

TRACOPOWER

Model: TSPC 120-124

EMC – Test Report

EUT: TRACOPOWER Model: TSPC 120-124

Serial No.: N/A

Manufacturer No.: 120POP184

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

Tester: David Lambe, Convertec

Date: 11/03/11

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.

Table of Contents:

1	Conducted Input Emissions Test	3
1.1	Test Setup.....	3
1.2	Conducted Input Emissions Results.....	4
2	Conducted Output Emissions Test.....	5
2.1	Test Setup.....	5
2.2	Conducted Output Emissions Results.....	6
3	Radiated Emissions Test	7
3.1	Test Setup.....	8
3.2	Radiated Emissions Results	9
4	Harmonic Current Emissions Test	10
4.1	Test Set-Up:	10
4.2	Harmonic Emissions Results	11
5	Electrostatic Discharge Test	12
5.1	Test Set-Up:	13
5.2	ESD Results	14
6	Surge Test	15
6.1	Test Setup.....	15
6.2	Surge Results	16
7	Fast Transient Test (Burst).....	17
7.1	Test Setup.....	17
7.2	Fast Transient Results	18
8	Voltage Dips and Short Interruptions Test	19
8.1	Test Setup.....	20
8.2	Voltage Dips & Short Interruptions Results (Classifications).....	20
9	Conducted Input RF Immunity Test	22
9.1	Test Setup.....	22
9.2	Conducted Input RF Immunity Results	23
10	Conducted Output RF Immunity Test	24
10.1	Test Setup:	24
10.2	Conducted Output RF Immunity Results.....	25
11	Radiated RF Immunity Test.....	26
11.1	Test Setup.....	26
11.2	Radiated RF Immunity Results.....	27
12	SEMI F47 Test.....	28
12.1	Test Setup.....	28
12.2	SEMI F47 Results	29
13	Power Frequency Magnetic Field Immunity	31
13.1	Test Setup.....	31
13.2	Power Frequency Magnetic Field Immunity Results.....	32
14	Summary	33
15	List of Equipment Used:	34

1 Conducted Input Emissions Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

- EUT tested under normal operating conditions of 220V 50Hz input at full load (24V/5A Resistive)
- Emissions measured using Agilent E7402A EMC Analyzer 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:

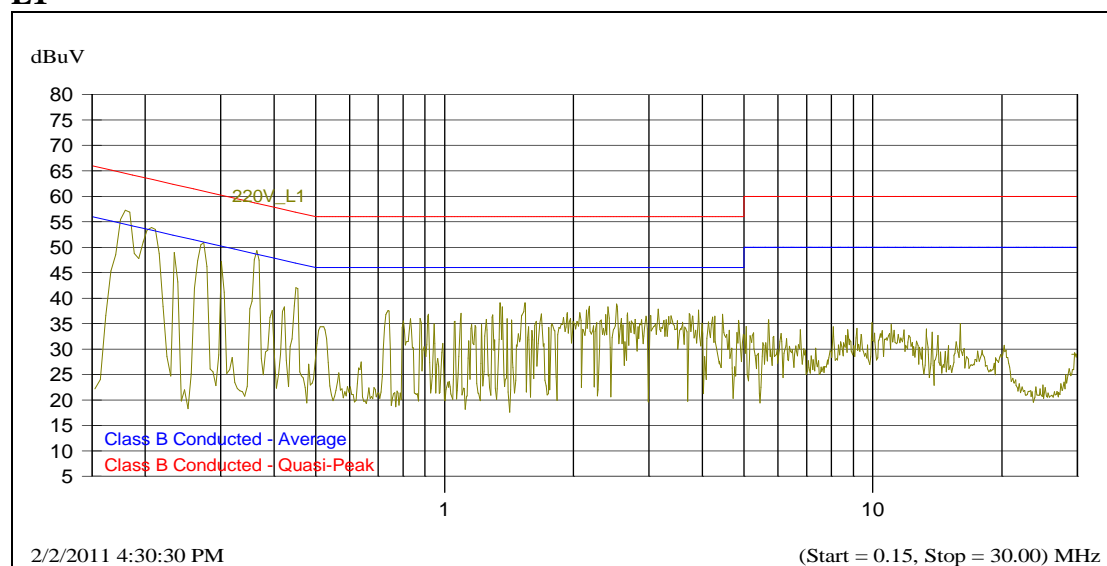
Start Freq.	Stop Freq.	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	200ms	200ms	200ms

Test Setup:

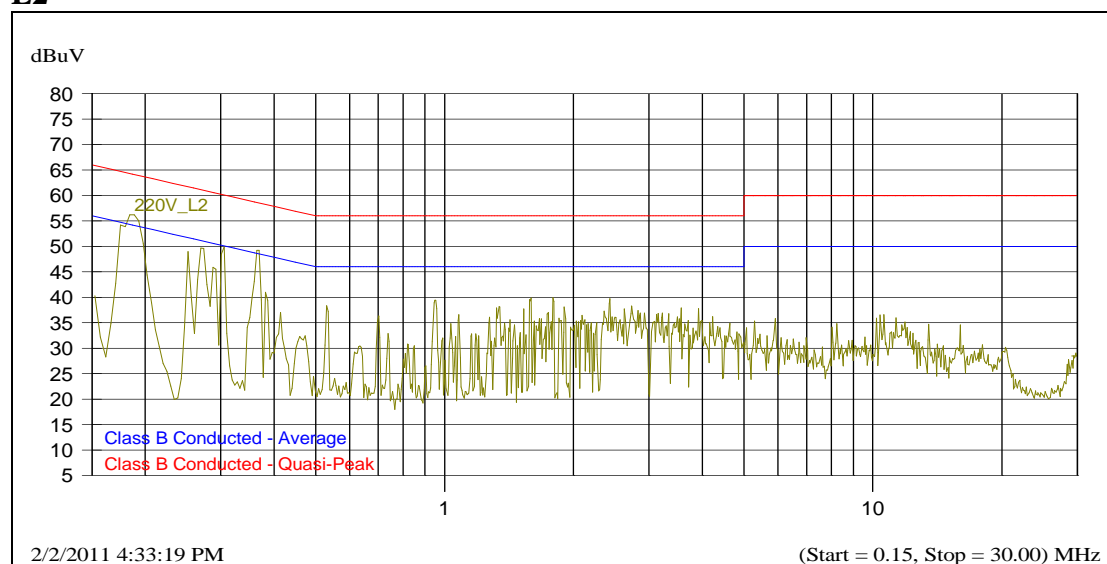


1.2 Conducted Input Emissions Results

L1



L2



PASS

2 Conducted Output Emissions Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2:2003

Notes:

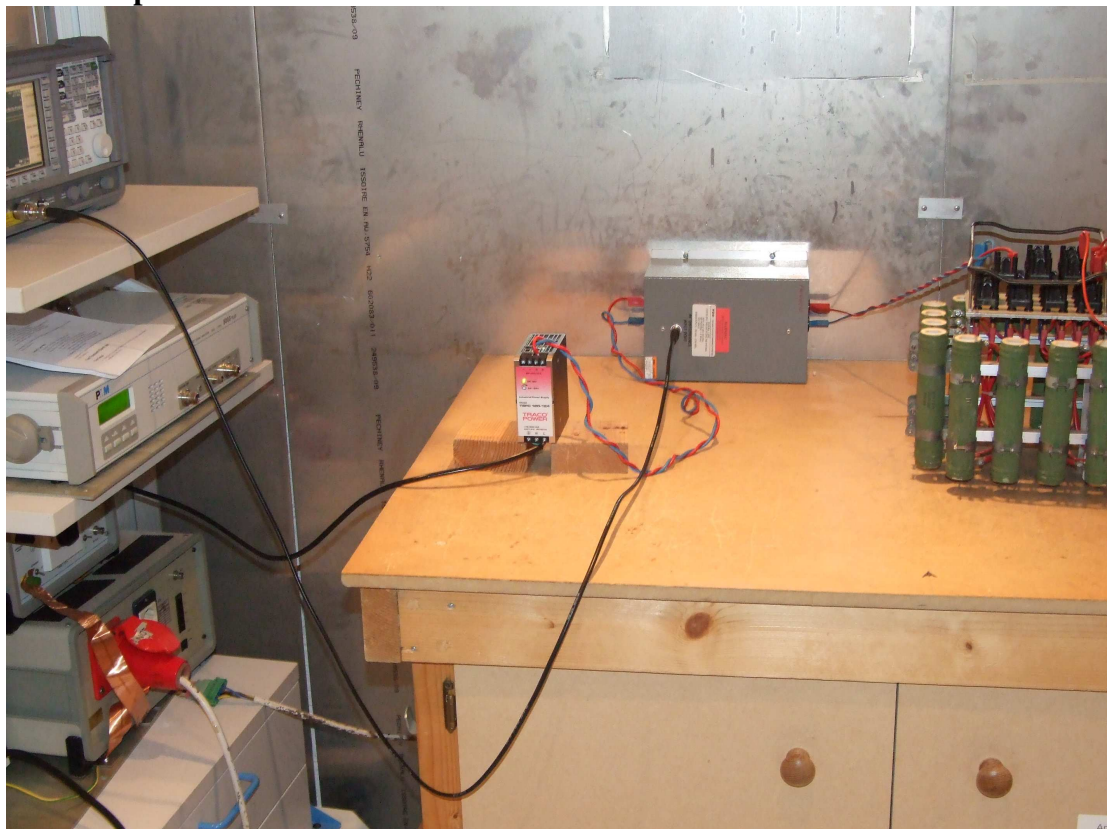
- EUT tested under normal operating conditions of 220V 50Hz input at full load (24V/5A Resistive)
- Emissions measured using Agilent E7402A and FCC-801-M2-50A Coupling/Decoupling network
- Tested to CISPR 16-1-2:2003 Class B limits
- Transient limiter used to protect Agilent E7402A, with appropriate correction factors applied
- Appropriate correction factors also applied for output Coupling/Decoupling network
- Tests carried out in a shielded room

2.1 Test Setup

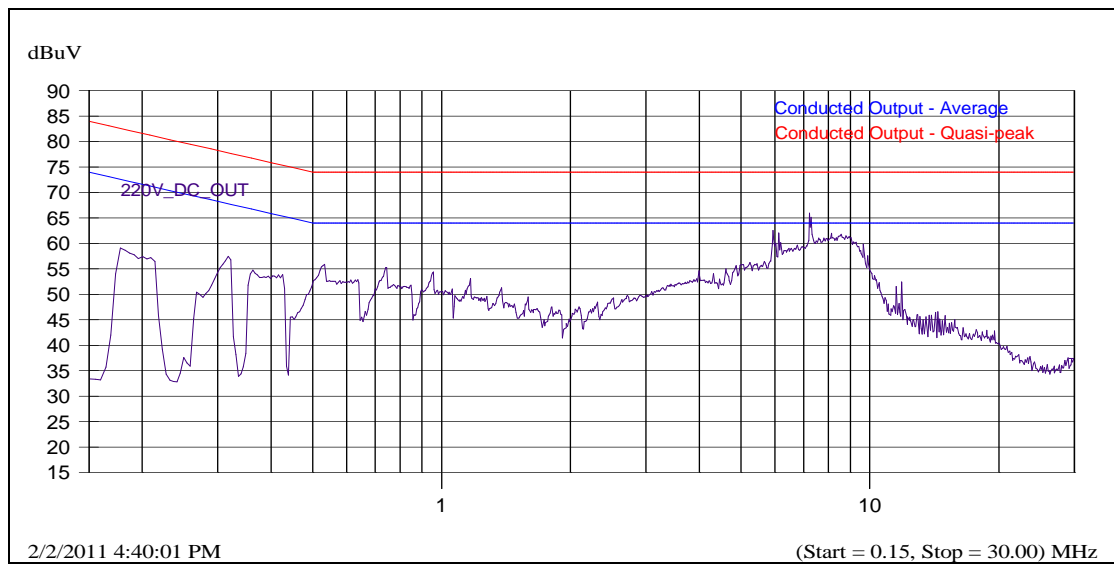
Test Equipment Settings:

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

Test Setup:



2.2 Conducted Output Emissions Results



PASS

3 Radiated Emissions Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
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 an 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:

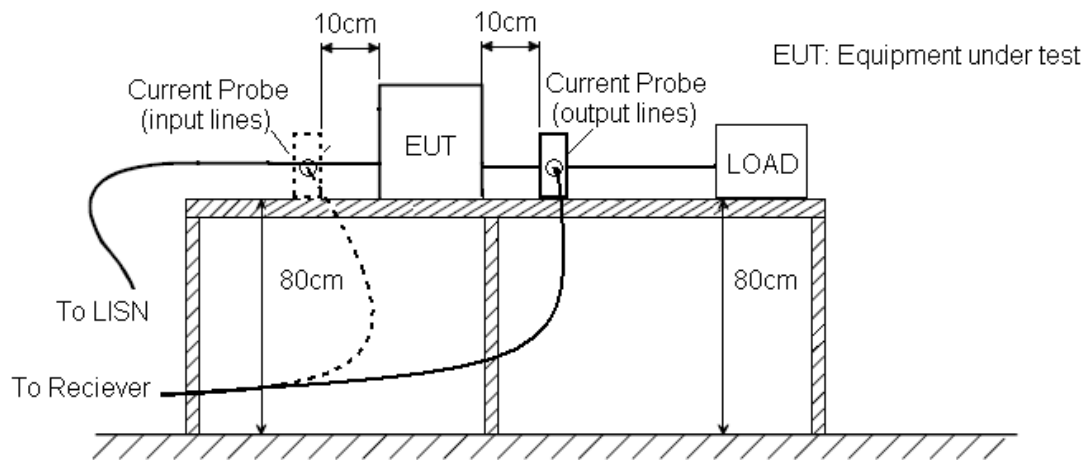
- Below limit line Fis_b: Limits are kept
- Below limit line Fis_a: Limits probably kept
- Above limit line Fis_a: Limits most likely not kept

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 220V 50Hz input at full load (24V/5A 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

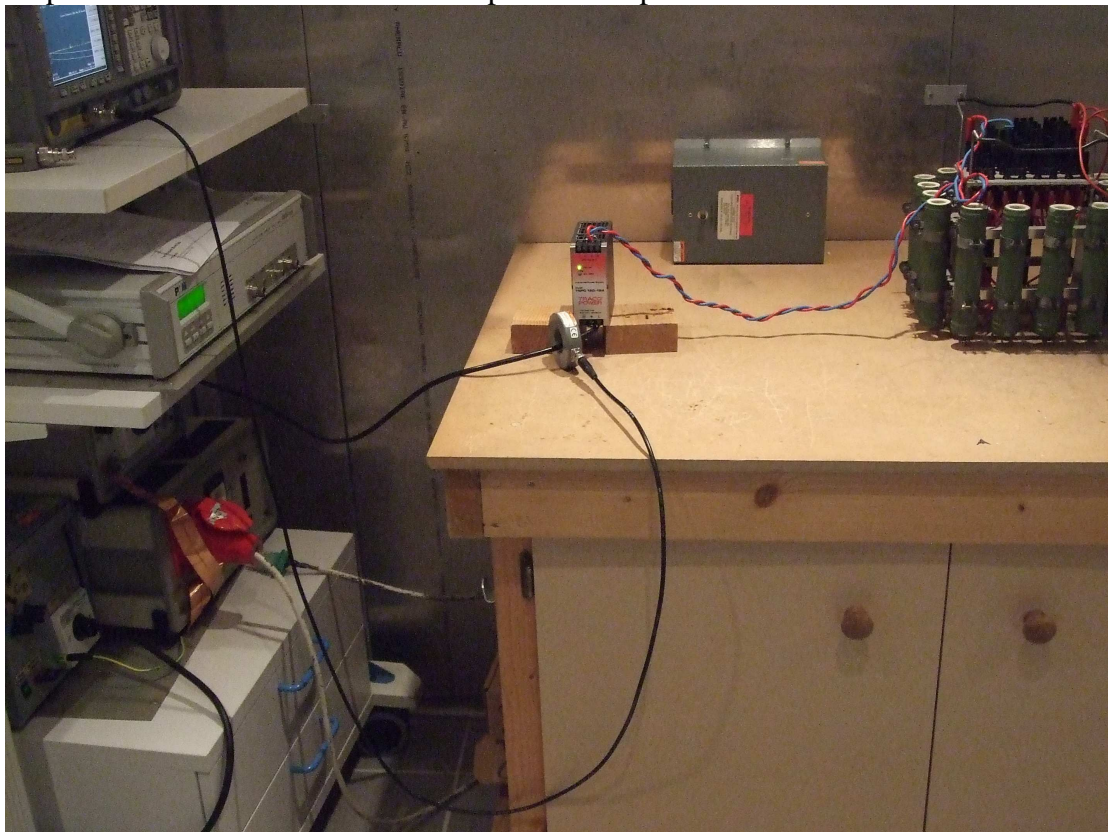
3.1 Test Setup



Test Equipment Settings:

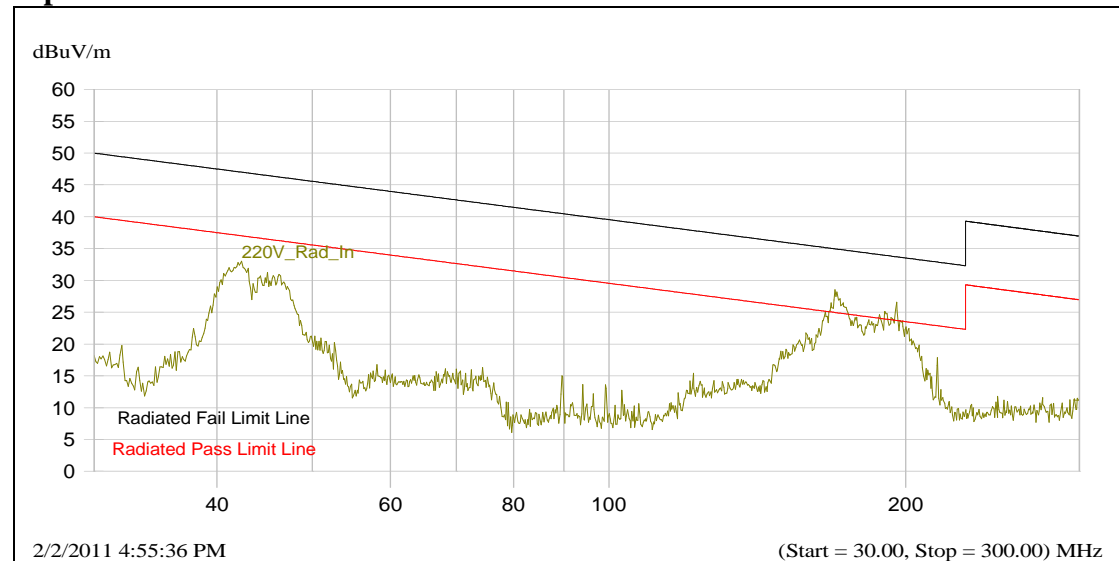
Start Freq.	Stop Freq.	Pk Time
30MHz	300MHz	200ms

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.

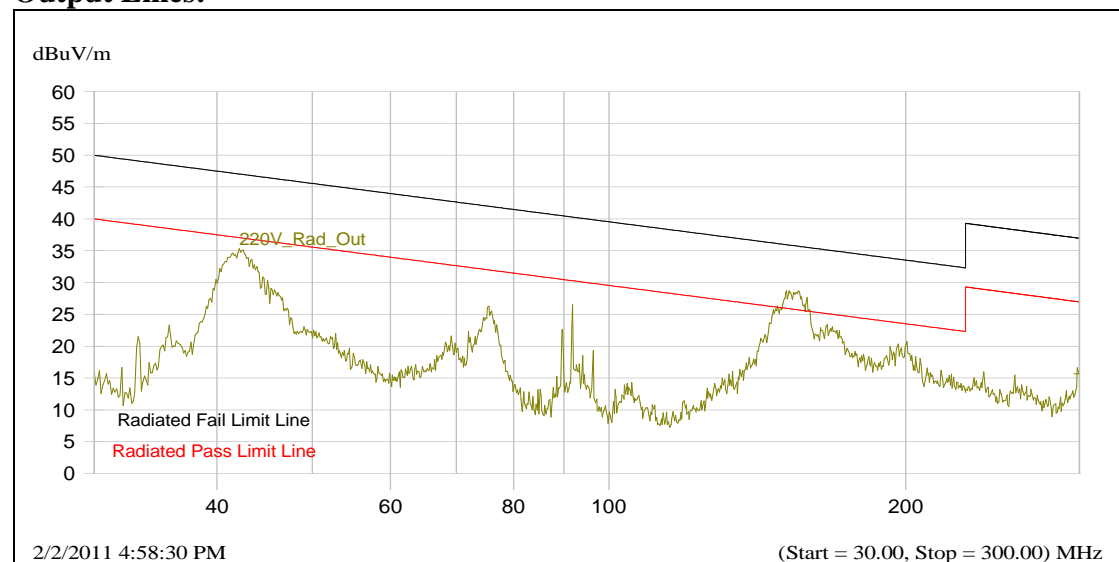


3.2 Radiated Emissions Results

Input Lines:



Output Lines:



PASS

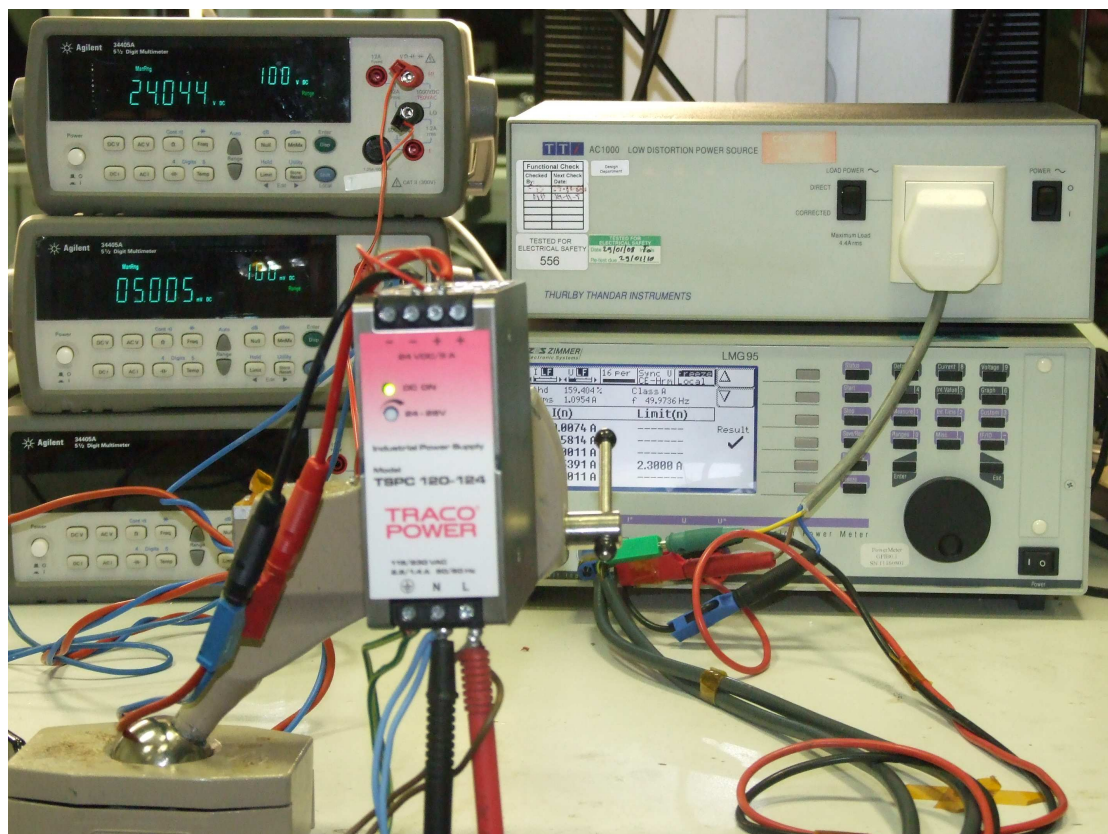
4 Harmonic Current Emissions Test

Equipment Under Test:	TSPC 120-124
EUT Serial No.:	N/A
Customer Spec:	CS-120POP184.doc
Date:	09/02/2011
Standard:	IEC61000-6-3: 2006 referring to IEC 61000-3-2: 2005

Notes:

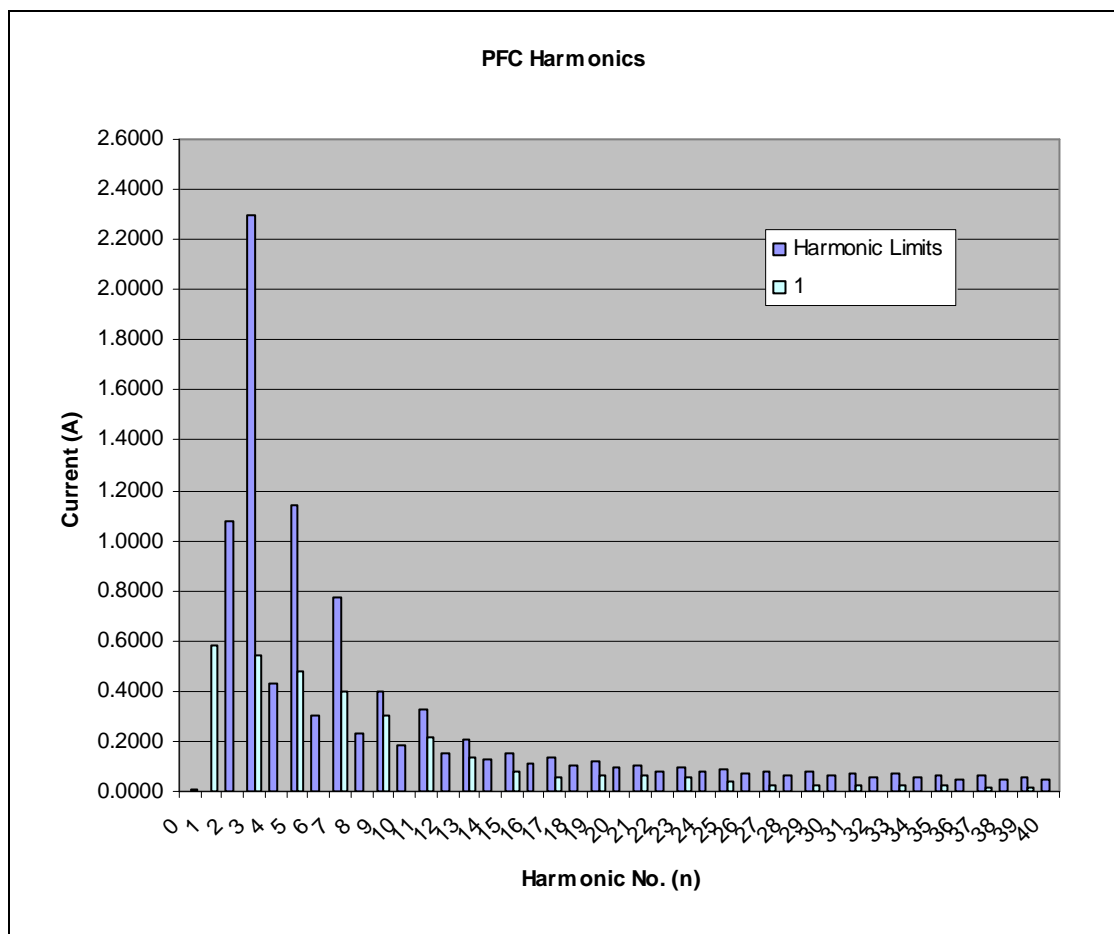
- EUT tested under normal operating conditions of 230V 50Hz input at full load (24V/5A Resistive)
- EUT powered by low-distortion AC Voltage Source, TTI AC-1000
- Harmonic Limits measured using LMG 95 Power Meter
- Tested to IEC61000-3-2 Table 1 Class A

4.1 Test Set-Up:



4.2 Harmonic Emissions Results

n	Harmonic Limit	Measured Values
3	2.3	0.5391
5	1.14	0.4791
7	0.77	0.3983
9	0.4	0.3067
11	0.33	0.215
13	0.21	0.134
15	0.15	0.076
17	0.1324	0.0552
19	0.1184	0.0601
21	0.1071	0.0626
23	0.0978	0.0552
25	0.09	0.0411
27	0.0833	0.0266
29	0.0776	0.0203
31	0.0726	0.0232
33	0.0682	0.0257
35	0.0643	0.024
37	0.0608	0.0186
39	0.0577	0.0125



PASS

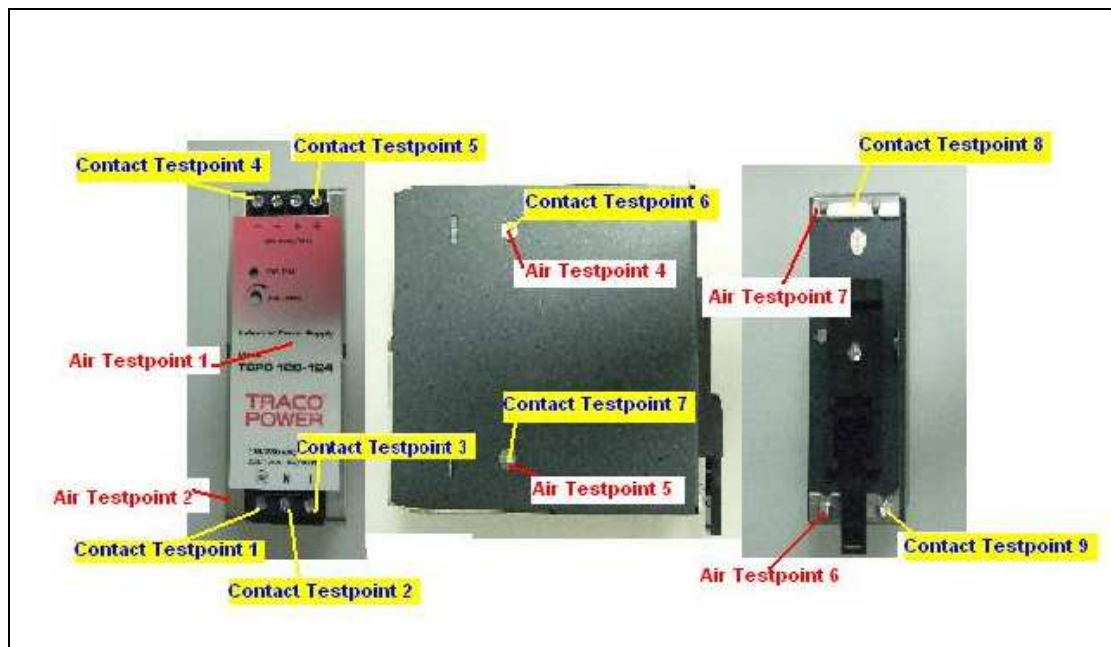
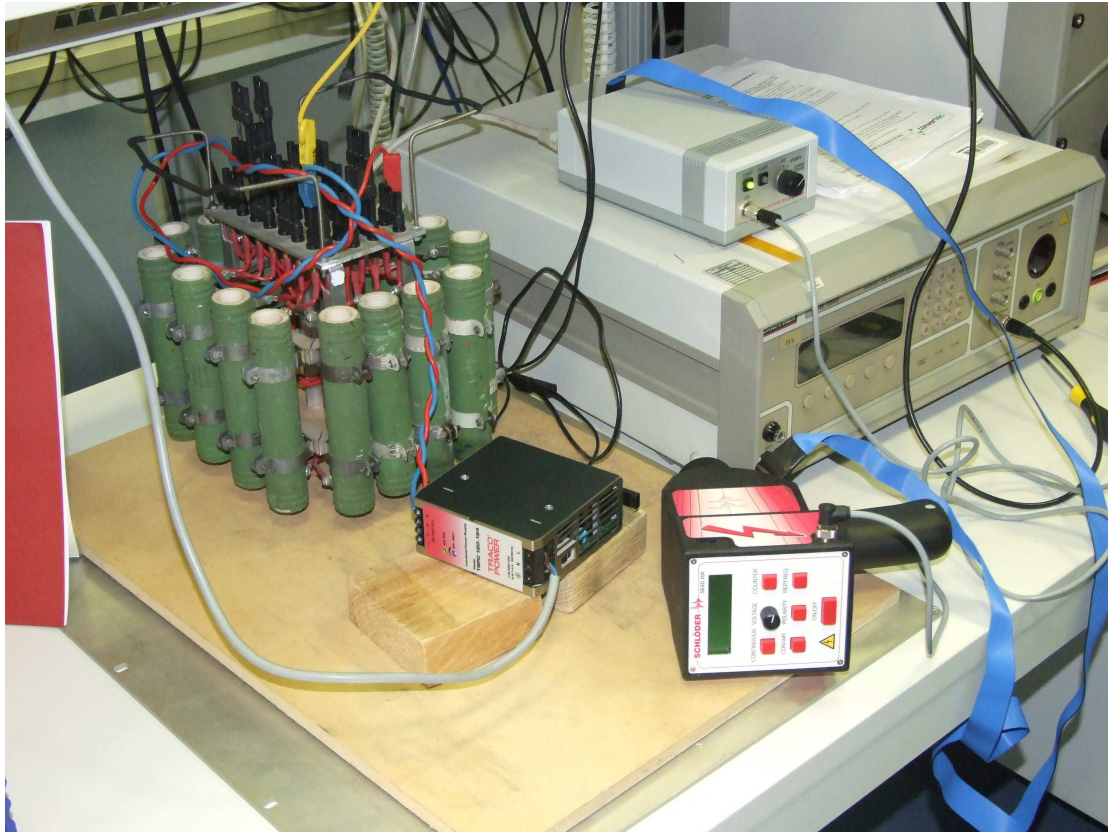
5 Electrostatic Discharge Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
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 (24V/5A 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 (See contact testpoints in diagram) using ESD gun SESD 200
- Test voltage shall be increased from 2kV up to the max 8kV/4kV (air/contact) As required by 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 ESD Results

	Contact Testpoints:	Air Testpoints:
EUT	PASS	PASS

Conclusion:

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

PASS

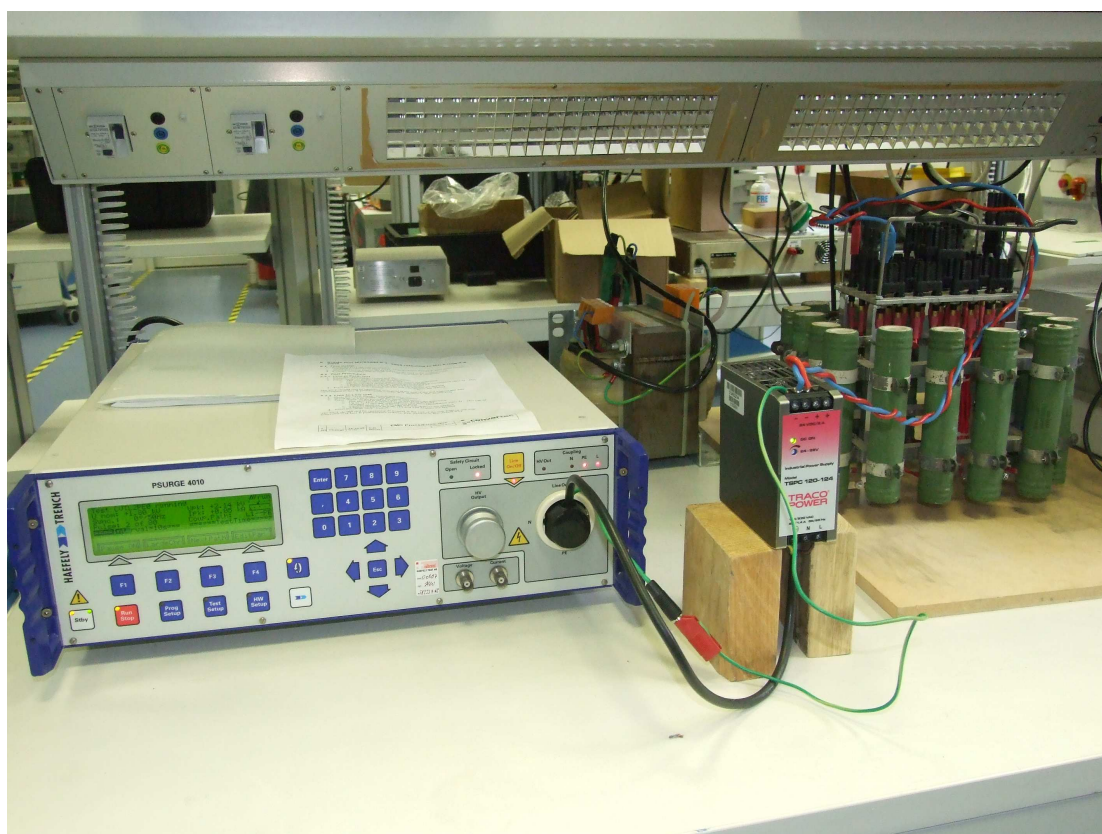
6 Surge Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
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 (24V/5A 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 at 0, 90, 180, and 270 and 5 tests Negative at 0, 90, 180, and 270
- Interval Between Surges: 10s

6.1 Test Setup



6.2 Surge Results

	L to N	L to PE	N to PE
EUT: 120POP184	PASS	PASS	PASS

Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-5)

Only Class B performance criteria are required as per Table 6, IEC 61204-3

PASS

7 Fast Transient Test (Burst)

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
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 (24V/5A 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
- Repetition rate: 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 Results

EUT: 120POP184	L-G	N-G	PE-G	L,N-G	L,PE-G	N,PE-G	L,N,PE-G
Positive	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Negative	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Conclusion:

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

Only Class B performance criteria are required as per Table 6, IEC 61204-3

PASS

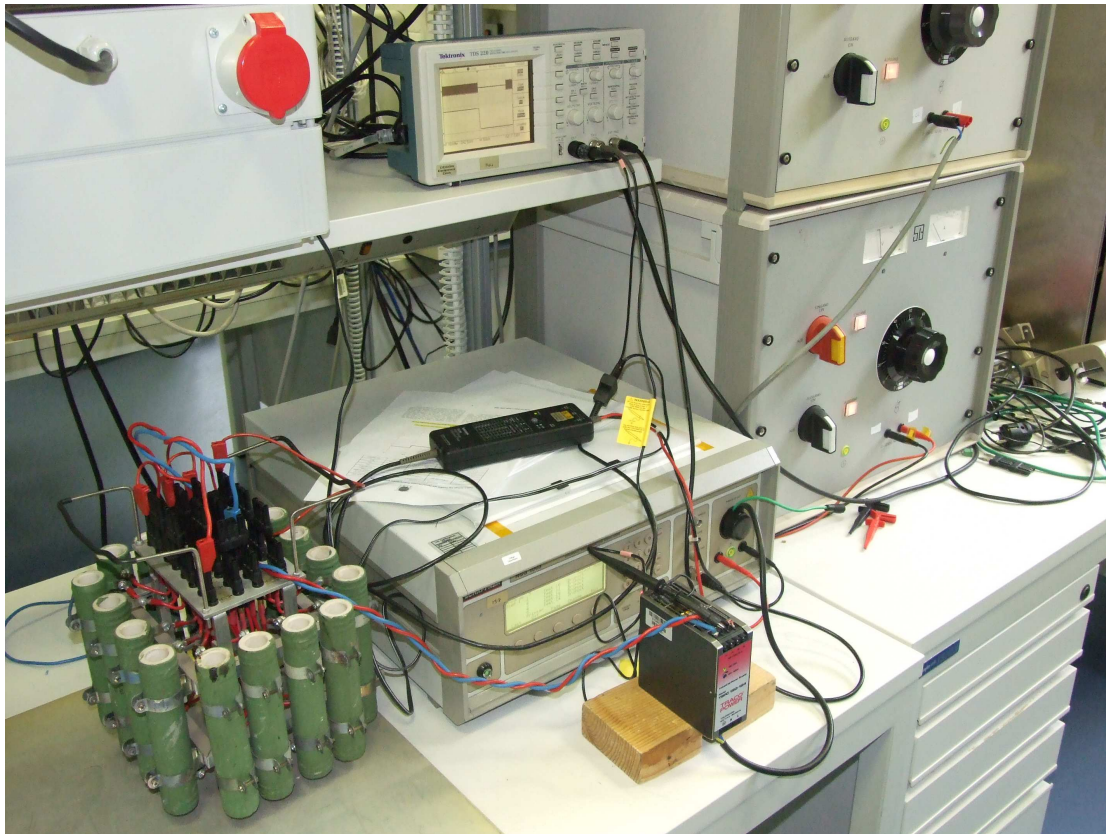
8 Voltage Dips and Short Interruptions Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
Standard: IEC61000-6-2:2005 referring to IEC 61000-4-11:2004

Notes:

- EUT tested under normal operating conditions of 240V 50Hz input at full load (24V/5A Resistive)
- Test carried out using 2 Variacs and dropout simulator NSG 1003
- Tested according to class 3 IEC61000-4-11 (as per Annex B)
- Units tested with highest and lowest nominal voltage (240V/100V) 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
100VAC				
Phase Angle:	0	90	180	270
100%-0%	A	A	A	A
100%-40%	B	B	B	B
100%-70%	B	B	B	B
100%-80%	B	A	B	A

Short Interruptions

100%-0%	0.1s	0.2s	0.5s	1s	2s	5s
100VAC	B	B	B	B	B	B
240VAC	B	B	B	B	B	B

Conclusion:

Test Result were evaluated in relation to the Customer Specification CS-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

9 Conducted Input RF Immunity Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
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 (24V/5A 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

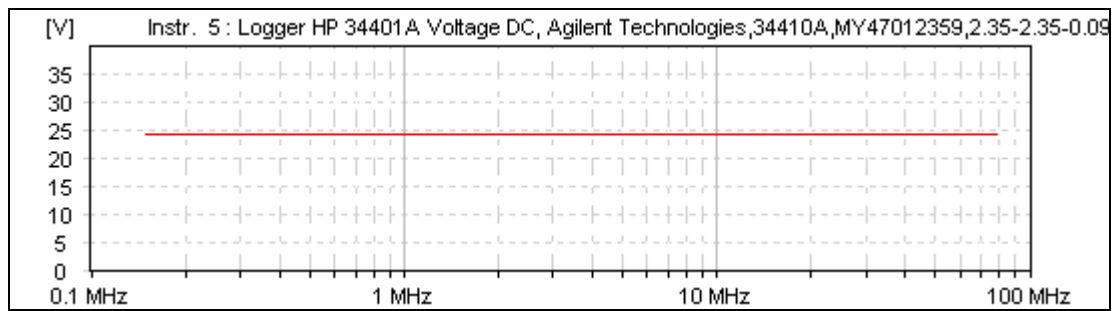
Test Equipment Settings:

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-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

10 Conducted Output RF Immunity Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2004

Notes:

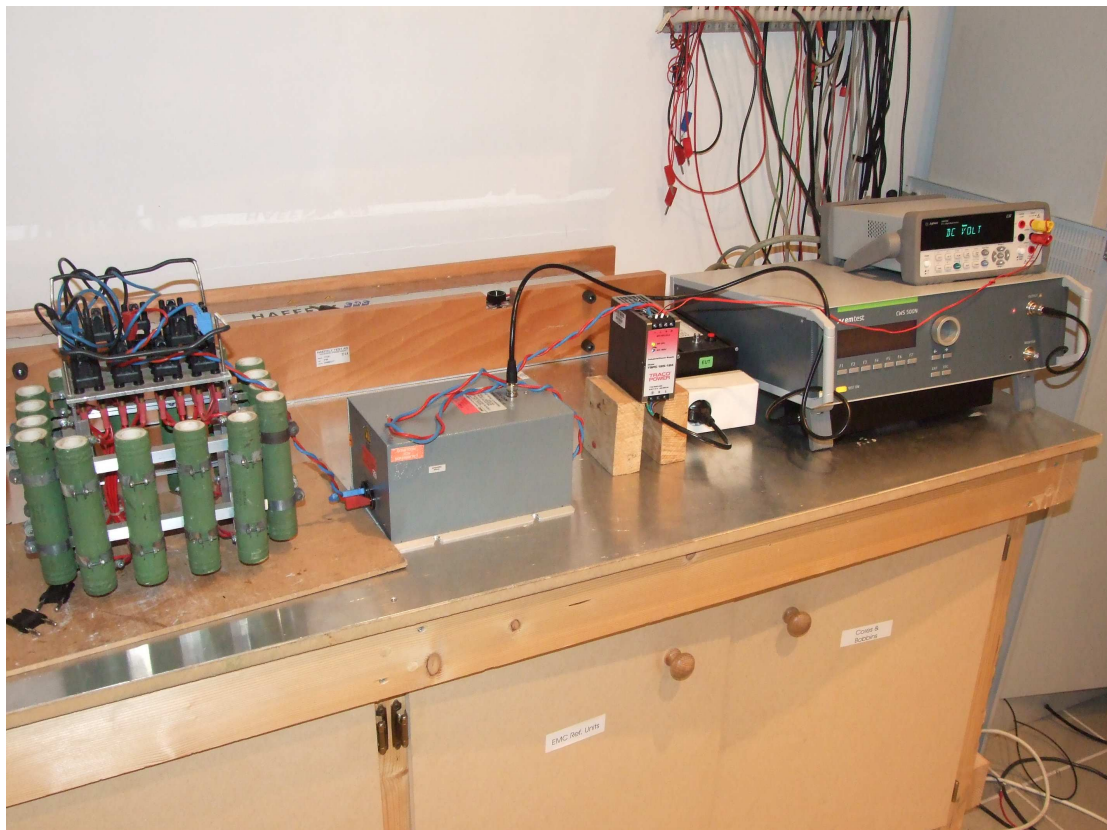
- EUT tested under normal operating conditions of 230V 50Hz input at full load (24V/5A Resistive)
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75”, measurement instrument “Agilent 34410A” and FCC-801-M2-50A Coupling/Decoupling network.
- Unit tested to IEC61000-4-6 test level 3

10.1 Test Setup:

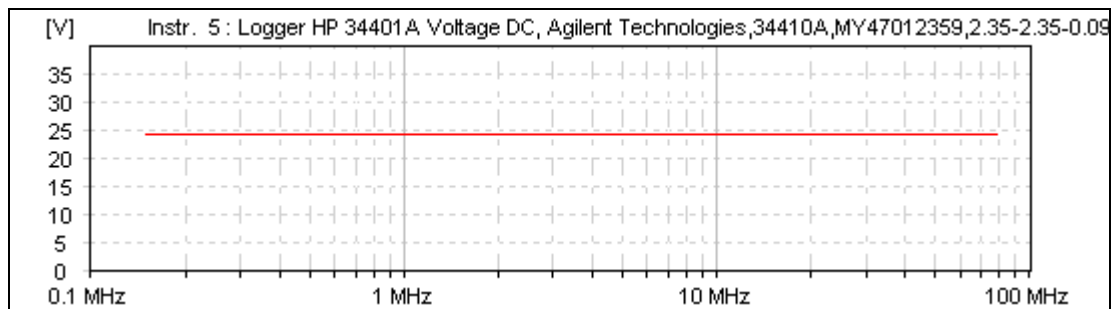
Test Equipment Settings:

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-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

11 Radiated RF Immunity Test

Equipment Under Test:	TSPC 120-124
EUT Serial No.:	N/A
Customer Spec:	CS-120POP184.doc
Date:	09/02/2011
Standard:	IEC61000-6-2: 2005 referring to IEC61000-4-3: 2004

Notes:

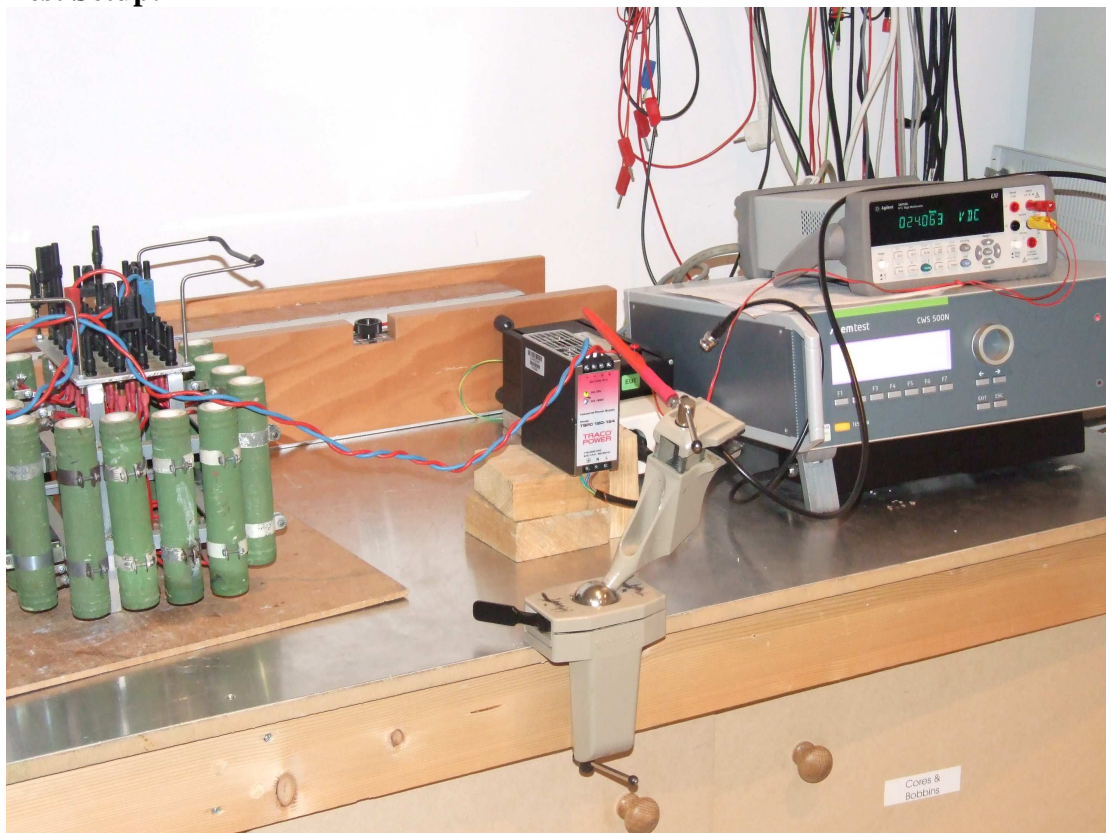
- EUT tested under normal operating conditions of 230V 50Hz input at full load (24V/5A Resistive)
- Test carried out using test generator “EM Test CWS 500N”, E-field probe and measurement instrument “Agilent 34410A”

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-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

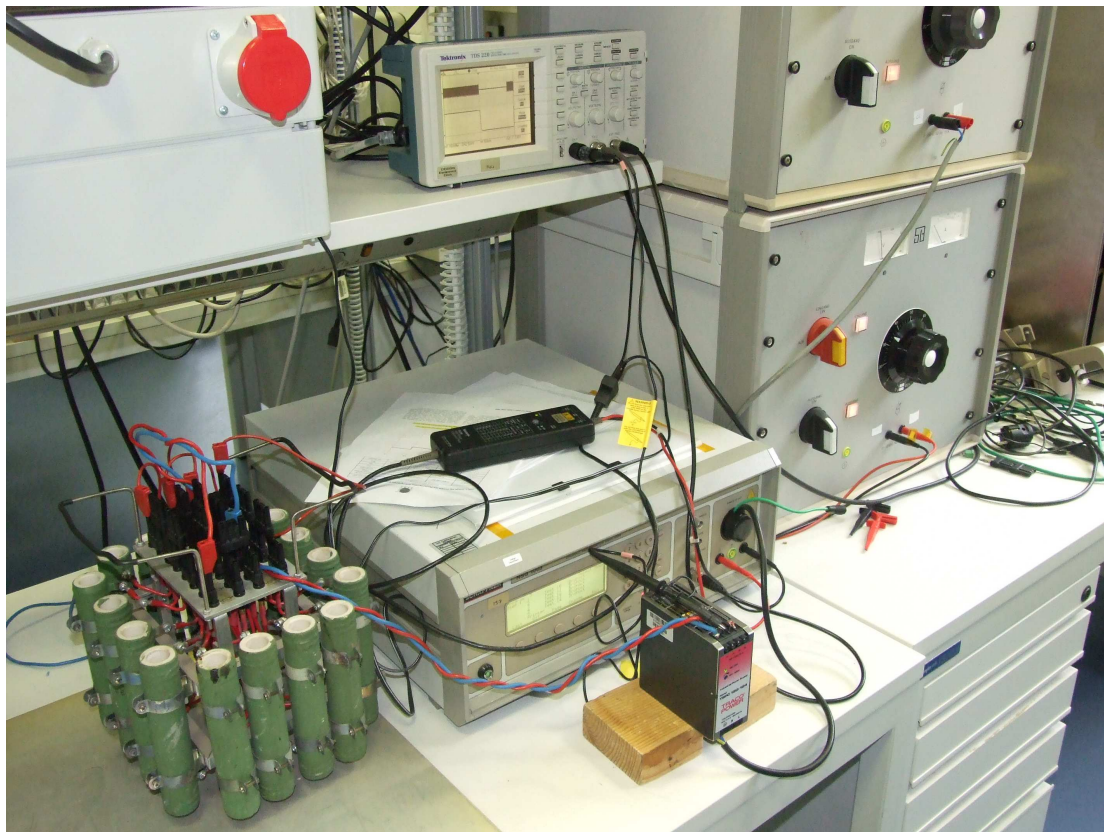
12 SEMI F47 Test

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 09/02/2011
Standard: SEMI F47-0706

Notes:

- EUT tested under operating conditions of 208V/115V 50Hz input at full load (24V/5A Resistive)
- Test carried out using test generator using Voltage Sag Generator: Schaffner NSG1003: Dropout and Variation Simulator and Oscilloscope Tektronix: TDS220

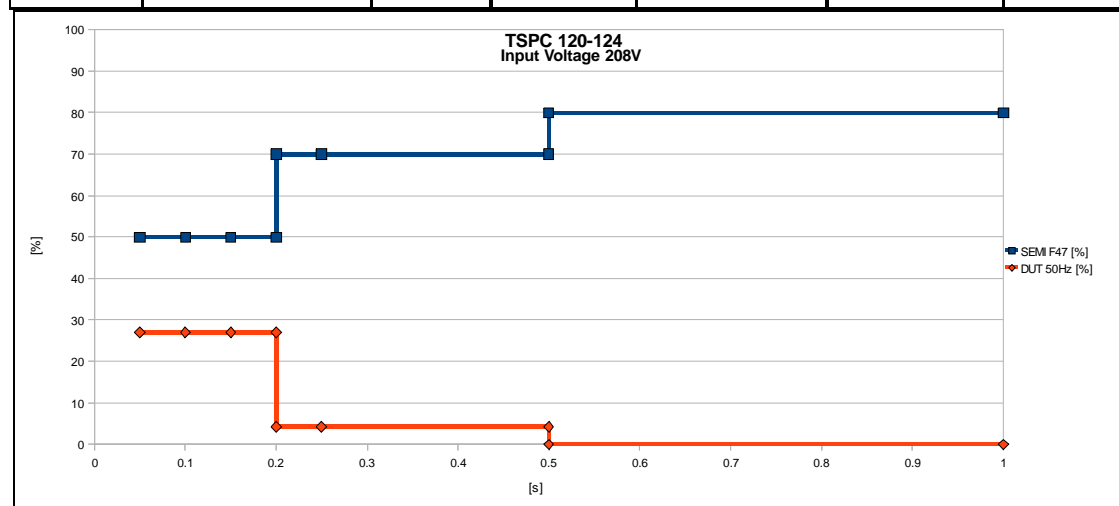
12.1 Test Setup



12.2 SEMI F47 Results

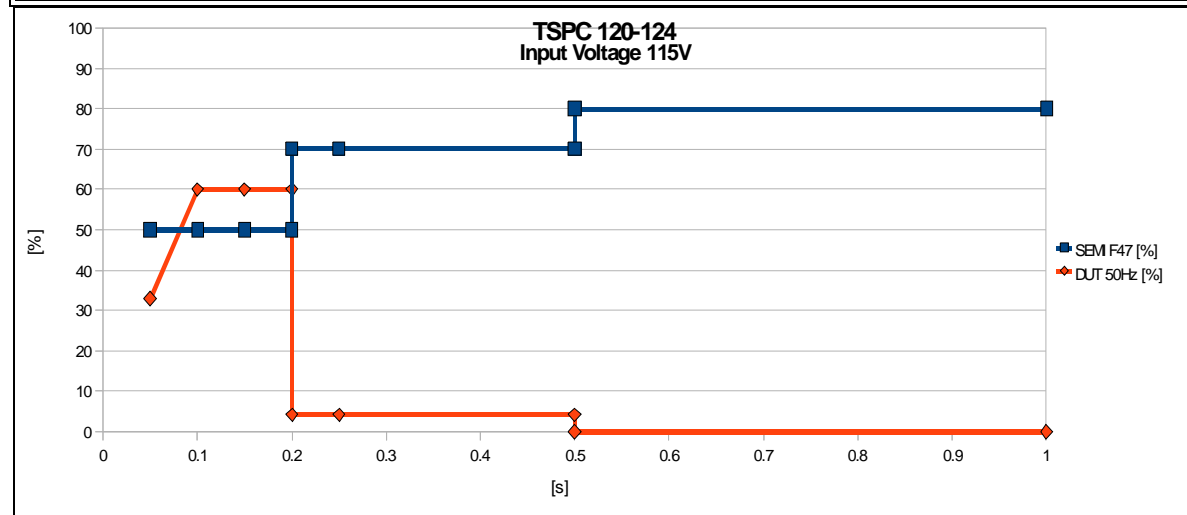
Input Voltage VAC = 208V, Output = 24VDC, 5A

Voltage Sag	Duration		Output Voltage	Percent of Nominal		
[V]	[s]	cycles	[V]	DUT 50Hz [%]	SEMI F47 [%]	Result
166.4	1	50	24	0	80	PASS
166.4	0.5	25	24	0	80	PASS
145.6	0.5	25	23	4.2	70	PASS
145.6	0.25	12.5	23	4.2	70	PASS
145.6	0.2	10	23	4.2	70	PASS
104	0.2	10	17.5	27	50	PASS
104	0.15	7.5	17.5	27	50	PASS
104	0.1	5	17.5	27	50	PASS
104	0.05	2.5	17.5	27	50	PASS
104	0.02	1	24	0	50	PASS
0	0.02	1	24	0	0	PASS



Input Voltage VAC = 115V, Output = 24VDC, 5A

Voltage Sag	Duration		Output Voltage	Percent of Nominal		
[V]	[s]	cycles	[V]	DUT 50Hz [%]	SEMI F47 [%]	Result
92	1	50	24	0	80	PASS
92	0.5	25	24	0	80	PASS
80.5	0.5	25	23	4.2	70	PASS
80.5	0.25	12.5	23	4.2	70	PASS
80.5	0.2	10	23	4.2	70	PASS
57.5	0.2	10	9.6	60	50	PASS
57.5	0.15	7.5	9.6	60	50	PASS
57.5	0.1	5	9.6	60	50	PASS
57.5	0.05	2.5	16	33	50	PASS
57.5	0.02	1	24	0	50	PASS
0	0.02	1	24	0	0	PASS



Conclusion:

Meets Criteria C (Ref. SEMI F47-0706)

Test Results were evaluated in relation to the Customer Specification CS-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

13 Power Frequency Magnetic Field Immunity

Equipment Under Test: TSPC 120-124
EUT Serial No.: N/A
Customer Spec: CS-120POP184.doc
Date: 10/03/2011
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 (24V/5A 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

13.1 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

Test Setup:



13.2 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-120POP184.doc and the UUT was considered to have PASSED the tests.

PASS

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	PASS	
Radiated (30-300MHz)	Class B	PASS	
IEC61000-6-3: 2006 + IEC 61000-3-2:2005			
Harmonic Current Emissions	Class A	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-5:2005			
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	+/- 2kV (Class B) L-N	PASS	
	+/- 4kV (Class B) L-PE	PASS	
	+/- 4kV (Class B) N-PE	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-4: 2004			
Fast Transient (Burst)			
- AC Supply	+/- 4kV (Class B Between all lines)	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-11:2004			
Voltage Dips			
- AC Supply	100%-0% (b)	PASS	
	100%-40% (b)	PASS	
	100%-70% (b)	PASS	
	100%-80% (b)	PASS	
Short Interruptions (100%-0% for: 0.1s, 0.2s, 0.5s, 1s, 2s and 5s)	(b)	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	
SEMI F47-0706			
Semi F47 Test	Class B	PASS	
IEC61000-6-2: 2005 + IEC61000-4-8: 2001			
Power Frequency Magnetic Field Immunity	Level 5 (Class A)	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
Low-Distortion AC Source	AC1000	Thurlby Thandar Instruments	151093
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
Dropout & Variation Simulator	NSG 1003	Schaffner	106
Electronic Load	ELA 500	Zentro-Electrik	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
Cables	Type	Length	Comments
Mains Supply Cable	3-wire	1m	Unshielded
DC Lines Cable	2-wire	1m	Unshielded