T R A C O P O W E R

Model: TCL 024-105
EMC – Test Report

EUT:	TRACOPOWER Model: TCL 024-105
Serial No.:	30829108615
Manufacturer No.:	020PSM181
Manufacturer:	Convertec Ltd. Whitemill Industrial Estate Wexford Republic of Ireland
Tester:	Colin Doyle, Convertec
Date:	19/12/2008

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

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
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 (5V/4A Resistive)
- Emissions measured using PMM 8000 analyzer and PMM LISN
- Tested to CISPR 16 -1-2:2003 Class B limits
- Transient limiter used to protect PMM 8000, with appropriate correction factors applied
- Tests carried out in a shielded room

1.1 Test Setup

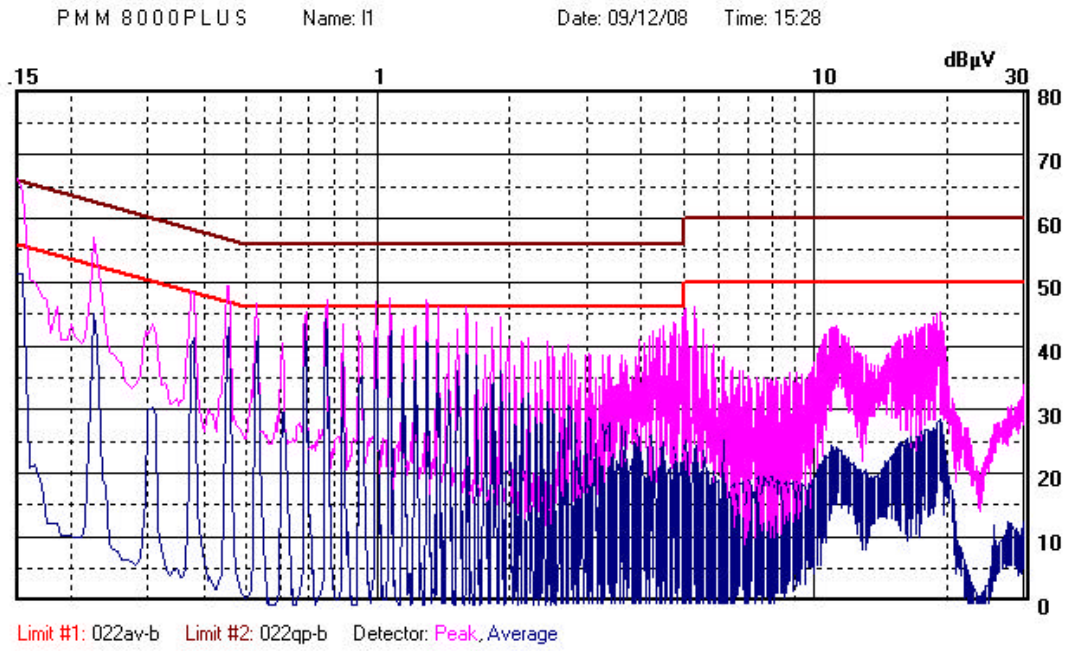
Test Equipment Settings:

Start Freq.	Stop Freq.	Step	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	5kHz	50ms	500ms	50ms

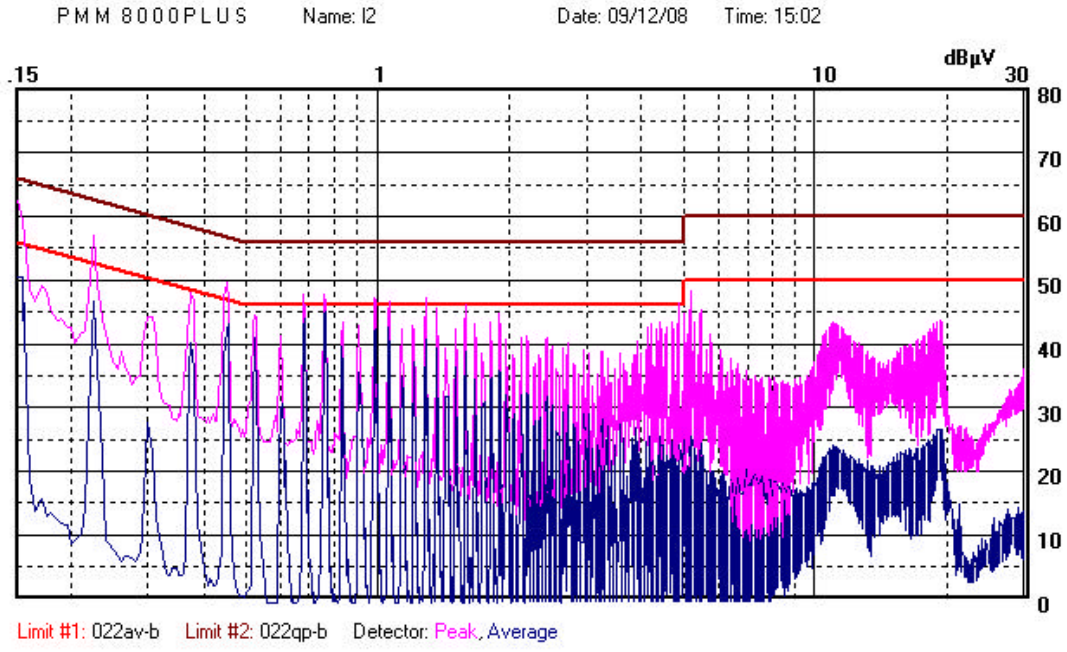
Test Setup:

1.2 Conducted Input Emissions Results

L1



L2



PASS

2 Radiated Emissions Test

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
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 230V 50Hz input at full load (5V/4A Resistive)
- Emissions measured using receiver “PMM 8000 plus EMI Test Signal Analyzer” 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

2.1 Test Setup

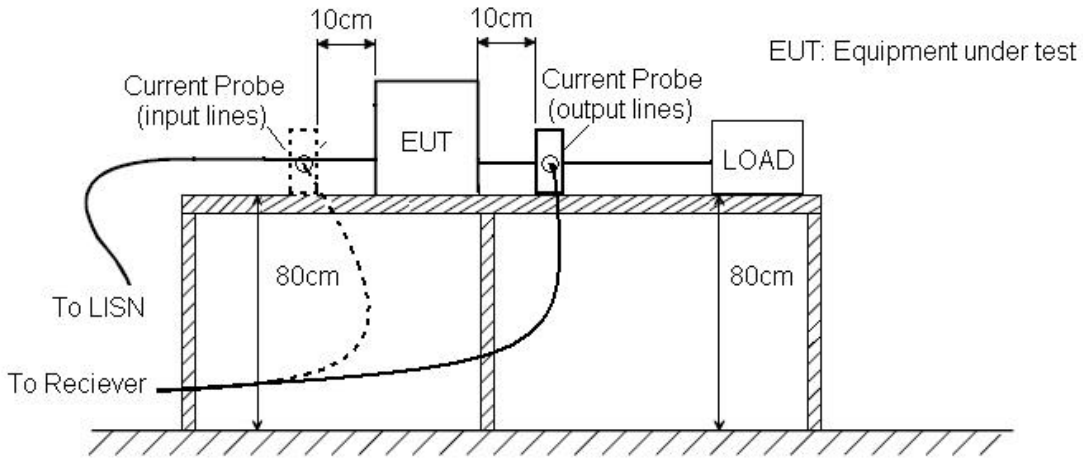


Figure 1. Test set-up for measurement of disturbance power similar to IEC61204-3

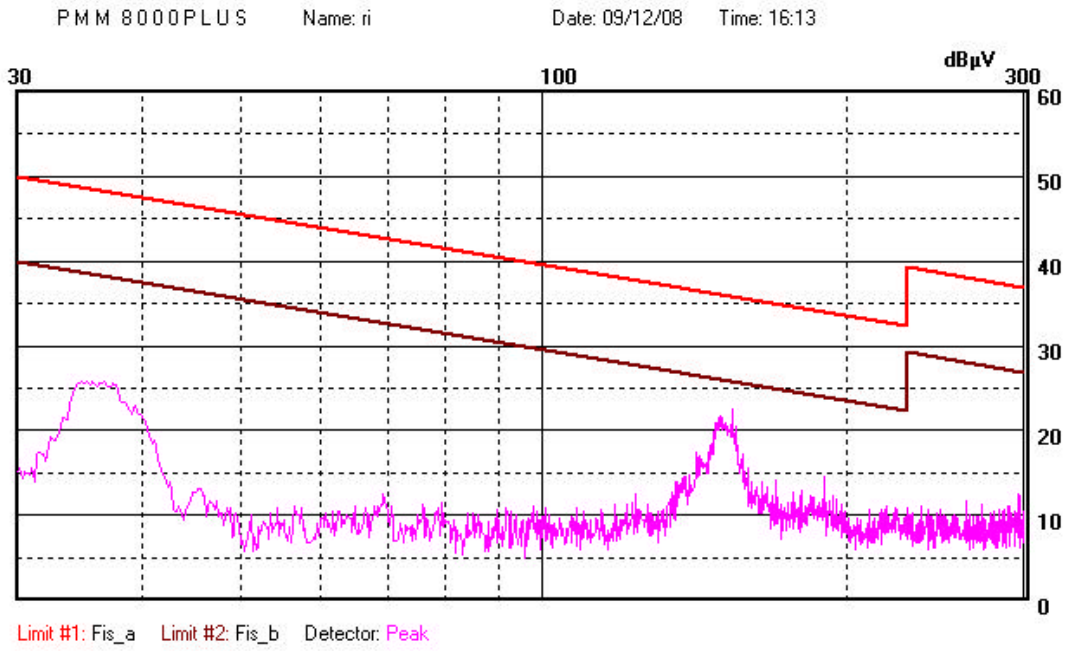
Test Equipment Settings:

Start Freq.	Stop Freq.	Step	Pk Time
30MHz	300MHz	100kHz	10ms

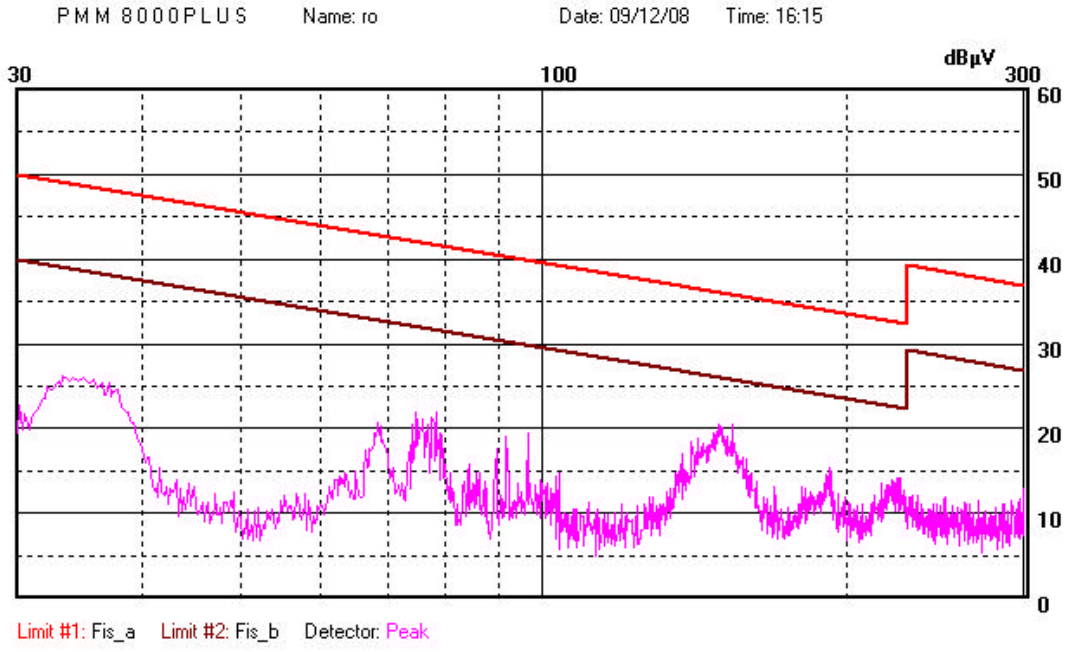
Test Setup: The following shows the setup used for input lines, the setup used for the output lines is the same with the clamp on the output lines.

2.2 Radiated Emissions Results

Input Lines:



Output Lines:



PASS

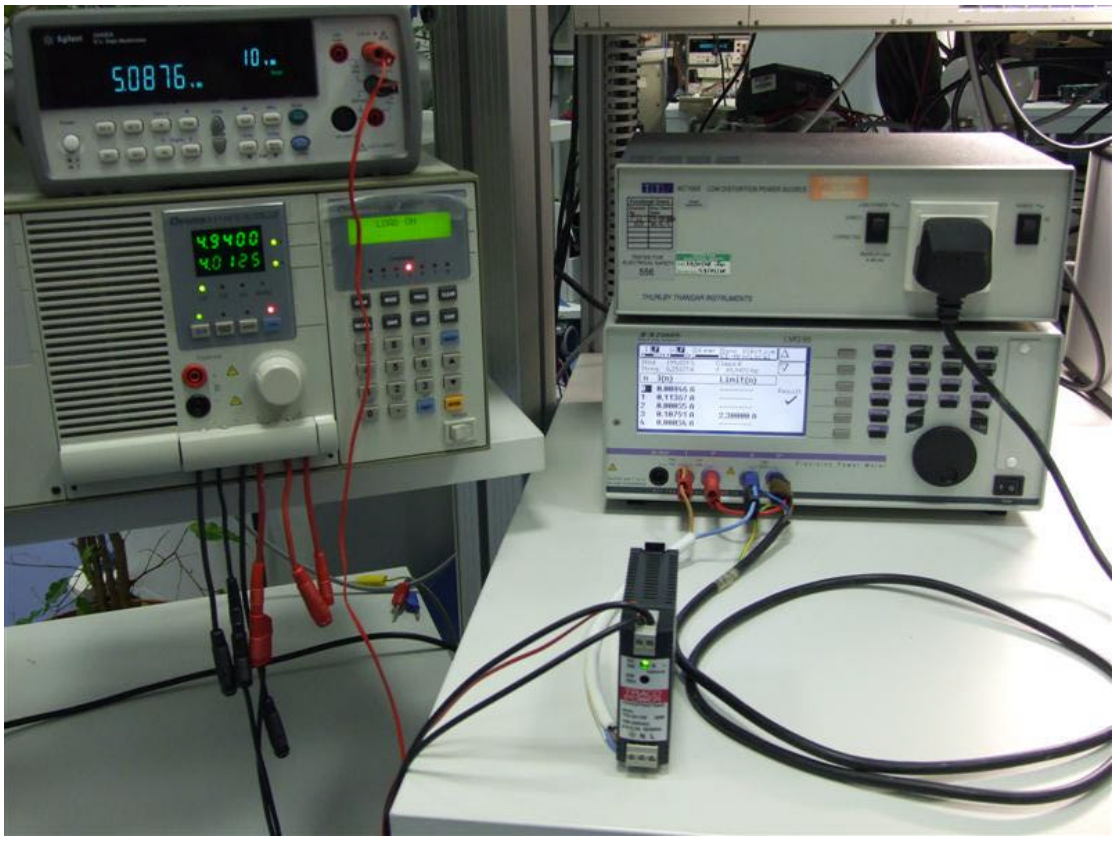
3 Harmonic Current Emissions Test

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
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 (5V/4A 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

3.1 Test Set-Up:



3.2 Harmonic Emissions Results

n	Harmonic Limit	Measured Values
3	2.3	0.108
5	1.14	0.102
7	0.77	0.094
9	0.4	0.084
11	0.33	0.072
13	0.21	0.06
15	0.15	0.048
17	0.1324	0.036
19	0.1184	0.025
21	0.1071	0.016
23	0.0978	0.009
25	0.09	0.007
27	0.0833	0.008
29	0.0776	0.01
31	0.0726	0.01
33	0.0682	0.01
35	0.0643	0.008
37	0.0608	0.007
39	0.0577	0.005

PASS

4 Electrostatic Discharge Test

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-2: 2000

Notes:

- As stated in the installation instructions at:
  http://www.tracopower.com/products/tcl_inst.pdf

  " This power supply is designed for professional indoor systems. In operation the power supply must not be accessible. It may be installed and put into service by qualified personnel only."

- And IEC 61000-4-2: 2000 section 8.3.1 states that:

  "Unless stated otherwise in the generic, product-related or product-family standards, the static electricity discharges shall be applied only to those points and surfaces of the EUT which are accessible to persons during normal use. The following exclusions apply (i.e. discharges are not applied to those items):

  c) Those points and surfaces of equipment which are no longer accessible after fixed installation or after following the instructions for use"

Therefore in accordance with IEC 61000-4-2: 2000 section 8.3.1 no ESD tests need to be carried out.

4.1 ESD Results

NOT APPLICABLE

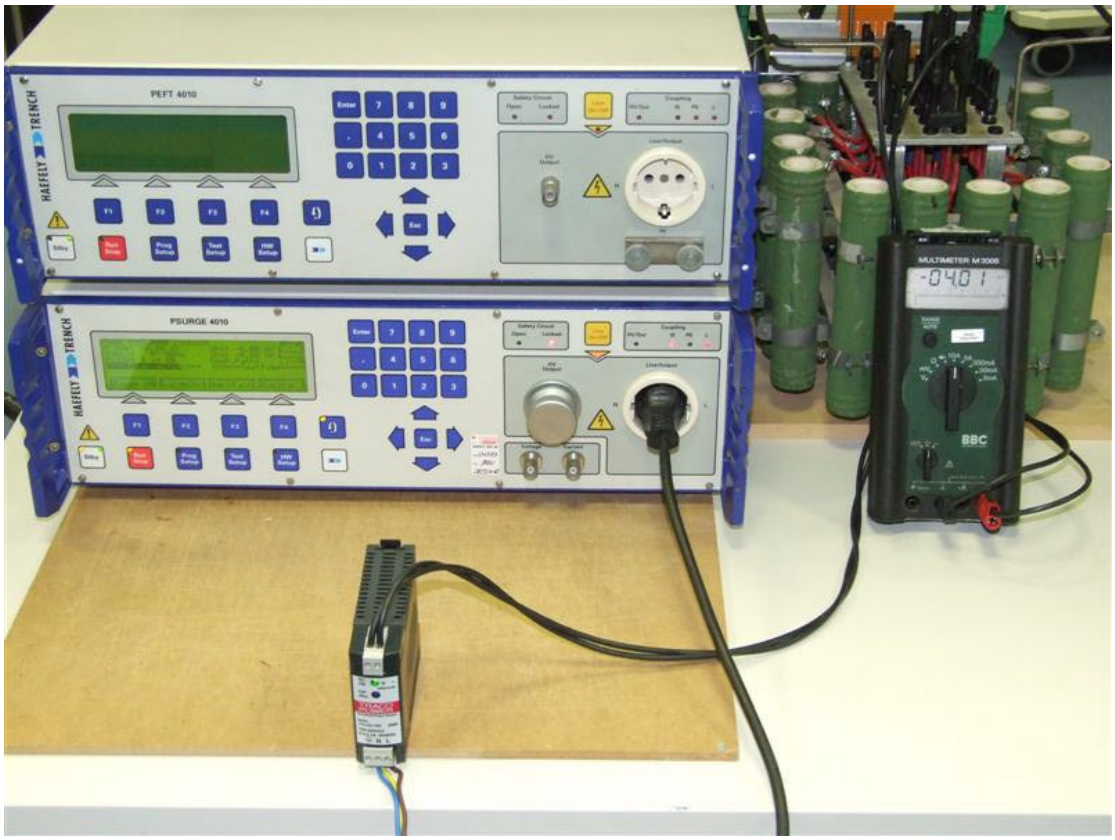
5 Surge Test

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
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 (5V/4A 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

5.1 Test Setup



5.2 Surge Results

	L to N	L to PE	N to PE
EUT: 30829108615	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

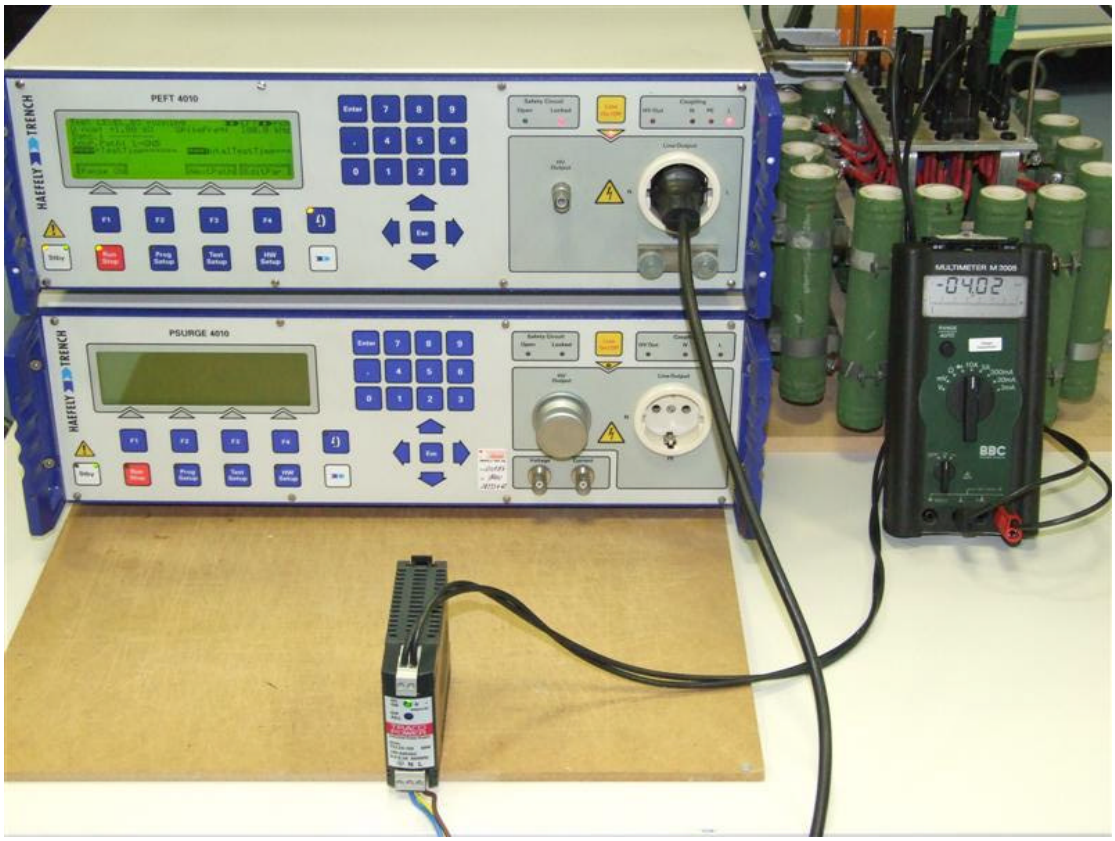
6 Fast Transient Test (Burst)

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
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 (5V/4A Resistive)
- Units tested to IEC61000-4-4 test level 3
- Used Haefely Burst tester PEFT 4010
- Voltage test level: +/-2Kv
- Burst Duration: 0.75ms
- Repition rate: 100kHz
- Burst Period: 300ms
- Individual test time: 1 min
- Polarity: Positive and Negative

6.1 Test Setup



6.2 Burst Results

EUT: 30829108615	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 Class B performance criteria are required as per Table 6, IEC 61204-3

PASS

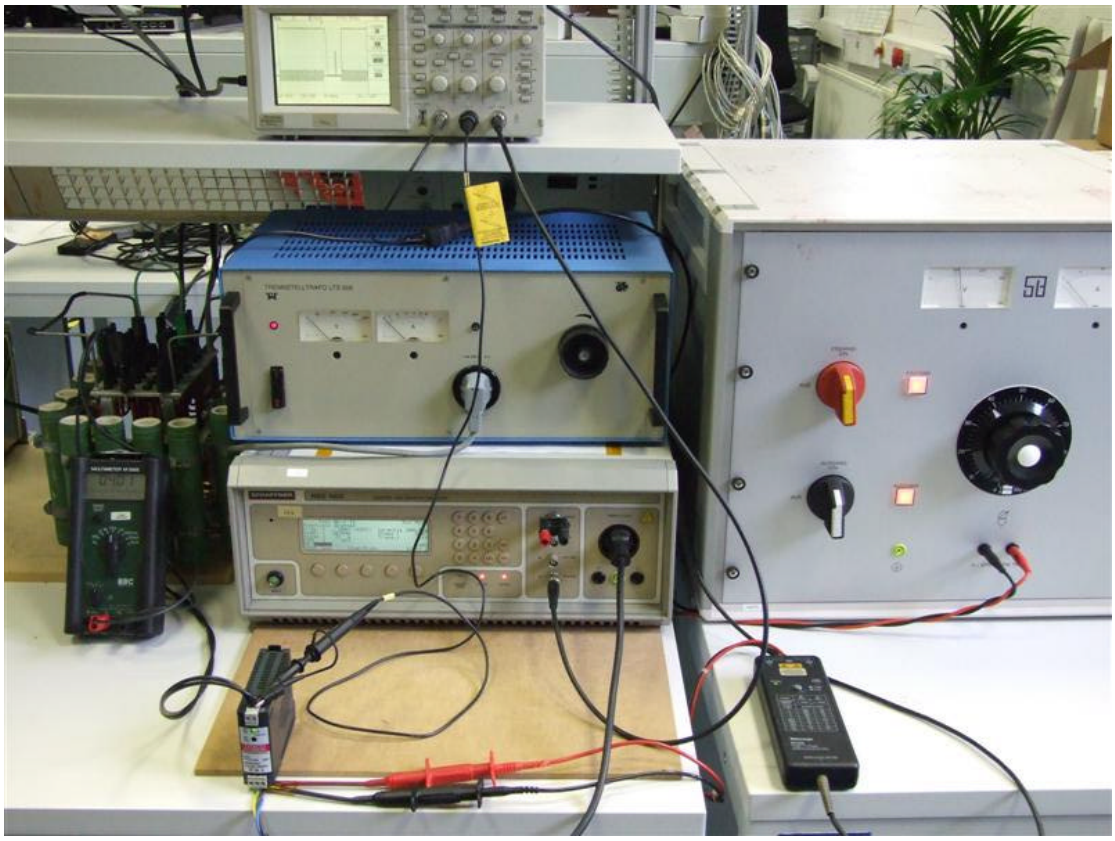
7 Voltage Dips and Short Interruptions

Equipment Under Test: TCL 024-105
EUT Serial No.: 30829108615
Customer Spec: CS-020PSM181.doc
Date: 19/12/2008
Standard: IEC61000-6-2:2005 referring to IEC 61000-4-11:2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (5V/4A Resistive)
- Test carried out using 2 Variacs and dropout simulator NSG 1003
- Tested according to class 3 IEC61000-4-11
- Units tested with highest 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^{o}, 90^{o}, 180^{o} and 270^{o} for each voltage level tested
- Dropouts were tested from 100%-80% for 250 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-70% for 25 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-40% for 10 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-0% for 1 Mains cycle in accordance with IEC61000-4-11 table 2
- 3 dropouts and 3 short interruptions were carried out per test
- Short interruptions tests were carried out at 100% to 0% for 0.1s, 0.2s, 0.5s, 1s, 2s,and 5s durations
- Short interruptions were done at worst case 0^{o} phase angle

7.1 Test Setup



7.2 Voltage Dips & Short Interruptions Results

Voltage Dips

240VAC				
Phase Angle:	0	90	180	270
100%-0%	Class A	Class A	Class A	Class A
100%-40%	Class A	Class A	Class A	Class A
100%-70%	Class A	Class A	Class A	Class A
100%-80%	Class A	Class A	Class A	Class A
110VAC				
Phase Angle:	0	90	180	270
100%-0%	Class A	Class A	Class A	Class A
100%-40%	Class B	Class B	Class B	Class B
100%-70%	Class A	Class A	Class A	Class A
100%-80%	Class A	Class A	Class A	Class A

Short Interruptions

100%-0%	0.1s	0.2s	0.5s	1s	2s	5s
110VAC	Class B	Class B	Class B	Class B	Class B	Class B
240VAC	Class A	Class A	Class B	Class B	Class B	Class B

Conclusion:

- In accordance with Class B, IEC61000-4-11 section 9 (b)

PASS

8 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	
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 61000-4-2: 2000			
EUT will be inaccessible to persons during normal use		NOT APPLICABLE	
IEC61000-6-2: 2005 + IEC 61000-4-5: 2005			
Surge			
-AC Supply	+/- 1kV (ClassB) L-N	PASS	
	+/- 2kV (ClassB) L-PE	PASS	
	+/- 2kV (ClassB) N-PE	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-4: 2004			
Fast Transient (Burst)			
-AC Supply	+/- 2kV (ClassB) Between all lines	PASS	
IEC61000-6-2:2005 + IEC 61000-4-11:2004			
Voltage Dips			
-AC Supply	100%-0% (Class A)	PASS	
	100%-40% (Class B)	PASS	
	100%-70% (Class A)	PASS	
	100%-80% (Class A)	PASS	
Short Interruptions (100%-0% for: 0.1s, 0.2s, 0.5s, 1s, 2s and 5s)	Class B	PASS	

9 List of Equipment Used:

Description	**Model No.**	**Manufacturer**	**Serial No.**
Test Signal Analyzer	PMM 8000PLUS	PMM	0100J91001
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
Dropout & Variation Simulator	NSG 1003	Schaffner	106
Electronic Load	6314/63106	Chroma	63145803
High Power Resistors	n/a	n/a	n/a
Multimeter	M2008	BBC	M24119181
Multimeter	Hit 23S	Metra	NE4126
Oscilloscope	TDS1002	Tektronix	C016388
Cables	**Type**	**Length**	**Comments**
Mains Supply Cable	3-wire	1m	Unshielded
DC Lines Cable	2-wire	1m	Unshielded

TRACO POWER
Model: TCL24-105
EMC – Test Report

Amendment report to EMC test report TCL 24-105 19/12/2008

EUT:	TRACO POWER Model: TCL24-105
Serial No.:	31250709761
Manufacturer No.:	020PSM181
Manufacturer:	Convertec Ltd. Whitemill Industrial Estate Wexford Republic of Ireland
Tester:	Gunnar Tapper, Convertec
Date:	10/10/2013

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

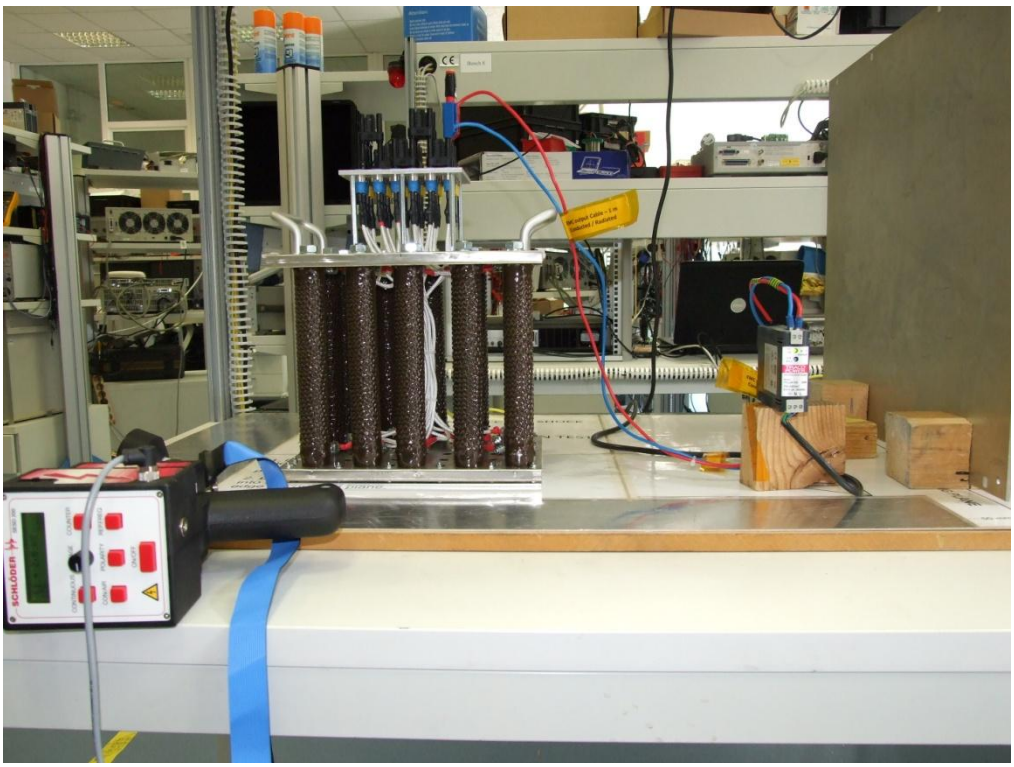
1. Electrostatic Discharge Immunity Test

Equipment under Test: TCL24-105
EUT Serial No.: 31250709761
Customer Spec: CS-020PSM181.doc
Date: 06/08/2013
Standards: 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 (5.0V/4.0A 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 air discharges, the trigger is engaged at about 20cm and the tester is moved quickly toward the test point until a spark occurs and trigger is released

1.1. Test Set-Up:



1.2. Electrostatic Discharge Immunity Test Results

All exposed metal screw heads and ground planes were tested as contact test points and also as air test points.
The connector pins and all vents and inlets were also tested as air test points.

	Contact Test points:	Air Test points:
EUT		PASS

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

PASS

Environmental conditions

Temperature: 15-30°C
Humidity: 30-60%
Air Pressure: 860-1060 hPa
Environmental conditions during the test: ☒ kept
☐ not kept

2. Conducted RF Immunity Test at AC Mains Terminals

Equipment under Test: TCL24-105
EUT Serial No.: 31250709761
Customer Spec: CS-020PSM181.doc
Date: 09/10/2013
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2006 + A1:2007, A2:2010

Notes:

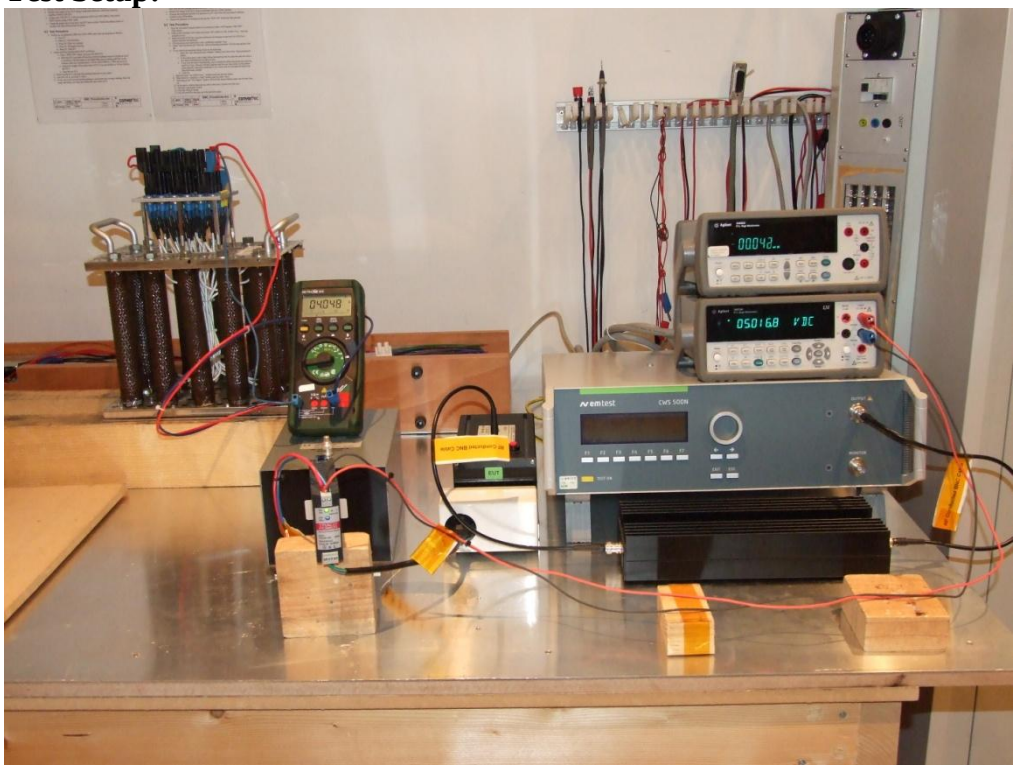
- EUT tested under normal operating conditions of 230V 50Hz input at full load (5.0V/4.0A Resistive).
- Test carried out using test generator "EM Test CWS 500N", Coupling/Decoupling network "EM Test CDN M2/M3", an attenuator "EM Test ATT6/75" and measurement instrument "Agilent 34410A"
- EUT tested to IEC61000-4-6 test level 3

2.1. Test Setup

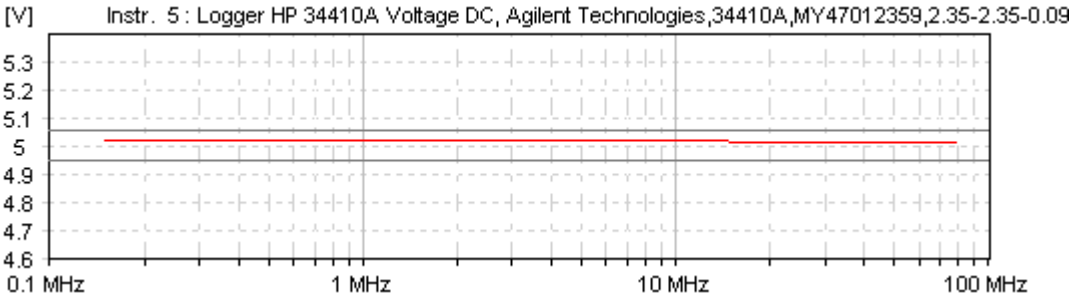
Test Equipment Settings:

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:



2.2. Conducted RF Immunity Test Results



Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-3)
Test Results were evaluated in relation to the Customer Specification CS-020PSM181.doc and the output did not change by more than +/-80mV therefore EUT was considered to have PASSED the tests.

PASS

Environmental conditions

Temperature:	15-30°C
Humidity:	30-60%
Air Pressure:	860-1060 hPa
Environmental conditions during the test:	☒ kept
	☐ not kept

3. Conducted RF Immunity Test at DC Output Terminals

Equipment under Test: TCL24-105
EUT Serial No.: 31250709761
Customer Spec: CS-020PSM181.doc
Date: 06/08/2013
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2006 + A1:2007, A2:2010

Notes:

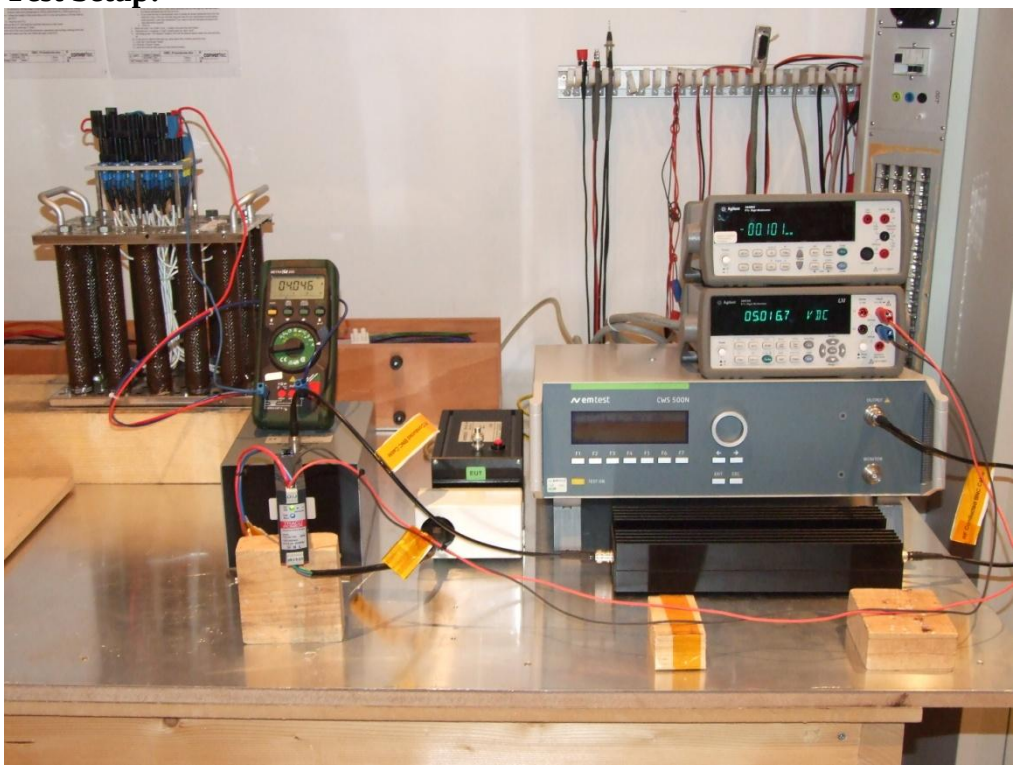
- EUT tested under normal operating conditions of 230V 50Hz input at full load (5.0V/4.0A Resistive).
- Test carried out using test generator "EM Test CWS 500N", Coupling/Decoupling network "EM Test CDN M2/M3", an attenuator "EM Test ATT6/75", measurement instrument "Agilent 34410A" and FCC-801-M2-50A Coupling/Decoupling network.
- Equipment was tested to IEC61000-4-6 test level 3

3.1. Test Setup:

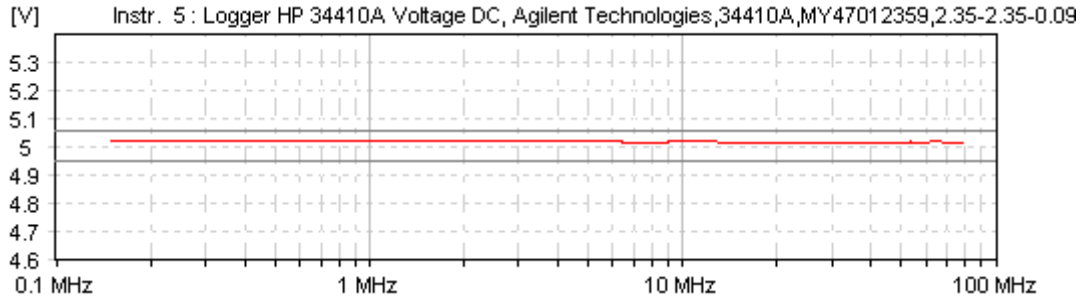
Test Equipment Settings:

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:



3.2. Conducted RF Immunity Test Results



Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-3)
Test Results were evaluated in relation to the Customer Specification CS-020PSM181.doc and the output did not change by more than +/-80mV therefore the EUT was considered to have PASSED the tests.

PASS

Environmental conditions

Temperature:	15-30°C
Humidity:	30-60%
Air Pressure:	860-1060 hPa
Environmental conditions during the test:	☒ kept
	☐ not kept

4. Radiated RF Immunity Test

Equipment under Test: TCL24-105
EUT Serial No.: 31250709761
Customer Spec: CS-020PSM181.doc
Date: 09/10/2013
Standard: IEC61000-6-2: 2005 referring to IEC61000-4-3: 2008

Notes:

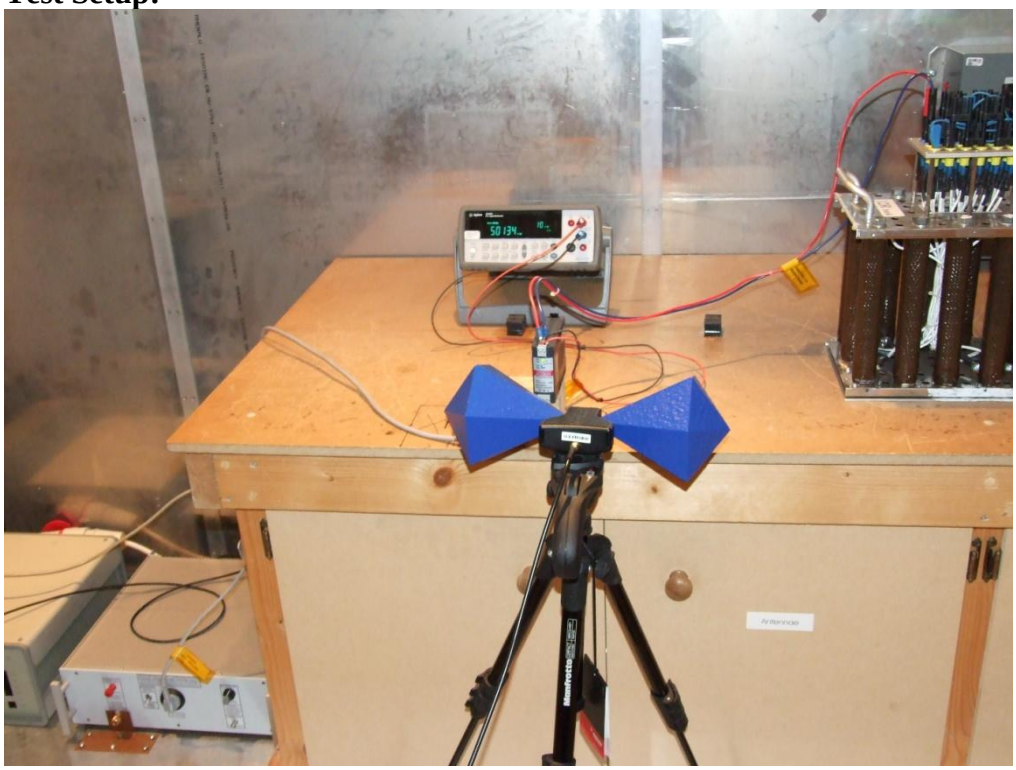
- EUT tested under normal operating conditions of 230V 50Hz input at full load (5.0V/4.0A Resistive).
- Test carried out using test generator "EM Test CWS 500N", Antenna BicoLOG 30100 X and Digitizing Multi Meter "Agilent 34405A"
- Measurement was carried out in a shielded room
- The input power port of the EUT was connected to mains via a 1.5m 3-core cable
- The output power port of the EUT was connected to the resistor bank via 1.5m long single core wires –wire size 14AWG

4.1. Test Setup

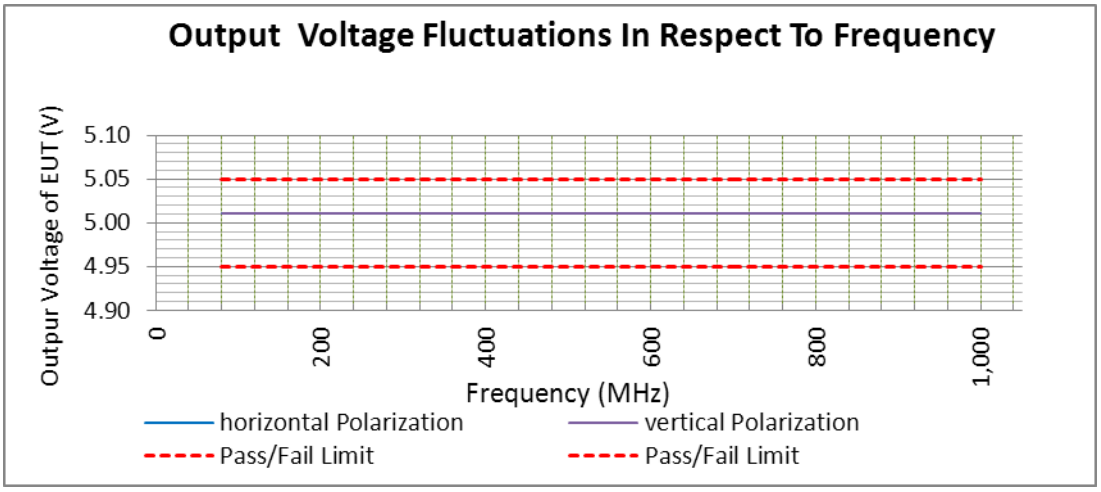
Test Equipment Settings:

Frq. start [MHz]	Level start [V/m]	Frq. stop [MHz]	Level stop [V/m]	Frq. step	Dwell time [s]	Rest Time [s]
80.0	10.0	1000.0	10.0	1.0 %	0.5	0.5

Test Setup:



4.2. Radiated RF Immunity Test Results



Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-3)
Test Results were evaluated in relation to the Customer Specification CS-020PSM181.doc and the output did not change by more than +/-80mV therefore the EUT was considered to have PASSED the tests.
PASS

Environmental conditions

Temperature:	15-30°C
Humidity:	30-60%
Air Pressure:	860-1060 hPa
Environmental conditions during the test:	☒ kept
	☐ not kept

5. Power Frequency Magnetic Field Immunity Test

Equipment under Test: TCL24-105
EUT Serial No.: 31250709761
Customer Spec: CS-020PSM181.doc
Date: 06/08/2013
Standard: IEC61000-6-2: 2005 referring to IEC61000-4-8: 2000

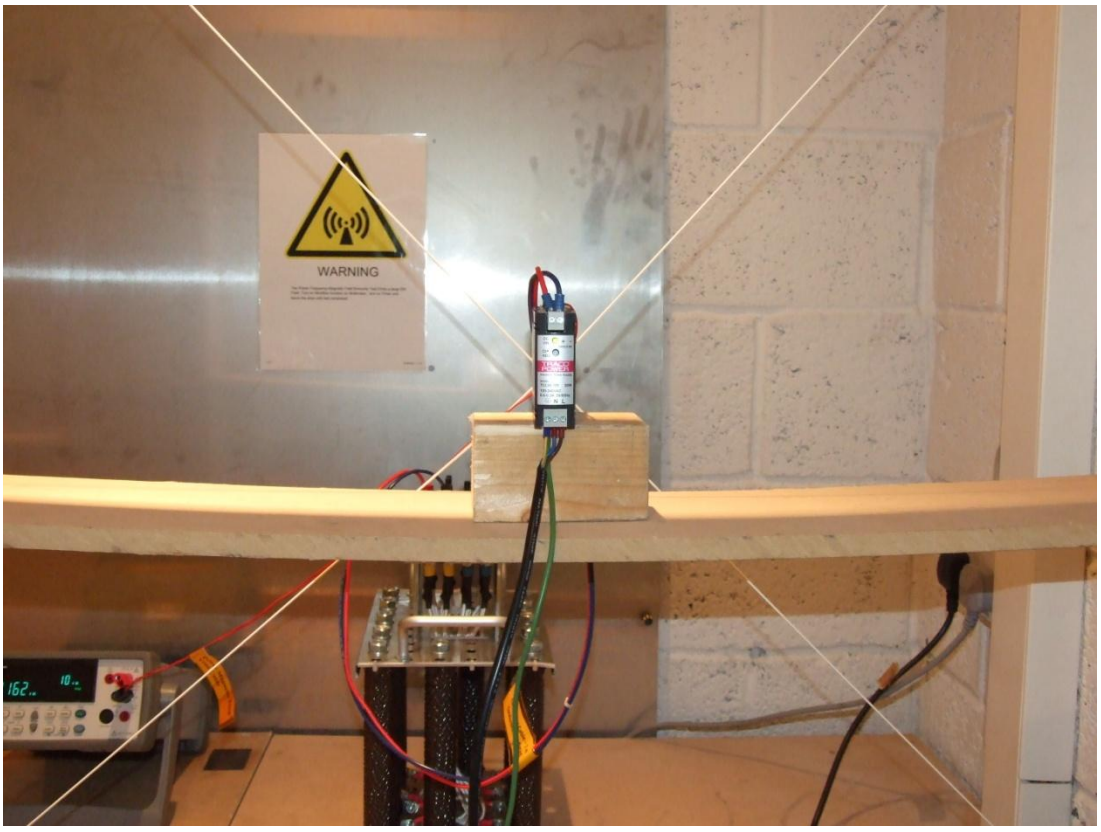
Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (5.0V/4.0A Resistive).
- Test carried out using test generator “Chroma Programmable AC Source”, “1meter x 1meter 100 turn Induction Coil" and measurement instrument “Agilent 34405A”
- EUT only required to meet test level 4 but tested to IEC61000-4-8 test levels 5

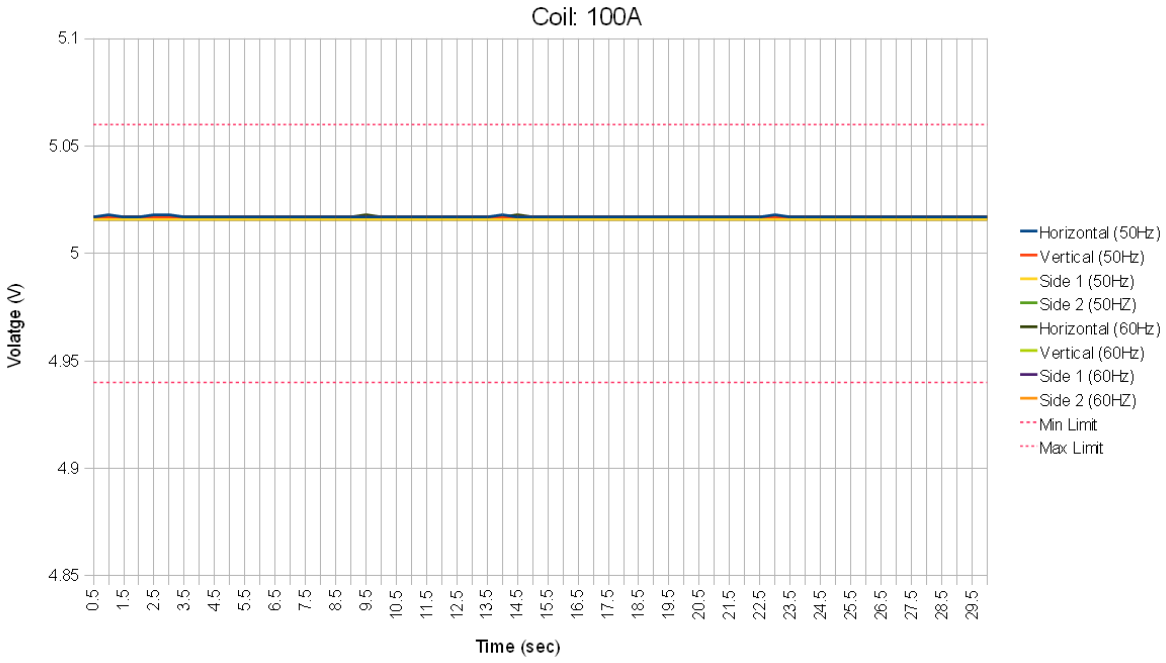
5.1. Test Setup

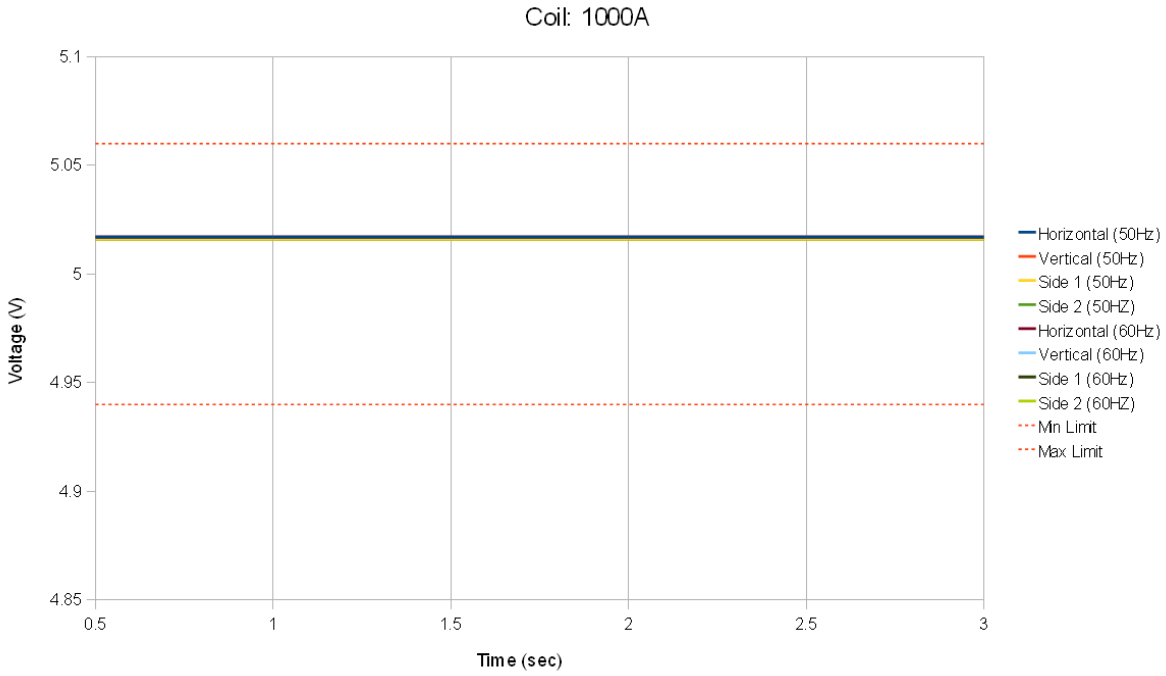
Test Equipment Settings:

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



5.2. Power Frequency Magnetic Field Immunity Test Results





Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-8)
Test Results were evaluated in relation to the Customer Specification CS-020PSM181.doc. The EUT was considered to have PASSED the tests.

PASS

Environmental conditions

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

Environmental conditions during the test: ☒ kept
☐ not kept

6. Summary

Regulation	Class/Test Level	Result	Comments
IEC61000-6-2: 2005 + IEC 61000-4-2:2000			
Electrostatic Discharge			
- Air Discharge	+/- 2/8kV (Class B)	PASS	
- Contact Discharge	+/- 2/4kV (Class B)	PASS	
IEC61000-6-2: 2005 + IEC61000-4-6:2008			
Conducted Input RF Immunity	Level III 10V **(**Class **A)**	PASS	
Conducted Output RF Immunity	Level III 10V **(**Class **A)**	PASS	
IEC61000-6-2: 2005 + IEC61000-4-3:2006+A1:2007,A2:2010			
Radiated RF Immunity	Level III 10V/m **(**Class **A)**	PASS	
IEC61000-6-2: 2005 + IEC61000-4-8: 2000			
Power Frequency Magnetic Field Immunity	Level 5 **(**Class **A)**	PASS	

7. 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
LISN 3	NSLK 8127	Schwarzbeck	8127683
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-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
Oscilloscope	TDS2014C	Tektronix	C010602
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	MY44044002
Biconical Antenna	BicoLOG 30100 X	AARONIA	79479
Cables	**Type**	**Length**	**Comments**
Mains Supply Cable	3-wire	1m	Unshielded
Mains Supply Cable	3-wire	1.5m	Unshielded
DC Lines Cable	2-wire	1m	Unshielded
DC Lines Cable	2-wire	1.5m	Unshielded