Test report

CO344_01.DOC

EUT:	Industrial Power Supply
Type:	TCL 120-124
Tested type:	TCL 120-124, 24VDC/5A
Production level:	10/07/2003
S/N:	xx
Manufacturer:	Convertec Ltd. Whitemill Industrial Estate Wexford Republic of Ireland
Measurement procedure:	EMC review of the EUT according the conformity with the provisions of 89/336/EEC Directive related standards: EN 55011:1998 + A1:1999 EN 61000-3-2:2000 EN 61000-3-3:1995 + A1:2001 EN 61000-6-2:2001
The standards were:	☒ kept ☐ not kept
Applicant:	Convertec Ltd. Whitemill Industrial Estate Wexford Republic of Ireland
Contact person:	Mr. Hinterleitner
Arrival of EUT:	10/21/2003
ID of EUT:	PR343_05
Date(s) of test of EUT:	10/22/2003, 10/24/2003

Remark:
The test results effects only to the relate items tested. The test report shall not be reproduced except in full without the written approval of the testing laboratory

Test laboratory: EMCE GmbH Ingenieurbüro für EMV-Prüfungen
und Schaltungsentwicklung
Laupheimer-Str. 25d
88483 Burgrieden / Germany
DAR-Registrierungsummer: TTI-P-G164/98
FCC Registration No. 90568

Test engineer: Mr. Hauser
EMCE GmbH Ingenieurbüro für EMV-Prüfungen
und Schaltungsentwicklung

EUT description: Industrial power supply with fixed output voltage $24V_{dc}$ at max. output current 5A. Input supply range 100-240VAC 50/60 Hz. "DC OK" voltage threshold 18…$22V_{dc}$.

EUT size: 100x85x75 mm (LxWxH)

Used accessories:

Designation	Type	Manufacturer	S/N
Variable resistor	13Ω/650W	Frizlen	Inv.Nr. 541
Multimeter	Fluke 77A	Fluke	Inv.Nr. 506
Multimeter	Protek 506	Protek	Inv.Nr. 573

EUT configuration:

Harness	Type	Length	Remarks
Mains leads	3-Wire	1.3 m	L/N/PE
DC-Output leads	2-Wire	2.0 m	xx

Additional information: The corresponding German edition of the regulations were used for the test procedures.

List of valid equipment

☒	Inv-Nr.	Designation	Type	Manufacturer	S/N
☒	001	Test receiver	ESS 5Hz - 1000 MHz	Rohde & Schwarz	833776/008
	002	Probe	ESH2-Z3	Rohde & Schwarz	-
	003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007
	004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003
☒	005	LISN 3	NNB 4/32T	Rolf Heine HF-Technik	4/32T-96015
	006	LISN	NNBM 8125	Schwarzbeck	8125371
	007	Absorbing clamp	MDS 21	Schwarzbeck	942436
	008	Antenna 9kHz - 30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002
	009	Antenna 30 - 300MHz	VHBA9123 / BBA9106	Schwarzbeck	435
☒	010	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	108
☒	011	Antenna 30 - 300MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
	012	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	166
	013	Antenna 9kHz - 30MHz	Loop antenna 1.5m	EMCE GmbH	-
	014	Open area test site	3m	EMCE GmbH	-
☒	015	Open area test site	10m	EMCE GmbH	-
	019	Burst generator	PEFT / PHV 41.2	Haefely	082948-50
☒	020	Coupling clamp	IP4A	Haefely	082672-13
☒	022	ESD-Gun	NSG 435	Schaffner	577
☒	024	HF-Generator	SMY01	Rohde & Schwarz	844146/046
	025	Current clamp BCI	F-120-2	FCC	47
☒	026	Coupling device network	CDN 801-M3-25	FCC	92
	027	Surge Generator	Transient 1000	EMC-Partner AG	TRA1000-85
	029	HF Amplifier	10W1000	Amplifier Research	10576
	030	Coupling device network	CDN-S9	EMCE GmbH	-
	031	Coupling device network	CDN-S9	EMCE GmbH	-

☒	Inv-Nr.	Designation	Type	Manufacturer	S/N
☒	032	HF Amplifier	75A250	Amplifier Research	22789
☒	033	Coupling device network	CDN-AF2	EMCE GmbH	
	034	Coupling device network	CDN-AF2	EMCE GmbH	
	035	3-Phase Coupling network	CDN-1000	EMC-Partner AG	CDN-1000-45
	036	Coupling device network	CDN-M5-25	EMCE GmbH	
	037	Coupling device network	CDN-S1	EMCE GmbH	
	038	Helmholtz coil	Rectangular 1x1m	EMCE GmbH	
	039	Helmholtz coil	Rectangular 1x1m	EMCE GmbH	
	040	Current transformer		EMCE GmbH	
	041	HZ-10	Shielded coil	Rohde & Schwarz	849788/020
☒	042	AC-Source / Analyser / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/0 0501
☒	xx	Susceptibility test equipment according EN 61000-4-3	Full anechoic chamber 3m test site	Siemens	xx
	043	Receiver	3DH/E Field meter ESM-100	Maschek	971521
☒	044	CDN	CN-U	EMC-Partner AG	86
	045	CDN	DN-HF	EMC-Partner AG	86
	046	CDN	DN-LF2	EMC-Partner AG	86
	047	CDN	DN-LF1	EMC-Partner AG	86
☒	048	ESD-/Burst-/Surge-Generator	Transient 2000	EMC-Partner AG	561
	049	ESD-Gun	ESD 2000	EMC-Partner AG	012

Scope:

1 EMC - Test(s)

1.1 Emission according DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

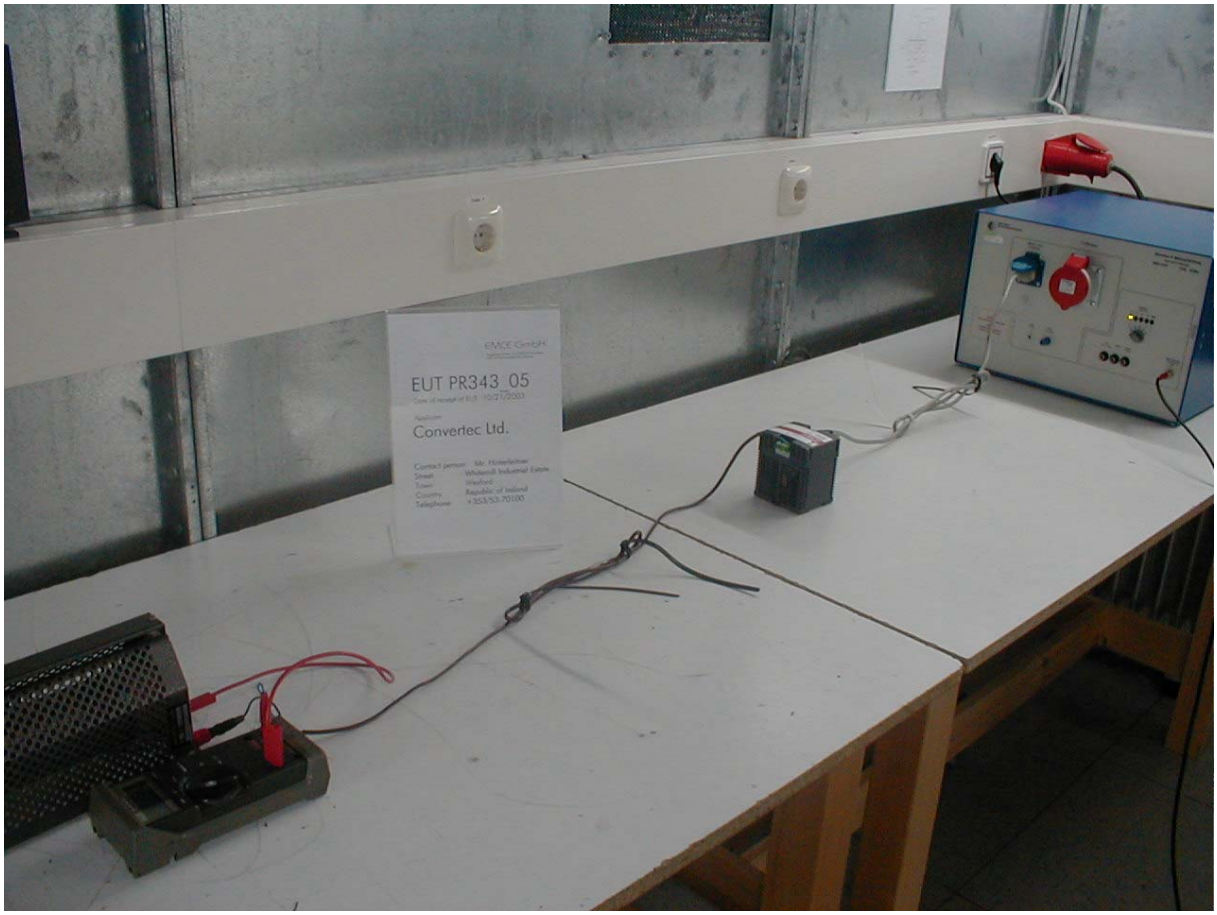
1.1.1 Conducted emission according DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

1.1.1.1 Test setup

According DIN EN 55011 (VDE 0875 Teil 11) /05.2000

Test location: ☒ Shielded room ☐ Laboratory
☐ __

☒ The test equipment was checked and complied to the requirements.



1.1.1.2 Test

Regulation:

DIN EN 55011 (VDE 0875 Teil 11) /05.2000
☐ 9kHz - 30MHz ☒ 150kHz - 30MHz

ISM-Classification	☒	Group 1*	☐	Group 2**
Limits:	☒	Class B	☐	Class A

*Group 1 comprises all ISM appliances, which use rf energy for internal functions.
**Group 2 comprises all ISM appliances, which use rf energy for tooling material.

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

Port #	Lead	Remarks
#1	Mains leads	L1/N/PE
#2		
#3		

Continuous operation at 3.3A load*.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept ☐ were not kept

Test results:

Measurements are made with a CISPR receiver. If the emanation is closer than 6dB to the limits or more, the receiver will stop and measure the exact value with quasipeak or average. The frequency, the maximum quasipeak value and the limit will be printed out.

Summary:

Limits for continuous disturbances: ☒ kept ☐ not kept

Remarks: * This mode met "worst case" operation.

Protocol scope:

☒ Readings
☒ Diagram continuous emanations

EMCE GmbH Ing_buero fuer EMV_Pruefungen

22. Oct 03 09:23

Terminal voltage

EUT:	SMPS TCL120-124
Manuf:	Convertec Ltd.
Op Cond:	3.3A load
Operator:	Mr. Hauser
Test Spec:	EN 55011 ISM-Appliances Class B
Comment:	TestID_EUT PR343_05
	CO343_11, Phase L1

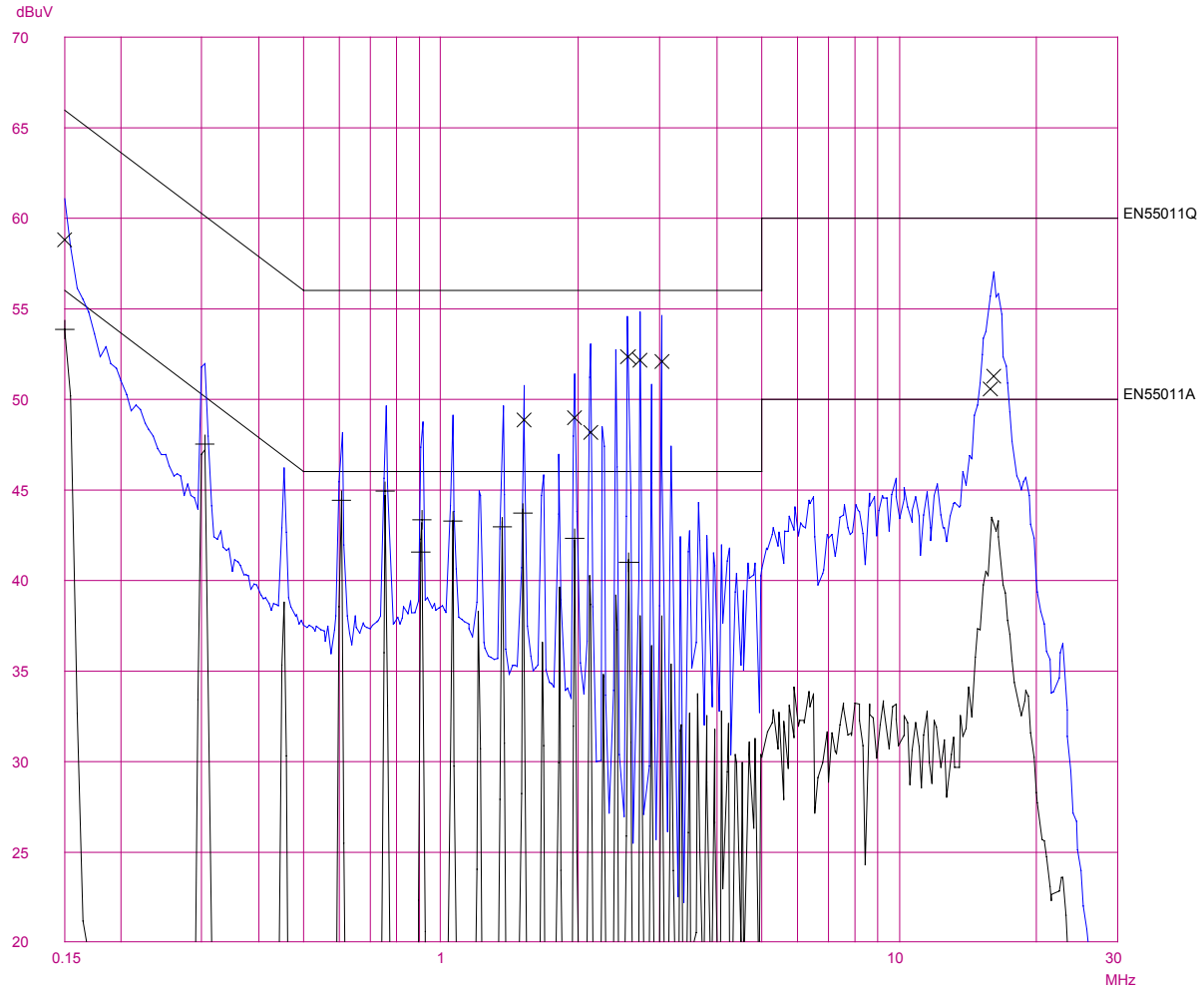
Scan Settings (1 Range)

|--------- Frequencies ----------||---------- Receiver Settings ----------|

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 50
Acc Margin: 6dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m



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22. Oct 03 09:23

Terminal voltage

EUT: SMPS TCL120-124
Manuf: Convertec Ltd.
Op Cond: 3.3A load
Operator: Mr. Hauser
Test Spec: EN 55011 ISM-Appliances Class B
Comment: TestID_EUT PR343_05
CO343_11, Phase L1

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15000	58.8	66.0
1.52000	48.8	56.0
1.96000	48.9	56.0
2.13000	48.1	56.0
2.56500	52.3	56.0
2.71500	52.1	56.0
3.02500	52.0	56.0
15.87000	50.5	60.0
16.09000	51.2	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.15000	53.9	56.0
0.30500	47.5	50.1
0.60500	44.4	46.0
0.75500	44.9	46.0
0.90500	41.5	46.0
0.91000	43.3	46.0
1.06000	43.2	46.0
1.36500	42.9	46.0
1.51500	43.7	46.0
1.96500	42.3	46.0
2.57000	40.9	46.0

* limit exceeded

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22. Oct 03 09:35

Terminal voltage

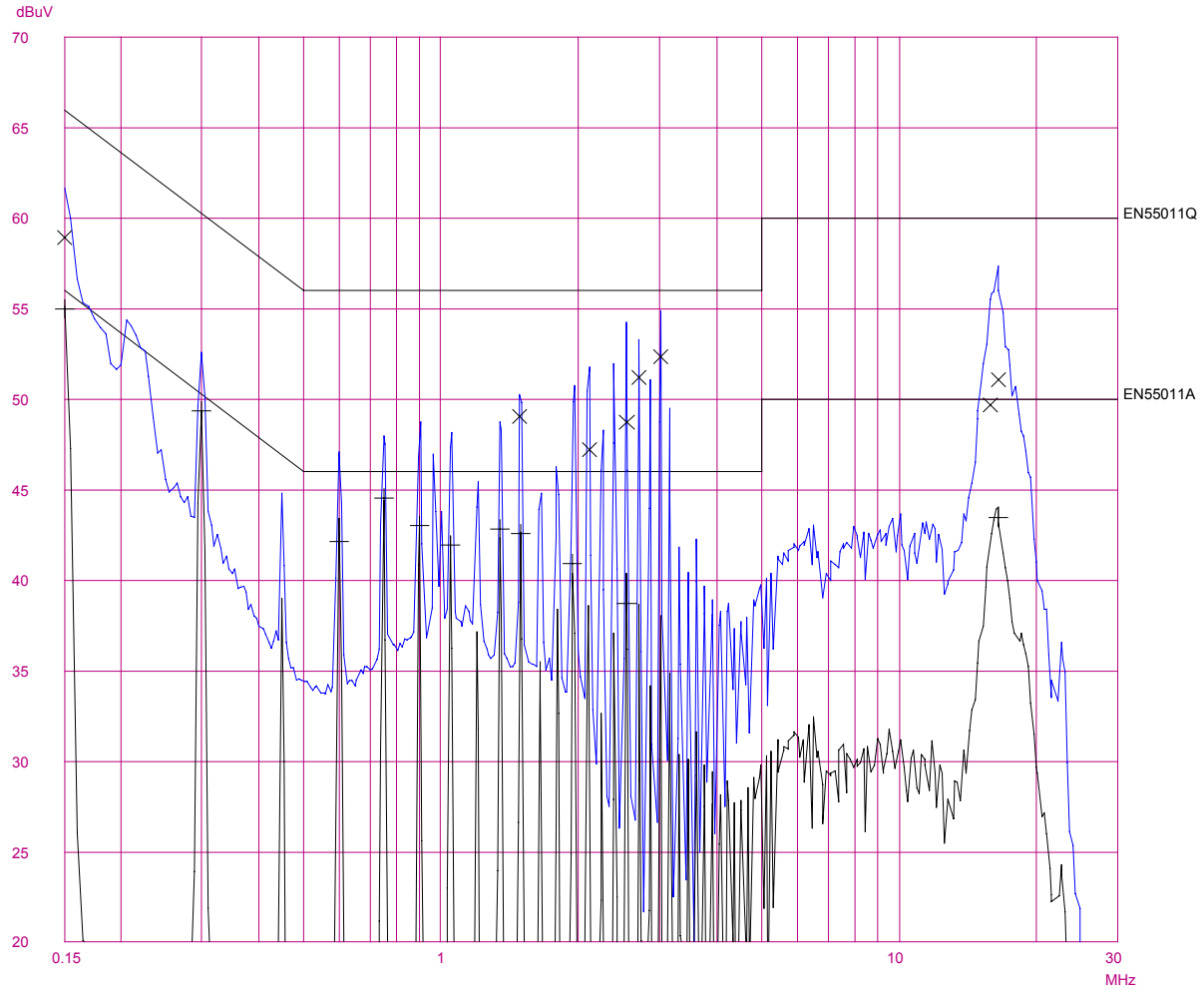
EUT:	SMPS TCL120-124
Manuf:	Convertec Ltd.
Op Cond:	3.3A load
Operator:	Mr. Hauser
Test Spec:	EN 55011 ISM-Appliances Class B
Comment:	TestID_EUT PR343_05
	CO343_12, Phase N

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 50
Acc Margin: 6dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m



EMCE GmbH Ing_buero fuer EMV_Pruefungen

22. Oct 03 09:35

Terminal voltage

EUT: SMPS TCL120-124
Manuf: Convertec Ltd.
Op Cond: 3.3A load
Operator: Mr. Hauser
Test Spec: EN 55011 ISM-Appliances Class B
Comment: TestID_EUT PR343_05
CO343_12, Phase N

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15000	58.9	66.0
1.49000	49.0	56.0
2.11000	47.2	56.0
2.54000	48.7	56.0
2.69500	51.2	56.0
3.00500	52.3	56.0
15.87000	49.7	60.0
16.48500	51.1	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.15000	54.9	56.0
0.30000	49.3	50.2
0.60000	42.1	46.0
0.75000	44.5	46.0
0.90000	43.0	46.0
1.05000	41.9	46.0
1.34500	42.8	46.0
1.49500	42.5	46.0
1.94500	40.9	46.0
2.54500	38.7	46.0
16.49500	43.4	50.0

* limit exceeded

1.1.2 Radio disturbances according DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

1.1.2.1 Test setup

According DIN EN 55011 (VDE 0875 Teil 11) /05.2000

Test location:

Precompliance	☐	Shielded room	☐	Laboratory
Full compliance	☐	Anechoic chamber		
	☐	OATS 3m	☒	OATS 10m

☒ The test equipment was checked and complied to the requirements.

1.1.2.2 Test

Regulation:

DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

☐	9kHz - 30MHz	☐	150kHz - 30MHz
☒	30MHz - 1000MHz	☐	11,7 – 12,7GHz

ISM-Classification	☒	Group 1*	☐	Group 2**
Limits:	☒	Class B	☐	Class A

*Group 1 comprises all ISM appliances, which use rf energy for internal functions.
**Group 2 comprises all ISM appliances, which use rf energy for tooling material.

Operation mode:

EUT arrangement:	☒	Tabletop	☐	Floor standing

Continuous operation at 3.6A load*.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test:	☒	were kept
	☐	were not kept

Test results:

Measurements are made with a CISPR receiver. If the emanation is closer than 6dB to the limits or more, the receiver will stop and measure the exact value with quasipeak or average. The frequency, the maximum quasipeak value and the limit will be printed out.

Summary:

Limits for continuous disturbances: ☒ kept ☐ not kept

Remarks: * This mode met "worst case" operation.

Protocol scope:

☒ Readings - Antenna horizontal polarized.
☒ Diagram radio disturbances - Antenna horizontal polarized.
☒ Readings - Antenna vertical polarized.
☒ Diagram radio disturbances - Antenna vertical polarized.
☐ Precompliance measuerment(s).

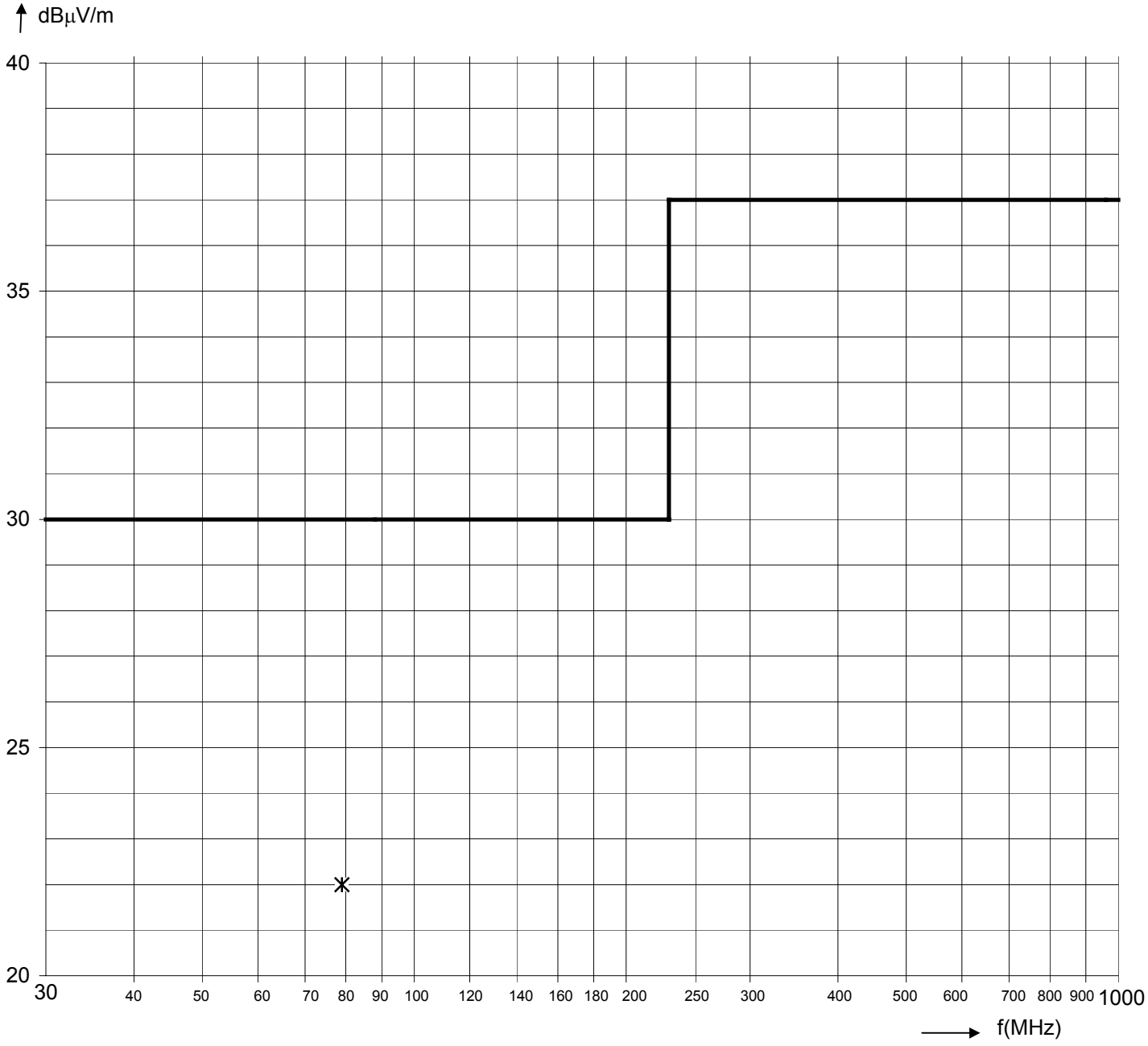
Readings - Antenna horizontal polarized

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
79.000	11.3	8.9	1.8	22.0	30.0	8.0	4.0	H
157.000	1.5	12.8	2.6	17.0	30.0	13.0	4.0	H

Diagram radio disturbances - Antenna horizontal polarized

Limits according DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

☐ Class A
☒ Class B



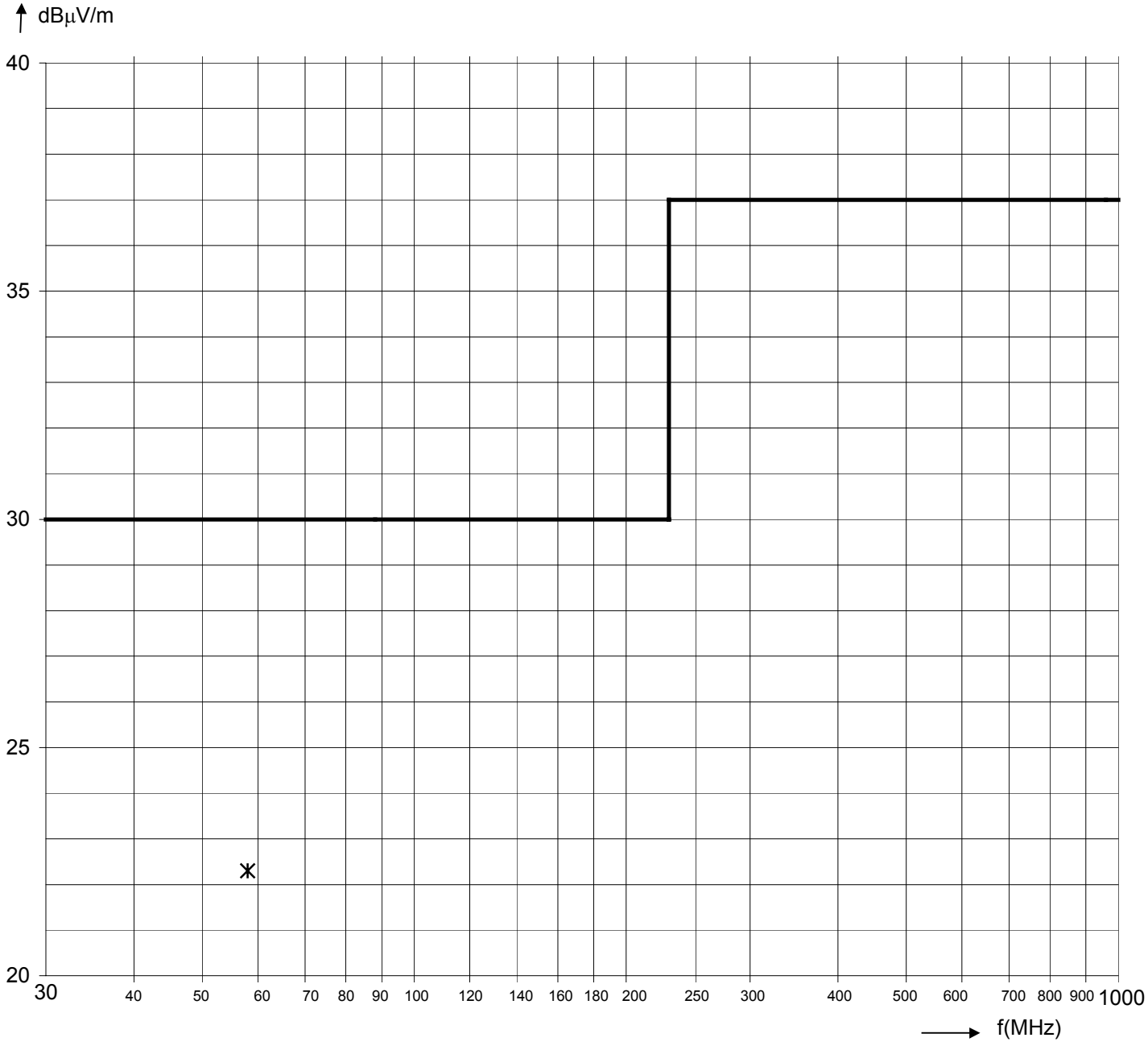
Readings - Antenna vertical polarized

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
58.000	12.6	8.2	1.5	22.3	30.0	7.7	1.0	V

Diagram radio disturbances - Antenna vertical polarized

Limits according DIN EN 55011 (VDE 0875 Teil 11) / 05.2000

☐ Class A
☒ Class B

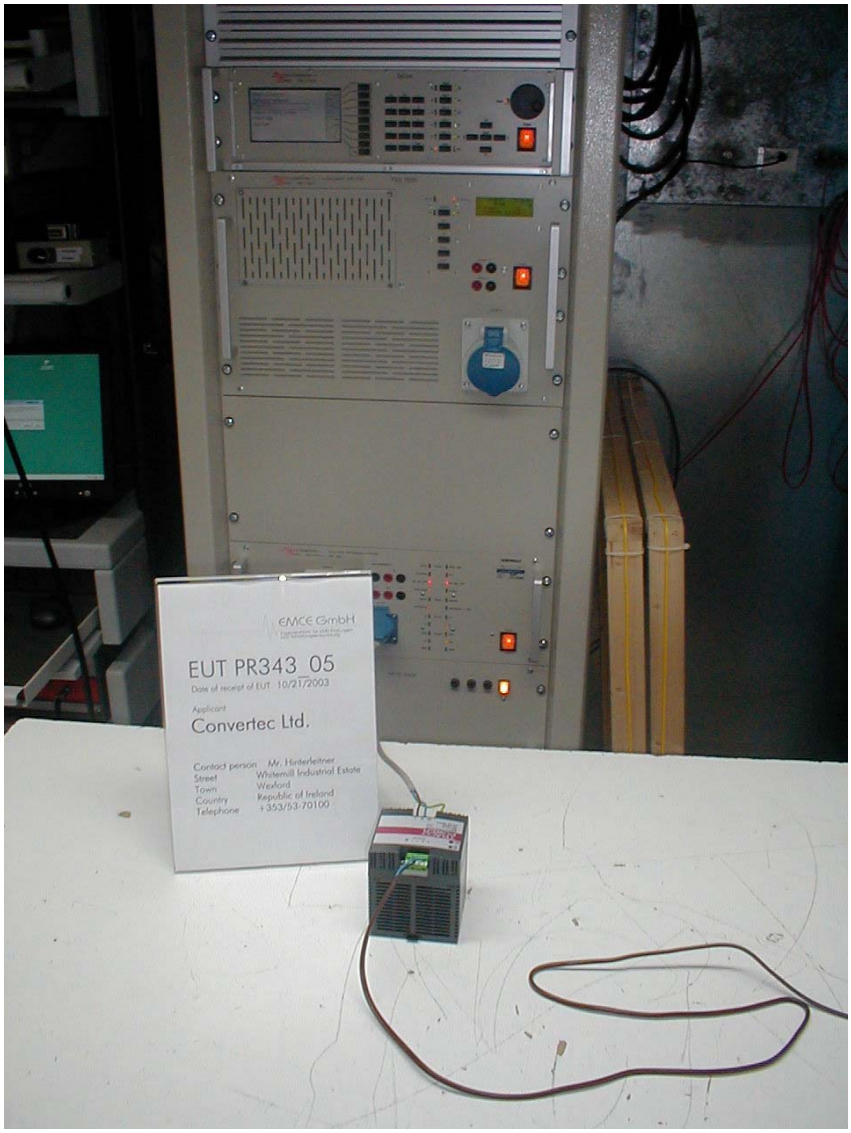


1.2 Harmonic current emissions according DIN EN 61000-3-2 (VDE 0838 Teil 2) / 12.2001

1.2.1 Test set up

According DIN EN 61000-3-2 (VDE 0838 Teil 2) / 12.2001

Test location:	☐	Shielded room	☒	Laboratory
	☐	Open field	☐	_



1.2.2 Test

Regulation:

DIN EN 61000-3-2 (VDE 0838 Teil 2) / 12.2001
100Hz - 2000Hz
Limit:

☐ Constant Harmonics ☒ Fluctuating Harmonics
☒ Class A ☐ Class B ☐ Class C ☐ Class D

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

The EUT was supplied via an AC-Source.
Continuous operation at maximum load*.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept ☐ were not kept

Test results:

Limits: ☒ kept ☐ not kept ☐ not relevant

Remarks: *This mode met “worst case” operation.

Diagrams:

☒ Harmonic test table
☒ Bar chart – Window #1
☒ Diagram margin

Name:	Mr. Hauser	Serial no:	xx
Department:	EMC Testing	Operating modes:	Max. load 5A
Company:	EMCE GmbH	Comment1:	EUT ID / PR343_05
Test report no:	xx	Comment2:	230V/50Hz
Device:	SMPS	Comment3:	--
Specimen:	Class A	Comment4:	--
Manufacturer:	Convertec Ltd	Date:	28.10.2003
Type:	TCL 120-124	Test date:	22.10.2003

Maximum RMS current and corresponding values in timewindow 443:

Voltage:	230.38 Vrms		THD=0.03 %	THV=0.058 V	POHV=0.024 V	PWHD=0.06 %
Current:	1.167 Arms		THD=169.22 %	THC=1.006 A	POHC=0.101 A	PWHD=115.53 %
Power:	135.3 W	P1=135.3 W	268.9 VA			
Powerfactor:	0.503	CosPhi1: 0.994				

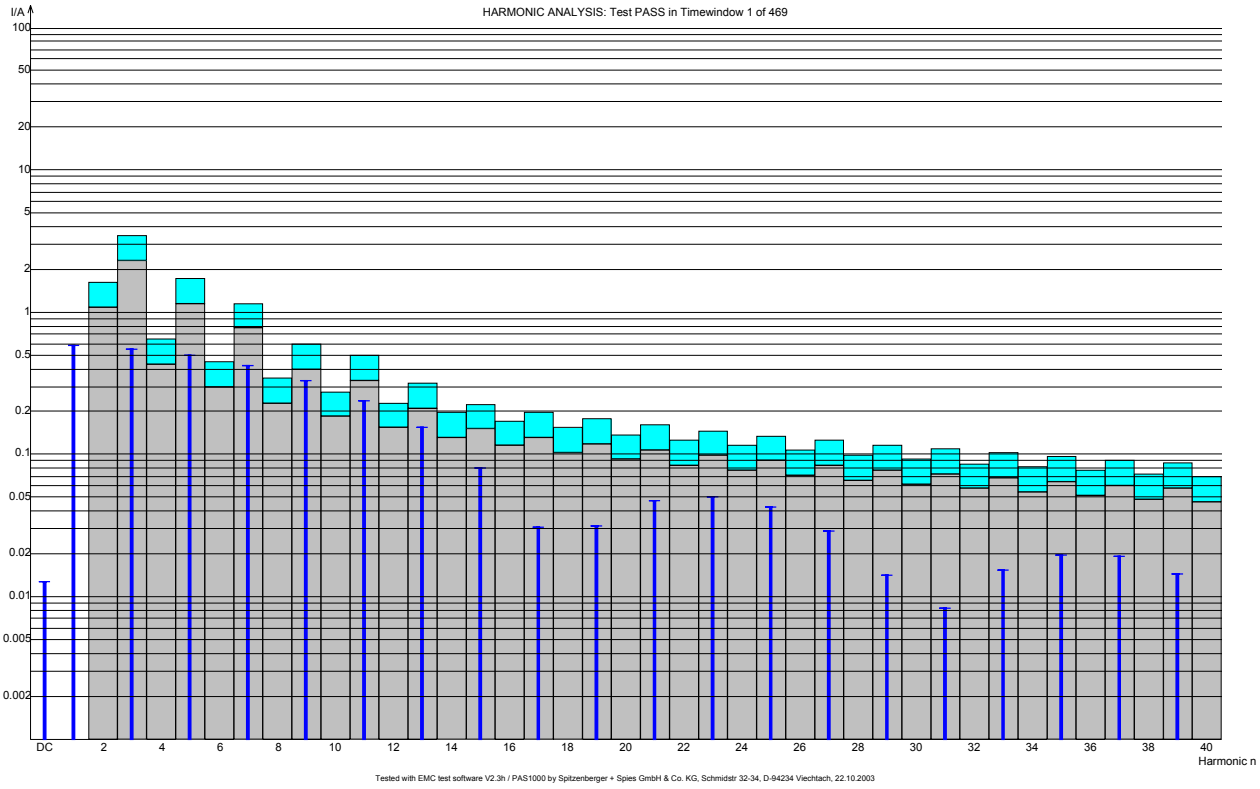
Testconditions: EN 61000-3-2 / A14, f=50 Hz, Phase=L1, Range=4.00 A
Time window cycles=16, Grouping of harmonics=off

HARMONIC ANALYSIS: Test PASS
Tobs = worst 2.5 min: tw 1..469 POHC: avg=0.099 A, limits=0.251 A

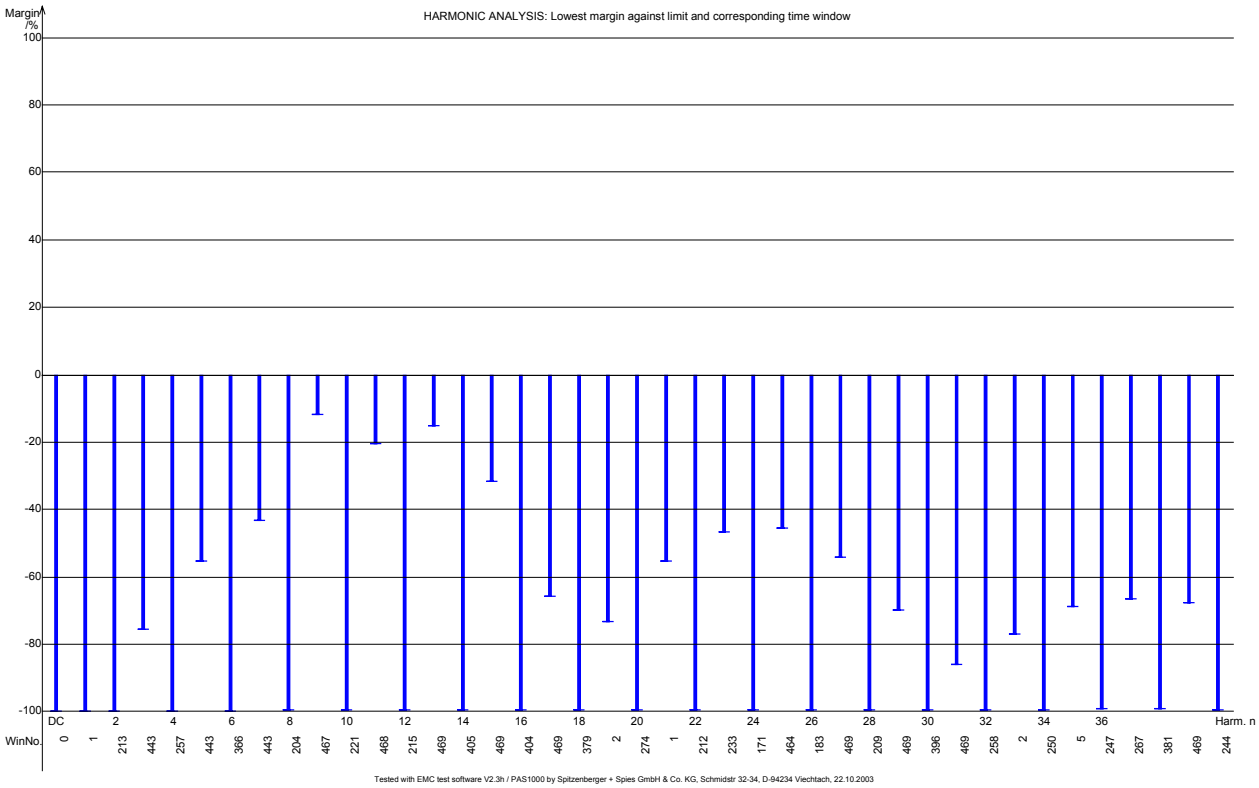
Ha	Entire measurement (2.5 min = 469 time windows)						Worst 2.5 min		Worst 2.5 min avg		PASS	FAIL
	Maximum	Window	EN61000-3-2 Class A	Margin in MaxWin	100 to 150%	Ex-ceeded	100 to 150%	Ex-ceeded	Value	Ex-ceeded		
DC	0.0135 A	153	-.- - - -	- - - . -	0	0	0	0	-0.0124 A	0	X	
1	0.5927 A	1	-.- - - -	- - - . -	0	0	0	0	0.5902 A	0	X	
2	0.0009 A	213	1.0800 A	-99.9 %	0	0	0	0	0.0007 A	0	X	
3	0.5613 A	443	2.3000 A	-75.6 %	0	0	0	0	0.5590 A	0	X	
4	0.0011 A	257	0.4300 A	-99.7 %	0	0	0	0	0.0007 A	0	X	
5	0.5087 A	443	1.1400 A	-55.4 %	0	0	0	0	0.5056 A	0	X	
6	0.0008 A	366	0.3000 A	-99.7 %	0	0	0	0	0.0006 A	0	X	
7	0.4362 A	443	0.7700 A	-43.4 %	0	0	0	0	0.4319 A	0	X	
8	0.0010 A	204	0.2300 A	-99.6 %	0	0	0	0	0.0006 A	0	X	
9	0.3522 A	467	0.4000 A	-12.0 %	0	0	0	0	0.3460 A	0	X	
10	0.0009 A	221	0.1840 A	-99.5 %	0	0	0	0	0.0006 A	0	X	
11	0.2632 A	468	0.3300 A	-20.2 %	0	0	0	0	0.2557 A	0	X	
12	0.0006 A	215	0.1533 A	-99.6 %	0	0	0	0	0.0004 A	0	X	
13	0.1778 A	469	0.2100 A	-15.3 %	0	0	0	0	0.1695 A	0	X	
14	0.0006 A	405	0.1314 A	-99.5 %	0	0	0	0	0.0004 A	0	X	
15	0.1026 A	469	0.1500 A	-31.6 %	0	0	0	0	0.0946 A	0	X	
16	0.0005 A	404	0.1150 A	-99.6 %	0	0	0	0	0.0003 A	0	X	
17	0.0453 A	469	0.1324 A	-65.8 %	0	0	0	0	0.0394 A	0	X	
18	0.0004 A	379	0.1022 A	-99.6 %	0	0	0	0	0.0003 A	0	X	
19	0.0317 A	2	0.1184 A	-73.2 %	0	0	0	0	0.0285 A	0	X	
20	0.0006 A	274	0.0920 A	-99.4 %	0	0	0	0	0.0003 A	0	X	
21	0.0478 A	1	0.1071 A	-55.4 %	0	0	0	0	0.0451 A	0	X	
22	0.0005 A	212	0.0836 A	-99.4 %	0	0	0	0	0.0003 A	0	X	
23	0.0523 A	233	0.0978 A	-46.5 %	0	0	0	0	0.0519 A	0	X	
24	0.0005 A	171	0.0767 A	-99.4 %	0	0	0	0	0.0003 A	0	X	
25	0.0491 A	464	0.0900 A	-45.4 %	0	0	0	0	0.0473 A	0	X	
26	0.0004 A	183	0.0708 A	-99.4 %	0	0	0	0	0.0003 A	0	X	
27	0.0381 A	469	0.0833 A	-54.2 %	0	0	0	0	0.0350 A	0	X	
28	0.0003 A	209	0.0657 A	-99.6 %	0	0	0	0	0.0002 A	0	X	
29	0.0233 A	469	0.0776 A	-70.0 %	0	0	0	0	0.0198 A	0	X	
30	0.0003 A	396	0.0613 A	-99.4 %	0	0	0	0	0.0002 A	0	X	
31	0.0101 A	469	0.0726 A	-86.0 %	0	0	0	0	0.0088 A	0	X	
32	0.0004 A	258	0.0575 A	-99.4 %	0	0	0	0	0.0002 A	0	X	
33	0.0157 A	2	0.0682 A	-76.9 %	0	0	0	0	0.0127 A	0	X	
34	0.0004 A	250	0.0541 A	-99.3 %	0	0	0	0	0.0003 A	0	X	
35	0.0201 A	5	0.0643 A	-68.7 %	0	0	0	0	0.0187 A	0	X	
36	0.0004 A	247	0.0511 A	-99.1 %	0	0	0	0	0.0003 A	0	X	
37	0.0205 A	267	0.0608 A	-66.4 %	0	0	0	0	0.0202 A	0	X	
38	0.0004 A	381	0.0484 A	-99.3 %	0	0	0	0	0.0002 A	0	X	
39	0.0187 A	469	0.0577 A	-67.6 %	0	0	0	0	0.0173 A	0	X	
40	0.0003 A	244	0.0460 A	-99.4 %	0	0	0	0	0.0002 A	0	X	

Tested with EMC test software V2.3h / PAS1000 by Spitzenberger + Spies GmbH & Co. KG, Schmidstr 32-34, D-94234 Viechtach, 22.10.2003

Spectrum Timewindow 1 of 469 - EN61000-3-2 Class A



Graphical Harmonic Overview - EN61000-3-2 Class A

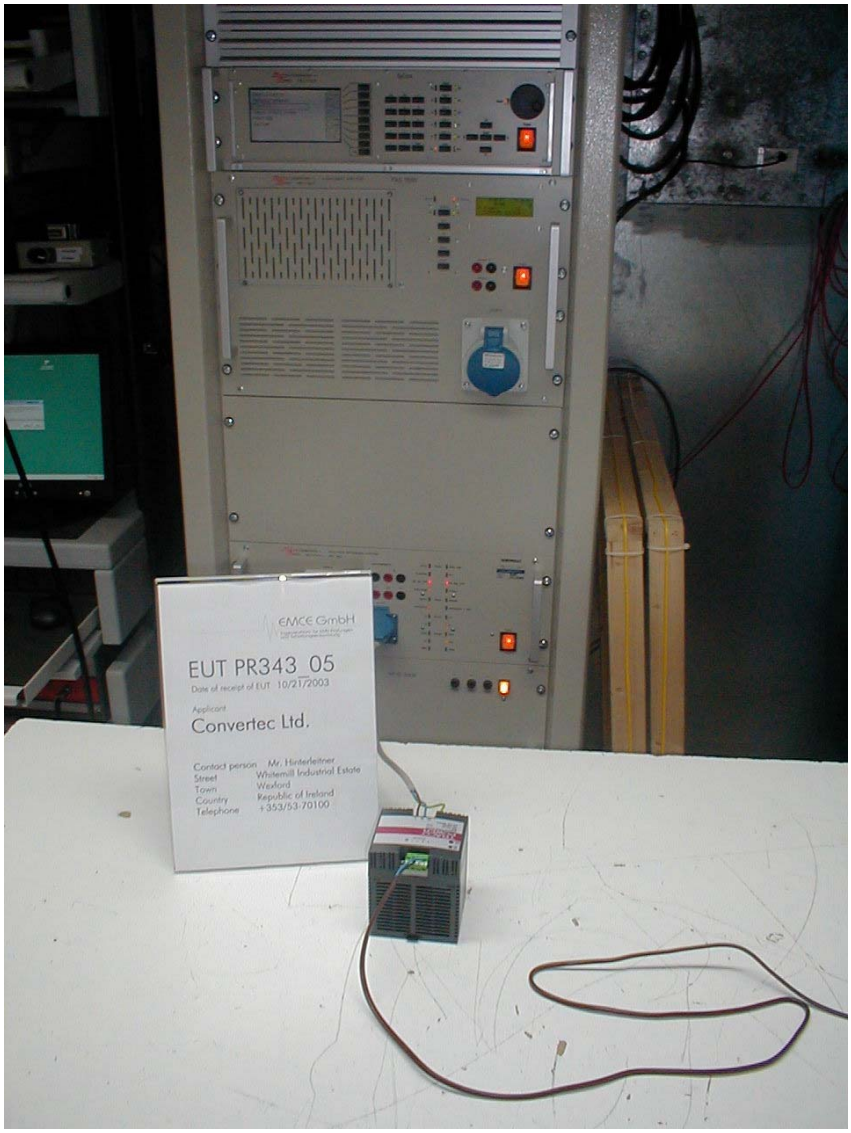


1.3 Voltage fluctuations and flicker according DIN EN 61000-3-3 (VDE 0838 Teil 3) / 05.2002

1.3.1 Test set up

According DIN EN 61000-3-3 (VDE 0838 Teil 3) / 05.2002

Test location:	☐	Shielded room	☒	Laboratory
	☐	Open field	☐	_



1.3.2 Test

Regulations:

DIN EN 61000-3-3 (VDE 0838 Teil 3) / 05.2002

☒ Voltage changes measured at a norm impedance according the „Voltage Method“
R_A= 0.24Ω / X_A= 0.15Ω at 50Hz
R_N= 0.16Ω / X_N= 0.10Ω at 50Hz

☐ Voltage changes measured according with the „Current Method“ - Precompliant.

☒ Voltage changes caused by hand.
- dc < 3.3%
- dmax < 4.0%
- d(t) < 500ms

The observation time for one cycle is 1 minute.

☐ Voltage changes, flicker caused by program
- dc < 3.3%
- dmax < 6.0%
- d(t) < 500ms
- Pst < 1
- Plt < 0.65

The observation time for one cycle is 10 minutes.

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

To get the voltage dips, the power supply was switched on / off at maximum load current. This procedure was repeated 24 times to get the maximum values.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept
☐ were not kept

Test results:

Limits: ☒ kept
☐ not kept
☒ Pst, Plt – not relevant

Remarks: xx

Name:	Mr. Hauser	Serial no:	xx
Department:	EMC Testing	Operating modes:	Max. load 5A
Company:	EMCE GmbH	Comment1:	EUT ID / PR343_05
Test report no:	xx	Comment2:	230V/50Hz
Device:	SMPS	Comment3:	--
Specimen:	Manual switching	Comment4:	--
Manufacturer:	Convertec Ltd	Date:	28.10.2003
Type:	TCL 120-124	Test date:	22.10.2003

Testconditions: 230 V / 50 Hz / Phase: L1 / Observations: 24 x 1 min / Ztest: (0.40+j0.25) Ohm

FLICKER: Test PASS!

Time	Pmax	Pst	Sliding Plt	d(t)>3.30% [s]	dmax [%]	dc [%]	PASS	FAIL
10:27:05	0.752	0.2230	-.----	0.000	0.988	0.093	X	
10:28:05	0.742	0.2220	-.----	0.000	0.991	0.093	X	
10:29:05	2.340	0.3310	-.----	0.000	1.224	0.025	X	
10:30:05	2.187	0.3220	-.----	0.000	1.622	0.020	X	
10:31:04	2.341	0.3310	-.----	0.000	1.272	0.019	X	
10:32:04	2.143	0.3200	-.----	0.000	1.621	0.017	X	
10:33:04	0.642	0.2140	-.----	0.000	0.931	0.016	X	
10:34:04	1.944	0.3080	-.----	0.000	1.571	0.014	X	
10:35:04	0.892	0.2340	-.----	0.000	1.099	0.014	X	
10:36:04	0.649	0.2140	-.----	0.000	0.934	0.013	X	
10:37:04	1.310	0.2660	-.----	0.000	1.328	0.013	X	
10:38:04	0.910	0.2360	0.2767	0.000	0.982	0.012	X	
10:39:04	1.872	0.3030	0.2827	0.000	1.568	0.012	X	
10:40:04	1.747	0.2960	0.2878	0.000	0.992	0.013	X	
10:41:04	0.672	0.2160	0.2787	0.000	0.952	0.013	X	
10:42:04	0.719	0.2200	0.2703	0.000	0.983	0.011	X	
10:43:04	0.664	0.2150	0.2599	0.000	0.944	0.012	X	
10:44:04	1.653	0.2900	0.2565	0.000	1.486	0.012	X	
10:45:04	2.465	0.3380	0.2681	0.000	1.516	0.012	X	
10:46:04	1.985	0.3110	0.2684	0.000	0.913	0.012	X	
10:47:04	1.082	0.2500	0.2695	0.000	1.213	0.008	X	
10:48:04	1.437	0.2750	0.2736	0.000	1.395	0.013	X	
10:49:04	2.181	0.3220	0.2789	0.000	1.632	0.013	X	
10:50:04	0.594	0.2090	0.2775	0.000	0.950	0.007	X	
Limits:		1.000	0.650	0.500	4.000	3.300		
Plt: 0.277118								
Evaluated: dc, dmax average (1.207 %), d(t)								

FLICKER: Source test PASS!

Time	Pmax	Pst	Sliding Plt	d(t)>3.30% [s]	dmax [%]	dc [%]	PASS	FAIL
10:27:05	0.000	0.0060	-.----	0.000	0.017	-.---	X	
10:28:05	0.000	0.0060	-.----	0.000	0.025	-.---	X	
10:29:05	0.000	0.0140	-.----	0.000	0.035	-.---	X	
10:30:05	0.000	0.0130	-.----	0.000	0.036	-.---	X	
10:31:04	0.000	0.0140	-.----	0.000	0.036	-.---	X	
10:32:04	0.000	0.0150	-.----	0.000	0.037	-.---	X	
10:33:04	0.000	0.0060	-.----	0.000	0.037	-.---	X	
10:34:04	0.000	0.0110	-.----	0.000	0.039	-.---	X	
10:35:04	0.000	0.0080	-.----	0.000	0.039	-.---	X	
10:36:04	0.000	0.0050	-.----	0.000	0.039	-.---	X	
10:37:04	0.000	0.0110	-.----	0.000	0.042	-.---	X	
10:38:04	0.000	0.0070	-.----	0.000	0.042	-.---	X	
10:39:04	0.000	0.0130	-.----	0.000	0.049	-.---	X	
10:40:04	0.000	0.0120	-.----	0.000	0.049	-.---	X	
10:41:04	0.000	0.0060	-.----	0.000	0.049	-.---	X	
10:42:04	0.000	0.0060	-.----	0.000	0.049	-.---	X	
10:43:04	0.000	0.0050	-.----	0.000	0.049	-.---	X	
10:44:04	0.000	0.0130	-.----	0.000	0.053	-.---	X	
10:45:04	0.000	0.0150	-.----	0.000	0.053	-.---	X	
10:46:04	0.000	0.0110	-.----	0.000	0.053	-.---	X	
10:47:04	0.000	0.0070	-.----	0.000	0.053	-.---	X	
10:48:04	0.000	0.0080	-.----	0.000	0.053	-.---	X	
10:49:04	0.000	0.0140	-.----	0.000	0.053	-.---	X	
10:50:04	0.000	0.0050	-.----	0.000	0.053	-.---	X	
Plt: 0.010827								
Evaluated: PST <= 0.4 dmax < 20% dmax1								

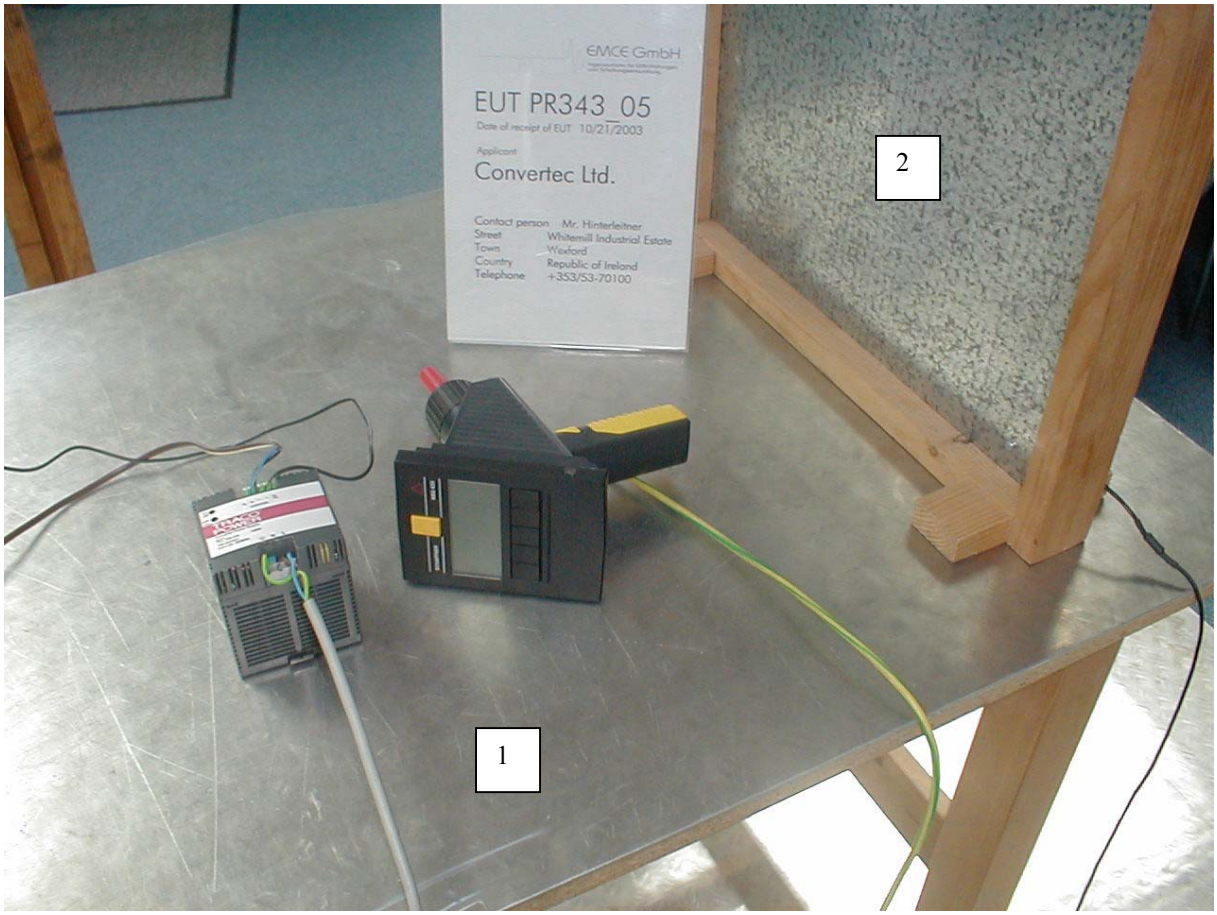
Tested with EMC test software V2.3h / PAS1000 by Spitzenberger + Spies GmbH & Co. KG, Schmidstr 32-34, D-94234 Viechtach, 22.10.2003

1.4 Electrostatic discharge immunity test according DIN EN 61000-4-2 (VDE 0847 Teil 4-2) / 12.2001

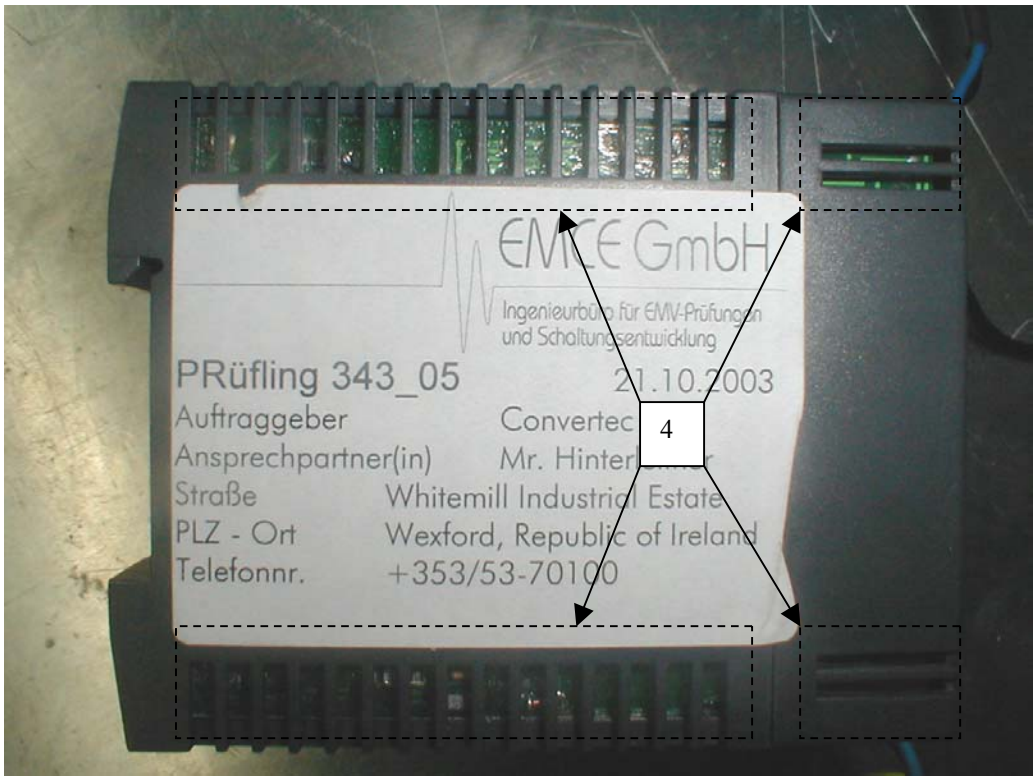
1.4.1 Test set up

According DIN EN 61000-4-2 (VDE 0847 Teil 4-2) / 12.2001

Test location: ☐ Shielded room ☒ Laboratory
☐ Open field ☐ _

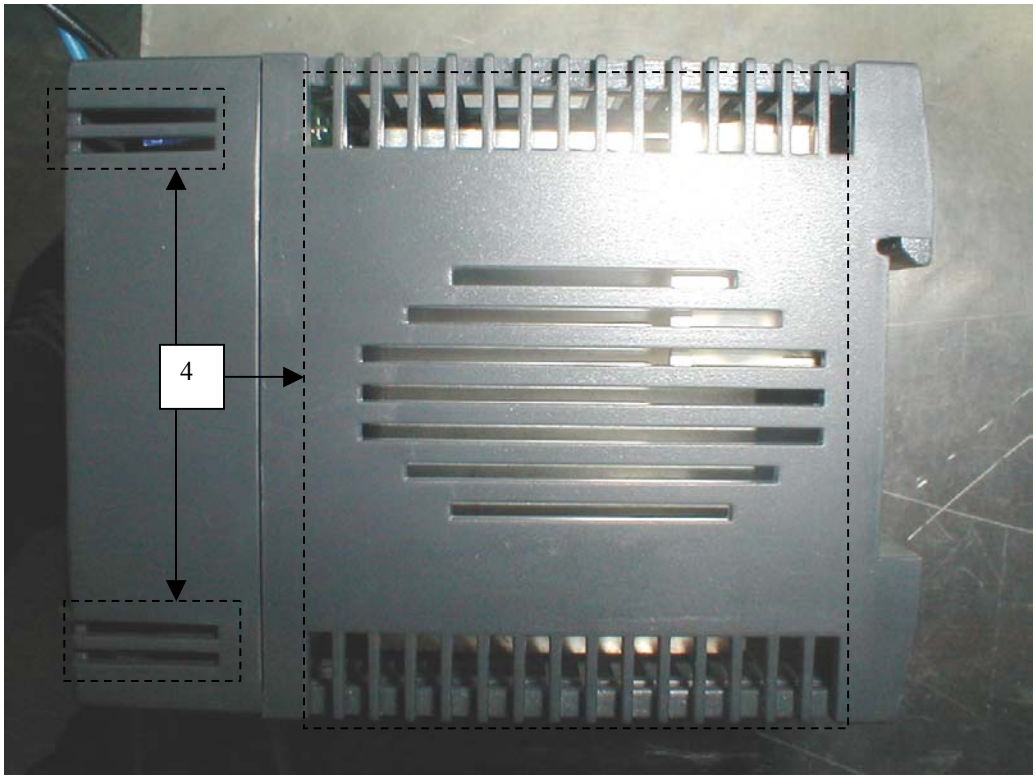



3
5
6
5
DC ON
O/P ADJ.
+ + - - DC OK
24VDC 5A
TRACO POWER
3
Industrial Power Supply
MODEL
TCL 120-124
120W
100-240VAC
2.4-1.2A 50/60Hz
N L


EMCE GmbH
Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung
PRüfling 343_05
21.10.2003
Auftraggeber
Convertec
Ansprechpartner(in)
Mr. Hinter
Straße
Whitemill Industrial Estate
PLZ - Ort
Wexford, Republic of Ireland
Telefonnr.
+353/53-70100
4


4


4


4

1.4.2 Test

Regulation:

DIN EN 61000-4-2 (VDE 0847 Teil 4-2) / 12.2001

Number of discharges:	☒	10 positive	☒	10 negative
Repetition rate:	☒	< 1 Pulse/s	☐	__Pulse/s
Test level Contact Discharge:	☒	±2kV	☒	±4kV
	☐	±6kV	☐	±__kV
Test level Air Discharge:	☒	±2kV	☒	±4kV
	☒	±8kV	☐	±__kV

Contact Discharge:

Port #	Discharge location	Test level ±2kV	Test level ±3kV	Test level ±4kV	Test level ±6kV	Test level ±8kV
1	Horizontal coupling plate	☒	☐	☒	☐	☐
2	Vertical coupling plate	☒	☐	☒	☐	☐
3	Output terminals	☒	☐	☒	☐	☐

Air Discharge:

Port #	Discharge location	Test level ±2kV	Test level ±4kV	Test level ±6kV	Test level ±8kV	Test level ±15kV
4	Air cooling ducts - housing	☒	☒	☐	☒	☐
5	DC ON LED / O/P Adj.	☒	☒	☐	☒	☐

The test level was increased step by step, starting from the lowest up to the given severity level, to evaluate the fault level. Minimum 10 discharges, with the most critical polarisation and level, were applied to the selected locations
All used test equipment are calibrated periodically.

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

Continuous operation at 2.5A load. During the test the output voltage and the "DC OK" voltage were observed.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept
☐ were not kept

Criterion B:

After the immunity test the EUT must work as intended. During the immunity test, there is some degradation of the performance allowed, but no change of the given working mode. The output voltage must be kept in the range of ± 5%.

Test results:

Immunity: ☒ Met criterion B
☐ Met not criterion B

Remarks: xx

1.5 Radiated, radio-frequency, electromagnetic field immunity test according DIN EN 61000-4-3 (VDE 0847 Teil 4-3) / 12.2001

1.5.1 Test set up

According DIN EN 61000-4-3 (VDE 0847 Teil 4-3) / 12.2001

Location:

Precompliance	☐	Shielded room	☐	Laboratory
Full compliance	☒	Full anechoic chamber		

☒ The test equipment was checked and complied to the requirements.


EUT PR343_05
Convertec Ltd.

1.5.2 Test

Regulation:

DIN EN 61000-4-3 (VDE 0847 Teil 4-3) / 12.2001

Frequency range:	☒	80MHz - 1000MHz	☐	26MHz - 1000MHz
Test level:	☐	1V/m	☐	3V/m
	☒	10V/m	☐	__V/m
Modulation:	☒	AM: 80%		
	☒	AF: 1000Hz		
	☐	not modulated		
	☒	900MHz pulsed - duty cycle 50% / f_{rep} 200Hz		
Frequency step:	☒	1% of the preceding frequency		
Sweep rate:	☒	0.0015 Decades/s	☐	__ Decades/s
Antenna – EUT:	☐	1m	☒	3m
Antenna polarisation:	☒	horizontal	☒	vertical

All used test equipment are calibrated periodically.

Operation mode:

EUT arrangement:	☒	Tabletop	☐	Floor standing
EUT Position:	☒	Front	☐	Backside
	☒	Side / 90°	☐	Side / 270°

Continuous operation at 2.5A load. During the test the output voltage and the “DC OK” LED were observed.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test:
☒ were kept
☐ were not kept

Criterion A:

During the immunity test the EUT must work as intended. There is no degradation of the performance allowed and no change of the given working mode. The output voltage must be kept in the range of ± 2%.

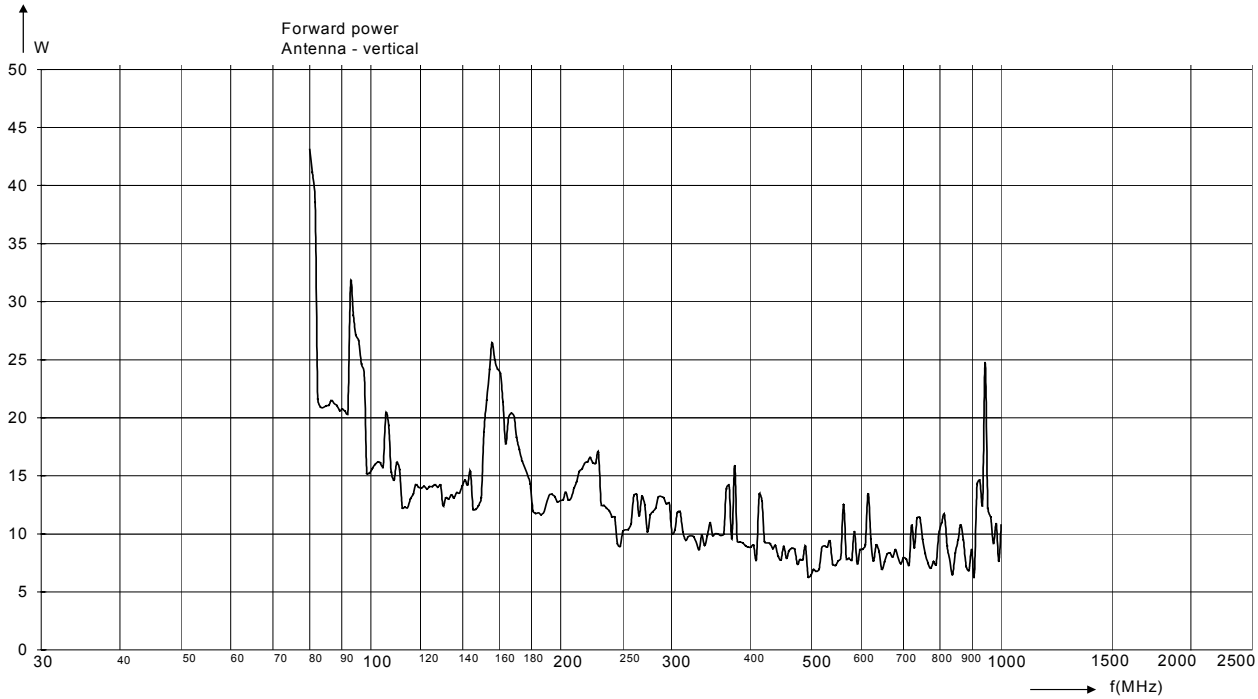
Test results:

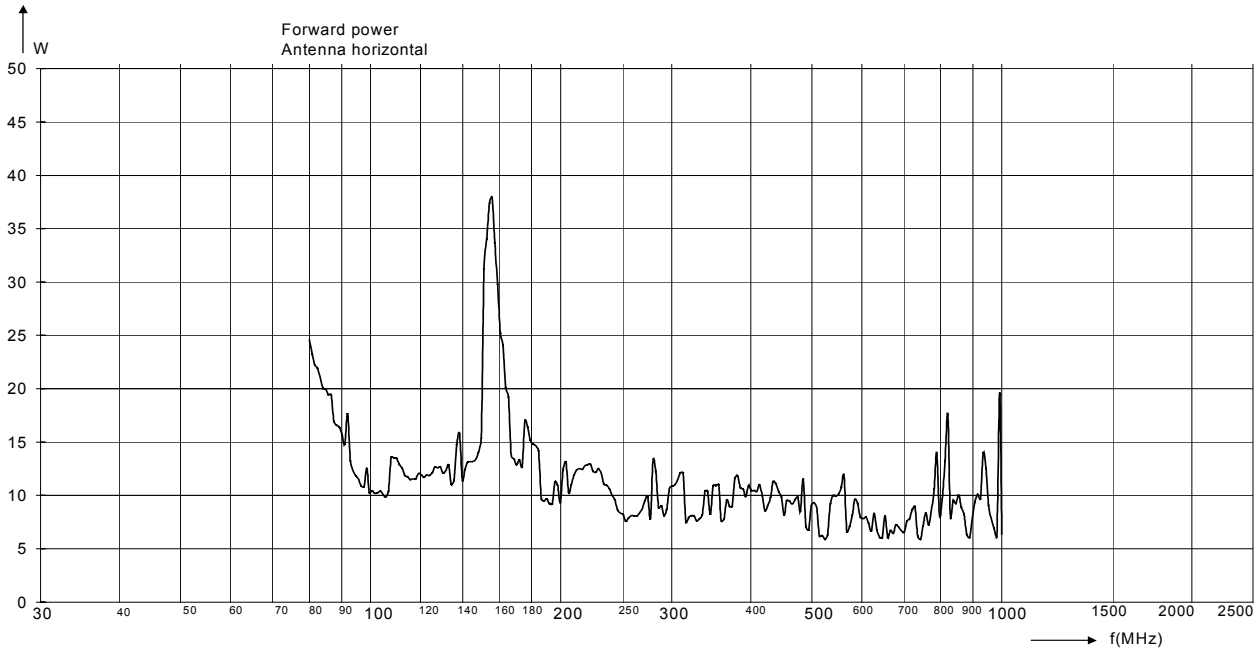
Frequency	Ant.-Polarization	Test parameter / max. deviation	Remarks

Immunity: ☒ Met criterion A
☐ Met not criterion A

Remarks: According customer request, the power supply was tested without “DC OK” flying lead.

Test level: 10V/m



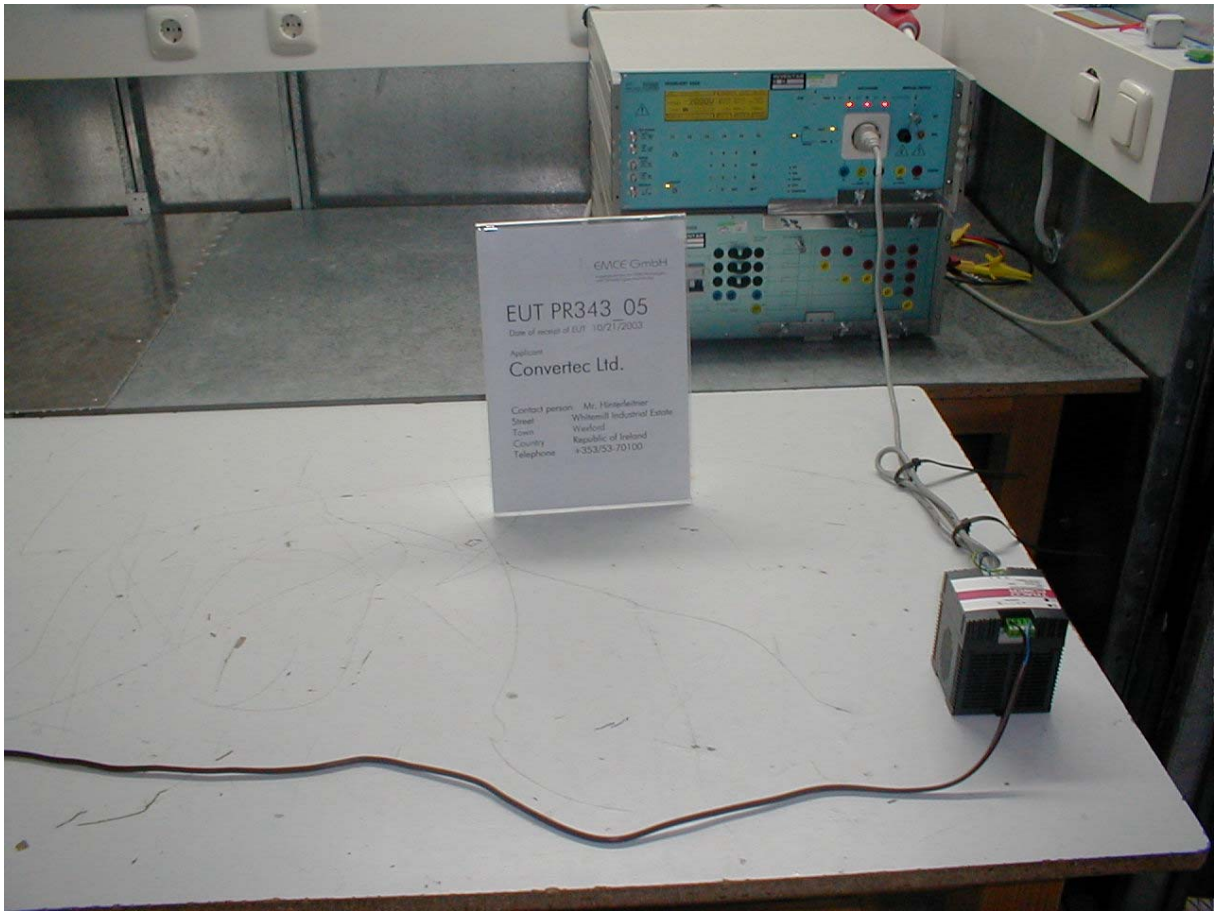


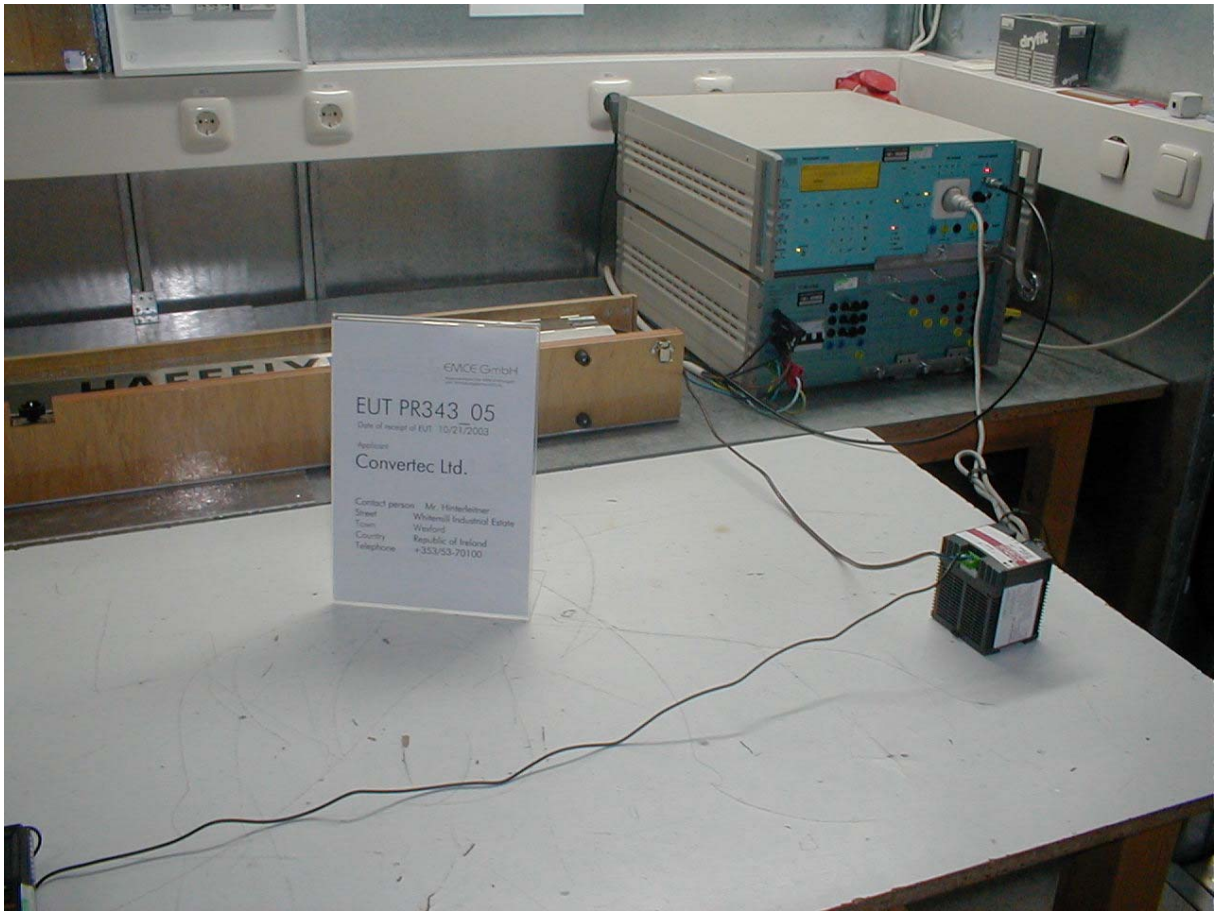
1.6 Electrical fast transient / burst immunity test according DIN EN 61000-4-4 (VDE 0847 Teil 4-4) / 12.2001

1.6.1 Test set up

According DIN EN 61000-4-4 (VDE 0847 Teil 4-4) / 12.2001

Test location:	☒	Shielded room	☐	Laboratory
	☐	Open field	☐	_




EMCE GmbH
EUT PR343_05
Convertec Ltd.

1.6.2 Test

Regulation:

DIN EN 61000-4-4 (VDE 0847 Teil 4-4) / 12.2001

Burst frequency:	☒	5kHz	☐	__kHz
Burst duration:	☒	15ms	☐	__ms
Burst repetition freq.:	☒	3Hz	☐	__Hz
Test duration:	☒	>120s		
Polarity	☒	positive	☒	negative

Coupling ports:

Port #1: Mains leads

Coupled to: L, N, PE, L-N, L-PE, N-PE, L-N-PE

Coupling device:	☒	CDN	☐	Coupling clamp
Test level:	☐	± 0.5kV	☐	± 1kV
	☒	± 2kV	☐	± 4kV

Port #2: DC – Output leads

Coupled to:+ / -

Coupling device:	☐	CDN	☒	Coupling clamp
Test level:	☐	± 0.5kV	☐	± 1kV
	☒	± 2kV	☐	± 4kV

Port #3: "DC OK" leads

Coupled to: DC OK / -

Coupling device:	☐	CDN	☒	Coupling clamp
Test level:	☐	± 0.5kV	☒	± 1kV
	☐	± 2kV	☐	± 4kV

All used test equipment are calibrated periodically.

Operation mode:

EUT arrangement:	☒	Tabletop	☐	Floor standing

Continuous operation at 2.5A load. During the test the output voltage and the "DC OK" voltage were observed.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept
☐ were not kept

Criterion B:

After the immunity test the EUT must work as intended. During the immunity test, there is some degradation of the performance allowed, but no change of the given working mode. The output voltage must be kept in the range of ± 5%.

Test results:

Immunity: ☒ Met criterion B
☐ Met not criterion B

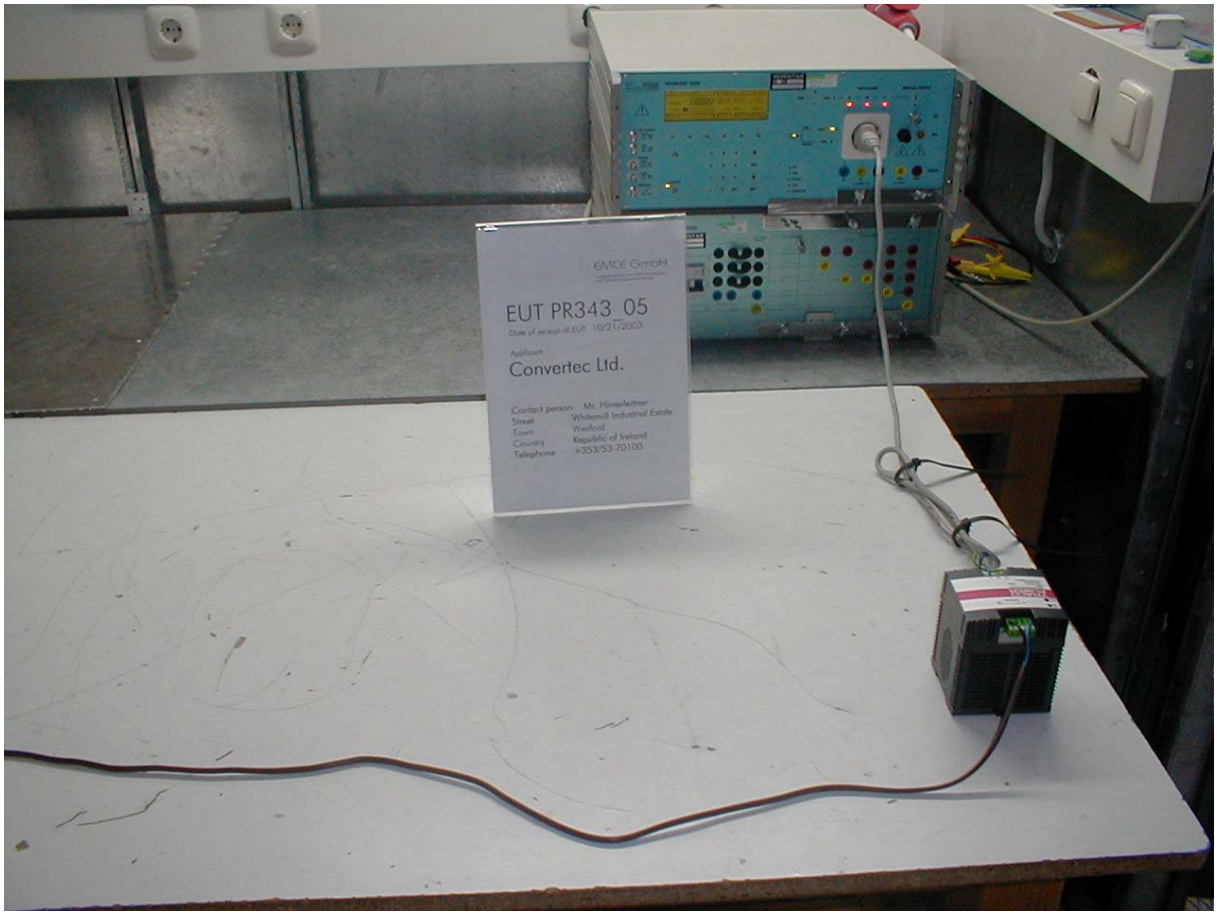
Remarks: xx

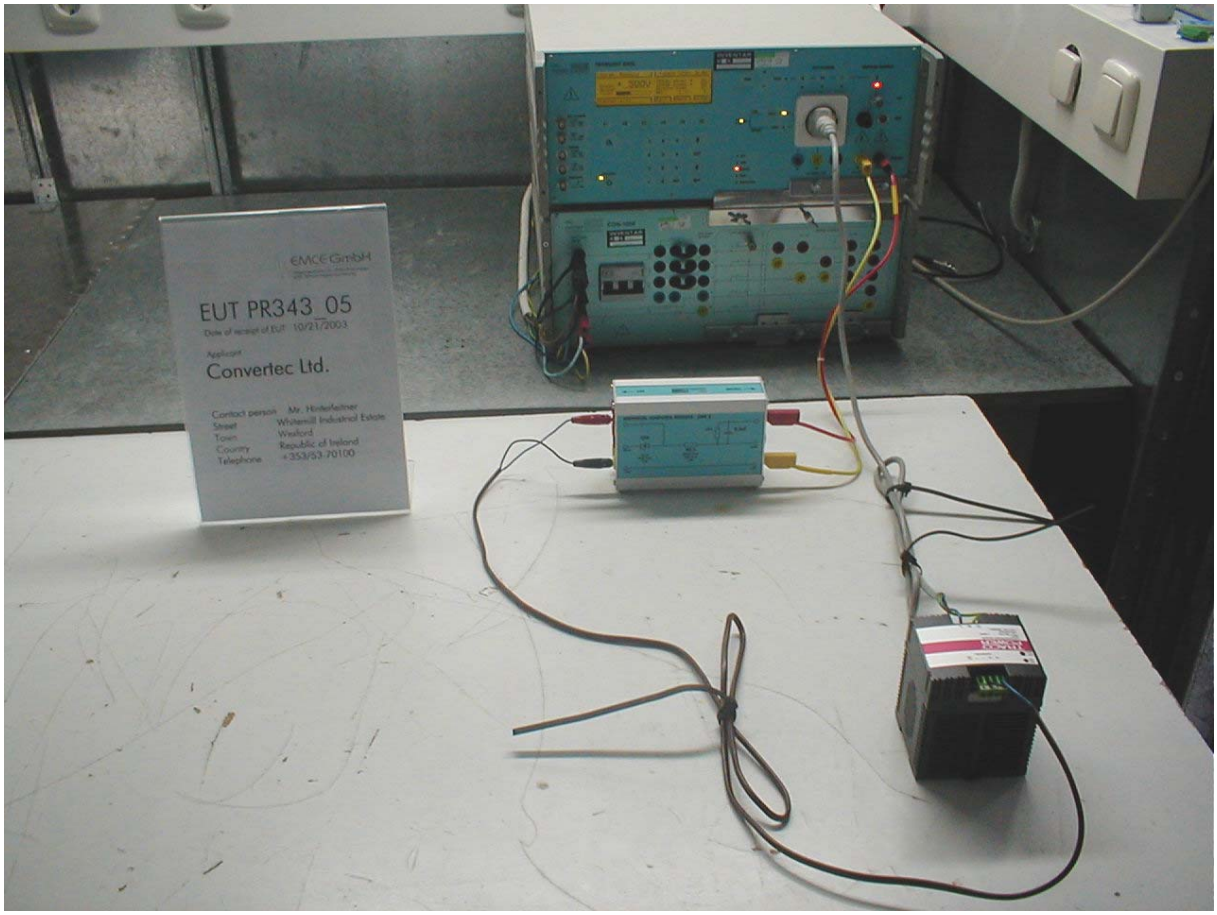
1.7 Surge immunity test according DIN EN 61000-4-5 (VDE 0847 Teil 4-5) / 12.2001

1.7.1 Test set up

According DIN EN 61000-4-5 (VDE 0847 Teil 4-5) / 12.2001

Test location: ☒ Shielded room ☐ Laboratory
☐ Open field ☐ _




EMCE GmbH
EUT PR343_05
Date of receipt of EUT 10/21/2003
Applicant
Convertec Ltd.
Contact person Mr. Hinterleitner
Street Whitemill Industrial Estate
Town Wexford
Country Republic of Ireland
Telephone +353/53.70100

1.7.2 Test

Regulation:

DIN EN 61000-4-5 (VDE 0847 Teil 4-5) / 12.2001

Number of surges:	☒	5 positive	☒	5 negative
Angle:	☒	0 Degree	☒	90 Degree
	☒	270 Degree	☐	__ Degree
Repetition rate:	☒	1 Surge / min	☐	__ Surge / min

Coupling ports:

Port #1: Mains leads

Type of lines: PE applied

Coupling device:	☒	CDN	☐		
Coupled to:	☒	L - N	☐	L/N - PE	☐
Test level:	☒	± 0.5kV	☒	± 1kV	
	☐	± 2kV	☐	± 4kV	
Source impedance:	☒	2Ω+18µF	☐	12Ω+9µF	
	☐	42Ω+0.1µF	☐	42Ω+0.5µF	
Coupled to:	☒	L - PE	☒	N – PE	☐
Test level:	☒	± 0.5kV	☒	± 1kV	
	☒	± 2kV	☐	± 4kV	
Source impedance:	☐	2Ω+18µF	☒	12Ω+9µF	
	☐	42Ω+0.1µF	☐	42Ω+0.5µF	

Port #2: DC leads

Type of lines: PE applied

Coupling device:	☒	CDN	☐		
Coupled to:	☒	+ / -	☐		
Test level:	☒	± 0.5kV	☐	± 1kV	
	☐	± 2kV	☐	± 4kV	
Source impedance:	☐	2Ω+18µF	☐	12Ω+9µF	
	☐	42Ω+0.1µF	☒	42Ω+0.5µF	
Coupled to:	☒	+ / PE	☒	- / PE	☐
Test level:	☒	± 0.5kV	☐	± 1kV	
	☐	± 2kV	☐	± 4kV	
Source impedance:	☐	2Ω+18µF	☐	12Ω+9µF	
	☐	42Ω+0.1µF	☒	42Ω+0.5µF	

All used test equipment are calibrated periodically.

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

Continuous operation at 2.5A load. During the test the output voltage and the "DC OK" voltage were observed.

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept ☐ were not kept

Criterion B:

After the immunity test the EUT must work as intended. During the immunity test, there is some degradation of the performance allowed, but no change of the given working mode. The output voltage must be kept in the range of ± 5%.

Test results:

Immunity: ☒ Met criterion B ☐ Met not criterion B

Remarks: The "DC OK" leads were not tested, it is supposed that they are shorter than 30m.

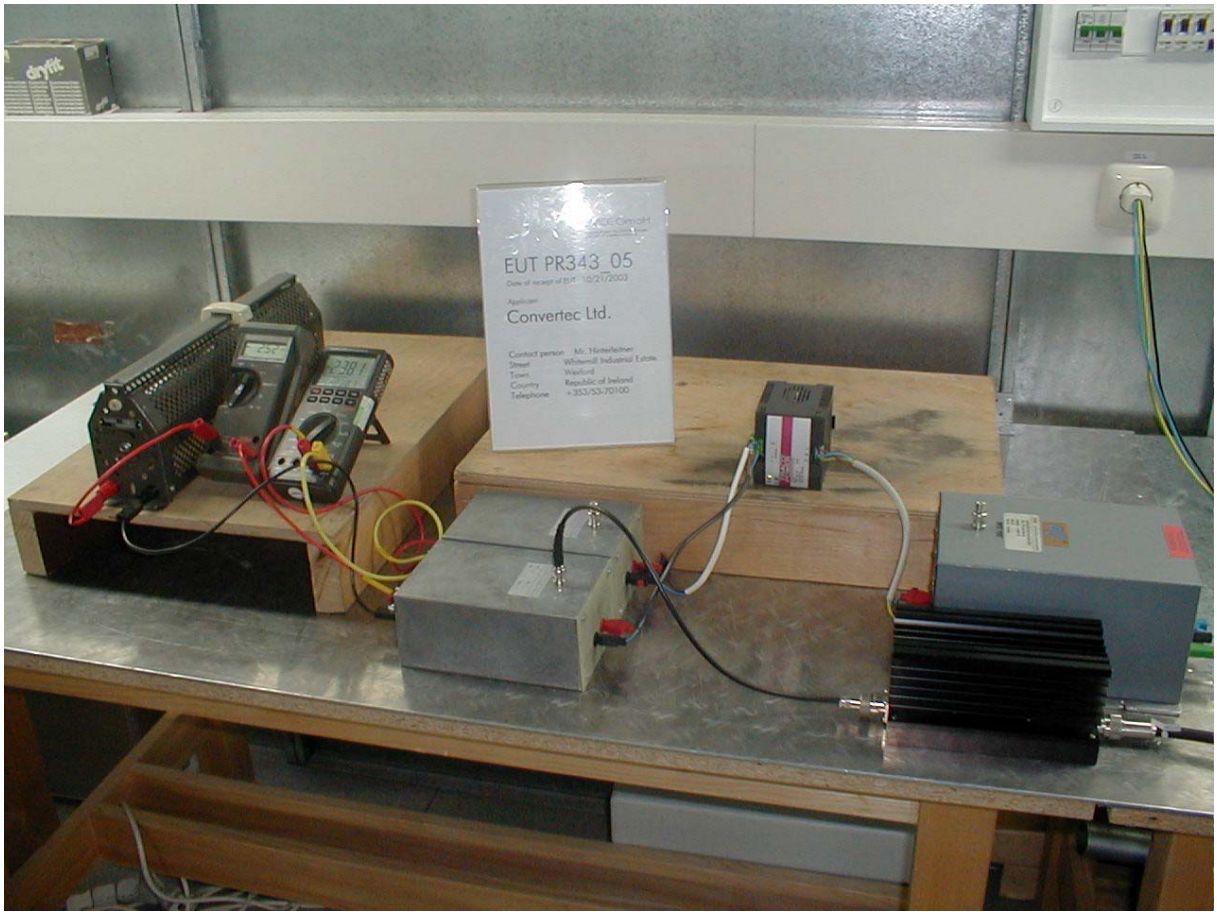
1.8 Immunity to conducted disturbances, induced by radio-frequency fields according DIN EN 61000-4-6 (VDE 0847 Teil 4-6) / 12.2001

1.8.1 Test set up

According DIN EN 61000-4-6 (VDE 0847 Teil 4-6) / 12.2001

Test location: ☒ Shielded room ☐ Laboratory
☐ Open field ☐ _

☒ The test equipment was checked and complied to the requirements.



1.8.2 Test

Regulation:

DIN EN 61000-4-6 (VDE 0847 Teil 4-6) / 12.2001

Frequency range:	☒	150kHz - 80MHz	☐	150kHz - 230MHz
Test level:	☐	1V	☐	3V
	☒	10V	☐	__V
Modulation	☒	AM: 80%		
	☒	AF: 1000Hz		
	☐	not modulated		
Frequency step:	☒	1% of the preceding frequency		
Sweep rate:	☒	0.0015 Decades/s	☐	__ Decades/s

Coupling ports:

Port #1: Mains leads

Type of line:	☒	unshielded	☐	shielded
Signal type:	☒	analogous	☐	digital
Status of lines:	☒	active	☐	passive
Cable length EUT –CDN:		20cm		
Coupling device network:	☐	CDN-AF2	☒	CDN-M3
	☐	CDN-M5	☐	CDN-S9
Clamp:	☐	F-120-2		

Port #2: DC-leads

Type of line:	☒	unshielded	☐	shielded
Signal type:	☒	analogous	☐	digital
Status of lines:	☒	active	☐	passive
Cable length EUT –CDN:		20cm		
Coupling device network:	☒	CDN-AF2	☐	CDN-M3
	☐	CDN-M5	☐	CDN-S9
Clamp:	☐	F-120-2		

Port #3: "DC OK" leads

Type of line:	☒	unshielded	☐	shielded
Signal type:	☒	analogous	☐	digital
Status of lines:	☒	active	☐	passive

Cable length EUT –CDN: 20cm

Coupling device network:	☒	CDN-AF2	☐	CDN-M3
	☐	CDN-M5	☐	CDN-S9
Clamp:	☐	F-120-2		

All used test equipment are calibrated periodically.

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

Continuous operation at 2.5A load. During the test the output voltage and the "DC OK" voltage were observed.

Coupling- / Decoupling-Network	CDN-AF2 Inv. Nr. 033	CDN-AF2 Inv. Nr. 034	CDN-M3 Inv. Nr. 026	CDN-M5 Inv. Nr. 036	CDN-S1 Inv. Nr. 037	CDN-S9 Inv. Nr. 030	CDN-S9 Inv. Nr. 031	CDN-F-120-2 Inv. Nr. 025
Port								
#1	☐	☐	☒	☐	☐	☐	☐	☐
#2	☒	☐	☐	☐	☐	☐	☐	☐
#3	☐	☒	☐	☐	☐	☐	☐	☐

Environmental conditions:

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

The environmental conditions during the test: ☒ were kept ☐ were not kept

Criterion A:

During the immunity test the EUT must work as intended. There is no degradation of the performance allowed and no change of the given working mode. The output voltage must be kept in the range of ± 2%.

Immunity:	☒	Met criterion A
	☐	Met not criterion A
Remarks:	xx	

1.9 Immunity against low frequency magnetic fields according DIN EN 61000-4-8 (VDE 0847 Teil 4-8) / 12.2001

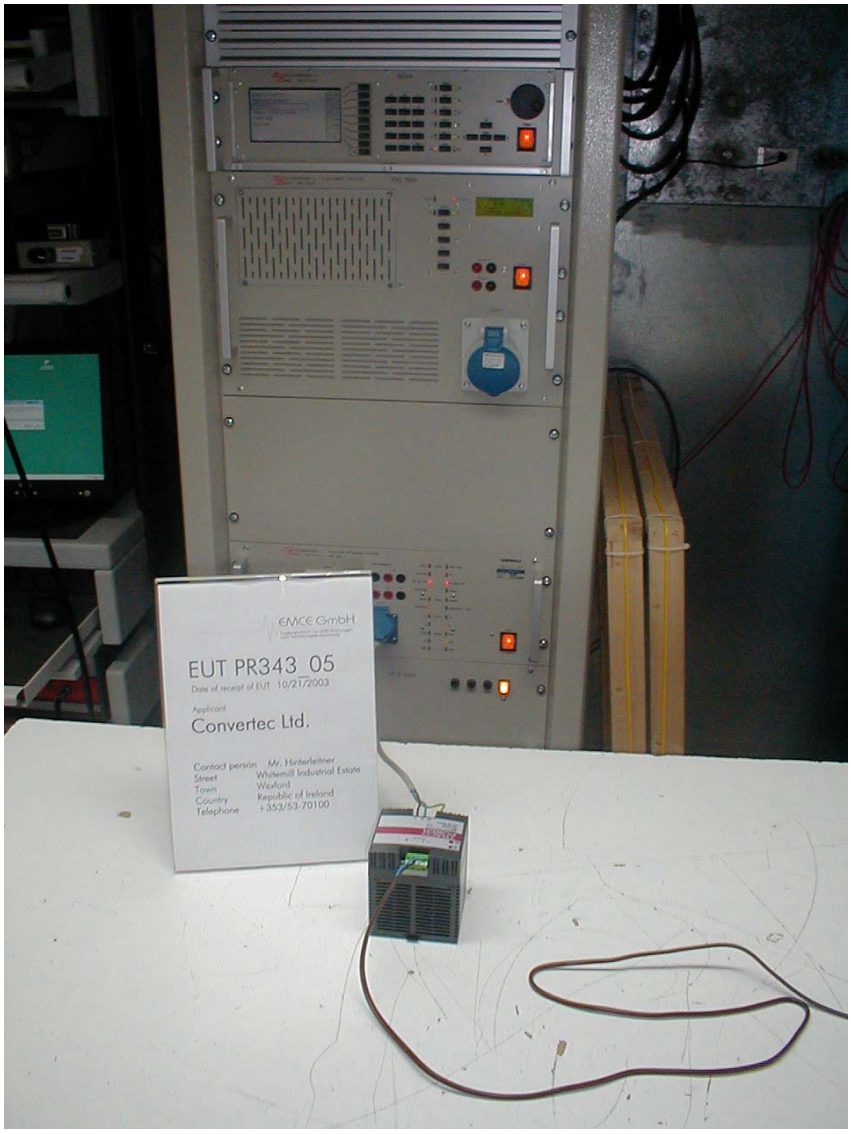
Not tested, there are no parts inside which are sensitive to low frequency magnetic fields.

1.10 Voltage dips, short interruptions and voltage variations immunity tests according DIN EN 61000-4-11 (VDE 0847 Teil 4-11) / 12.2001

1.10.1 Test set up

According DIN EN 61000-4-11 (VDE 0847 Teil 4-11) / 12.2001

Test location:	☐	Shielded room	☒	Laboratory
	☐	Open field	☐	_



1.10.2 Test

Regulation:

DIN EN 61000-4-11 (VDE 0847 Teil 4-11) / 12.2001
Nominal mains voltage UN: ☒ 230V ☐ __V
Nominal mains frequency: f: ☒ 50Hz ☐ __Hz
All used test equipment are calibrated periodically.

Name:	Mr. Hauser	Serial no:	xx
Department:	EMC Testing	Operating modes:	Max. load 5A
Company:	EMCE GmbH	Comment1:	EUT ID / PR343_05
Test report no:	xx	Comment2:	230V/50Hz
Device:	SMPS	Comment3:	--
Specimen:		Comment4:	--
Manufacturer:	Convertec Ltd	Date:	28.10.2003
Type:	TCL 120-124	Test date:	22.10.2003

Test conditions: EN 61000-4-11 voltage dips, short interruptions and variations test

Voltage / frequency:	230.0 V / 50.0 Hz
Test phase:	1
Executed test:	Dip example 1: Total drop out
Test description:	Total drop out, time increasing from 1 period up to 100 periods
Disturbances per step:	3 (per phase angle) / 10.5 sec delay between

Step	Disturbance	TestLevel	Duration	Phase angle(s) (Ref.Ph.1)
1	Voltage dip / short interruption	70 %	0.5 periods	0°
2	Voltage dip / short interruption	40 %	5 periods	0°
3	Voltage dip / short interruption	40 %	50 periods	0°
4	Voltage dip / short interruption	0 %	250 periods	0°

Operation mode:

EUT arrangement: ☒ Tabletop ☐ Floor standing

Continuous operation at 5A load. During the test the output voltage and the DC OK voltage were observed.

Environmental conditions:

Temperature: 15 - 35 °C
Humidity: 30 - 60 %
Air pressure: 860 - 1060 hPa

The environmental conditions during the test: ☒ were kept
☐ were not kept

Criterion B:

After the immunity test the EUT must work as intended. During the immunity test, there is some degradation of the performance allowed, but no change of the given working mode. The output voltage must be kept in the range of ± 5%.

Test results - Step #1:

Immunity: ☒ Met criterion B
☐ Met not criterion B

Remarks: xx

Criterion C:

A function degradation is allowed, but not a permanent failure.

Test results – Step #2, #3, #4:

Immunity: ☒ Met criterion C
☐ Met not criterion C

Remarks: xx

2 Summary

Regulation	Class / Test level	Result	Remark(s)
DIN EN 55011 VDE 0875 Teil 11 / 05.2000			
Conducted emission [0.15-30MHz]	B	Limits kept	
Radiated emission [30-1000MHz]	B	Limits kept	
DIN EN 61000-3-2 VDE 0838 Teil 2 / 12.2001			
Harmonic current emissions	A	Limits kept	
DIN EN 61000-3-3 VDE 0838 Teil 3/ 05.2002			
Flicker, Voltage fluctuations	Manual switching	Limits kept	
DIN EN 61000-4-2 VDE 0847 Teil 4-2/ 12.2001			
Electrostatic discharge			
- Air discharge	±2/4/8kV	Met criterion B	
- Contact discharge	±2/4kV	Met criterion B	
DIN EN 61000-4-3 VDE 0847 Teil 4-3/ 12.2001			
Radiated, radio-frequency, electromagnetic field [80 – 1000MHz]	10V/m	Met criterion A	
DIN EN 61000-4-4 VDE 0847 Teil 4-4 / 12.2001			
Electrical fast transient / burst			
- AC-Supply I / O	±2kV	Met criterion B	
- DC I / O	±2kV	Met criterion B	
- Signal-, Data-, Control I/O	±1kV	Met criterion B	
DIN EN 61000-4-5 VDE 0847 Teil 4-5 / 12.2001			
Surge			
- AC-Supply I / O	±1kV L – N ±2kV L – PE ±2kV N – PE	Met criterion B Met criterion B Met criterion B	
- DC I / O	±0.5kV + - Gnd ±0.5kV + - PE ±0.5kV Gnd - PE	Met criterion B Met criterion B Met criterion B	

Regulation	Class / Test level	Result	Remark(s)
DIN EN 61000-4-6 VDE 0847 Teil 4-6 / 12.2001			
Conducted disturbances, induced by radio-frequency fields [0.15 – 80MHz]			
- AC-Supply I / O	10V	Met criterion A	
- DC I / O	10V	Met criterion A	
- Signal-, Data-, Control I/O	10V	Met criterion A	
DIN EN 61000-4-8 VDE 0847 Teil 4-8 / 12.2001			
Low frequency magnetic fields			n. r.
DIN EN 61000-4-11 VDE 0847 Teil 4-11 / 12.2001			
Voltage dips, short interruptions and voltage variations			
- AC-Supply I / O	Step #1 Step #2,#3,#4	Met criterion B Met criterion C	

Burgrieden, 11/05/2003

Responsible Tester – Peter Hauser

Principal engineer - Christian Vogelmann