

TRACO POWER

Model: TPC 120-112

EMC – Test Report

EUT: TRACO POWER Model: TPC 120-112

Serial No.: 31219606797_Winsdon Sample

Manufacturer No.: 120PSC182

Manufacturer: Convertec Ltd.
Whitemill Industrial Estate
Wexford
Republic of Ireland

Tester: Gunnar Tapper, Convertec

Date: 22/10/2012

It should be noted, that combining two or more CE compliant finished appliances does not automatically produce a compliant system. The manufacturer of an apparatus or a fixed installation as defined in the “Guide for the EMC Directive 2004/108EC, 21. May 2007” is responsible for the EMC-compliance of the final apparatus.

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1. Conducted Input Emissions Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Emissions measured using Agilent E7402A EMC Analyser and PMM LISN L2-16
- Tested to CISPR 16 -1-2:2003 Class B limits
- Transient limiter used to protect Agilent E7402A, with appropriate correction factors applied
- Tests carried out in a shielded room

1.1. Test Setup

Test Equipment Settings:

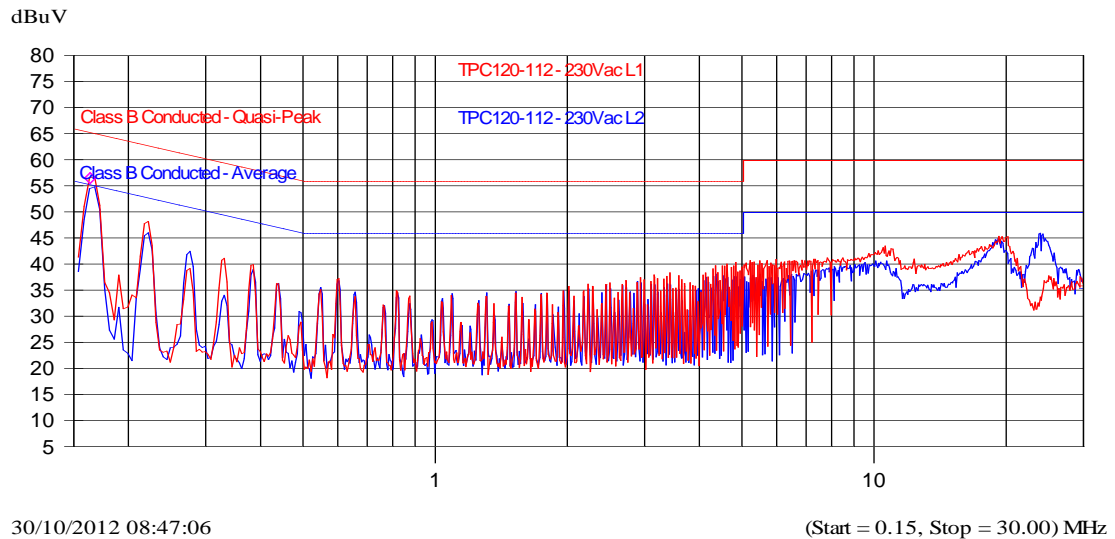
Start Freq.	Stop Freq.	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	200ms	200ms	200ms

Test Setup:



1.2. Conducted Input Emissions Results

L1 and L2



Frequency	Peak	Avg	QP	Pk-QP Limit	Avg-Avg Limit	QP-QP Limit	Trace Name
MHz	dBuV	dBuV	dBuV	dB	dB	dB	
0.162	56.6	48.5	55.7	-8.8	-6.9	-9.7	TPC120-112 - 230Vac L1
0.162	56.6	48.4	55.6	-8.7	-6.9	-9.7	TPC120-112 - 230Vac L1

Table 1 - average and quasi peak measurements of the 120PSC182

Remarks:

The red graph represents peak measurements of line 2 and the blue graph represents peak measurements of line 2. Quasi peak and average measurements are measured if the peak measurement is above the relevant limit. See Table 1.

PASS

2. Conducted Output Emissions Test

Not needed for the TPC range.

3. Radiated Emissions Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standards: IEC61000-6-3: 2006 referring to CISPR 16-2-3: 2003

For an apparatus to comply with EMC radiated emissions requirements as set down in CISPR 16-2-3, free field measurements need to be performed. A test method similar to that described in IEC61204-3 (for low-voltage power supplies) section 6.4.2 shall be used here instead of free field measurements. This test is designed to give a good indication of whether a EUT will pass free field measurements or not. The absorber clamp used in this method is replaced by a Fischer high frequency current probe (Model: F-33-1). The limits used are set by comparison with open field measurements and are compensated by 20dB per frequency decade. Two limit lines are indicated; Fis_a and Fis_b, and the results may be interpreted as follows:

- Below limit line Fis_b: Limits are kept
- Below limit line Fis_a: Limits probably kept
- Above limit line Fis_a: Limits most likely not kept

Final Compliance can only be established by free field measurements in accordance to the relevant standard applicable to the apparatus or enclosure in which the power supply is used

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Emissions measured using receiver Agilent E7402A and FCC RF current probe
- RF current probe kept a distance of 10cm from input/output
- Tests carried out in shielded room
- Tested to CISPR 16 -2-3:2003 Class B limits

3.1. Test Setup

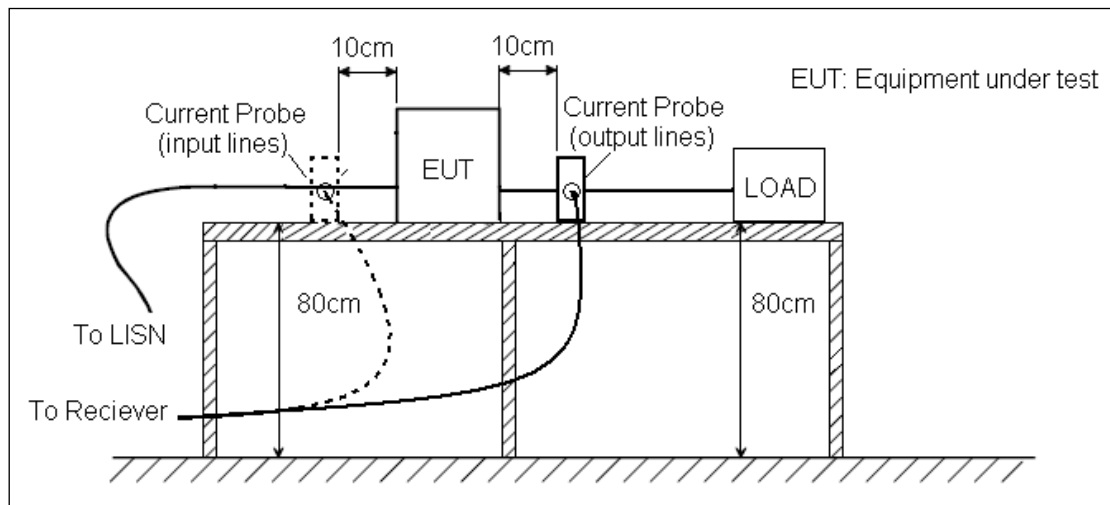


Figure 1. Test set-up for measurement of disturbance power similar to IEC61204-3

Test Equipment Settings:

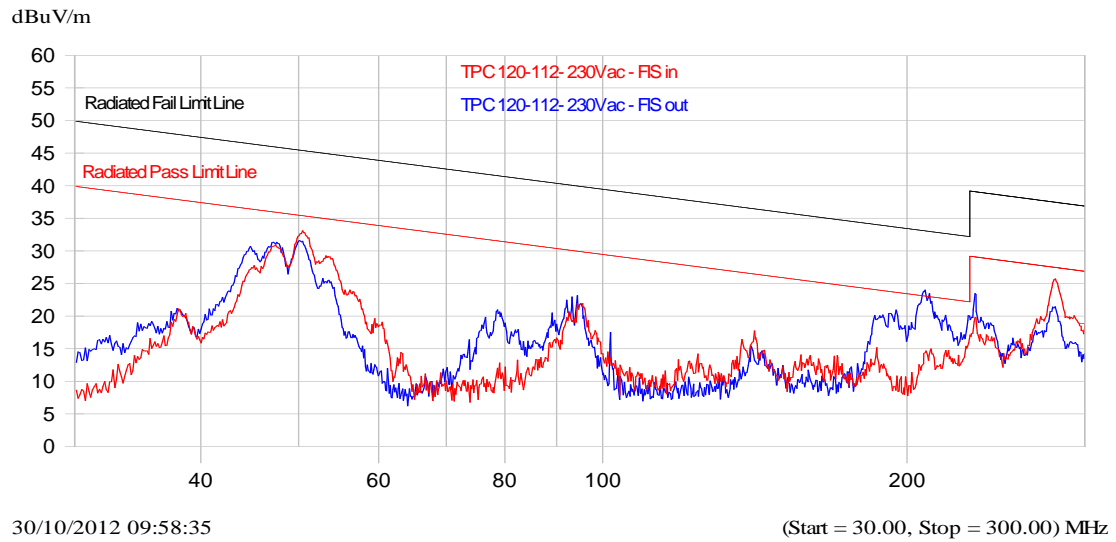
Start Freq.	Stop Freq.	Pk Time
30MHz	300MHz	200ms

Test Setup: The following shows the setup used for input lines, the setup used for the output lines is the same with the clamp on the output lines.



3.2. Radiated Emissions Results

Input Lines and Output Lines:



PASS

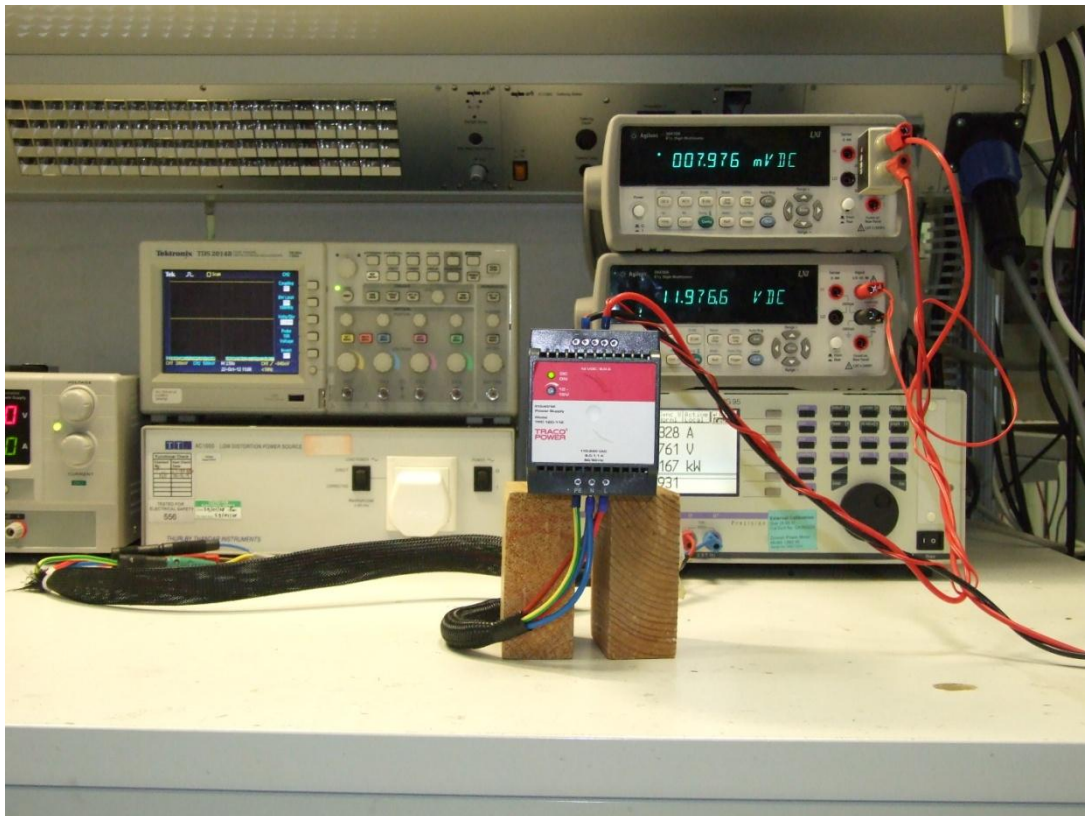
4. Harmonic Current Emissions Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standards: IEC61000-6-3: 2006 referring to IEC 61000-3-2: 2005

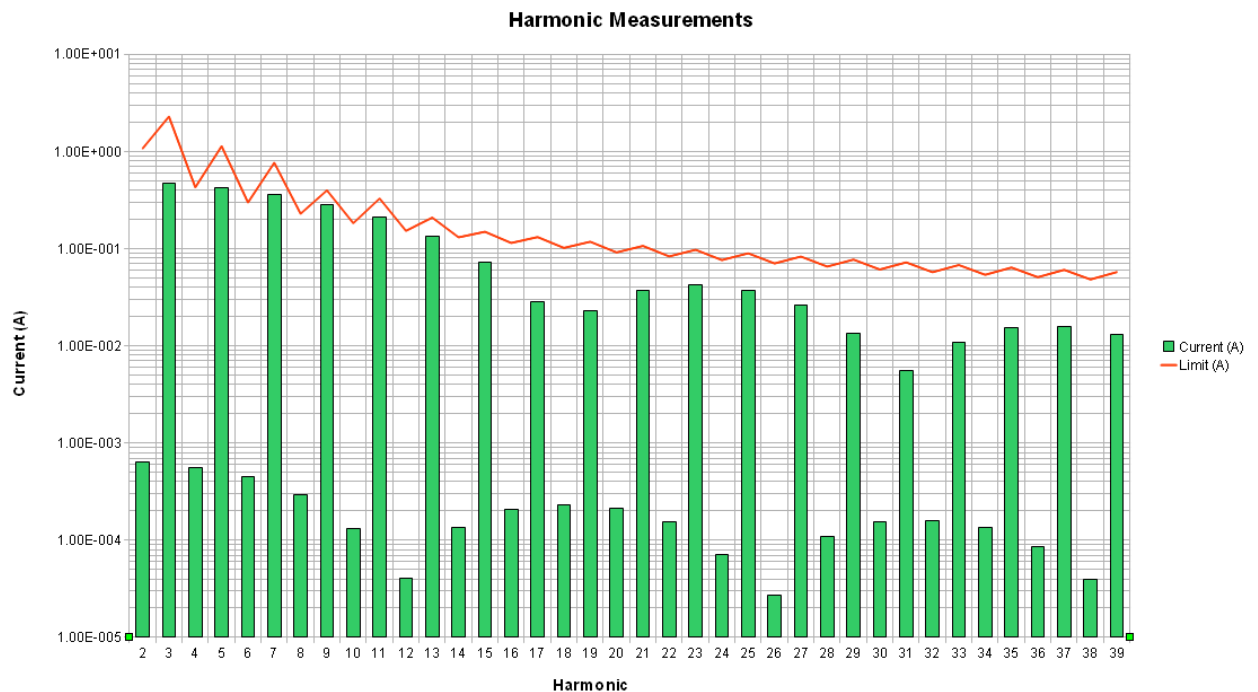
Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- EUT powered by low-distortion AC Voltage Source, TTI AC-1000
- Harmonic Limits measured using LMG 95 Power Meter
- Tested to IEC61000-3-2 Table 1 Class A

4.1. Test Setup:



4.2. Harmonic Current Emissions Test Results:



Harmonic	Current (A)	Limit (A)	Harmonic	Current (A)	Limit (A)
0	0.000363		20	0.000211	0.0920
1	0.502099		21	0.037547	0.1071
2	0.000646	1.0800	22	0.000153	0.0836
3	0.470806	2.3000	23	0.042114	0.0978
4	0.000565	0.4300	24	0.000071	0.0767
5	0.424258	1.1400	25	0.037246	0.0900
6	0.000451	0.3000	26	0.000027	0.0708
7	0.360781	0.7700	27	0.026377	0.0833
8	0.000293	0.2300	28	0.000109	0.0657
9	0.286716	0.4000	29	0.013570	0.0776
10	0.000132	0.1840	30	0.000154	0.0613
11	0.209402	0.3300	31	0.005520	0.0726
12	0.000041	0.1533	32	0.000160	0.0575
13	0.136270	0.2100	33	0.010964	0.0682
14	0.000136	0.1314	34	0.000137	0.0541
15	0.073562	0.1500	35	0.015496	0.0643
16	0.000209	0.1150	36	0.000085	0.0511
17	0.028120	0.1324	37	0.016008	0.0608
18	0.000234	0.1022	38	0.000040	0.0484
19	0.023189	0.1184	39	0.013109	0.0577

PASS

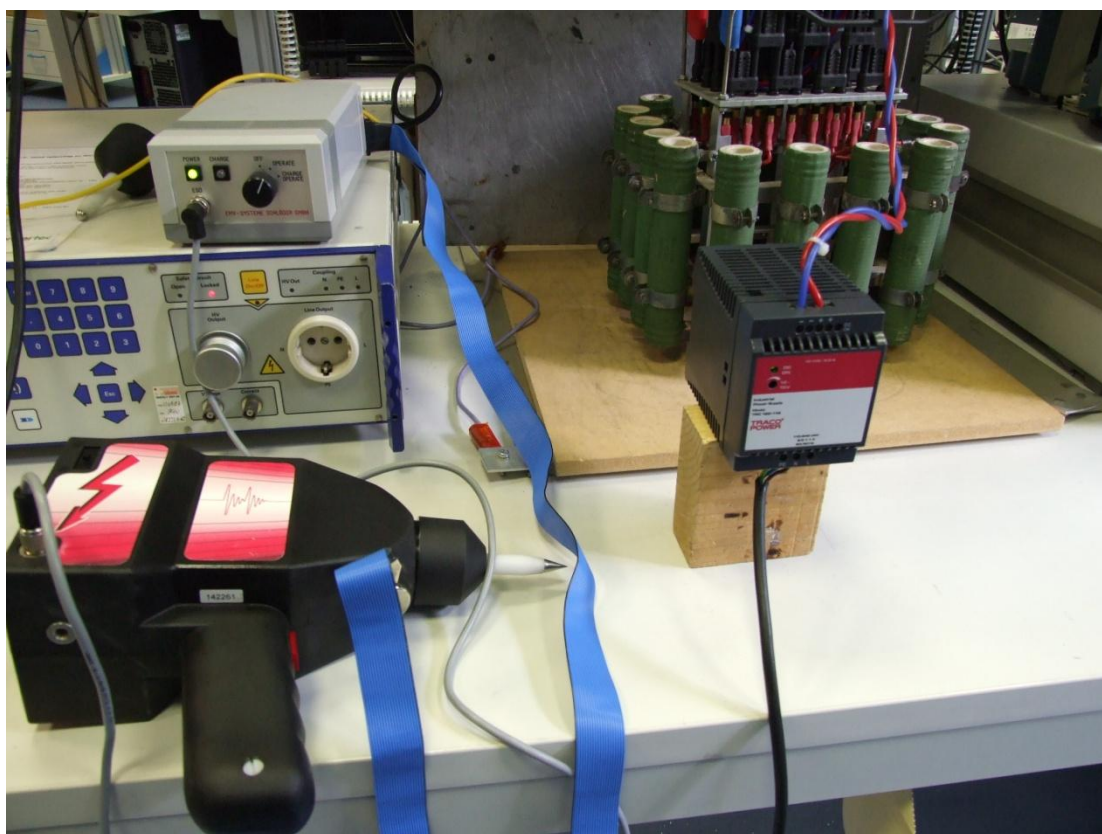
5. Electrostatic Discharge Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-2: 2000

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Since the EUT output is isolated from earth, a 470K HV resistor was placed between output and Earth to provide a discharge path between spikes
- Contact discharge tests shall be applied to all areas exposed to the end user under final installation using ESD gun SESD 200
- Test voltage shall be increased from 2kV up to the max 8kV/4kV (air/contact) as required by the standard IEC/EN 61000-4-2
- At least 10 discharges were applied per test-point (in both polarities)
- A time interval between discharges of a least 1s was used
- The ESD generator was held perpendicular to the test-point wherever possible for repeatability of results
- In the case of contact discharges, the trigger is engaged at about 20cm and the tester is moved quickly toward the testpoint until a spark occurs and trigger is released

5.1. Test Set-Up:



5.2. Electrostatic Discharge Test Results

All exposed metal screw heads and connector pins and ground planes were tested as contact testpoints and also as air testpoints.

The plastic case and all vents and inlets were also tested as air testpoints.

	Contact Testpoints:	Air Testpoints:
EUT	PASS	PASS

Conclusion:

EUT still functions as expected after tests therefore are in accordance with IEC61000-4-2

PASS

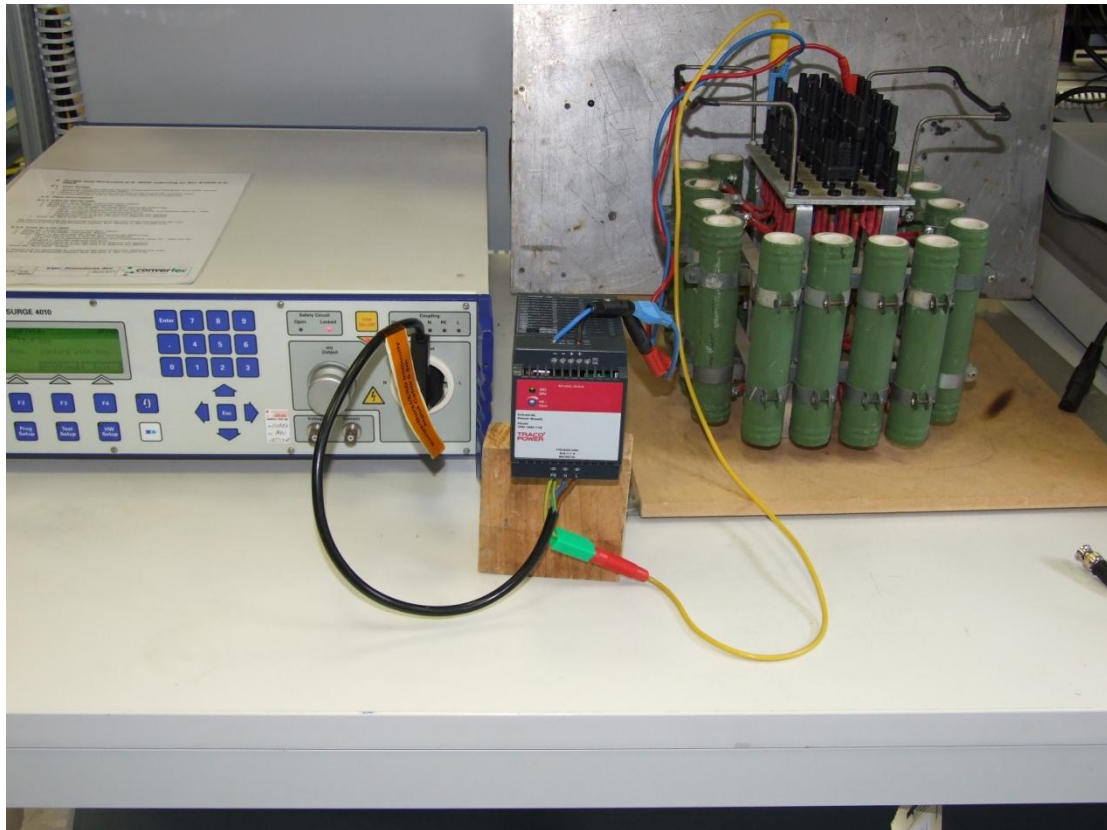
6. Surge Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-5: 2005

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Used Haefely Surge generator PSURGE 4010
- Voltage test level: +/- 1kV Line-Line, +/- 2kV Line-Earth (installation class 3)
- No. of Surges per set: 5 tests Positive and 5 tests Negative
- Interval Between Surges: 10s

6.1. Test Setup



6.2. Surge Results

	L+VE to L-VE	L+VE to PE	L-VE to PE
EUT: 120PSC184	PASS	PASS	PASS

Conclusion:

Meets Classification B as required per Table 6, IEC 61204-3

PASS

7. Fast Transient Test (Burst)

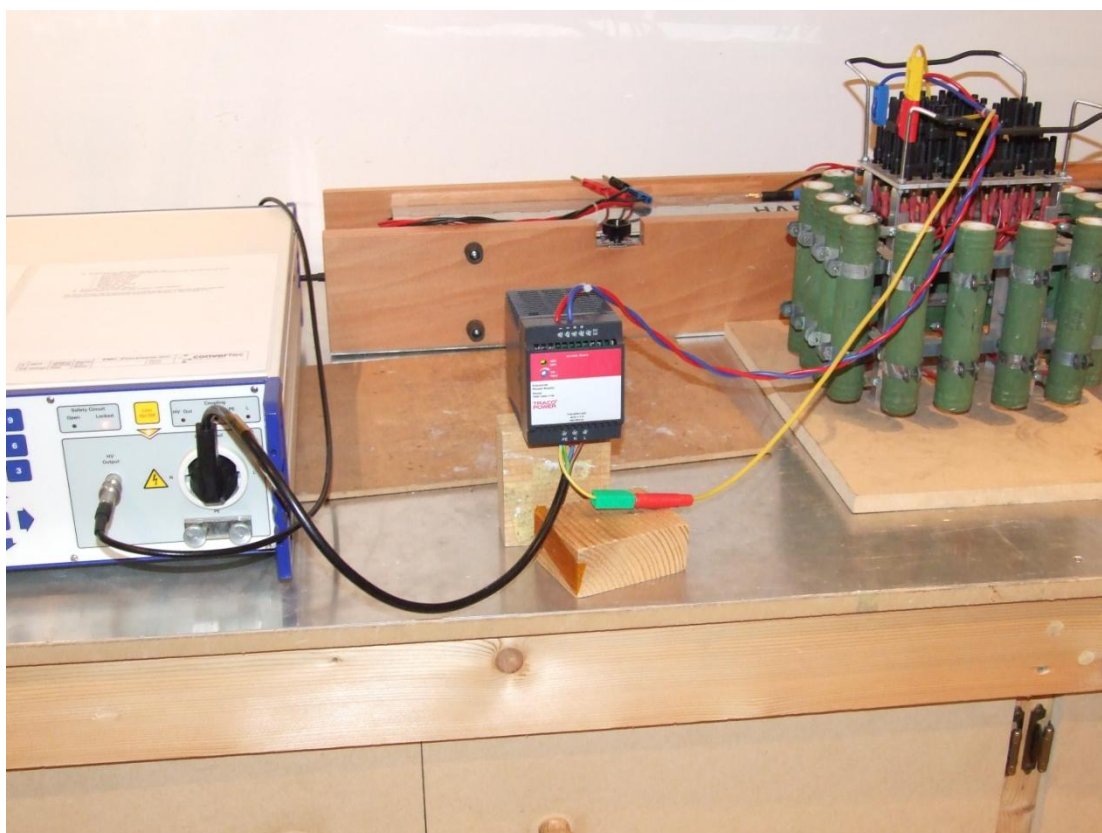
Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-4: 2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Units tested to IEC61000-4-4 test level 3
- Used Haefely Burst tester PEFT 4010
- Voltage test level: $\pm 2\text{Kv}$
- Burst Duration: 0.75ms
- Spike frequency 100kHz
- Burst Period: 300ms
- Individual test time: 1 min
- Polarity: Positive and Negative

The output lines were also tested as above to $\pm 1\text{kV}$ with Haefely coupling capacitor IP4A

7.1. Test Setup



7.2. Fast Transient Test (Burst) Test Results.

EUT: 120PSC184	+VE-G	-VE-G	PE-G	+VE, VE-G	+VE,PE-G	-VE,PE-G	+VE, - VE,PE-G	Outputs - G
Positive	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Negative	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Conclusion:

Meets Classification B as required per Table 6, IEC 61204-3

PASS

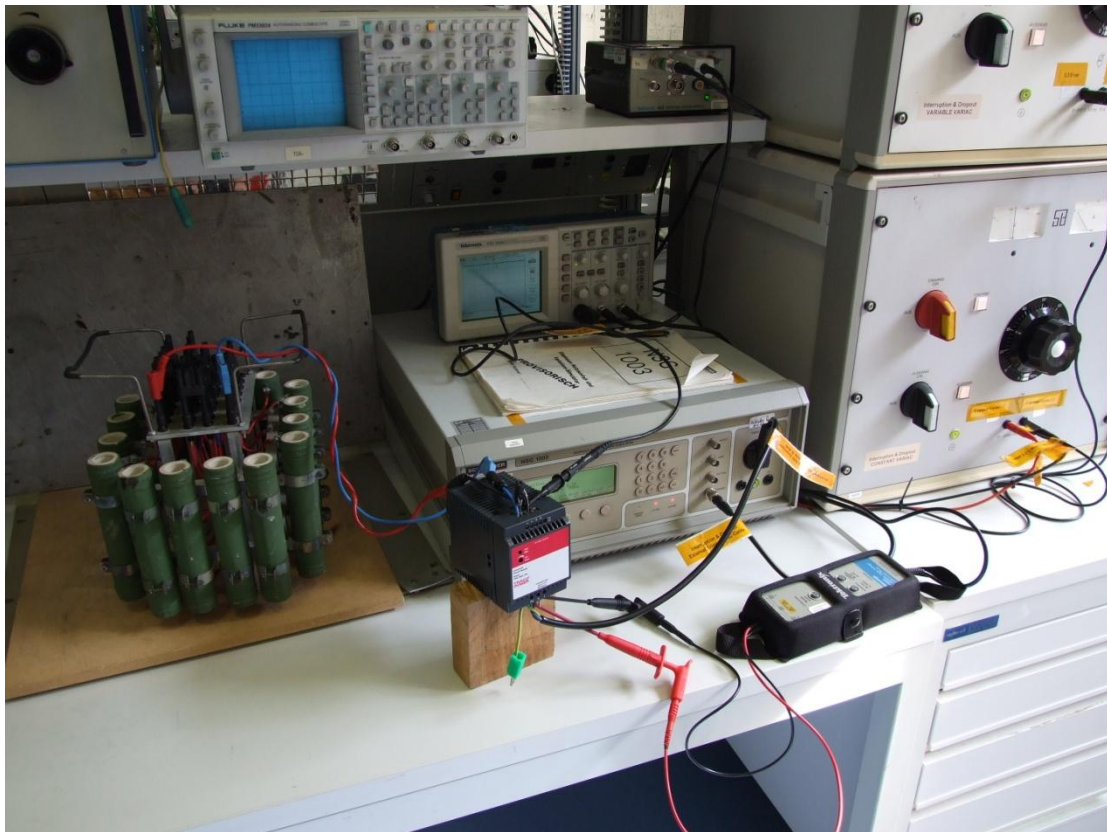
8. Voltage Dips and Short Interruptions Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2:2005 referring to IEC 61000-4-11:2004

Notes:

- EUT tested at full load (12V/8A Resistive).
- Test carried out using 2 Variacs and dropout simulator NSG 1003
- Tested according to class 3 IEC61000-4-11 (as per Annex B)
- Unit tested with the highest nominal and lowest nominal voltage (240V/110V) in accordance with IEC61000-4-11 section 5
- Interval between dropouts and short interruptions was 10s
- Phase angle was set to 0°, 90°, 180°, 270° for each voltage level tested
- Voltage Dips were tested from 100%-80% for 250 Mains cycles in accordance with IEC61000-4-11 table 2
- Voltage Dips were tested from 100%-70% for 25 Mains cycles in accordance with IEC61000-4-11 table 2
- Voltage Dips were tested from 100%-40% for 10 Mains cycles in accordance with IEC61000-4-11 table 2
- Voltage Dips were tested from 100%-0% for 1 Mains cycle in accordance with IEC61000-4-11 table 2
- 3 Voltage dips and 3 Short Interruptions were carried out per test
- Short interruptions tests were carried out at 100% to 0% for each duration 0.1s, 0.2s, 0.5s, 1s, 2s, and 5s.
- Short interruptions were done at worst case 0° phase angle
- Classification of performance in accordance to IEC61000-4-1 Section 9.

8.1. Test Setup



8.2. Voltage Dips & Short Interruptions Results (Classifications)

Voltage Dips

240VAC				
Phase Angle:	0	90	180	270
100%-0%	A	A	A	A
100%-40%	B	B	B	B
100%-70%	A	A	A	A
100%-80%	A	A	A	A

110VAC				
Phase Angle:	0	90	180	270
100%-0%	B	B	B	B
100%-40%	B	B	B	B
100%-70%	B	B	B	B
100%-80%	B	B	B	B

Short Interruptions

	0.1s	0.2s	0.5s	1s	2s	5s
110VAC	B	B	B	B	B	B
240VAC	A	B	B	B	B	B

Conclusion:

Test Result were evaluated in relation to the Customer Specification
CS-030/050/080/120/PSC.doc and the UUT was considered to have PASSED the tests.

PASS

9. Conducted Input RF Immunity Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75” and measurement instrument “Agilent 34410A”
- Unit tested to IEC61000-4-6 test level 3

9.1. Test Setup

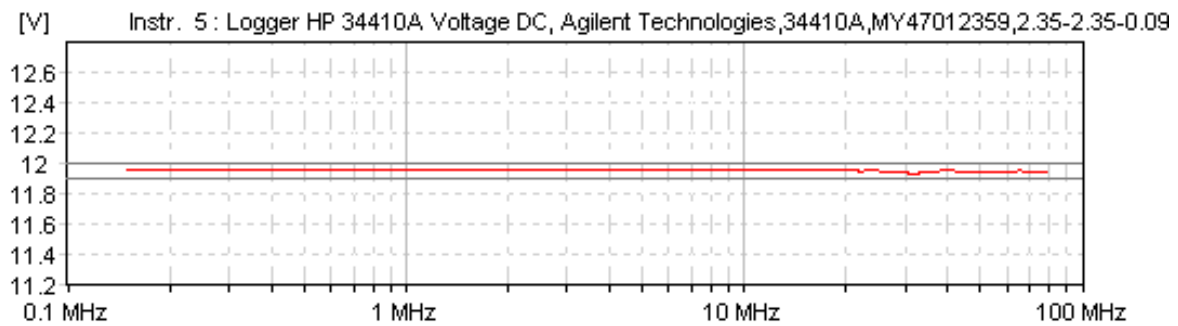
Test Equipment Settings:

Frq. start [MHz]	Level start [V]	Frq. stop [MHz]	Level stop [V]	Frq. step	td [s]	tp [s]	Modulation
0.150	10.0	80.000	10.0	1.0 %	0.5	0.0	AM 1kHz 80%

Test Setup:



9.2. Conducted Input RF Immunity Results



Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-3)

Test Results were evaluated in relation to the Customer Specification

CS-030/050/080/120/PSC.doc and the output did not change by more than $\pm 60\text{mV}$ therefore UUT was considered to have PASSED the tests.

PASS

10. Conducted Output RF Immunity Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2004

Notes:

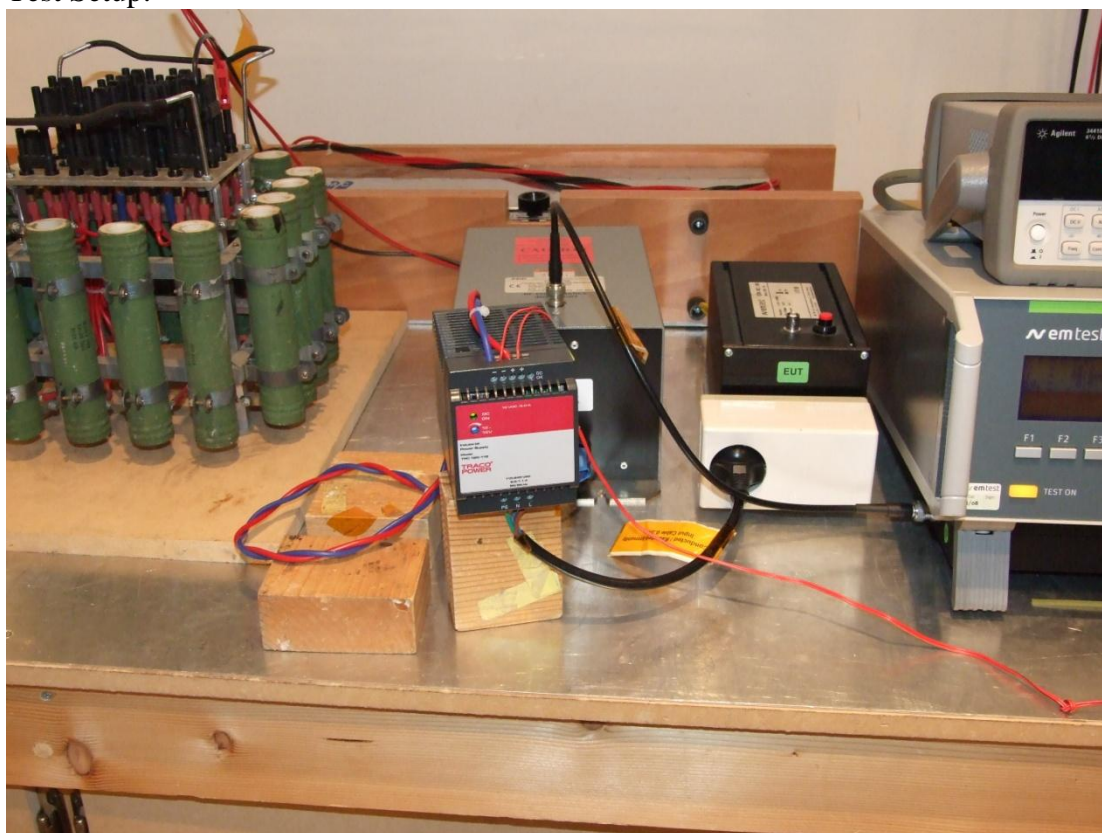
- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75”, measurement instrument “Agilent 34410A” and FCC-801-M2-50A Coupling/Decoupling network.
- Unit tested to IEC61000-4-6 test level 3

10.1. Test Setup:

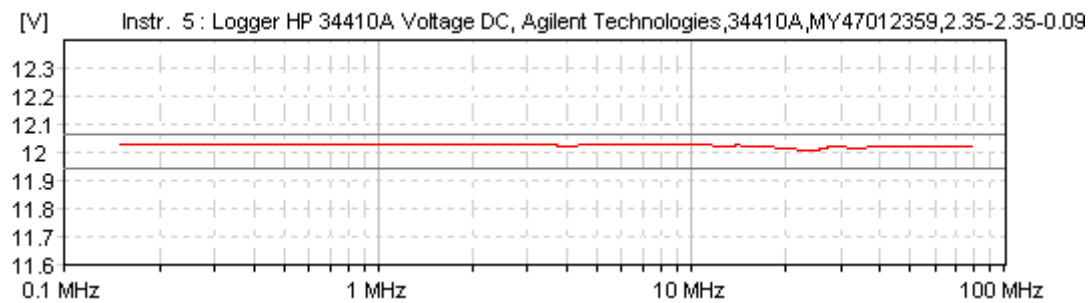
Test Equipment Settings:

Frq. start [MHz]	Level start [V]	Frq. stop [MHz]	Level stop [V]	Frq. step	td [s]	tp [s]	Modulation
0.150	10.0	80.000	10.0	1.0 %	0.5	0.0	AM 1kHz 80%

Test Setup:



10.2. Conducted Output RF Immunity Results



Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-3)

Test Results were evaluated in relation to the Customer Specification

CS-030/050/080/120/PSC.doc and the output did not change by more than $\pm 60\text{mV}$ therefore the UUT was considered to have PASSED the tests.

PASS

11. Radiated RF Immunity Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC61000-4-3: 2004

Notes:

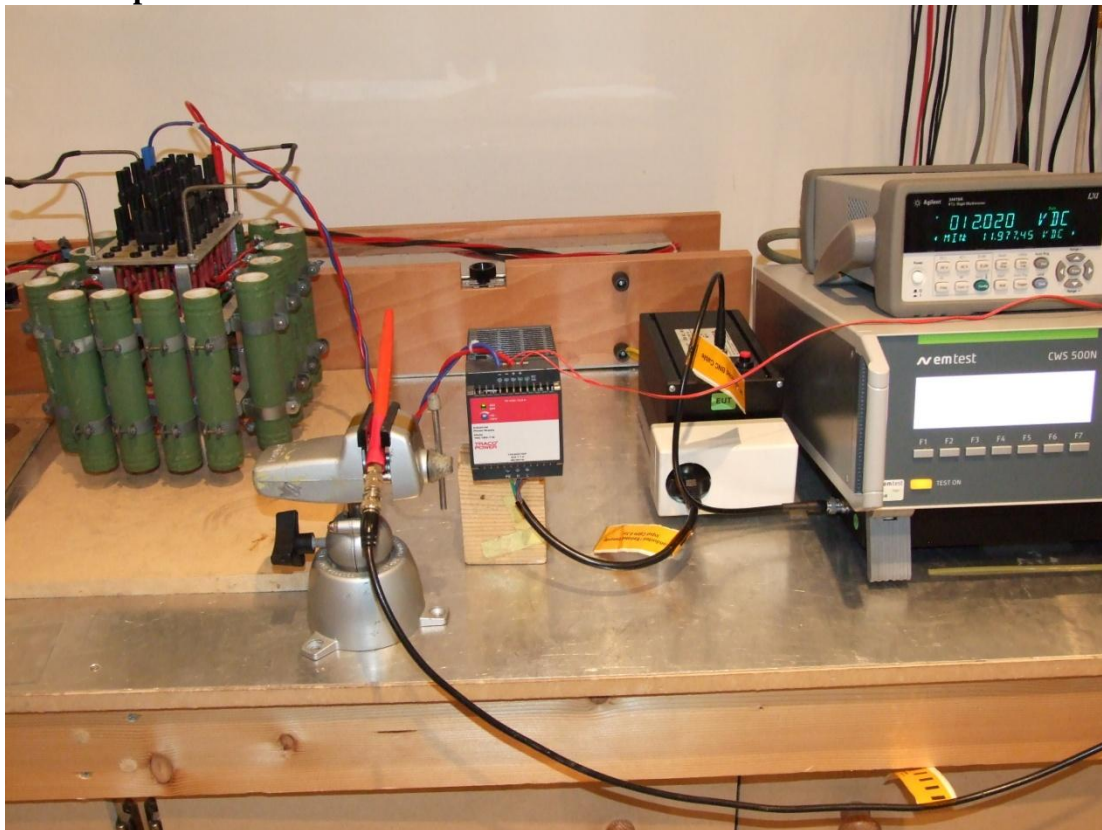
- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, E-field probe and measurement instrument “Agilent 34410A”

11.1. Test Setup

Test Equipment Settings:

Frq. start [MHz]	Level start [V]	Frq. stop [MHz]	Level stop [V]	Frq. step	td [s]
80.0	20.0	1000.0	20.0	1.0 %	1

Test Setup:



11.2. Radiated RF Immunity Results

Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-3)

Test Results were evaluated in relation to the Customer Specification

CS-030/050/080/120/PSC.doc and the UUT was considered to have PASSED the tests.

PASS

12. Power Frequency Magnetic Field Immunity Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: IEC61000-6-2: 2005 referring to IEC61000-4-8: 2001

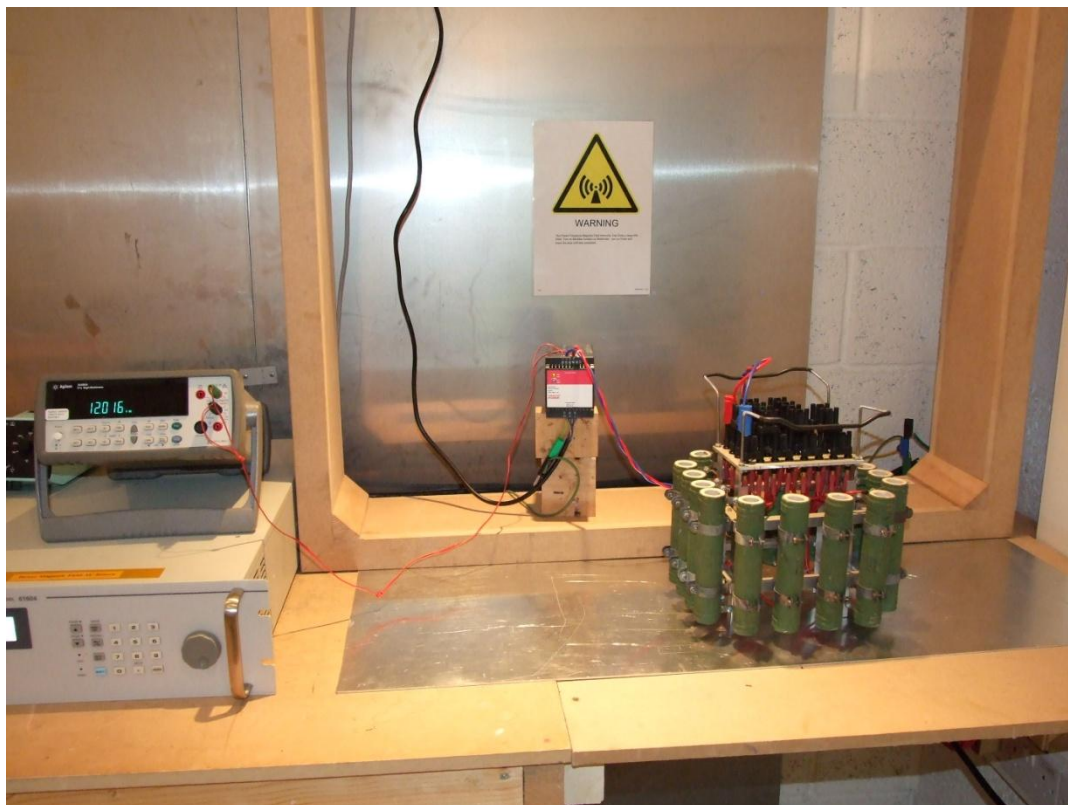
Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (12V/8A Resistive).
- Test carried out using test generator “Chroma Programmable AC Source”, “1meter x 1meter 100 turn Induction Coil” and measurement instrument “Agilent 34405A”
- Unit tested to IEC61000-4-8 test levels 5

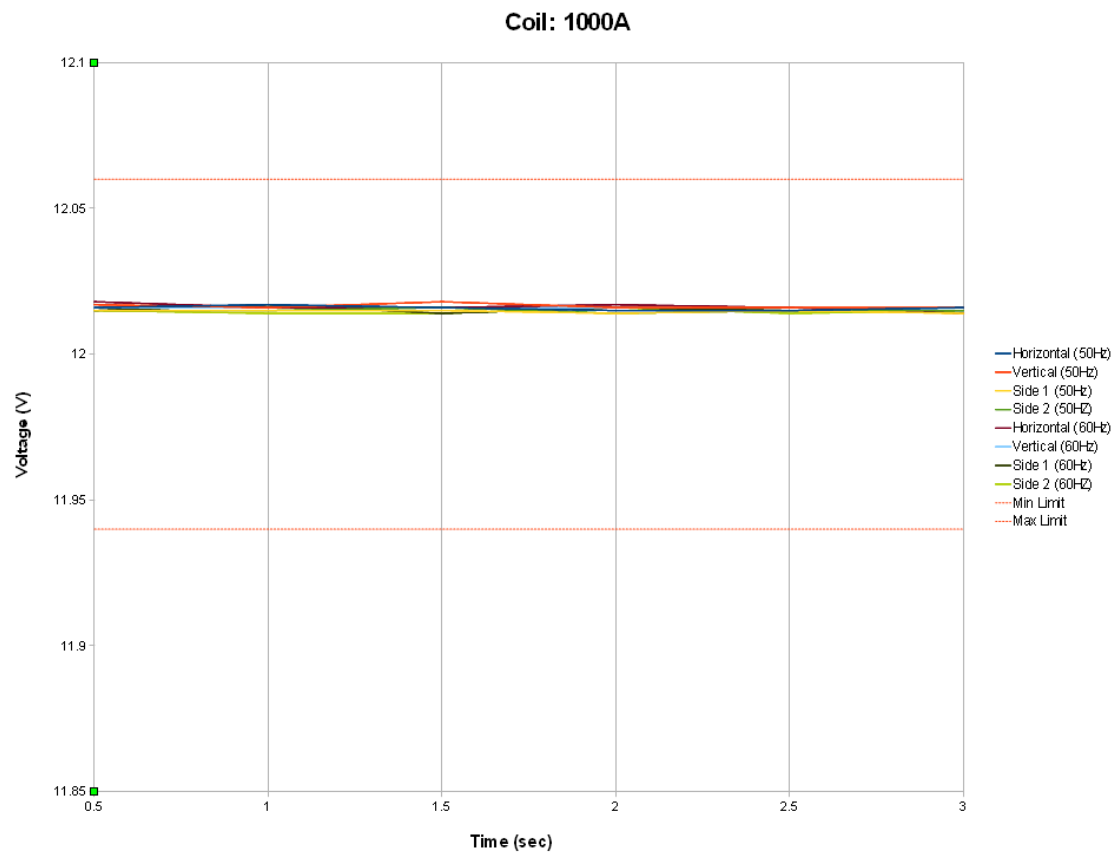
12.1. Test Setup

Test Equipment Settings:

Test generator settings			
Frequency	AC Current through Induction Coil (Arms)	Magnetic Field Strength (A/m)	Applied Field duration [s]
50Hz	1	100	Continuous
60Hz	1	100	Continuous
50Hz	10	1000	3
60Hz	10	1000	3



12.2. Power Frequency Magnetic Field Immunity Results



Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-8)

Test Results were evaluated in relation to the Customer Specification

CS-030/050/080/120/PSC.doc and the UUT was considered to have PASSED the tests.

PASS

13.Semi F47 Test

Equipment under Test: TPC 120-112
EUT Serial No.: 31219606794
Customer Spec: CS-030/050/080/120/PSC.doc
Date: 30/10/2012
Standard: SEMI F47-0706

Notes:

- EUT tested under operating conditions of 230V/110V 50Hz input at full load (12V/8A Resistive).
- Test carried out using test generator using Voltage Sag Generator: Schaffner NSG1003: Dropout and Variation Simulator and Oscilloscope Tektronix: TDS220

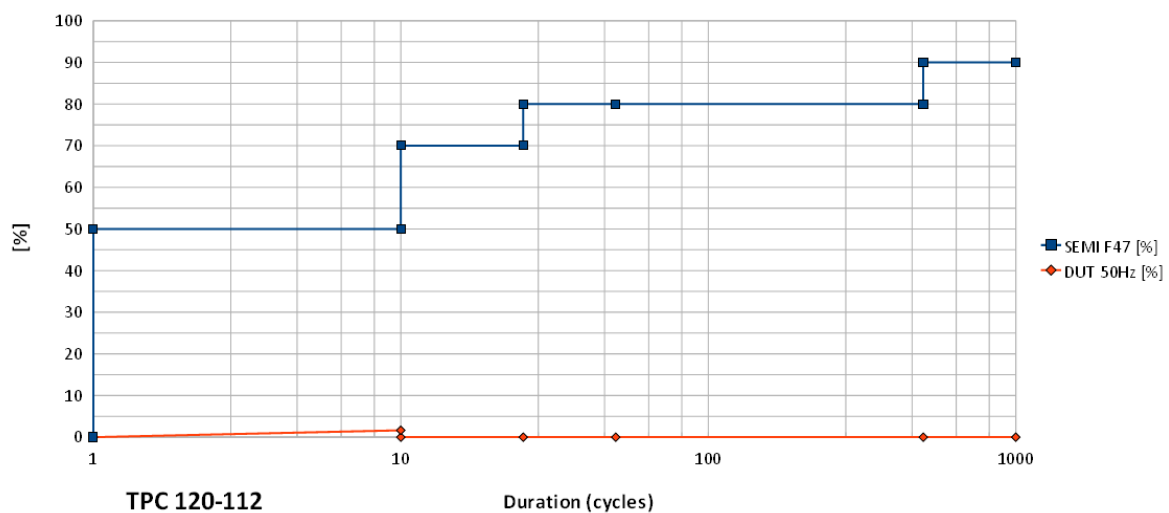
13.1. Test Setup



13.2. SEMI F47 Results

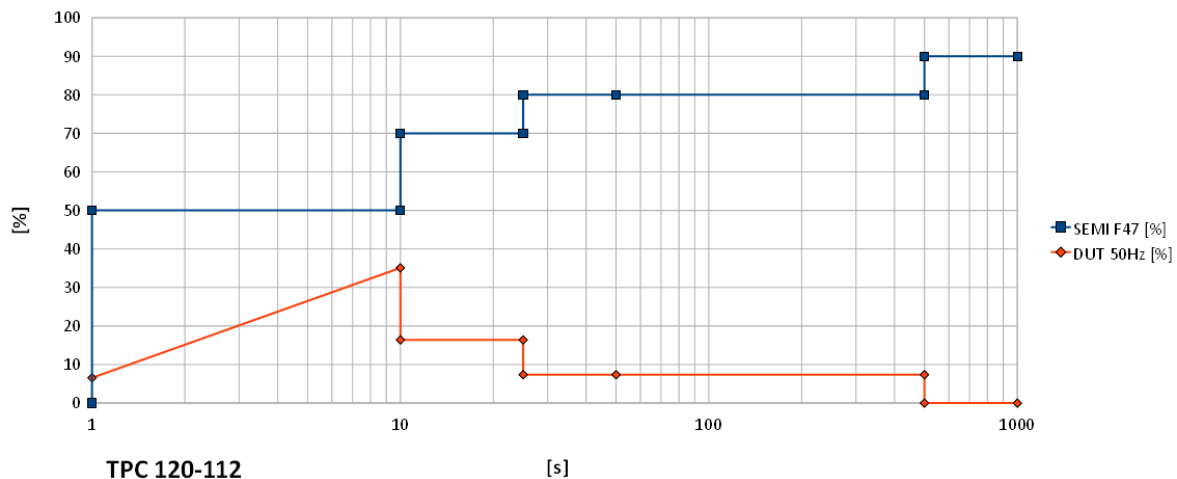
Input Voltage VAC = 230V, Output = 12VDC, 8A

Voltage Sag [V]	Duration [s]	Duration cycles	Output Voltage [V]	% delta of Nominal		
				DUT 50Hz [%]	SEMI F47 [%]	Result
207	20	1000	12.2	0.0	90	PASS
207	10	500	12.2	0.0	90	PASS
184	10	500	12.2	0.0	80	PASS
184	1	50	12.2	0.0	80	PASS
184	0.5	25	12.2	0.0	80	PASS
161	0.5	25	12.2	0.0	70	PASS
161	0.5	10	12.2	0.0	70	PASS
115	0.2	10	12.0	1.6	50	PASS
115	0.02	1	12.2	0.0	50	PASS
0	0.02	1	12.2	0.0	0	PASS



Input Voltage VAC = 110V, Output = 12VDC, 8A

Voltage Sag	Duration	Duration	Output Voltage	% delta of Nominal		
[V]	[s]	cycles	[V]	DUT 50Hz [%]	SEMI F47 [%]	Result
99	20	1000	12.2	0.0	90	PASS
99	10	500	12.2	0.0	90	PASS
88	10	500	11.3	7.4	80	PASS
88	1	50	11.3	7.4	80	PASS
88	0.5	25	11.3	7.4	80	PASS
77	0.5	25	10.2	16.4	70	PASS
77	0.2	10	10.2	16.4	70	PASS
55	0.2	10	7.9	35.1	50	PASS
55	0.02	1	11.4	6.6	50	PASS
0	0.02	1	11.4	6.6	0	PASS



Conclusion:

Meets Classification B (Ref. SEMI F47-0706)

Test Results were evaluated in relation to the Customer Specification

CS-030/050/080/120/PSC.doc and the UUT was considered to have PASSED the tests.

14.Summary

Regulation	Class/Test Level	Result	Comments
IEC61000-6-3: 2006 + CISPR 16-1-2: 2003 + CISPR 16-2-3: 2003			
Conducted Input (0.15-30MHz)	Class B	PASS	
Conducted Output (0.15-30MHz)	Class B	N/A	
Radiated (30-300MHz)	Class B	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-2:2005			
Electrostatic Discharge			
- Air Discharge	+/- 2/8kV (Class B)	PASS	
- Contact Discharge	+/- 2/4kV (Class B)	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-5:2005			
Surge			
- AC Supply	+/- 1kV (Class B) +VE to -VE	PASS	
	+/- 2kV (Class B) +VE to PE	PASS	
	+/- 2kV (Class B) -VE to PE	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-4: 2004			
Fast Transient (Burst)			
- AC Supply	+/- 2kV (Class B) between all lines	PASS	
- Outputs	+/- 1kV (Class B) between all lines	PASS	
IEC61000-6-2: 2005 + IEC61000-4-6:2004			
Conducted Input RF Immunity	Level III 10V (Class A)	PASS	
Conducted Output RF Immunity	Level III 10V (Class A)	PASS	
IEC61000-6-2: 2005 + IEC61000-4-3:2004			
Radiated RF Immunity	20V (Class A)	PASS	
IEC61000-6-2: 2005 + IEC61000-4-8: 2001			
Power Frequency Magnetic Field Immunity	Level 5 (Class A)	PASS	
IEC61000-6-2:2005 + IEC 61000-4-11:2004			
Voltage Dips			
-AC Supply (240VAC and 110VAC)	100%-0% (Class B)	PASS	

	100%-40% (Class B)	PASS	
	100%-70% (Class B)	PASS	
	100%-80% (Class B)	PASS	
Short Interruptions (100%-0% for: 0.1s, 0.2s, 0.5s, 1s, 2s and 5s)	100%-0% (Class B)	PASS	
SEMI F47-0706			
Semi F47 Voltage SAG Immunity			
-AC Supply (230VAC and 110VAC)	(Class B)	PASS	

15.List of Equipment Used:

Description	Model No.	Manufacturer	Serial No.
EMC Analyzer	E7402A	Agilent	MY45119210
LISN 1	PMM L2-16	PMM	1230L00301
LISN 2	FCC-801-M2-50A	FCC	3035
RF Current Probe	F-33-1	FCC	759
Transient Limiter	11947A	Agilent	3107A03645
Precision Power Meter	LMG95	Zimmer	10790709
ESD Gun	SESD 200	Schloder	142261
Surge Generator	PSURGE 4010	Haefely	583 334-63
Burst generator	PEFT 4010	Haefely	080 981-08
Coupling Capacitor	IP4A	Haefely	171241
Electronic Load	ELA 500	Zentro-Elektrik	63145803
High Power Resistors	n/a	n/a	n/a
Multimeter	34405A	Agilent	TW46290007
Multimeter	34405A	Agilent	TW46290015
Multimeter	34410A	Agilent	MY47012359
Multimeter	1906	TTI	n/a
High frequency generator	CWS 500N	EM Test	V0847104427
Coupling/Decoupling Network	CDN M2/M3	EM Test	1108-34
Attenuator	ATT6/75	EM Test	1107-53
Oscilloscope	TDS1002	Tektronix	C016388
Programmable AC Source	61604	Chroma	ABR000000672
DC power supply	SM 7020 - D	Delta electronika	014604000011
DC power supply	SM 7020 - D	Delta electronika	014604000024
Pulse Generator	33220A	AGILENT	MY440444002
Cables	Type	Length	Comments
Mains Supply Cable	3-wire	1m	Unshielded
DC Lines Cable	2-wire	1m	Unshielded