
MINI MAST	ETS	2075	—	Calibration not required
BICONILOG ANTENNA	ETS	3142B	RCE000854	February 2012 – ETS

10.2 Test Procedure

Measurement procedures comply with the CISPR11 standard. Quasi-peak values for radiated field were used as reference. The product was classified as a Class A / Group 1 equipment. EUT assembly and operation followed the procedures established in CISPR11 as described in Section 9.

10.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 22.3 °C	Relative air humidity	Initial: 63.0 %
	Final: 22.1 ºC		Final: 53.3 %

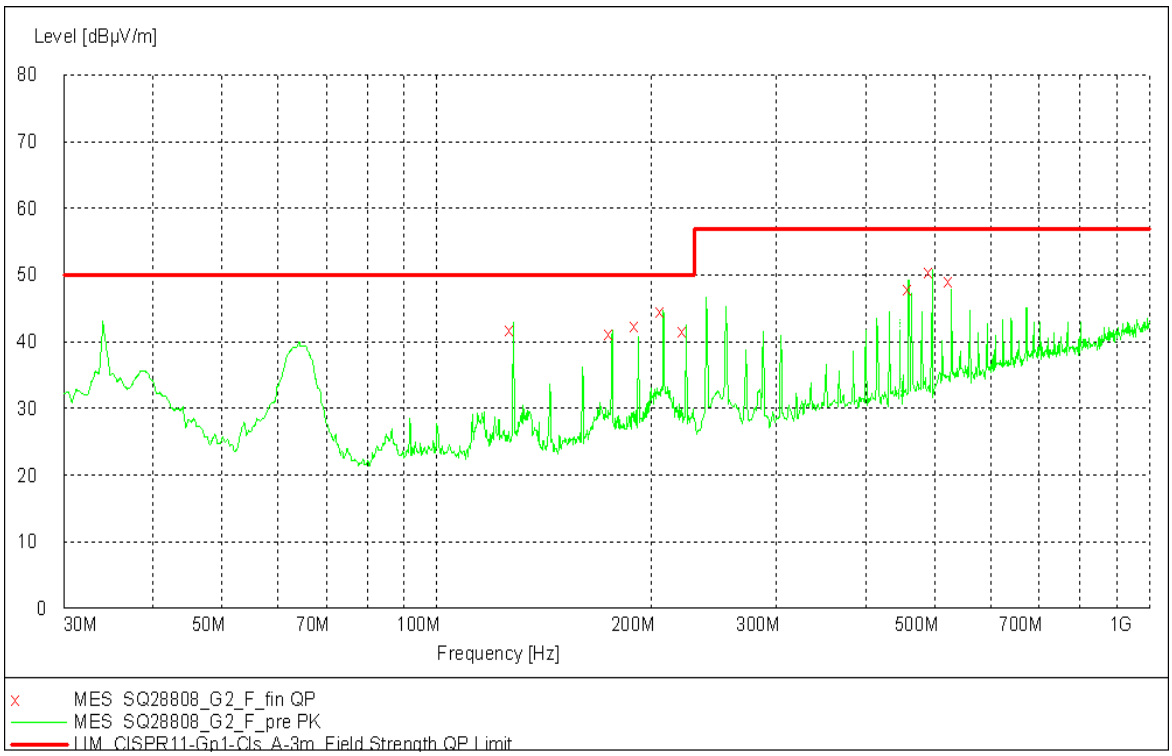
10.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 3 Radiated Emission Test Results

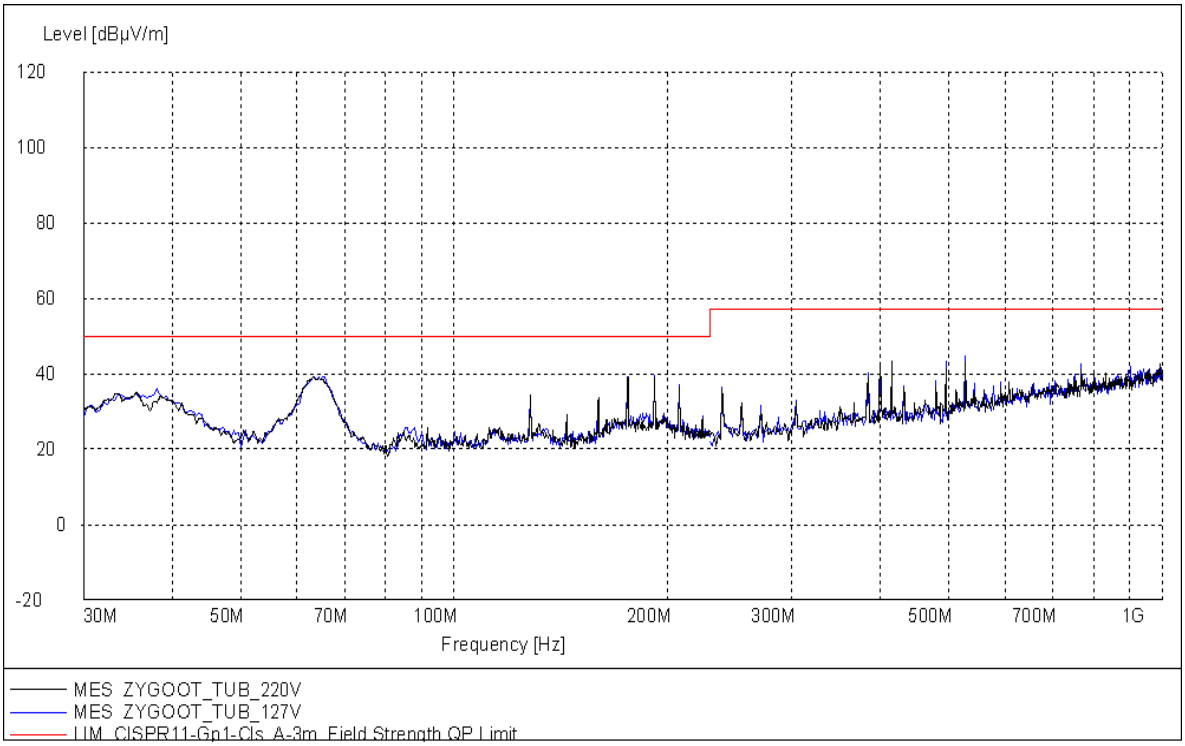
Graph 1 – Radiated Emission Test Results – Default Configuration – Power Supply 220V @ 60 Hz – Sample 5286						
Quasi-Peak Values						
Frequency (MHz)	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Height (cm)**	**Azimuth (°)**	**Polarization**
127,98	41,9	50,0	8,1	272	359	HORIZONTAL
175,98	41,1	50,0	8,9	175	0	HORIZONTAL
192,00	42,4	50,0	7,6	146	19	HORIZONTAL
208,02	44,5	50,0	5,5	146	281	HORIZONTAL
223,98	41,6	50,0	8,4	127	282	HORIZONTAL
463,98	48,0	57,0	9,0	100	248	VERTICAL
496,02	50,5	57,0	6,5	100	88	VERTICAL
528,00	49,1	57,0	7,9	100	146	VERTICAL

Legend
Frequency: Tuned frequency
Level: Level measured (corresponding factors applied) through a quasi-peak detector.
Limit: Quasi-peak limit set by the corresponding standard (CISPR11) and correction factor applied for the 3 m distance ([10 m Limit] + 20 * Log [10 m/3 m]).
Margin: Difference between the corresponding limit and the level measured (**positive: does not exceed the limit/negative: exceeds the limit**).
Height: the height of the receiving antenna
Azimuth: the angle of the rotating base
Polarization: the polarization of the receiving antenna



Graph 1 Radiated Emission Test Results – Default Configuration – Power Supply 220V @ 60 Hz (24 Vdc output)– Sample 5286

Note: Preliminary tests were run using the product power supply and a complete test was conducted at the higher emission level. Graph 2 shows the preview.



Graph 2 Radiated Emission Preliminary Test Results – Default Configuration – Power Supply 127V @ 60 Hz / 220V @ 60 Hz – Sample 5286

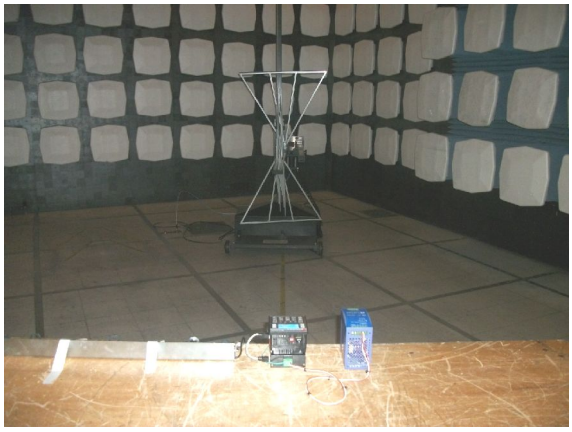
10.4.1 Measurement Uncertainty

The following table shows the strength measurement uncertainty values of the electromagnetic field.

Test	Quantity	Uncertainty	k	Confidence level
Radiated Emission	Electric field strength	±4.960 dB	2	95%

According to Section 12.5 of CISPR11 (Edition 5.1 – 2010), assessment of compliance with the standard will be based on the measurement results, without taking into account uncertainties.

10.5 Photos of the Test Assembly



Photos 11 and 12 - Radiated emission

11 Conducted Emission in Electric Power Terminals

11.1 Instruments Used

Table 4 List of equipment used in the Conducted Emission Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SEMI-ANECHOIC CHAMBER	ETS	3m	CSA pr-12	Site Attenuation: July 2014 – CPqD
EMI TEST RECEIVER	R&S	ESI26	S/N 835336/007	December 2011 – CPqD
RELAY SWITCH UNIT	R&S	331.1601.31	S/N 338969/001	Calibration not required
MICROCOMPUTER	COMPAQ	PENTIUM III	—	Calibration not required
HIGH-PASS FILTER	Rohde & Schwarz	EZ-25	RCE001230	June 2012 – CPqD
LISN	EMCO	3825/2	CPqD032769	October 2012 – LabCal CPqD

11.2 Test Procedure

Measurement procedures comply with the CISPR11 standard. Quasi-peak and average values for disturbance voltage were used. The product was classified as a Class A / Group 1 equipment. EUT assembly and operation followed the procedures established in CISPR11 as described in Section 9.

11.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 20.3 °C	Relative air humidity	Initial: 54.4 %
	Final: 20.4 ºC		Final: 53.4 %

11.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 5 Conducted Emission in Electric Power Terminals Test Results

Graph 3 – Conducted Emission in Electric Power Terminals Test Results – Default Configuration– Power Supply 24Vdc – Sample 5286			
Average Values			
Frequency (MHz)	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
0,1600	64,5	66,0	1,5
0,1900	62,9	66,0	3,1
0,2200	61,2	66,0	4,8
0,2650	59,3	66,0	6,7
0,2800	58,7	66,0	7,3
0,2950	58,0	66,0	8,0
0,7000	46,3	60,0	13,7
0,8850	42,7	60,0	17,3
0,9900	42,0	60,0	18,0
1,9800	35,7	60,0	24,3
6,2950	28,2	60,0	31,8

Quasi-peak Values			
Frequency (MHz)	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
0,1600	67,2	79,0	11,8
0,1900	65,8	79,0	13,2
0,2200	64,3	79,0	14,7
0,2650	62,4	79,0	16,6
0,2800	61,8	79,0	17,2
0,2850	61,3	79,0	17,7
0,2950	61,4	79,0	17,6
0,3000	62,0	79,0	17,0
0,7000	50,2	73,0	22,8
0,8850	46,6	73,0	26,4
0,9800	45,8	73,0	27,2
1,9800	40,2	73,0	32,8
6,2500	34,7	73,0	38,3

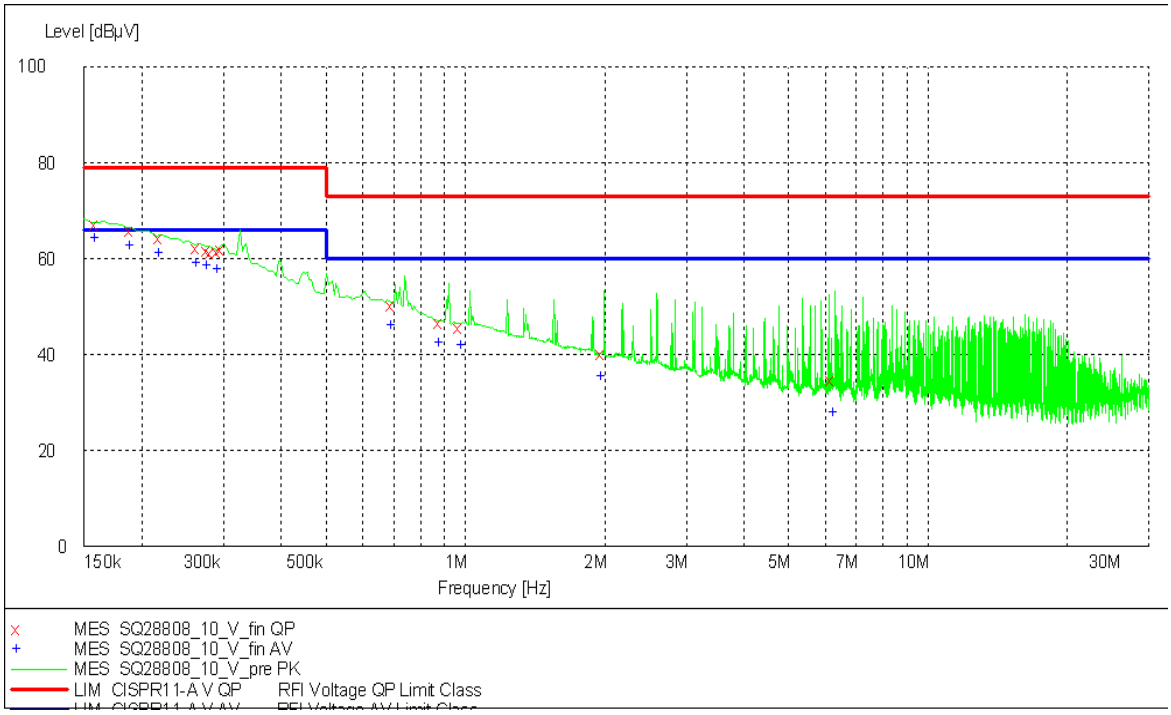
Legend

Frequency: Frequency measured

Level: Level measured (corresponding factors applied) through quasi-peak and average detectors.

Limit: Quasi-peak limit set according to the corresponding standard (CISPR11).

Margin: Difference between the corresponding limit and the level measured (**positive: does not exceed the limit/negative: exceeds the limit**).



Graph 3 Conducted Emission in Electric Power Terminals Test Results – Default Configuration – Power Supply 24Vdc – Sample 5286

11.4.1 Measurement Uncertainty

The following table shows the values of the Conducted RF Voltage measurement uncertainty.

Test	Quantity	Uncertainty	k	Confidence level
Conducted Emission	Conducted Voltage Level	±3.60 dB	2	95%

According to Section 12.5 of CISPR11 (Edition 5.1 – 2010), assessment of compliance with the standard will be based on the measurement results, without taking into account uncertainties.

11.5 Photos of the Test Assembly

Photos 13 and 14 - Conducted emission

12 Radiated Disturbance Immunity

12.1 Instruments Used

Table 6 List of equipment used in the Radiated Disturbance Immunity Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SEMI-ANECHOIC CHAMBER	ETS	SpaceSaver 26H – Part Number ETS SS26H	CSA pr-T3	Field uniformity adjustment: April 2012 – CPqD
SIGNAL GENERATOR	R&S	SMB100A	S/N 1406.6000.02	April 2014 – PD.SM.11.22A.2286A/CC-03-AA
USB ADAPTER FOR NRP-Z	R&S	NRP-Z4	S/N 1146.8001.02	N/A

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
AVERAGE POWER SENSOR	R&S	NRP-Z91	CPqD036865	April 2013 – PD.SM.11.22A.2285A/CC-03-AA
OPEN SWITCH AND CONTROL PLATFORM OSP	R&S	OSP 120	1505300902	N/A
AMPLIFIER 80 MHZ – 1GHz	Bonn	BLW0810-250/100	087036B	N/A
DUAL AMPLIFIER 0.8 – 2.5 GHz / 2.5 – 6 GHz	Bonn	BLW0860-75/50D	087098	N/A
ULTRALOG ANTENNA	R&S	HL562	100425	N/A
BROADBAND HORN ANTENNA	SB	BBHA9120E	387	N/A
STACKED LOG-PER ANTENNA	SB	STLP9149	24	N/A
SYSTEM SOFTWARE	R&S	EMC32-S	N/A	N/A
DELL PC	DELL	Optiplex 755	CPqD03570407	N/A
19 INCH RACK	R&S	TS-SEMS	N/A	N/A
TRIPOD	R&S	HL562Z1	100157	N/A

12.2 Test Procedure

Procedures comply with the IEC 61000-4-3 standard, with a 10 V/m severity level range varying from 80 MHz to 1 GHz and from 1 GHz to 3 GHz.

12.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 19.8 °C	Relative air humidity	Initial: 48.3 %
	Final: 19.5 ºC		Final: 49.1 %

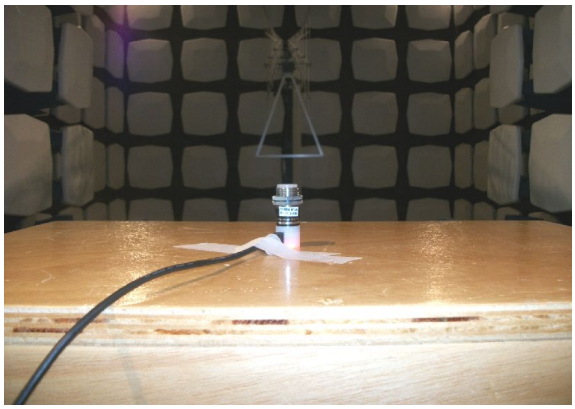
12.4 Results

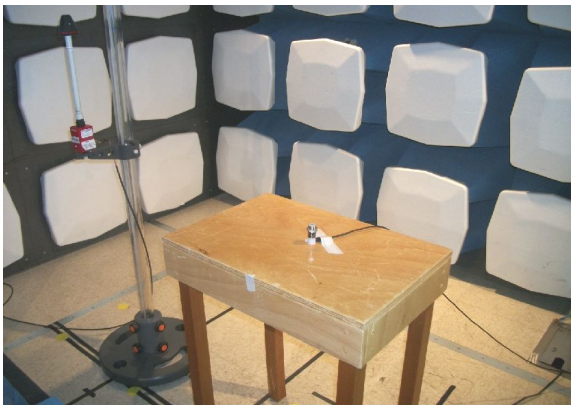
Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 7 Radiated Disturbance Immunity Test Results

Default Configuration – Sample 5286			
Frequency Range: 80 MHz to 1 GHz			
Vertical Polarization		***Horizontal Polarization***	
EUT side	***Note***	***EUT side***	***Note***
Front side (LVF)	Nothing on record	Front side (LVF)	Nothing on record
Frequency Range: 1 GHz to 3GHz			
Vertical Polarization		***Horizontal Polarization***	
EUT side	***Note***	***EUT side***	***Note***
Front side (HVF)	Nothing on record	Front side (HVF)	Nothing on record
Based on the performance criteria established in the IEC 61000-4-3 standard, the EUT performance was monitored while applying the disturbance and no difference was detected when comparing both with and without disturbance operation modes.			

12.5 Photos of the Test Assembly





Photos 15 and 16 - Radiated Disturbance Immunity

13 Immunity to Conducted RF Disturbances in Telecommunications and Electric Power Terminals

13.1 Instruments Used

Table 8 List of equipment used in the Immunity to Conducted RF Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SEMI-ANECHOIC CHAMBER	ETS	SpaceSaver 26H – Part Number ETS SS26H	CSA pr-T3	N/A
SIGNAL GENERATOR	R&S	SMB100A	S/N 1406.6000.02	April 2014 – PD.SM.11.22A.2286A/CC-03-AA
USB ADAPTER FOR NRP-Z	R&S	NRP-Z4	S/N 1146.8001.02	N/A
AVERAGE POWER SENSOR	R&S	NRP-Z91	CPqD036865	April 2013 – PD.SM.11.22A.2285A/CC-03-AA
OPEN SWITCH AND CONTROL PLATFORM OSP	R&S	OSP 120	1505300902	N/A
AMPLIFIER	AMPLIFIER RESEARCH	150A100B	CPqD 035440	Not required
SYSTEM SOFTWARE	R&S	EMC32-S	N/A	N/A
DELL PC	DELL	Optiplex 755	CPqD03570407	N/A
19 INCH RACK	R&S	TS-SEMS	N/A	N/A
6 dB ATTENUATOR 6 dB - DC of 2 GHz / 100 W 50 Ohms	ROHDE&SCHWARZ	RBU100 1073.8495.06	RCE000984	April 2012 – CPqD
20 dB ATTENUATOR	JFW	766-2050FHC-020-20 20DB	SN2687A (RCE000850)	June 2012 – CPqD
CDN	EM TEST	M2/M3	SN0708-38	Voltage adjustment: July 2012 – CPqD
EMCLAMP	LUTHI	EM101	CPqD 008514	Voltage adjustment: February 2012 – CPqD

13.2 Test Procedure

Procedures comply with the IEC 61000-4-6 standard, with a 10 V severity level range varying from 0.15 MHz to 80 MHz.

13.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 19.1 °C	Relative air humidity	Initial: 51.1 %
	Final: 18.7 ºC		Final: 53.4 %

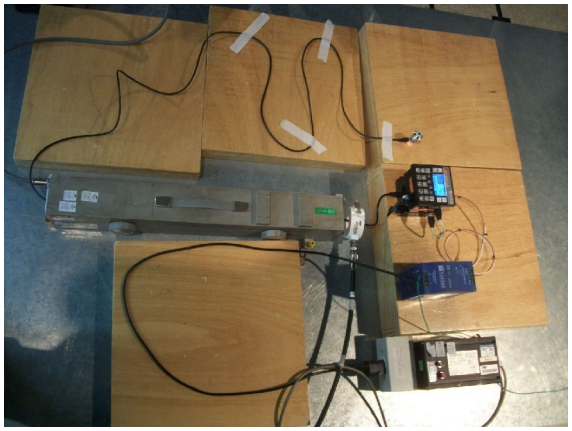
13.4 Results

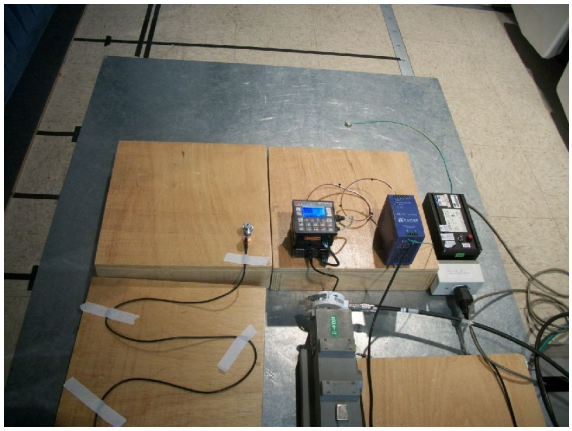
Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 9 Immunity to Conducted RF Test Results

Coupling	***Sample 5286 Configuration/Interface***	***Note***
CDN M2/M3	Default / Power Supply	Nothing on record
EMCLAMP EM101	Default / Communication	Nothing on record
Based on the performance criteria established in the IEC 61000-4-6 standard, the EUT performance was monitored while applying the disturbance and no difference was detected when comparing both with and without disturbance operation modes.		

13.5 Photos of the Test Assembly





Photos 17 and 18 - Immunity to Conducted RF

14 Immunity to Electrical Fast Transient/Burst in Electric Power Terminals

14.1 Instruments Used

Table 10 List of equipment used in the Immunity to Electrical Fast Transients/Burst Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SHIELDED CHAMBER	CPqD	—	CB pr-12	Calibration not required
TRANSIENTS GENERATOR	EM TEST	UCS 500 M4	CPqD 035569	October 2012
THREE-PHASE CDN	EM TEST	CNI 503 A2	SN V0812103558	October 2012
CAPACITIVE CLAMP	EM TEST	—	s/n 304613	Calibration not required

14.2 Test Procedure

Procedures comply with the IEC 61000-4-4 standard, with 2 kV severity level for electric power terminals and 2 kV for telecommunications terminals.

14.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 25.3 °C	Relative air humidity	Initial: 50.4 %
	Final: 25.2 ºC		Final: 51.3 %

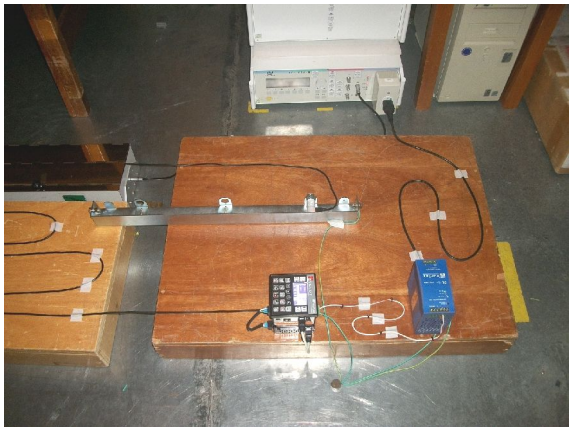
14.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 11 Immunity to Electrical Fast Transient/Burst Test Results

Coupling	***Sample 5286 Configuration / Cable***	***Note***
L+N @ ± 2 kV / 5 kHz	Default / Power Supply	Nothing on record
CCP @ ± 2 kV / 5 kHz	Default / Communication	Nothing on record
Notes: CCP = Capacitive Coupling Clamp.		
Based on the performance criteria established in the IEC 61000-4-4 standard, the EUT performance was monitored while applying the disturbance and no difference was detected when comparing both with and without disturbance operation modes.		

14.5 Photos of the Test Assembly



Photos 19 and 20 - Immunity to Electrical Fast Transient/Burst

15 Immunity to Electrostatic Discharges

15.1 Instruments Used

Table 12 List of equipment used in the Immunity to Electrostatic Discharge Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SHIELDED CHAMBER	CPqD	—	CB pr-12	Calibration not required
ESD SIMULATOR	EM TEST	ESD 30 C	SNV0812103563	January 2012 – CPqD

15.2 Test Procedure

Procedures comply with the IEC 61000-4-2 standard, and severity levels are 6 kV for contact discharge and 8 kV for air discharge.

15.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 23.3 °C	Relative air humidity	Initial: 52.7 %
	Final: 23.4 ºC		Final: 51.7 %

15.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 13 Immunity to Electrostatic Discharge Test Results

Default Configuration – Sample 5286			
HCP – Horizontal Coupling Plane			
EUT side	***Photo***	***10 discharges of +6 kV***	***10 discharges of -6 kV***
		Note	***Note***
Front side	Photo 21	Nothing on record	Nothing on record
Right side	Photo 22	Nothing on record	Nothing on record
Rear side	Photo 23	Nothing on record	Nothing on record
Left side	Photo 24	Nothing on record	Nothing on record
VCP – Vertical Coupling Plane			
EUT side	***Photo***	***10 discharges of +6 kV***	***10 discharges of -6 kV***
		Note	***Note***
Left side	Photo 21	Nothing on record	Nothing on record
Front side	Photo 22	Nothing on record	Nothing on record
Right side	Photo 23	Nothing on record	Nothing on record
Rear side	Photo 24	Nothing on record	Nothing on record
Air Discharge (applied only on non-conductive parts)			
Photo + Application point		***10 discharges of +8 kV***	***10 discharges of -8 kV***
		Note	***Note***
Photo 25 – point 1.		Nothing on record	Nothing on record
Direct Contact Discharge (applied only on conductive parts)			
Photo + Application point		***10 discharges of +6 kV***	***10 discharges of -6 kV***
		Note	***Note***
Photo 26 – point 2.		Nothing on record	Nothing on record
Based on the performance criteria established in the IEC 61000-4-2 standard, the EUT performance was monitored while applying the disturbance and no difference was detected when comparing both with and without disturbance operation modes.			

Photo 21 Horizontal front view and vertical left view of EUT

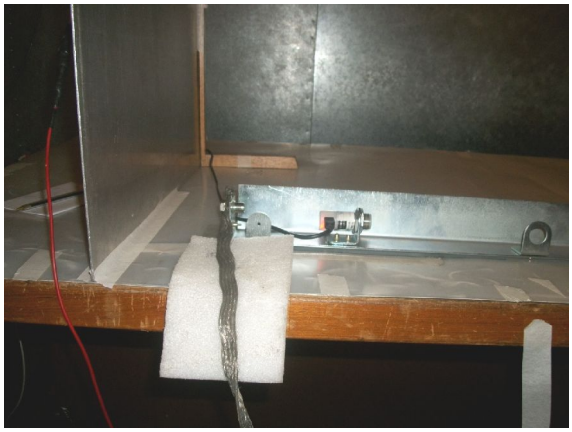


Photo 22 Horizontal right view and vertical front view of EUT

Photo 23 Horizontal rear view and vertical right view of EUT

Photo 24 Horizontal left view and vertical rear view of EUT

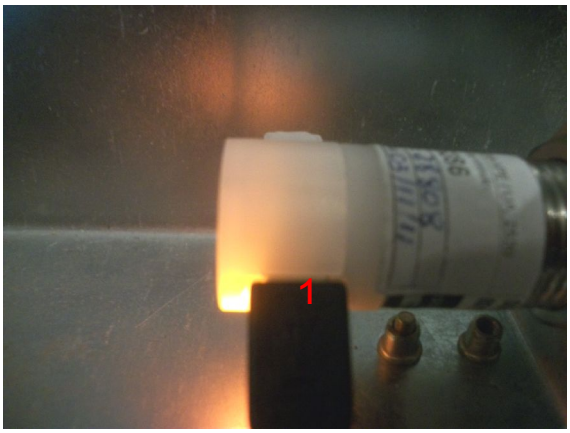


Photo 25 Upper view of EUT

Photo 26 Lower view of EUT

16 Surge Immunity in Electric Power Terminals

16.1 Instruments Used

Table 14 List of equipment used in the Surge Immunity Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SHIELDED CHAMBER	CPqD	—	CB pr-12	Calibration not required
TRANSIENTS GENERATOR	EM TEST	UCS 500 M4	CPqD 035569	October 2012
THREE-PHASE CDN	EM TEST	CNI 503 A2	SN V0812103558	October 2012

16.2 Test Procedure

Procedures comply with the IEC 61000-4-5 standard, with 2 kV severity level line-to-ground, and 1 kV line-to-line, for electric power terminals.

16.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 23.3 °C	Relative air humidity	Initial: 44.2 %
	Final: 23.8 ºC		Final: 44.5 %

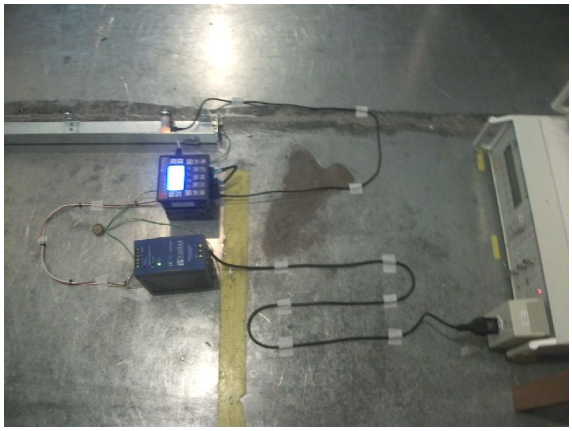
16.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 15 Surge Immunity Test Results

Coupling	***Sample: 5286 Configuration / Cable***	***Note***
L1-PE @ ± 2kV/1,2/50µs	Default / Power Supply	Nothing on record
N-PE @ ± 2kV/1,2/50µs	Default / Power Supply	Nothing on record
L1-N @ ± 1kV/1,2/50µs	Default / Power Supply	Nothing on record
Based on the performance criteria established in the IEC 61000-4-5 standard, the EUT performance was monitored while applying the disturbance and no difference was detected when comparing both with and without disturbance operation modes.		

16.5 Photos of the Test Assembly



Photos 27 and 28 - Surge Immunity

17 Immunity to Magnetic Fields

17.1 Instruments Used

Table 16 List of equipment used in the Immunity to Magnetic Fields Test

Equipment	Manufacturer	Model	Identification	Validity of calibration/verification – Traceability
SHIELDED CHAMBER	CPqD	—	CB pr-12	Calibration not required
TRANSIENTS GENERATOR	EM TEST	UCS 500 M4	CPqD 035569	October 2012
VARIAC	EM TEST	MV 2616	SN V0812103559	October 2012
THREE-PHASE CDN	EM TEST	CNI 503 A2	SN V0812103558	October 2012
ANTENNA	EM TEST	MS100	SN 0308-19	October 2012
TRAFO	EM TEST	MS2630	—	October 2012
TRAFO	EM TEST	MS26100	SN 1207-21	October 2012

17.2 Test Procedure

Procedures comply with the IEC 61000-4-8 standard and the severity levels indicated next:

	Continuous Mode		Short Duration	
Level	Intensity (A/m)	Duration (min)	Intensity (A/m)	Duration (seconds)
4	30	10	not applicable	not applicable

17.3 Environmental Conditions

All tests were performed in a controlled environment as specified in the documents listed in Section 5.

Temperature	Initial: 23.8 °C	Relative air humidity	Initial: 43.1 %
	Final: 23.9 ºC		Final: 43.4 %

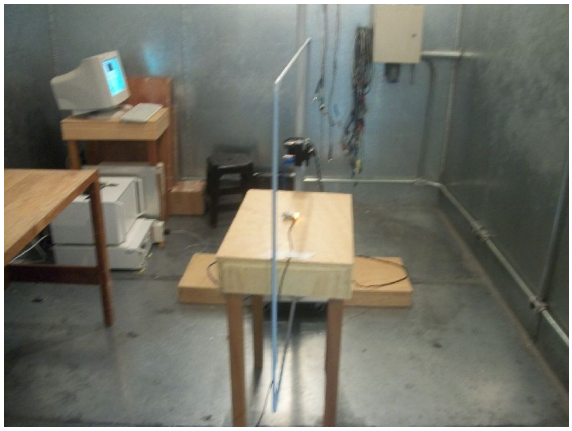
17.4 Results

Note: Changes in the sample, if applicable, will be described in Section 2.1. Changes are designated by the sample number followed by the word “modified” and a number (in sequence). The customer is responsible for all changes.

Table 17 Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

Severity	***Mode***	***Sample: 5286 Configuration / Nominal Voltage***	***Note***
4	Continuous Horizontal	Default / 127 Vac @ 60Hz	Nothing on record
4	Continuous Vertical	Default / 127 Vac @ 60Hz	Nothing on record
Based on the performance criteria established in the IEC 61000-4-8 standard, the EUT performance was checked during the test, and no difference was detected when comparing both with and without disturbance operation modes.			

17.5 Photos of the Test Assembly



Photos 29 and 30 - Immunity to Magnetic Fields

18 Immunity Test Measurement Uncertainty

In the immunity tests, the measurement uncertainty of the test method is not applicable. The uncertainty, in such cases, is related to the calibration of disturbance generators. CPqD makes sure calibration uncertainty of all instruments used during the tests is registered and updated. If necessary, the customer can formally request such record.

19 Comments

The test results refer only to the sample described in this report.

20 Document Issues

Issue date	Version Number	Description of changes
25/Nov/11	AA	First version

21 Execution and Approval

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