Test Report

EN 50155: 2007

(EMC, Characteristic, Environmental…Test)

Product: **DC/DC Converter**

Trade Name: TRACO POWER

Model Number: TEP Series (Refer to section 1.2)

Prepared for

TRACO ELECTRONIC Co., Ltd.

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Prepared by

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Remark:

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The test result in this report is only subjected to the test sample.

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Statement of Compliance

Applicant: TRACO ELECTRONIC Co., Ltd.

Manufacturer: [redacted]

Product: DC/DC Converter

Model No.: TEP Series (Refer to section 1.2)

Tested Power Supply: DC 48V

Date of Final Test: Apr. 05, 2012

Revision of Report: Rev. 02

Measurement Procedures and Standards Used :

☒ EN 50155: 2007 for EMC, Characteristic and Environmental
- ☒ EN 50121-3-2: 2006 for EMC
- ☒ EN 60068-2-1: 2007 for Environmental
- ☒ EN 60068-2-2: 2007 for Environmental
- ☒ EN 60068-2-30: 2005 for Environmental
- ☒ EN 61373: 1999 for Environmental

The device described above was performed by Interocean EMC Technology Corporation to determine the EMC & Environmental & Characteristic compliance with the requirement of above standards. The results contained in this report are subjected to the test sample only.

Report Issued : 2012/06/06

Project Engineer : Roy Chiang (Roy Chiang) Approved : (Benson Tsai)

1 General Information

1.1 Description of Equipment Under Test

Product	: DC/DC Converter
Model Number	: TEP Series (Refer to section 1.2)
Applicant	: **TRACO ELECTRONIC Co., Ltd.** Jenatschstrasse 1, CH-8002 Zurich, Switzerland
Manufacturer	: [redacted]
Date of Test	: Mar. 16 ~ Apr. 05, 2012
Power Supply	: Input & Output : The detailed specification, please see "Specifications" as section 1.3.
Additional Description	: 1.) The Model Number "**TEP 200-4818WIR**" is representative selected in the test and included in this report. 2.) The detailed specification, please refer to "Specifications" showed in section 1.3. 3.) For more detail specification about EUT, please refer to the user's manual.

1.2 Model Numbers

TEP 75-2410WI	TEP 75-2411WI	TEP 75-2412WI
TEP 75-2413WI	TEP 75-2415WI	TEP 75-2416WI
TEP 75-2418WI	TEP 75-4810WI	TEP 75-4811WI
TEP 75-4812WI	TEP 75-4813WI	TEP 75-4815WI
TEP 75-4816WI	TEP 75-4818WI	TEP 75-7210WI
TEP 75-7211WI	TEP 75-7212WI	TEP 75-7213WI
TEP 75-7215WI	TEP 75-7216WI	TEP 75-7218WI
TEP 160-2410WIR	TEP 160-2411WIR	TEP 160-2412WIR
TEP 160-2413WIR	TEP 160-2415WIR	TEP 160-2416WIR
TEP 160-2418WIR	TEP 160-4810WIR	TEP 160-4811WIR
TEP 160-4812WIR	TEP 160-4813WIR	TEP 160-4815WIR
TEP 160-4816WIR	TEP 160-4818WIR	TEP 160-7210WIR
TEP 160-7211WIR	TEP 160-7212WIR	TEP 160-7213WIR
TEP 160-7215WIR	TEP 160-7216WIR	TEP 160-7218WIR
TEP 200-2410WIR	TEP 200-2411WIR	TEP 200-2412WIR
TEP 200-2413WIR	TEP 200-2415WIR	TEP 200-2416WIR
TEP 200-2418WIR	TEP 200-4810WIR	TEP 200-4811WIR
TEP 200-4812WIR	TEP 200-4813WIR	TEP 200-4815WIR
TEP 200-4816WIR	TEP 200-4818WIR	TEP 200-7210WIR
TEP 200-7211WIR	TEP 200-7212WIR	TEP 200-7213WIR
TEP 200-7215WIR	TEP 200-7216WIR	TEP 200-7218WIR

1.3 Specifications

Model Number	Input Range	Output Voltage	Output Current	Input Current
TEP 75-2410WI	9 ~ 36 VDC	3.3 VDC	20 A	8.4A
TEP 75-2411WI	9 ~ 36 VDC	5 VDC	15 A	9.4A
TEP 75-2412WI	9 ~ 36 VDC	12 VDC	6.3 A	9.5A
TEP 75-2413WI	9 ~ 36 VDC	15 VDC	5A	9.4A
TEP 75-2415WI	9 ~ 36 VDC	24 VDC	3.2 A	9.8A
TEP 75-2416WI	9 ~ 36 VDC	28 VDC	2.7 A	9.6A
TEP 75-2418WI	9 ~ 36 VDC	48 VDC	1.6 A	9.8A
TEP 75-4810WI	18 ~ 75 VDC	3.3 VDC	20 A	4.1A
TEP 75-4811WI	18 ~ 75 VDC	5 VDC	15 A	4.6A
TEP 75-4812WI	18 ~ 75 VDC	12 VDC	6.3 A	4.7A
TEP 75-4813WI	18 ~ 75 VDC	15 VDC	5A	4.7A
TEP 75-4815WI	18 ~ 75 VDC	24 VDC	3.2 A	4.8A
TEP 75-4816WI	18 ~ 75 VDC	28 VDC	2.7 A	4.8A
TEP 75-4818WI	18 ~ 75 VDC	48 VDC	1.6 A	4.9A
TEP 75-7210WI	43 – 160 VDC	3.3 VDC	20.0A	2.0A
TEP 75-7211WI	43 – 160 VDC	5 VDC	15.0A	2.2A
TEP 75-7212WI	43 – 160 VDC	12 VDC	6.3A	2.2A
TEP 75-7213WI	43 – 160 VDC	15 VDC	5.0A	2.2A
TEP 75-7215WI	43 – 160 VDC	24 VDC	3.2A	2.2A
TEP 75-7216WI	43 – 160 VDC	28 VDC	2.7A	2.2A
TEP 75-7218WI	43 – 160 VDC	48 VDC	1.6A	2.3A
TEP 160-2410WIR	9 – 36 VDC	3.3 VDC	40.0A	16.7A
TEP 160-2411WIR	9 – 36 VDC	5 VDC	28.0A	17.3A
TEP 160-2412WIR	8.5 – 36 VDC	12 VDC	12.0A	18.8A
TEP 160-2413WIR	8.5 – 36 VDC	15 VDC	9.5A	18.4A
TEP 160-2415WIR	8.5 – 36 VDC	24 VDC	6.0A	18.8A
TEP 160-2416WIR	8.5 – 36 VDC	28 VDC	5.0A	18.3A
TEP 160-2418WIR	8.5 – 36 VDC	48 VDC	3.0A	18.8A
TEP 160-4810WIR	16.5 – 75 VDC	3.3 VDC	40.0A	9.0A
TEP 160-4811WIR	16.5 – 75 VDC	5 VDC	30.0A	10.0A
TEP 160-4812WIR	16.5 – 75 VDC	12 VDC	13.0A	10.4A
TEP 160-4813WIR	16.5 – 75 VDC	15 VDC	10.0A	10.0A
TEP 160-4815WIR	16.5 – 75 VDC	24 VDC	6.5A	10.4A
TEP 160-4816WIR	16.5 – 75 VDC	28 VDC	5.5A	10.3A
TEP 160-4818WIR	16.5 – 75 VDC	48 VDC	3.2A	10.2A
TEP 160-7210WIR	43 – 160 VDC	3.3 VDC	43.0A	3.8A
TEP 160-7211WIR	43 – 160 VDC	5 VDC	32.0A	4.1A
TEP 160-7212WIR	43 – 160 VDC	12 VDC	15.0A	4.7A
TEP 160-7213WIR	43 – 160 VDC	15 VDC	12.0A	4.7A
TEP 160-7215WIR	43 – 160 VDC	24 VDC	7.5A	4.7A
TEP 160-7216WIR	43 – 160 VDC	28 VDC	6.5A	4.7A
TEP 160-7218WIR	43 – 160 VDC	48 VDC	3.8A	4.7A

Model Number	Input Range	Output Voltage	Output Current	Input Current
TEP 200-2410WIR	9 – 36 VDC	3.3 VDC	50.0A	21.1A
TEP 200-2411WIR	9 – 36 VDC	5 VDC	36.0A	22.2A
TEP 200-2412WIR	8.5 – 36 VDC	12 VDC	15.0A	23.8A
TEP 200-2413WIR	8.5 – 36 VDC	15 VDC	12.0A	23.5A
TEP 200-2415WIR	8.5 – 36 VDC	24 VDC	7.5A	23.5A
TEP 200-2416WIR	8.5 – 36 VDC	28 VDC	6.5A	23.8A
TEP 200-2418WIR	8.5 – 36 VDC	48 VDC	3.7A	23.5A
TEP 200-4810WIR	16.5 – 75 VDC	3.3 VDC	50.0A	11.4A
TEP 200-4811WIR	16.5 – 75 VDC	5 VDC	40.0A	13.3A
TEP 200-4812WIR	16.5 – 75 VDC	12 VDC	18.0A	14.5A
TEP 200-4813WIR	16.5 – 75 VDC	15 VDC	14.0A	14.0A
TEP 200-4815WIR	16.5 – 75 VDC	24 VDC	9.0A	14.5A
TEP 200-4816WIR	16.5 – 75 VDC	28 VDC	7.5A	14.0A
TEP 200-4818WIR	16.5 – 75 VDC	48 VDC	4.5A	14.5A
TEP 200-7210WIR	43 – 160 VDC	3.3 VDC	57.0A	5.0A
TEP 200-7211WIR	43 – 160 VDC	5 VDC	44.0A	5.7A
TEP 200-7212WIR	43 – 160 VDC	12 VDC	20.0A	6.3A
TEP 200-7213WIR	43 – 160 VDC	15 VDC	16.0A	6.2A
TEP 200-7215WIR	43 – 160 VDC	24 VDC	10.0A	6.3A
TEP 200-7216WIR	43 – 160 VDC	28 VDC	8.5A	6.1A
TEP 200-7218WIR	43 – 160 VDC	48 VDC	5.0A	6.3A

1.4 Details of tested supporting system

1.4.1 Battery

Manufacture	:	GLOBAL
Model No.	:	SMF750D23R

1.4.2 Load

FULL LOAD WATT	:	240W (48Vdc, 5A)

1.4.3 Test Cable

Power Cord	:	Non-shielded, Detachable, 1.8 m, w/o core

1.5 Summary of Test Results

Report Clause	Phenomenon	EN 50155 Reference Clause(s)	Reference standard	Result
2	Characteristic Test			
2.1	Visual Inspection	12.2.1	-	Applicable
2.2	Performance (Supply variations)	12.2.2 5.1.1.1	-	Applicable
2.3	Performance (Supply interruption)	12.2.2 5.1.1.2 5.1.3	-	Applicable
2.4	Performance (Supply over change)	12.2.2 5.1.3	-	Applicable
2.5	Insulation Test	12.2.9	-	Applicable
2.6	Supply Overvoltages	12.2.6	-	Applicable
3	Electromagnetic Compatibility (EMC)			
3.1	Surges Test	12.2.7.1	EN 50121-3-2 EN 61000-4-5	Meet Criterion A
3.2	Electrostatic Discharge Test	12.2.7.2	EN 50121-3-2 EN 61000-4-2	Meet Criterion A
3.3	Transient Burst Susceptibility Test	12.2.7.3	EN 50121-3-2 EN 61000-4-4	Meet Criterion A
3.4	Radio- Frequency, Electromagnetic Field Immunity Test	12.2.8.1	EN 50121-3-2 EN 61000-4-3	Meet Criterion A
3.5	Radio- Frequency, Conducted Disturbances Immunity Test	12.2.8.1	EN 50121-3-2 EN 61000-4-6	Meet Criterion A
3.6	Power Line Conducted Emission Measurement	12.2.8.2	EN 50121-3-2 EN 55011	Under Limit
3.7	Radiated Emission Measurement	12.2.8.2	EN 50121-3-2 EN 55011	Under Limit
4	Environmental Tests			
	Low Temperature Storage Test	12.2.14	EN 60068-2-14	Not applicable
4.1	Cooling Test	12.2.3	EN 60068-2-1	Applicable
4.2	Dry Heat Test	12.2.4	EN 60068-2-2	Applicable
4.3	Damp Heat Test, Cyclic	12.2.5	EN 60068-2-30	Applicable
4.4	Vibration Test	12.2.11	EN 61373	Applicable
4.5	Increased Vibration Test	12.2.11	EN 61373	Applicable
4.6	Shock Test	12.2.11	EN 61373	Applicable

1.6 Test Facility

Site Description : ☒Conduction 2 ☒OATS 1 ☒EMS Site

Name of Firm : Interocean EMC Technology Corp.

Company web : http://www.ietc.com.tw

Site 1, 2, 3 Location : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.

Site Filing :

- Federal Communication Commissions – USA
  Registration No.: 96399 (OATS 1 & 2)
  Registration No.: 518958 (OATS 3)
  Designation No.: TW1020
- Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan
  Member No.: 1349
  Registration No. (Conducted Room): C-1094
  Registration No. (Conducted Room): T-1562
  Registration No. (OATS 1): R-1040; G-274
  Registration No. (OATS 2): R-1041
- Industry Canada (IC)
  OUR FILE: 46405-4437 Submission: 145171
  Registration No. (OATS 1): Site# 4437A-1
  Registration No. (OATS 2): Site# 4437A-2
  Registration No. (OATS 3): Site# 4437A-3

Site Accreditation :

- Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
  Accreditation No.:
  SL2-IN-E-0026 for CNS13438 / CISPR22
  SL2-R1-E-0026 for CNS13439 / CISPR13
  SL2-R2-E-0026 for CNS13439 / CISPR13
  SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
  SL2-L1-E-0026 for CNS 14115 / CISPR 15
- Taiwan Accreditation Foundation (TAF)
  Accrditation No.: 1113
- TüV NORD
  Certificate No: TNTW0801R-04

1.7 Measurement Uncertainty

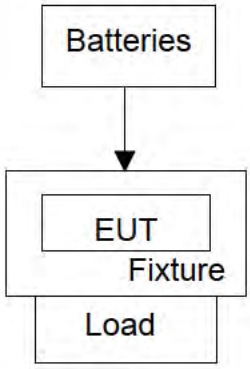
Item	Value
Conduction 1:	
Power Line Conducted Emission (9kHz~30MHz)	2.4 dB
Telecom. Port Conducted Emission / ISN-T4 (150kHz~30MHz)	2.6 dB
Telecom. Port Conducted Emission / ISN-T8 (150kHz~30MHz)	2.6 dB
Telecom. Port Conducted Emission / Current Probe (150kHz~30MHz)	2.8 dB
Radiated Electromagnetic disturbance / Loop Antenna (9kHz~30MHz)	4.8 dB
Conduction 2:	
Power Line Conducted Emission (9kHz~30MHz)	2.4 dB
Telecom. Port Conducted Emission / ISN-T4 (150kHz~30MHz)	2.6 dB
Telecom. Port Conducted Emission / ISN-T8 (150kHz~30MHz)	2.6 dB
Telecom. Port Conducted Emission / Current Probe (150kHz~30MHz)	2.8 dB
Disturbance Power Emission (30MHz~300MHz)	3.1 dB
Click disturbances Emission (150kHz~30MHz)	2.4 dB
OATS 1:	
Radiated Emission Test (30MHz~1GHz)	4.2 dB
Radiated Emission Test (1GHz~6GHz)	3.2 dB
OATS 2:	
Radiated Emission Test (30MHz~1GHz)	4.2 dB
Radiated Emission Test (1GHz~6GHz)	3.2 dB
OATS 3:	
Radiated Emission Test (30MHz~1GHz)	4.2 dB
Radiated Emission Test (1GHz~6GHz)	3.2 dB
Conducted Immunity Room:	
Conducted Immunity Test / CDN-M2	1.3 dB
Conducted Immunity Test / CDN-M3	1.3 dB
Conducted Immunity Test / EM Clamp	3.2 dB

1.8 Measured Mode

1.8.1 The test modes for preliminary test are as following:

- Mode 1: Full Load (Model No.: TEP 200-4818WIR)

1.9 Configuration of EUT Setup



1.10 Test Step of EUT

1.10.1 Setup the EUT and peripheral as above.
1.10.2 Connected the EUT with DC Source and Load.
1.10.3 Turn on the EUT power to start the test.

2 Characteristic Test

2.1 Visual Inspection

2.1.1 Inspection Requirement

The visual inspection shall be carrier out to ensure that the equipment construction meets it's specified requirements.

2.1.2 Test Procedures

Test Procedures were referred to EN 50155 sub-clause 12.2.1

2.1.3 Inspection Result

Pass.

2.2 Performance (Supply variations)

2.2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Arbitrary Waveforms Test System	SCHAFFNER	NSG5600	560-0030	2012/11/29
Module Test System	SCHAFFNER	NSG5500	550-0030	2012/11/29
Power Amplifier	SCHAFFNER	PA5840-75	581-0010	2012/11/29

Note: The above equipments are within the valid calibration period.

2.2.2 Test Requirement

☒ D.C. supplied equipment:

Test performed to prove correct functioning at nominal supply voltage and at the upper and lower limits of specified voltage as defined below.

- Minimum voltage: 0.7 U_n
- Nominal voltage: U_n
- Rated voltage: 1.15 U_n
- Maximum voltage: 1.25 U_n

Voltage fluctuations (e.g. during start-up of auxiliary equipment or voltage oscillations of battery chargers) lying between 0,6 U_n and 1,4 U_n and not exceeding 0,1 s shall not cause deviation of function.

Voltage fluctuations lying between 1,25 U_n and 1,4 U_n and not exceeding 1 s shall not cause damage: equipment may not be fully functioning during these fluctuations.

☐ A.C. supplied equipment:

Test performed to prove correct functioning at:

- Nominal voltage and frequency;
- The upper and lower limits of voltage and frequency in all combinations.

2.2.3 Test Procedures

Test Procedures were referred to EN 50155 sub-clause 12.2.2 & 5.1.1.1

2.2.4 Test Result

Temperature: 23 ℃； Humidity: 39 %； Atm pres: 101 Kpa； Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Test Voltage		Test Time	Result / Observation
0.7 U_n	33.6VDC	10 min.	No deviation
U_n	48VDC	10 min.	No deviation
1.15 U_n	55.2VDC	10 min.	No deviation
1.25 U_n	60VDC	10 min.	No deviation
1.25 U_n	60VDC	1 sec.	No deviation
1.4 U_n	67.2VDC	1 sec.	No deviation
0.6 U_n	28.8VDC	0.1 sec.	No deviation
1.4 U_n	67.2VDC	0.1 sec.	No deviation

2.3 Performance (Supply interruption)

2.3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Arbitrary Waveforms Test System	SCHAFFNER	NSG5600	560-0030	2012/11/29
Module Test System	SCHAFFNER	NSG5500	550-0030	2012/11/29
Power Amplifier	SCHAFFNER	PA5840-75	581-0010	2012/11/29

Note: The above equipments are within the valid calibration period.

2.3.2 Test Requirement

Interruptions of input voltage as defined below:

- Class S1: no interruptions
- Class S2: 10 ms interruptions

Test acceptance requirements:

The equipment continues to function and indicate correctly without intervention or need for resetting by the operator.

2.3.3 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 12.2.2 & 5.1.1.2

2.3.4 Test Result

Temperature: 23 ℃； Humidity: 39 %； Atm pres: 101 Kpa； Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Supply Interruption	Class	Interruption Time	Result / Observation
100%	S1	0 ms	No deviation
100%	S2	10 ms	Deviation

Note 1: “Deviation”: During the test, the connection was disconnected, but it was restored automatically after the test.

Note 2: EUT is satisfied in class S1 requirement.

2.4 Performance (Supply change over)

2.4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Arbitrary Waveforms Test System	SCHAFFNER	NSG5600	560-0030	2012/11/29
Module Test System	SCHAFFNER	NSG5500	550-0030	2012/11/29
Power Amplifier	SCHAFFNER	PA5840-75	581-0010	2012/11/29

Note: The above equipments are within the valid calibration period.

2.4.2 Test Requirement

- Class C1 at 0.6 Un during 100ms (without interruptions)
- Class C2 during a supply break of 30ms

Test acceptance requirements:

The equipment continues to function and indicate correctly without intervention or need for resetting by the operator.

2.4.3 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 12.2.2 & 5.1.3

2.4.4 Test Result

Temperature: 23 ℃； Humidity: 39 %； Atm pres: 101 Kpa； Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Supply Voltage		Class	Repeated time	Result / Observation
Dips	40%	C1	100 ms	No deviation
Dips	100%	C2	30 ms	Deviation

Note 1: “Deviation”: During the test, the connection was disconnected, but it was restored automatically after the test.

Note 2: EUT is satisfied in class C1 requirement.

2.5 Insulation Test

2.5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Withstand Voltage / insulation tester	EXTECH	7142	1344529	2012/12/22

Note: The above equipments are within the valid calibration period.

2.5.2 Test Requirement

(1) Insulation measurement Test: 500VDC

- The insulation resistance test carried out at 500 VDC and the values recorded.
- The test repeated after the voltage withstand test.

Test acceptance requirements:

There shall be no fundamental deterioration from the initial measurement.

(2) Voltage withstand test:

- 500 VAC or 700 VDC for nominal battery voltages below 72 V (or 50 VAC)
- 1000 VAC or 1400 VDC for nominal battery voltages from 72 V up to 125 V, (or from 50 to 90 VAC), and
- 1500 VAC or 2100 VDC for nominal battery voltages above 125 V and up to 315 V, (or from 90 to 225 VAC)

Test acceptance requirements:

Neither disruptive discharge nor flashover shall occur.

2.5.3 Test Procedures

Test Procedures were referred to EN 50155 sub-clause 12.2.9

2.5.4 Test Result

Temperature: 22.9 ℃ ; Humidity: 41 % ; Atm pres: 101 Kpa ; Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

1. Initial Insulation measurement Test: 500VDC

Test Item	Insulation measurement test (Before)	Resistance	Insulation measurement test (After)	Resistance
Vin TO Vout	>10G	Ω	>10G	Ω
Vin TO Sense	>10G	Ω	>10G	Ω
Vin TO Trim	>10G	Ω	>10G	Ω
Ctrl TO Vout	>10G	Ω	>10G	Ω
Ctrl TO Sense	>10G	Ω	>10G	Ω
Ctrl TO Trim	>10G	Ω	>10G	Ω

2. Voltage withstand test: 700VDC
   Test was performed after initial insulation measurement

Test Item	Current	Result
Vin TO Vout	0.00001 mA	PASS
Vin TO Sense	0.00001 mA	PASS
Vin TO Trim	0.00001 mA	PASS
Ctrl TO Vout	0.00001 mA	PASS
Ctrl TO Sense	0.00001 mA	PASS
Ctrl TO Trim	0.00001 mA	PASS

2.6 Supply Overvoltages

2.6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Arbitrary Waveforms Test System	SCHAFFNER	NSG5600	560-0030	2012/11/29
Module Test System	SCHAFFNER	NSG5500	550-0030	2012/11/29
Power Amplifier	SCHAFFNER	PA5840-75	581-0010	2012/11/29

Note: The above equipments are within the valid calibration period.

2.6.2 Test Requirement

☒ D.C. supplied equipment:

Voltage Level min.	Duration d max.	Duration D max.	Series Resistor (Tol. ± 10 %)
1.4 Un	0.1 s	1.0 s	1Ω

Test acceptance requirements: No failure shall occur

☐ A.C. supplied equipment:

Voltage Level min.	Duration D min.	Series Resistor [a] (Tol. ± 10 %)
1.4 Un	1.0 s	1Ω
[a] Inclusive of power supply impedance.		

Test acceptance requirements: No failure shall occur

2.6.3 Test Procedures

Test Procedures were referred to EN 50155 sub-clause 12.2.6

2.6.4 Test Result

Temperature: 22.5 ℃ ; Humidity: 40 % ; Atm pres: 101 Kpa ; Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Voltage level (minimum)	Duration d (maximum)	Duration D (maximum)	Series resistor Rs (Tol. ±10%)	Result / Observation
67.2VDC	0.1s	1.0s	1Ω	No deviation

3 Electromagnetic compatibility (EMC)

3.1 Surges Test

3.1.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Test System	EMC PARTNER	TRANSIENT-2000	812	2012/09/24

Note: The above equipments are within the valid calibration period.

3.1.2 Test Requirement

Reference to EN 50155 clause 12.2.7.1 and EN 50121-3-2 table 7

☐ Auxiliary AC power ports: ☐ Line to Neutral: ±1kV (peak), 1.2/50 us, 42Ω, 0.5μF
☐ Line (Neutral) to earth: ±2kV (peak), 1.2/50 us, 42Ω, 0.5μF

☒ Battery referenced ports: ☒ Line to Neutral: ±1kV (peak), 1.2/50 us, 42Ω, 0.5μF
☒ Line (Neutral) to earth: ±2kV (peak), 1.2/50 us, 42Ω, 0.5μF

Performance criterion: B

3.1.3 Test Procedure

Test Procedures were referred to EN 61000-4-5 sub-clause 8

3.1.4 Test Result

Temperature: 22 ℃； Humidity: 43 %； Atm pres: 101 Kpa； Test Engineer: Roy

PASS.

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

☒ ±0.5 kV (peak) Battery referenced port: Line to line
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ ±1.0 kV (peak) Battery referenced port: Line to line
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ ±0.5 kV (peak) Battery referenced port: Line to earth
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ ±1.0 kV (peak) Battery referenced port: Line to earth
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ ±2.0 kV (peak) Battery referenced port: Line to earth
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

* “A”: The apparatus shall continue to operate as intended during and after the test, no degradation of performance or loss of function.

3.2 Electrostatic Discharge Test

3.2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
ESD Simulator	EMC PARTNER	ESD3000	276	2013/03/01

Note: The above equipments are within the valid calibration period.

3.2.2 Test Requirement

Reference to EN 50155 clause 12.2.7.2 and EN 50121-3-2 table 9

☒ Air discharge: ±8 KV

☒ Contact discharge: ±6 kV

Performance criterion: B

3.2.3 Test Procedures

Test Procedures were referred to EN 61000-4-2 sub-clause 8

3.2.4 Test Result

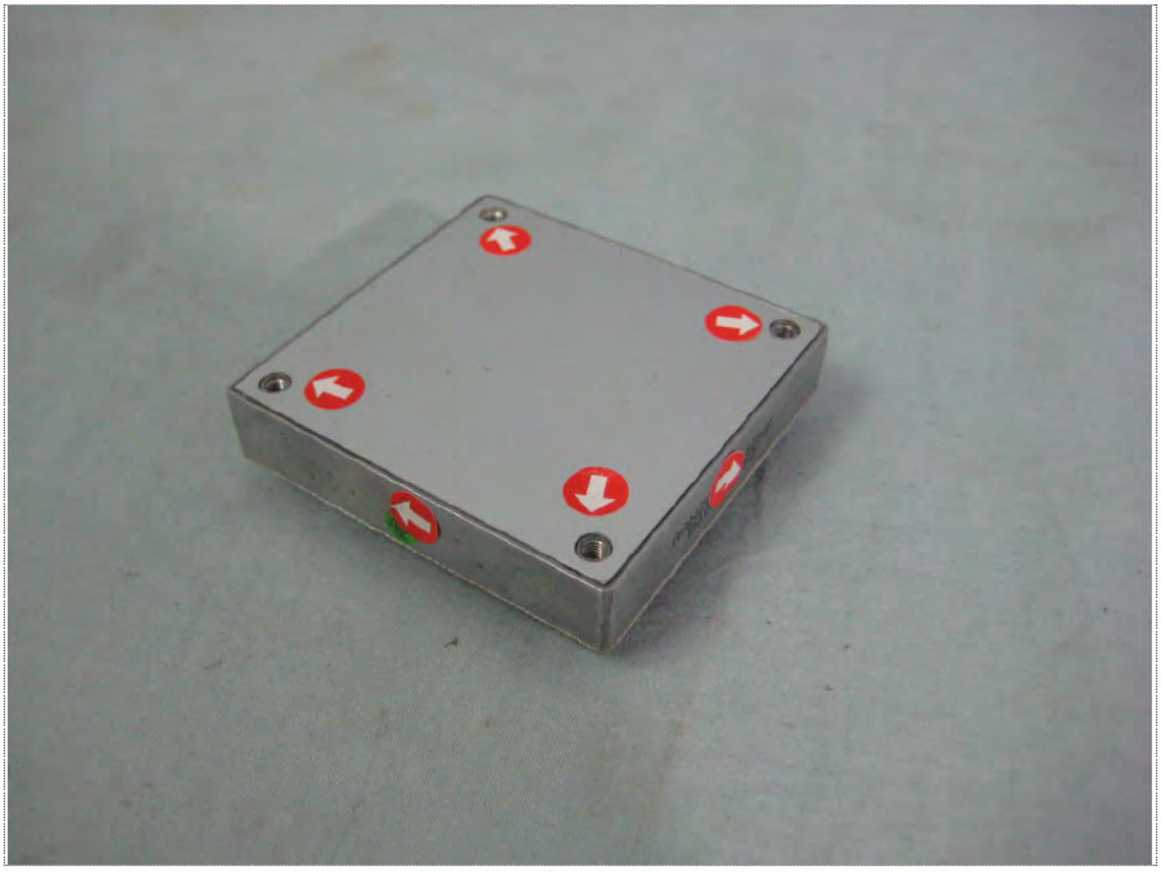
Temperature: 23 ℃； Humidity: 44 %； Atm pres: 101 Kpa； Test Engineer: Roy

PASS.

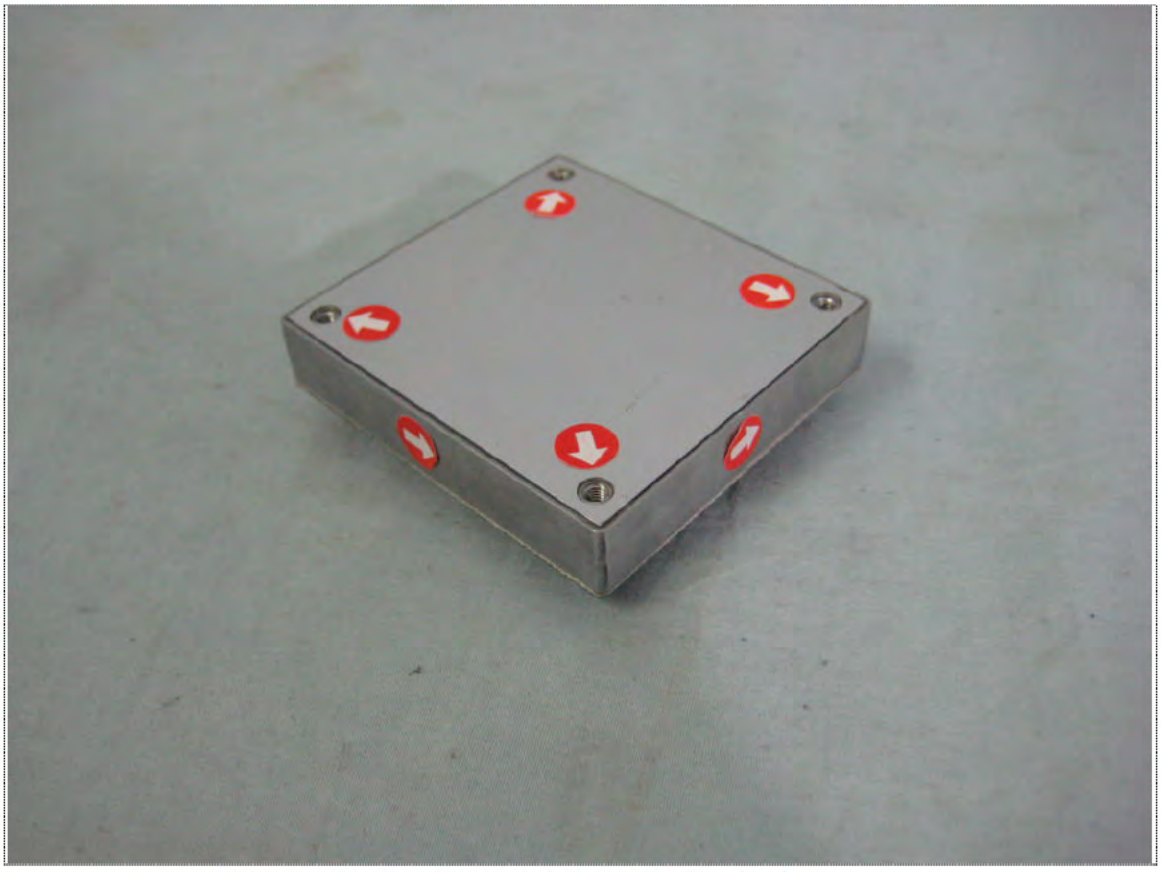
Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Air discharge ±2 kV, ±4 kV, ±8 kV:	☒ **A**	☐ **B**	☐ **C**
Contact discharge ±2 kV, ±4 kV, ±6 kV:	☒ **A**	☐ **B**	☐ **C**
Indirect discharge (HCP) ±2 kV, ±4 kV, ±6 kV:	☒ **A**	☐ **B**	☐ **C**
Indirect discharge (VCP Front, Left, Back, Right) ±2 kV, ±4 kV, ±6 kV:	☒ **A**	☐ **B**	☐ **C**

* “A”: The apparatus shall continue to operate as intended during and after the test, no degradation of performance or loss of function.



View of Discharge Point-1 (Red: Contact discharge)



View of Discharge Point-2 (Red: Contact discharge)

3.3 Transient Burst Susceptibility Test

3.3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Test System	EMC PARTNER	TRANSIENT-2000	812	2012/09/24

Note: The above equipments are within the valid calibration period.

3.3.2 Test Requirement

Reference to EN 50155 clause 12.2.7.3 and EN 50121-3-2 table 7 & 8

5 kHz Repetition frequency

☐ ±2.0 kV Auxiliary AC power ports.

☒ ±2.0 kV Battery referenced ports.

☐ ±2.0 kV Signal and control ports .

Performance criterion: A

3.3.3 Test Procedures

Test Procedures were referred to EN 61000-4-4 sub-clause 8

3.3.4 Test Result

Temperature: 21.2 ℃ ; Humidity: 40 % ; Atm pres: 101 Kpa ; Test Engineer: Roy

PASS.

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

☒ ±2.0 kV Battery referenced port: Line + Neutral

Performance criterion: ☒ **A** ☐ **B** ☐ **C**

* "A": The apparatus shall continue to operate as intended during and after the test, no degradation of performance or loss of function.

3.4 Radio- Frequency, Electromagnetic Field Immunity Test

3.4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	R&S	SM300	101279	2012/10/18
RF Power Amplifier	Frankonia	FLG-200B	1038	2013/02/19
RF Power Amplifier	Frankonia	FLG-50C	1013	2013/02/19
Bilog Antenna	Frankonia	BTA-M	06012M	2013/02/19

Note: The above equipments are within the valid calibration period.

3.4.2 Test Requirement

Reference to EN 50155 clause 12.2.8.1 and EN 50121-3-2 table 9

The frequency steps: 1%, Log sweep, Dwell time: 3.0 sec.

☒ Frequency range: 80 to 1000 MHz, Field strength: 20 V/m, 80% AM (1kHz),
(Note: For equipment mounted in network communication center a severity level of 10V/m may be used.)

☒ Frequency range: 1400 to 2100 MHz, Field strength: 10 V/m, 80% AM (1kHz),

☒ Frequency range: 2100 to 2500 MHz, Field strength: 5 V/m, 80% AM (1kHz),

Performance criterion: A

3.4.3 Test Procedures

Test Procedures were referred to EN 61000-4-3 sub-clause 8

3.4.4 Test Result

Temperature: 21 ℃； Humidity: 41 %； Atm pres: 101 Kpa； Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

☒ Frequency range: **80** to **1000** MHz, Field strength: **20** V/m, 80% AM (1kHz),
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ Frequency range: **1400** to **2100** MHz, Field strength: **10** V/m, 80% AM (1kHz),
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

☒ Frequency range: **2100** to **2500** MHz, Field strength: **5** V/m, 80% AM (1kHz),
Performance criterion: ☒ **A** ☐ **B** ☐ **C**

* "A": The apparatus shall continue to operate as intended during and after the test, no degradation of performance or loss of function.

3.5 Radio- Frequency, Conducted Disturbances Immunity Test

3.5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	R&S	SMY02	829846/013	2012/08/25
Power Amplifier	Frankonia	CIT-10	162D1278	2013/02/09
Attenuator	SCHAFFNER	ATN6075	22300	2013/02/09
C.D.N	FCC	FCC-801-M3-25A	2045	2013/02/09
C.D.N	SCHAFFNER	M216	16394	2013/02/09

Note: The above equipments are within the valid calibration period.

3.5.2 Test Requirement

Reference to EN 50155 clause 12.2.8.1 and EN 50121-3-2 table 7 & 8

Frequency range: **0.15** to **80** MHz, Field strength: **10** V, 80% AM (1kHz)

☐ Auxiliary AC power ports.

☒ Battery referenced ports.

☐ Signal and control ports.

Performance criterion: A

3.5.3 Test Procedure

Test Procedures were referred to EN 61000-4-6 sub-clause 8

3.5.4 Test Result

Temperature: 21.3 ℃； Humidity: 40.5 %； Atm pres: 101 Kpa； Test Engineer: Roy

Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Frequency range: **0.15** to **80** MHz, Field strength: **10** V (r.m.s), 80% AM (1kHz),

☒ Battery referenced port.

Performance criterion: ☒ **A** ☐ **B** ☐ **C**

* "A": The apparatus shall continue to operate as intended during and after the test, no degradation of performance or loss of function.

3.6 Power Line Conducted Emission

3.6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCS30	100134	2012/08/16
RF Cable	HARBOUR	RG-58/U	CBL39	2012/11/09
L.I.S.N.	Schaffner	MN2050D	1597	2013/06/20
L.I.S.N.	Rohde & Schwarz	ESH3-Z5	829996/016	2013/01/02

Note: The above equipments are within the valid calibration period.

3.6.2 Test Requirement

Reference to EN 50155 clause 12.2.8.2 and EN 50121-3-2 table 5

Frequency (MHz)	Q.P. (Quasi-Peak)
0.15 ~ 0.50	99
0.50 ~ 30	93

3.6.3 Test Procedure

Test Procedures were referred to EN 55011 sub-clause 7

3.6.4 Test Result

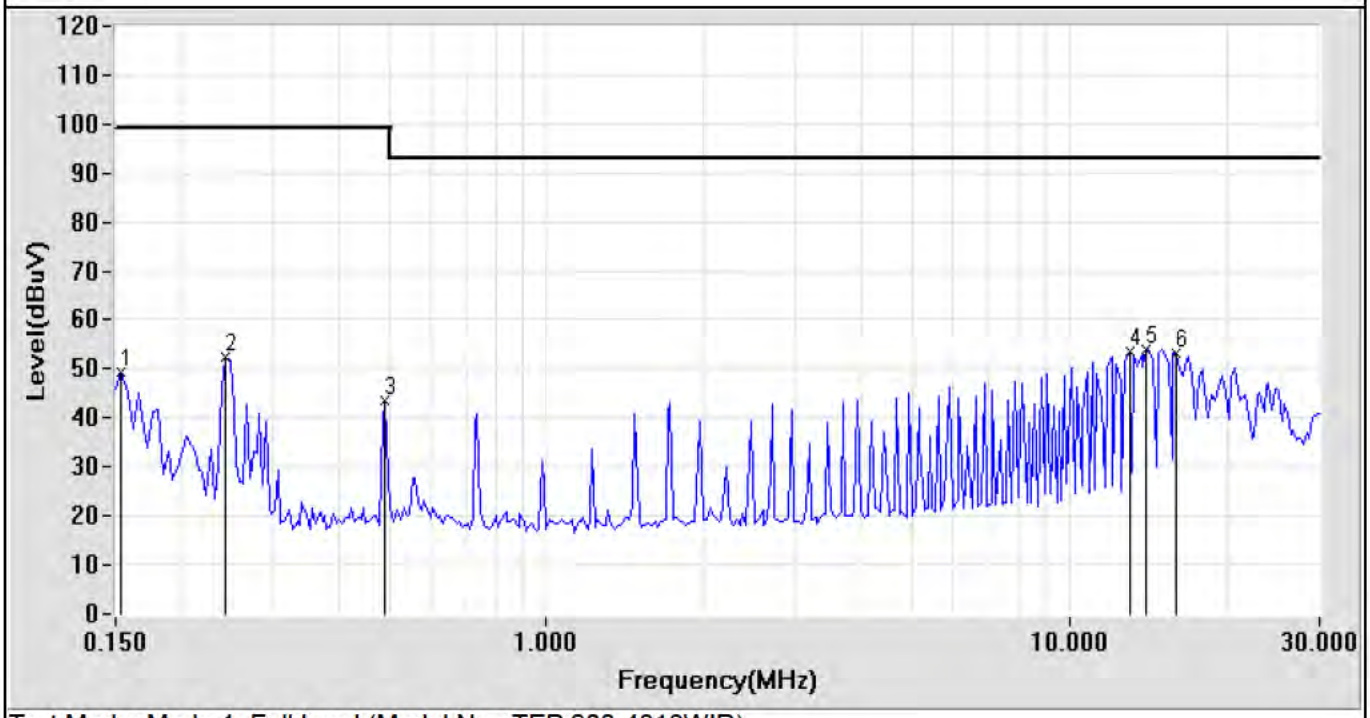
The final test data is shown as following pages.

Power Line Conducted Test Data

EUT: DC/DC Converter	POLARITY: Line
CLIENT: TRACO ELECTRONIC Co., Ltd.	DISTANCE:
MODEL: TEP 200-4818WIR	Serial No.:
RATING: DC 48V	FILE/DATA#: [redacted]
Temperature: 21.2 ℃	OPERATOR: Roy
Humidity: 53 %	TEST SITE: Conduction 2

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV) Quasi-Peak	Emission Level (dBμV) Quasi-Peak	Limits (dBμV) Quasi-Peak	Margin (dB) Quasi-Peak
0.154	0.20	47.14	47.34	99.00	-51.66
0.244	0.17	52.60	52.77	99.00	-46.23
0.490	0.17	44.80	44.97	99.00	-54.03
12.994	0.72	53.90	54.62	93.00	-38.38
13.974	0.76	53.10	53.86	93.00	-39.14
15.931	0.84	43.88	44.72	93.00	-48.28

Remark:
1. All readings are Quasi-Peak values.
2. Factor = Insertion Loss + Cable Loss.



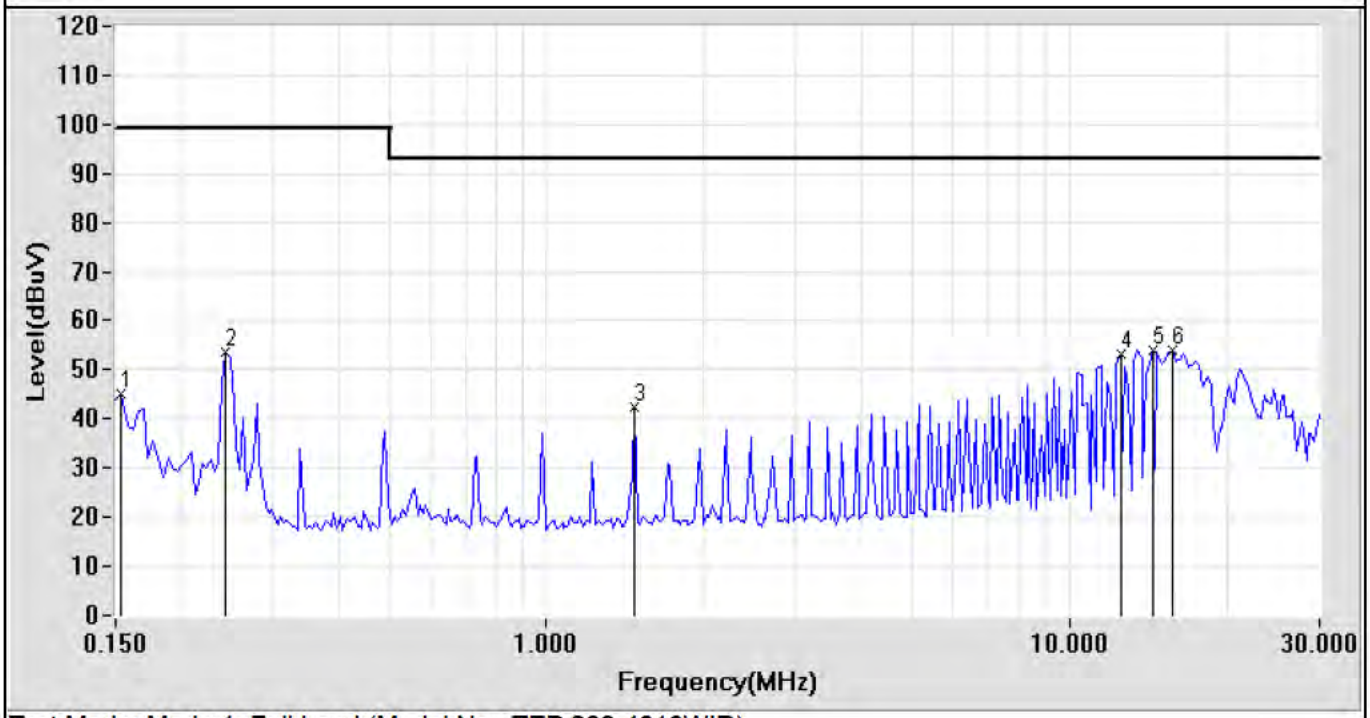
Test Mode: Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Power Line Conducted Test Data

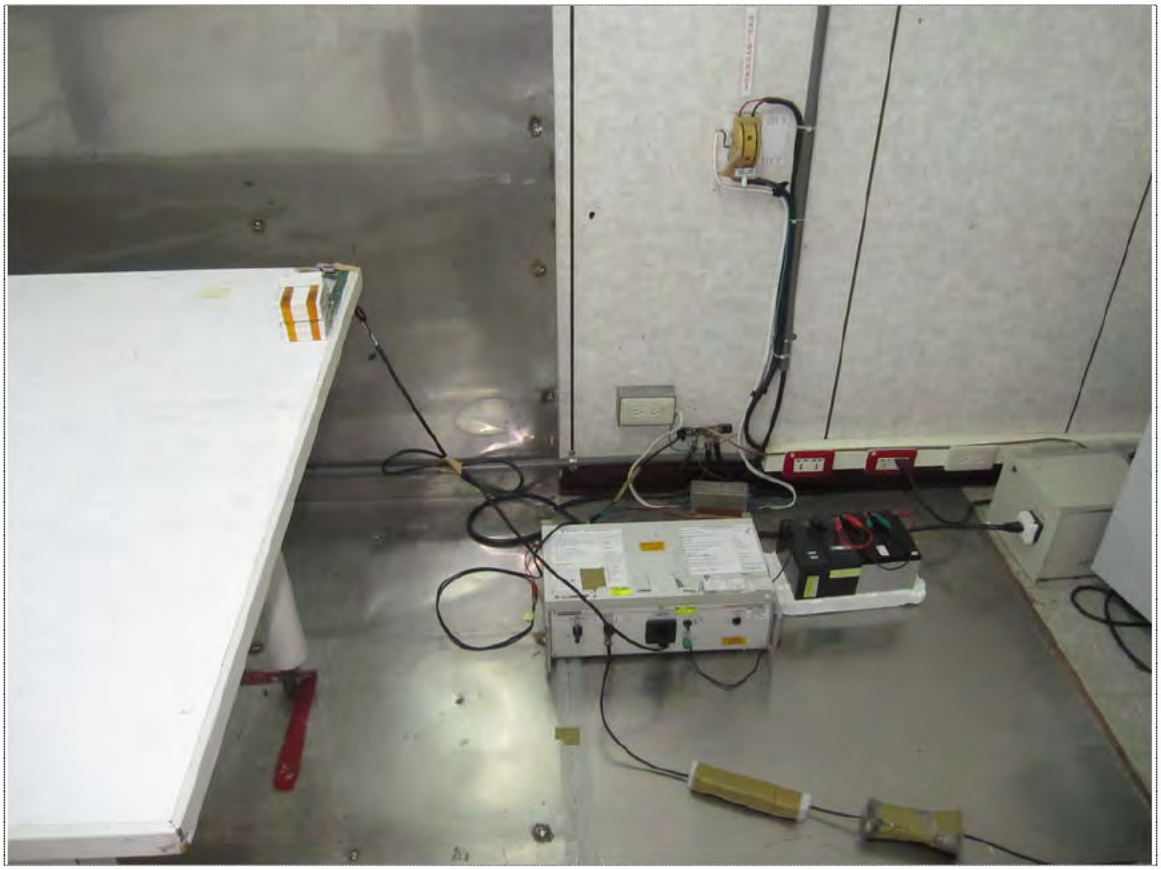
EUT: DC/DC Converter	POLARITY: Neutral
CLIENT: TRACO ELECTRONIC Co., Ltd.	DISTANCE:
MODEL: TEP 200-4818WIR	Serial No.:
RATING: DC 48V	FILE/DATA#: [redacted]
Temperature: 21.2 ℃	OPERATOR: Roy
Humidity: 53 %	TEST SITE: Conduction 2

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV) Quasi-Peak	Emission Level (dBμV) Quasi-Peak	Limits (dBμV) Quasi-Peak	Margin (dB) Quasi-Peak
0.154	0.25	45.10	45.35	99.00	-53.65
0.244	0.22	53.50	53.72	99.00	-45.28
1.470	0.20	43.60	43.80	93.00	-49.20
12.490	0.69	44.70	45.39	93.00	-47.61
14.451	0.76	49.50	50.26	93.00	-42.74
15.677	0.80	48.73	49.53	93.00	-43.47

Remark:
1. All readings are Quasi-Peak values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Mode 1: Full Load (Model No.: TEP 200-4818WIR)



Front View

Rear View

3.7 Radiated Emission Measurement

3.7.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCS30	100135	2012/12/15
Biconical Antenna	Schwarzbeck	BBA 9106	VHA 9103-2418	2013/03/28
Log Antenna	Schwarzbeck	UHALP 9108 A	0738	2013/03/28
Pre-Amplifier	Agilent	8447D	1937A01903	2012/12/05
RF Cable	PACIFIC	CBL41	CBL41	2012/11/17

Note: The above equipments are within the valid calibration period.

3.7.2 Test Requirement

Reference to EN 50155 clause 12.2.8.2 and EN 50121-3-2 table 6

Frequency (MHz)	Quasi-Peak dB(μV/m)
30 ~ 230	40.0
230 ~ 1000	47.0

3.7.3 Test Procedure

Test Procedures were referred to EN 55011 sub-clause 7

3.7.4 Test Result

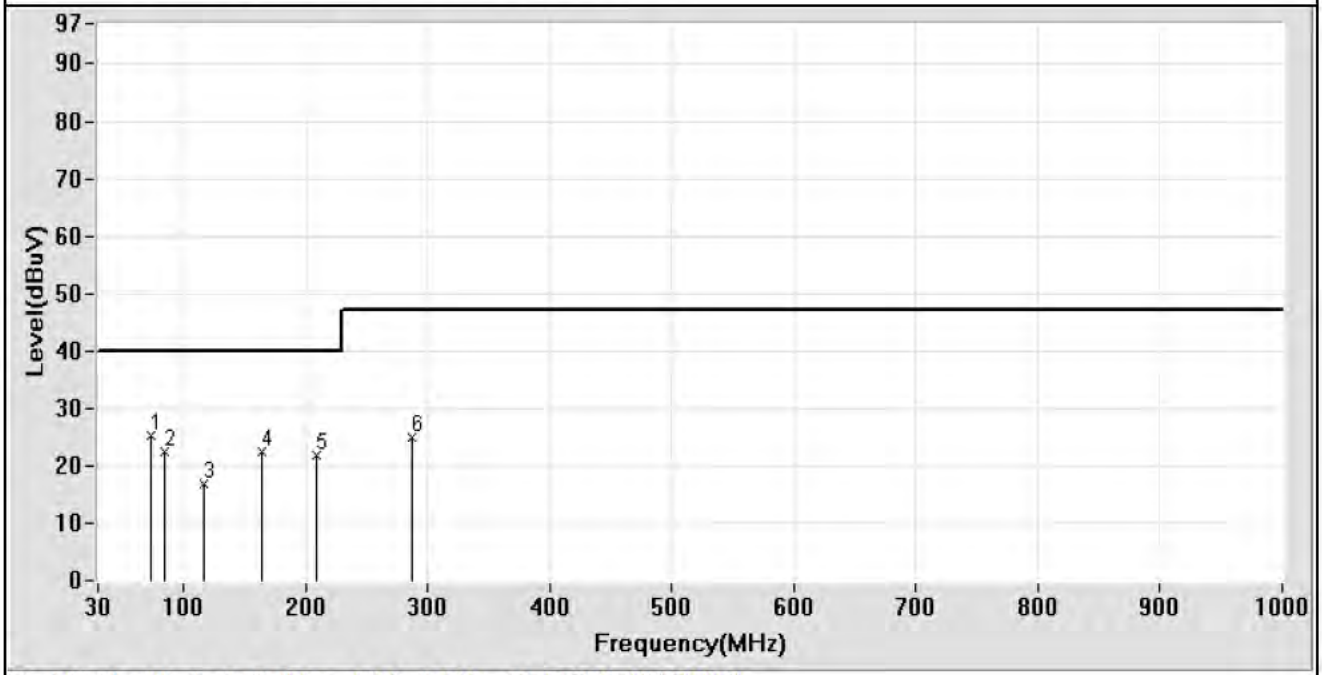
The final test data is shown as following pages.

Radiated Emission Measurement Data

EUT: DC/DC Converter	POLARITY: Horizontal
CLIENT: TRACO ELECTRONIC Co., Ltd.	DISTANCE: 10 m
MODEL: TEP 200-4818WIR	Serial No.:
RATING: DC 48V	FILE/DATA#: [redacted]
Temperature: 21.8 ℃	OPERATOR: Mark
Humidity: 68 %	TEST SITE: OATS 1

Frequency	Factor	Meter Reading	Emission Level	Limits	Margin
(MHz)	(dB)	(dBμV)	(dBμV/m)	(dBμV/m)	(dB)
73.406 **	-21.57	46.90	25.33	40.00	-14.67
83.915 **	-20.40	43.00	22.60	40.00	-17.40
116.080 **	-15.57	32.30	16.73	40.00	-23.27
164.176 **	-12.09	34.50	22.41	40.00	-17.59
209.194 **	-10.06	31.80	21.74	40.00	-18.26
286.533 **	-7.78	32.80	25.02	47.00	-21.98

Remark:
1. " * " Mark means readings are Peak Values.
2. " ** " Mark means readings are Quasi-Peak values.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



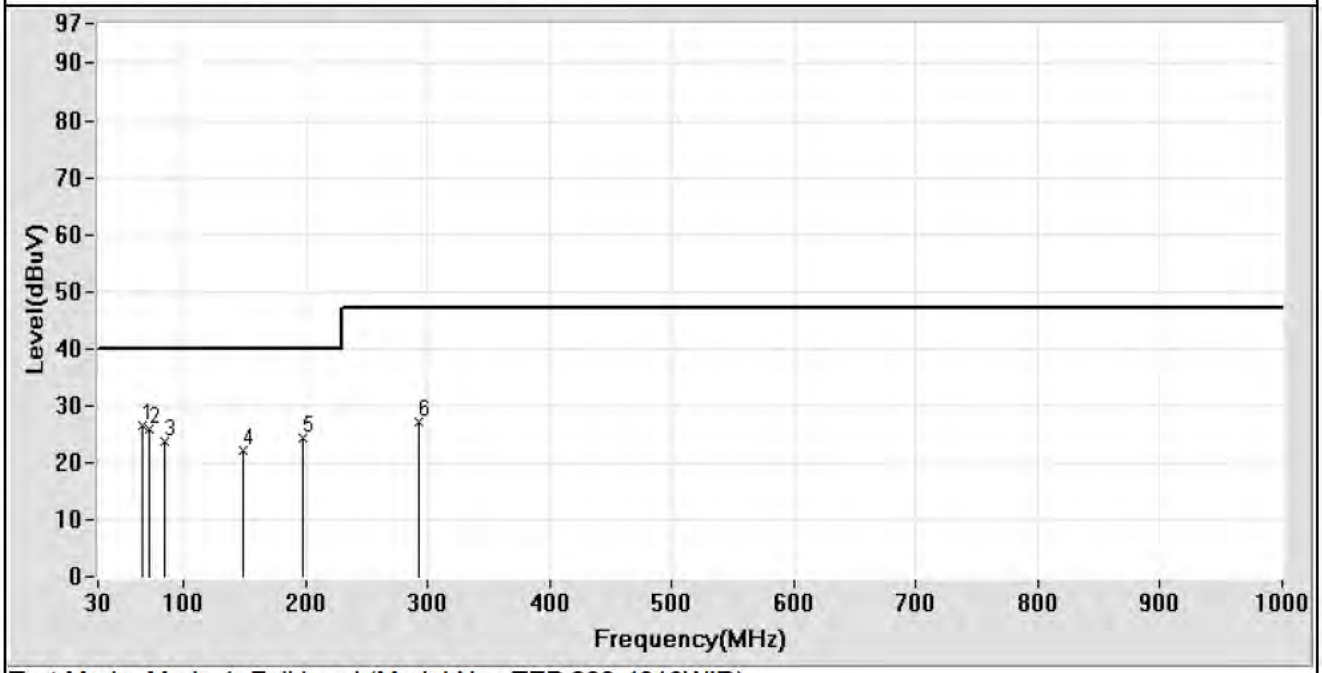
Test Mode: Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Radiated Emission Measurement Data

EUT: DC/DC Converter	POLARITY: Vertical
CLIENT: TRACO ELECTRONIC Co., Ltd.	DISTANCE: 10 m
MODEL: TEP 200-4818WIR	Serial No.:
RATING: DC 48V	FILE/DATA#: [redacted]
Temperature: 21.8 ℃	OPERATOR: Mark
Humidity: 68 %	TEST SITE: OATS 1

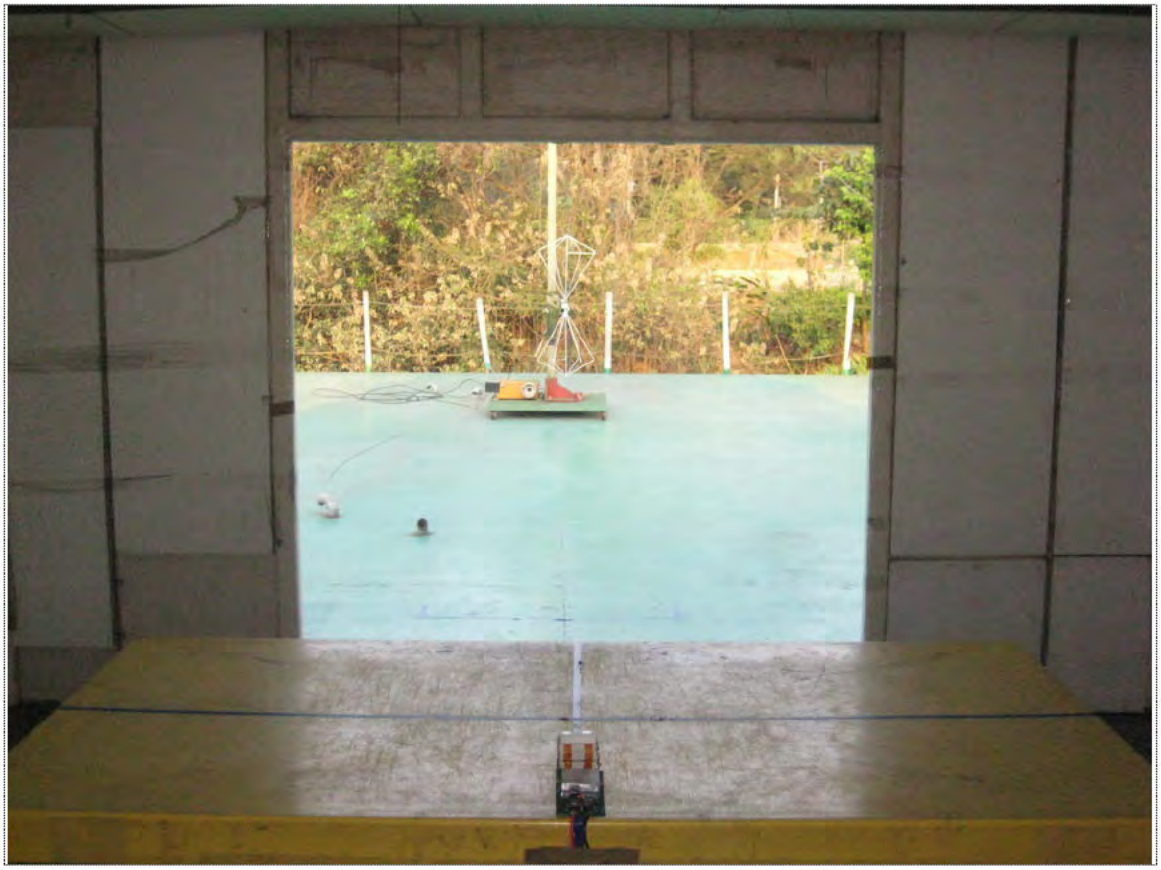
Frequency	Factor	Meter Reading	Emission Level	Limits	Margin
(MHz)	(dB)	(dBμV)	(dBμV/m)	(dBμV/m)	(dB)
66.438 **	-21.99	48.40	26.41	40.00	-13.59
72.378 **	-21.93	47.80	25.87	40.00	-14.13
84.372 **	-19.96	43.60	23.64	40.00	-16.36
148.400 **	-13.16	35.20	22.04	40.00	-17.96
197.651 **	-10.15	34.50	24.35	40.00	-15.65
293.074 **	-6.87	34.10	27.23	47.00	-19.77

Remark:
1. " * " Mark means readings are Peak Values.
2. " ** " Mark means readings are Quasi-Peak values.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Test Mode: Mode 1: Full Load (Model No.: TEP 200-4818WIR)

Front View



Rear View

4 Environmental Tests

4.1 Cooling Test

4.1.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2013/05/24

4.1.2 Test ambience

Temperature: 21.3℃

Humidity: 39%

4.1.3 Test Requirement

Reference to EN 50155 section 12.2.3 (Column 4, Class TX).

Temperature: -40℃

Dwell Time: 2 hours

Performance Check: At first the specimens was power off, then at the end of dwell period the specimens was power on and a performance check was carried out. A further performance check was carried out after the specimens temperature was recovery to ambient temperature.

4.1.4 Test Procedure

Test Procedures were referred to EN 60068-2-1

4.1.5 Test Result

PASS.

1. Test configurations was show in Fig. 1.
2. The testing data were shown in Fig. 2.
3. Test specimens were visually inspected after test. No external physical damage was noted.
4. The functions of specimens was normal during and after Cooling Test.

Fig. 1 Cooling Test Photo

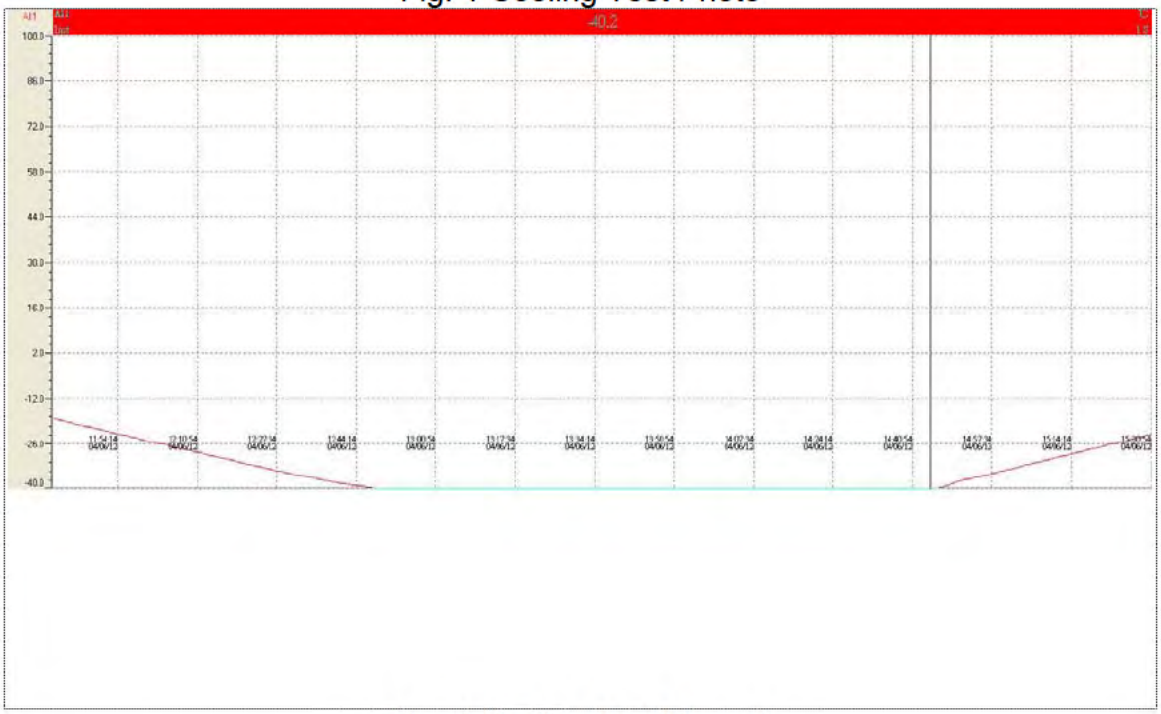


Fig. 2 Cooling Test Record

4.2 Dry Heat Test

4.2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2013/05/24

4.2.2 Test ambience

Temperature: 22.1℃

Humidity: 42% (RH)

4.2.3 Test Requirement

Reference to EN 50155 section 12.2.4 (Column 4, Class TX).

Temperature: 85℃

Dwell Time: 6 hours

Performance Check: At first the specimens was power off, then at the end of dwell period the specimen was power on and a performance check was carried out. A further performance check was carried out after the specimen temperature was recovery to ambient temperature.

4.2.4 Test Procedure

Test Procedures were referred to EN 60068-2-2

4.2.5 Test Result

PASS.

3. Test configurations was show in Fig. 1.
4. The testing data were shown in Fig. 2.
5. Test specimens were visually inspected after test. No external physical damage was noted.
6. The functions of specimens was normal during and after Dry Heat Test.

Fig. 1 Dry Heat Test Photo

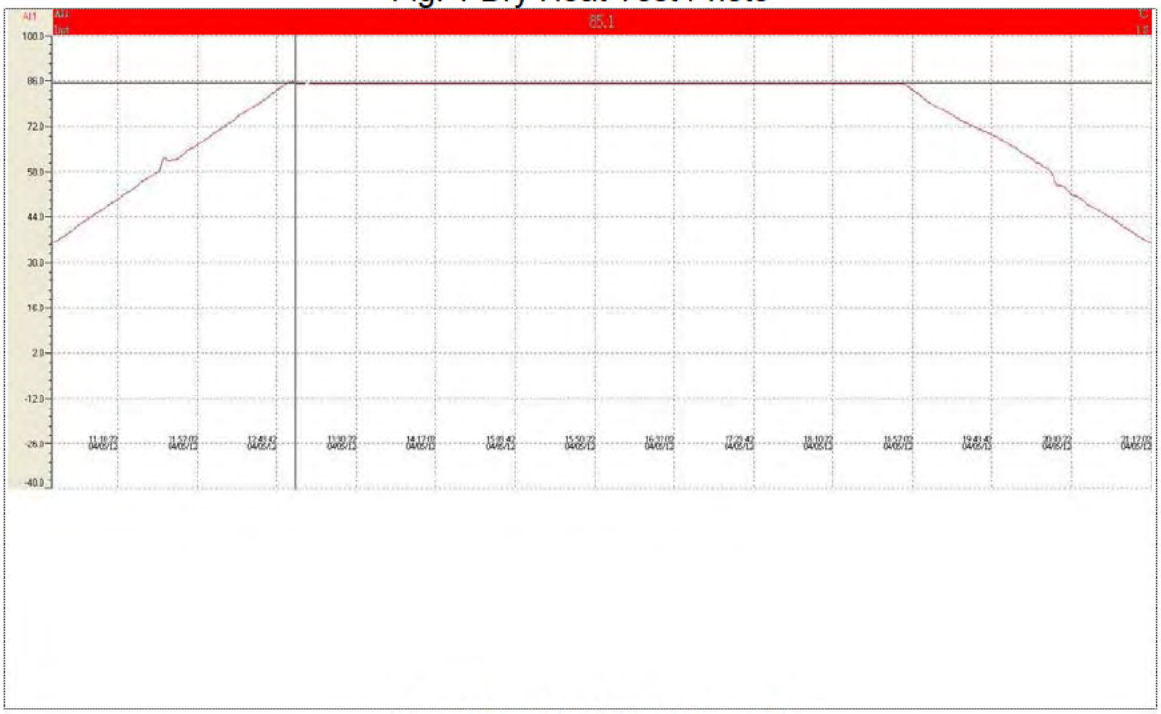


Fig. 2 Dry Heat Test Record

4.3 Damp Heat Test, Cyclic

4.3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2013/05/24

4.3.2 Test ambience

Temperature: 22.2℃

Humidity: 40%

4.3.3 Test Requirement

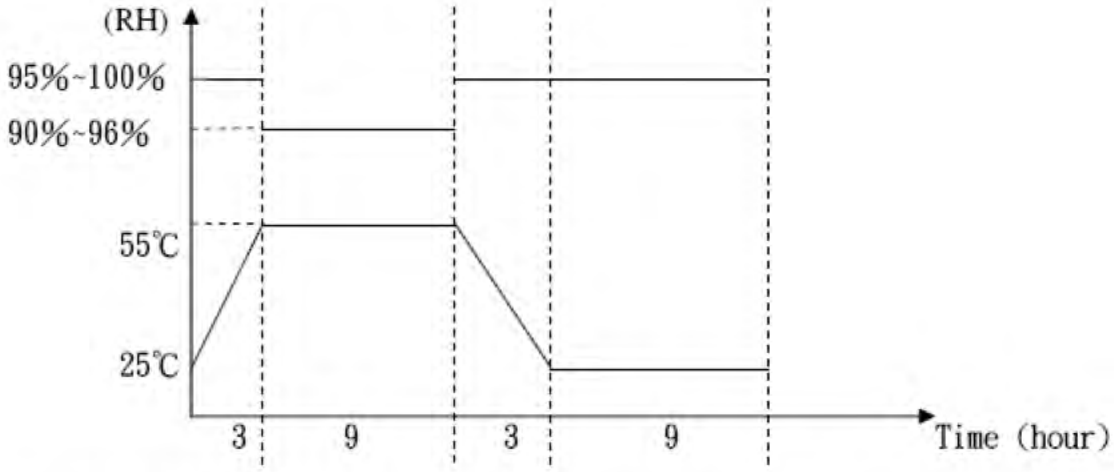
Reference to EN 50155 section 12.2.5

Temperature/Humidity 25℃~55℃/90%~100%RH

Test duration: 24 hours/cycle, 2 cycles, total 48 hours.

Speed of temperature variation: 1℃/min., and with a maintained relative humidity.

Test Profile: Shown as in bellow.



Performance Check: At first the specimens was power off, then at each cycle of the end of dwell under 55℃ and 90%~96%(RH) period the specimen was power on and a performance check was carried out. A further performance check was carried out after the specimen temperature was recovery to ambient temperature.

4.3.4 Test Procedure

Test Procedures were referred to EN 60068-2-30

4.3.5 Test Result

1. Test configurations was show in Fig. 1.
2. The testing data were shown in Fig. 2.

Performance checks should be pass before the test (Damp Heat Test, Cyclic), then the test result refer to report clause 2.2, 2.3 and 2.4

Equipment under test return to ambient temperature is carried out under controlled recovery conditions.
Check and final measurements:

(1) Insulation test (Insulation measurement Test: **500**VDC)
Test was performed **before** Voltage withstand test

Test Item	Resistance	Result
Vin TO Vout	> 10GΩ	PASS
Vin TO Sense	> 10GΩ	PASS
Vin TO Trim	> 10GΩ	PASS
Ctrl TO Vout	> 10GΩ	PASS
Ctrl TO Sense	> 10GΩ	PASS
Ctrl TO Trim	> 10GΩ	PASS

(2) Insulation test (Voltage withstand test: **700**VDC)

Test Item	Current	Result
Vin TO Vout	0.00001 mA	PASS
Vin TO Sense	0.00001 mA	PASS
Vin TO Trim	0.00001 mA	PASS
Ctrl TO Vout	0.00001 mA	PASS
Ctrl TO Sense	0.00001 mA	PASS
Ctrl TO Trim	0.00001 mA	PASS

(3) Performance (Supply variations)

Test voltage		Test Time	Result / Observation
0.7 U_n	33.6VDC	10 min.	No deviation
U_n	48VDC	10 min.	No deviation
1.15 U_n	55.2VDC	10 min.	No deviation
1.25 U_n	60VDC	10 min.	No deviation
1.25 U_n	60VDC	1 sec.	No deviation
1.4 U_n	67.2VDC	1 sec.	No deviation
0.6 U_n	28.8VDC	0.1 sec.	No deviation
1.4 U_n	67.2VDC	0.1 sec.	No deviation

(4) Performance (Supply interruption)

Supply interruption	Class	Interruption time	Result / Observation
100%	S1	0 ms	No deviation

(5) Performance (Supply change over)

Supply Voltage		Class	Repeated time	Result / Observation
Dips	40%	C1	100 ms	No deviation

(6) Visual inspection

Inspection Result: PASS

Fig. 1 Damp Heat Test, Cyclic Photo

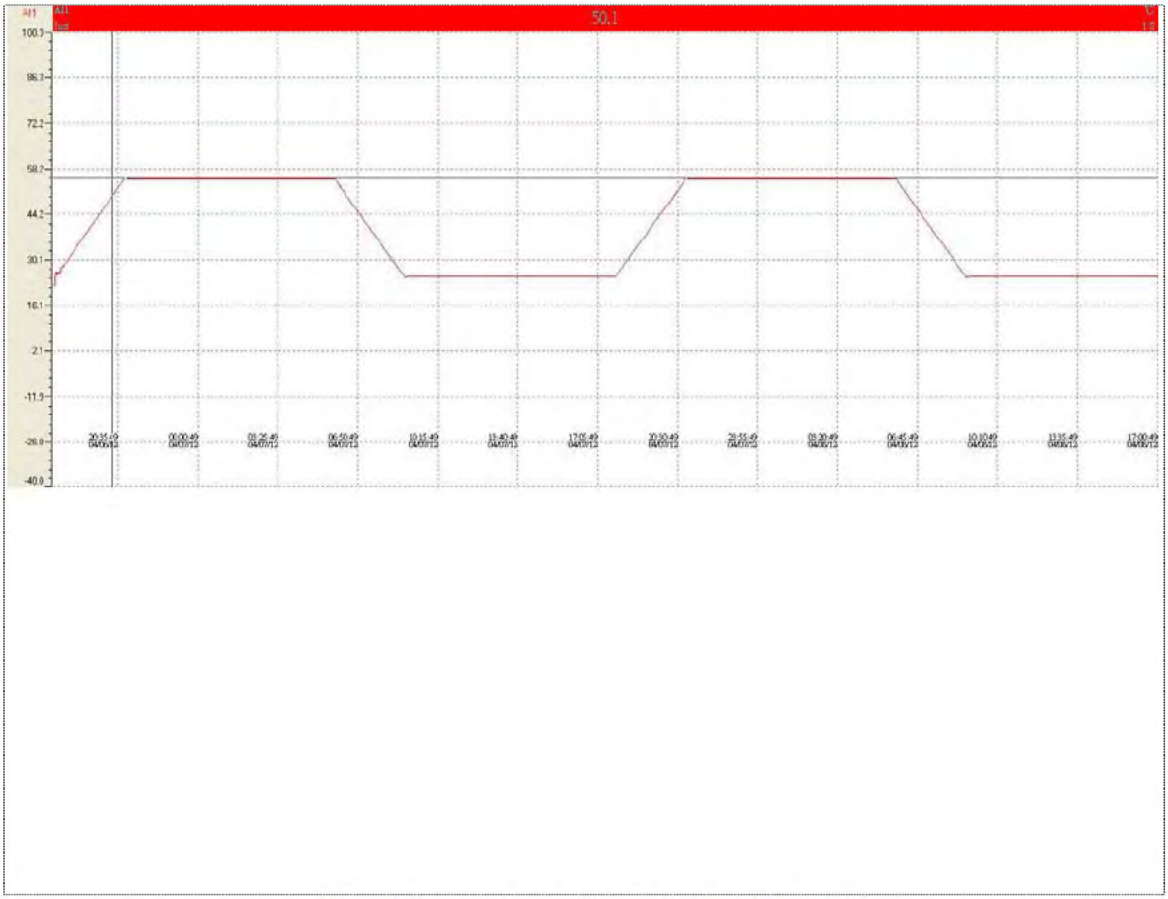


Fig. 2 Damp Heat Test, Cyclic Record

4.4 Vibration Test

4.4.1 Instrument

Instrument	Manufacturer	Model	Serial No.
U-D vibration machine	N/A	TA240D-208/CSTA.	N/A
Control System	LDS DACTRON	CONTROLLER	N/A
Accelerometer	N/A	DYTRAN 3055B2	N/A

4.4.2 Test ambience

Temperature: 21 ± 3℃

Humidity: 65% ± 5% (RH)

4.4.3 Specimen & Model quantity :

Specimen : DC/DC Converter

Model : TEP 200-4818WIR

Quantity : 1 set for each model

4.4.4 Test Requirement

Reference to EN 50155 section 12.2.11

Frequency Range: 5Hz to 150Hz

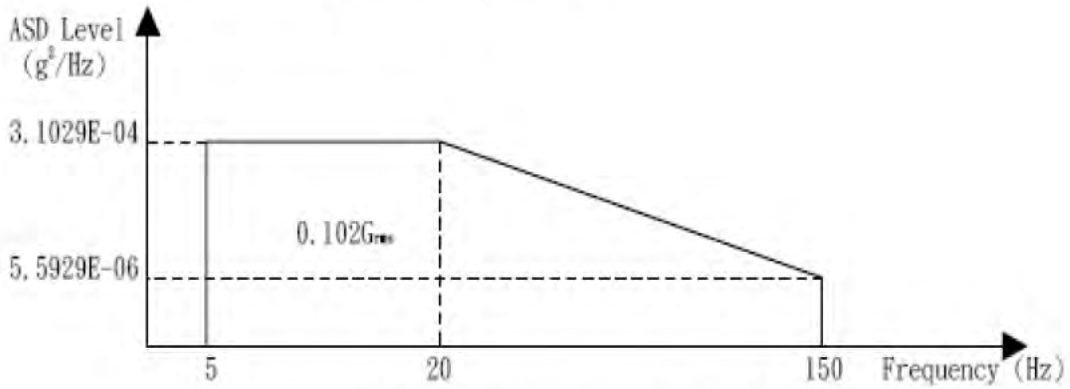
G_{rms} value: Vertical (Z-Axis) 0.102 G_{rms} (1.00m/s^2),

Transverse (Y-Axis) 0.046 G_{rms} (0.45m/s^2),

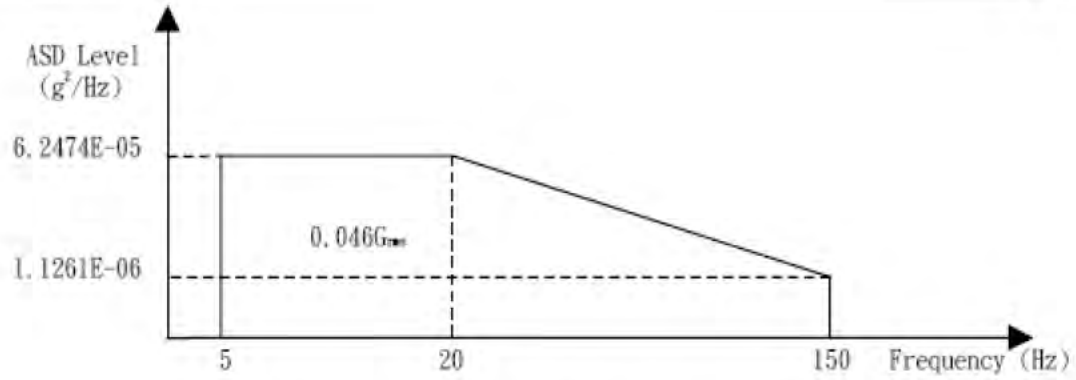
Longitudinal (X-Axis)0.0714 G_{rms}(0.70m/s^2).

Duration: 20 mins/axis。

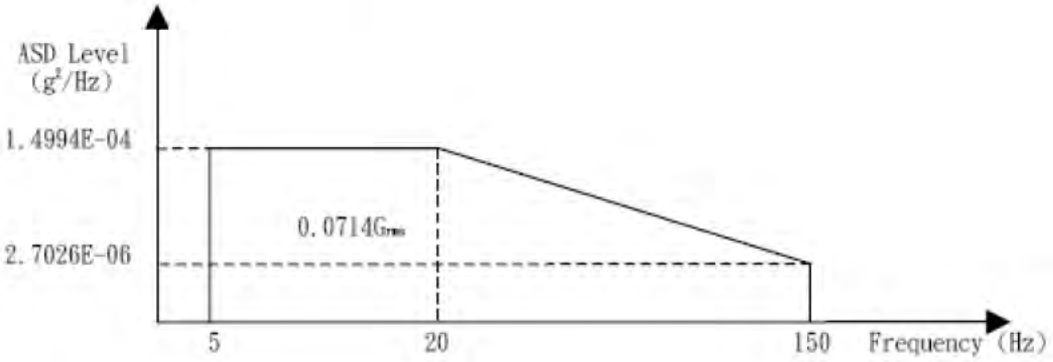
Power Spectrum Density shown as follow:



PSD of Vertical (Z) Axis



PSD of Transverse (Y) Axis



PSD of Longitudinal (X) Axis

4.4.5 Test Procedures

Reference to EN 61373

4.4.6 Test Result

PASS.

1. Test configurations were shown in Fig.1～Fig.3.
2. The testing data were shown in Fig.4～Fig.6.
3. Test specimen was visually inspected after test. No external physical damage was noted.
4. The function of specimen was normal during and after the vibration test.

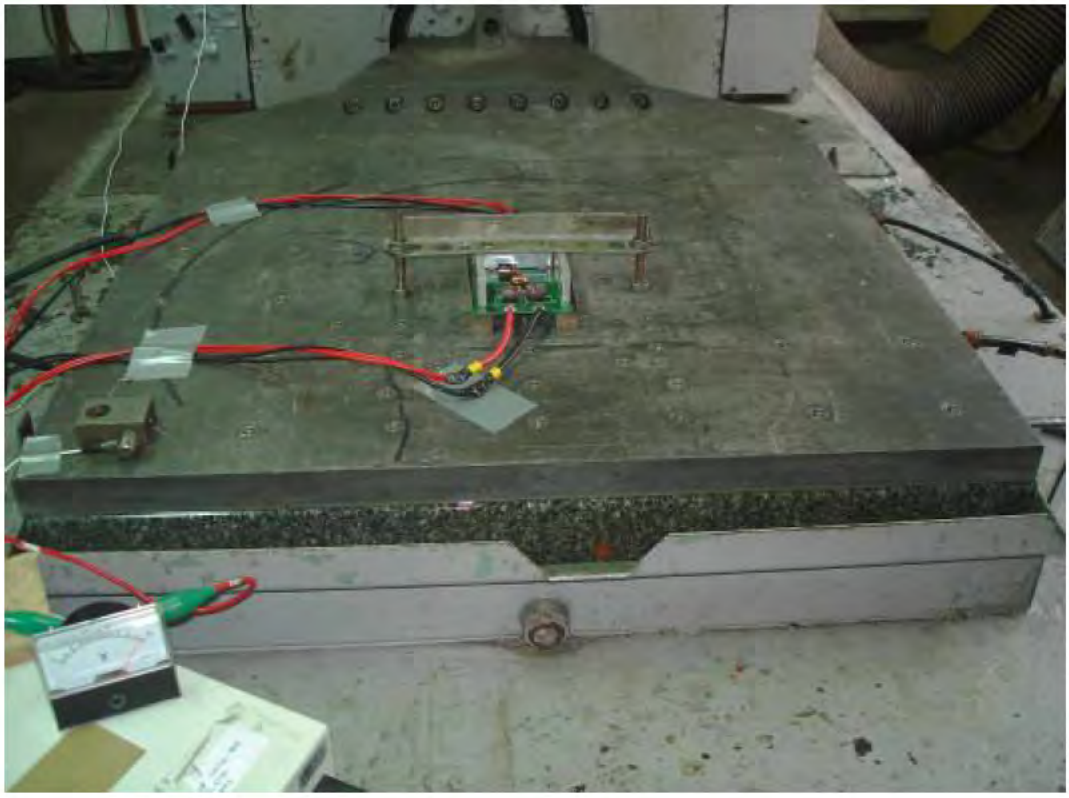


Fig. 1: Vibration Test in X-Axis

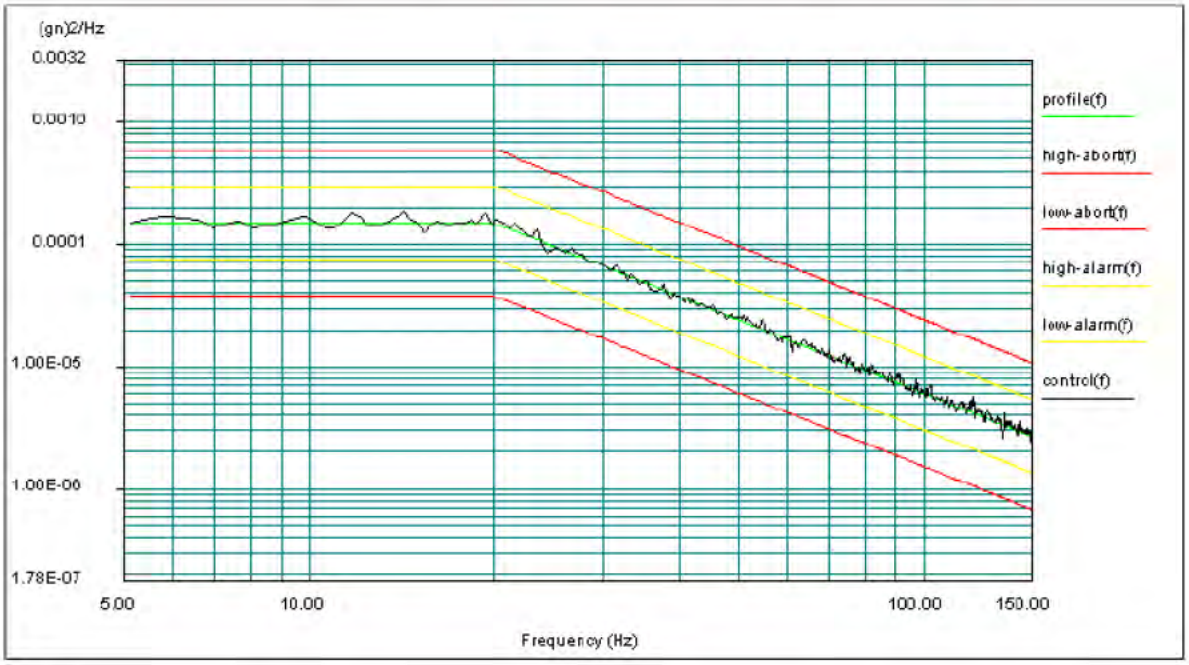
Fig. 2: Vibration Test in Y-Axis

Fig. 3: Vibration Test in Z-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC61373X-op.prj

Profile Name: X-Axis (Operating) Test Type: Random Run Folder: .\RunDefault Apr 02, 2012 15-55-26



Level: 100 %

Control RMS: 0.077780 gn Full Level Elapsed Time: 00:10:00 Lines: 400 Frame Time: 2.730667 Seconds

Demand RMS: 0.069882 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.366211 Hz

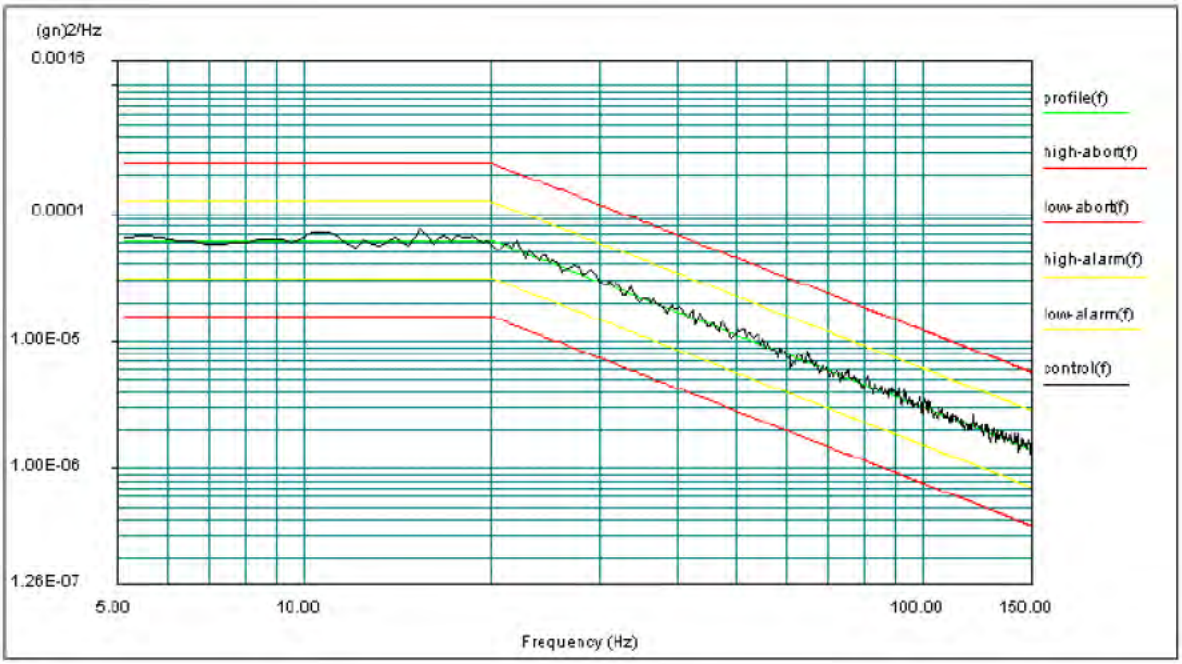
Data saved at 04:06:54 PM, Monday, April 02, 2012

Fig. 4 : Vibration Testing data of X-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC61373Y-op.prj

Profile Name: Y-Axis (Operating) Test Type: Random Run Folder: .\RunDefault Apr 02, 2012 10-30-11



Level: 100 %

Control RMS: 0.055706 gn Full Level Elapsed Time: 00:10:00 Lines: 400 Frame Time: 2.730667 Seconds

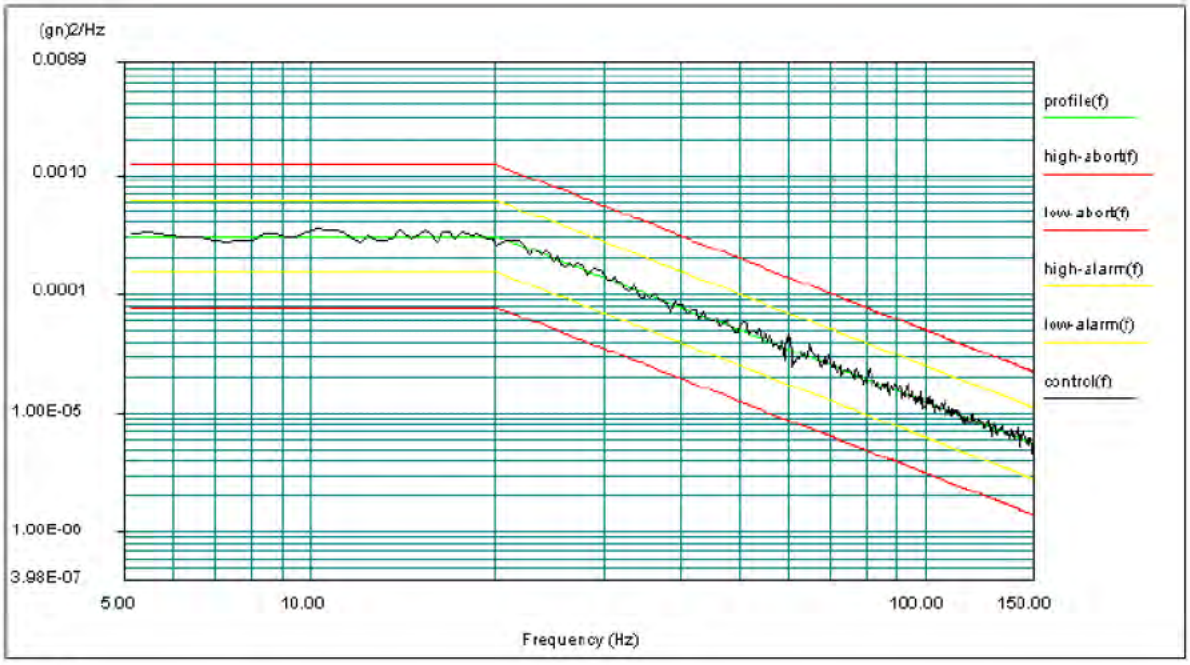
Demand RMS: 0.045471 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.366211 Hz

Data saved at 10:41:33 AM, Monday, April 02, 2012

Fig. 5 : Vibration Testing data of Y-Axis

DC/DC Converter (TEP 200-4818WIR)

Profile Name: Z-Axis (Operating) Test Type: Random Run Folder: .\RunDefault Apr 03, 2012 09-44-17



Level: 100 %

Control RMS: 0.110257 gn Full Level Elapsed Time: 00:10:00 Lines: 400 Frame Time: 2.730667 Seconds

Demand RMS: 0.100526 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.366211 Hz

Data saved at 09:56:09 AM, Tuesday, April 03, 2012

Fig. 6 : Vibration Testing data of Z-Axis

4.5 Increased Vibration test

4.5.1 Instrument

Instrument	Manufacturer	Model	Serial No.
U-D vibration machine	N/A	TA240D-208/CSTA.	N/A
Control System	LDS DACTRON	CONTROLLER	N/A
Accelerometer	N/A	DYTRAN 3055B2	N/A

4.5.2 Test ambience

Temperature: 21 ± 3℃

Humidity: 65% ± 5% (RH)

4.5.3 Specimen & Model quantity :

Specimen : DC/DC Converter

Model : TEP 200-4818WIR

Quantity : 1 set for each model

4.5.4 Test Requirement

Reference to EN 50155 section 12.2.11

Frequency Range: 5Hz to 150Hz

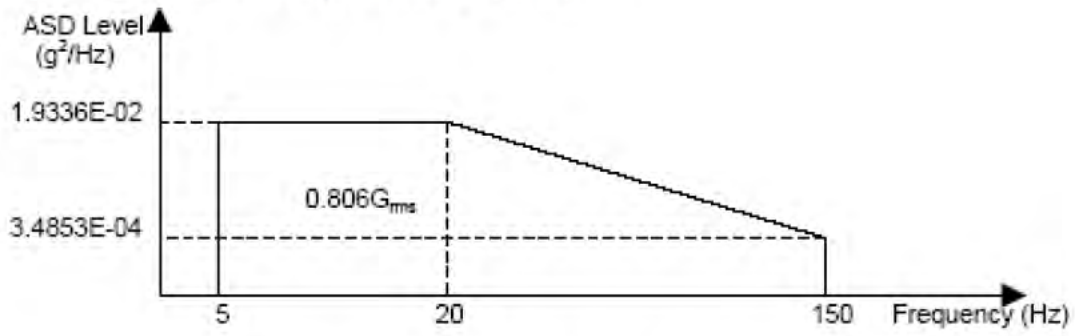
G_{rms} value: Vertical (Z-Axis) 0.806 G_{rms} (7.90m/s^2),

Transverse (Y-Axis) 0.357 G_{rms} (3.50m/s^2),

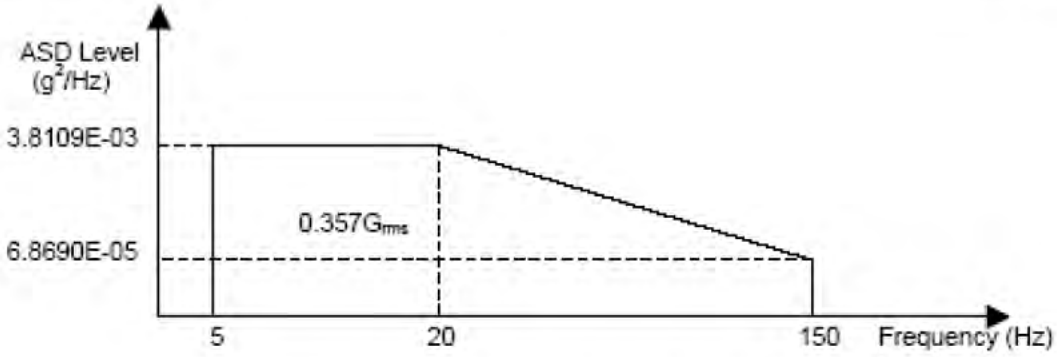
Longitudinal (X-Axis) 0.561 G_{rms}(5.50m/s^2).

Duration : 5 hours/axis。

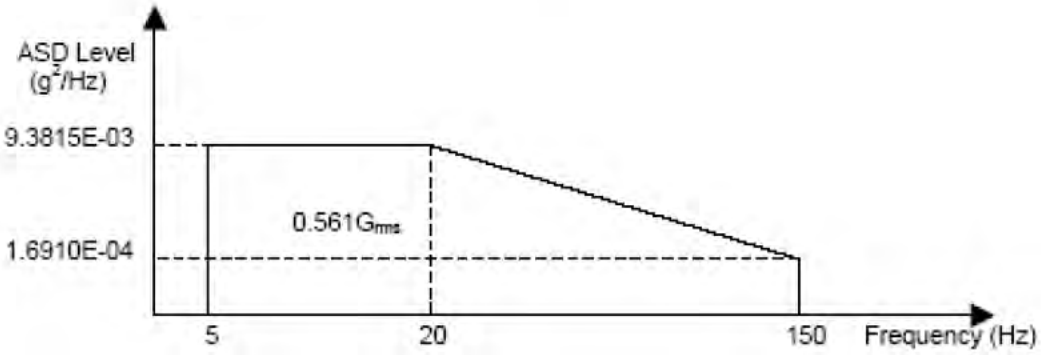
Power Spectrum Density shown as follow:



PSD of Vertical (Z) Axis



PSD of Transverse (Y) Axis



PSD of Longitudinal (X) Axis

4.5.5 Test Procedures

Reference to EN 61373

4.5.6 Test Result

PASS.

1. Test configurations were shown in Fig.1～Fig.3.
2. The testing data were shown in Fig.7～Fig.9.
3. Test specimen was visually inspected after test. No external physical damage was noted.
4. The function of specimen was normal after the increased vibration test.

Fig. 1: Vibration Test in X-Axis

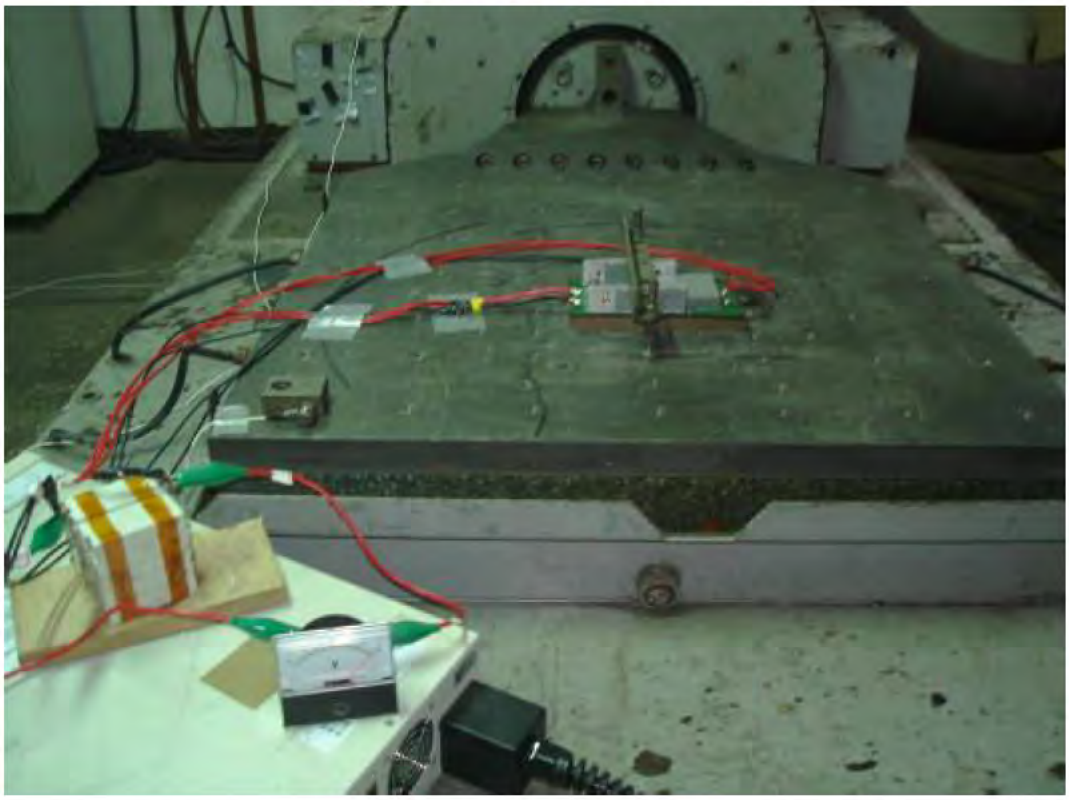


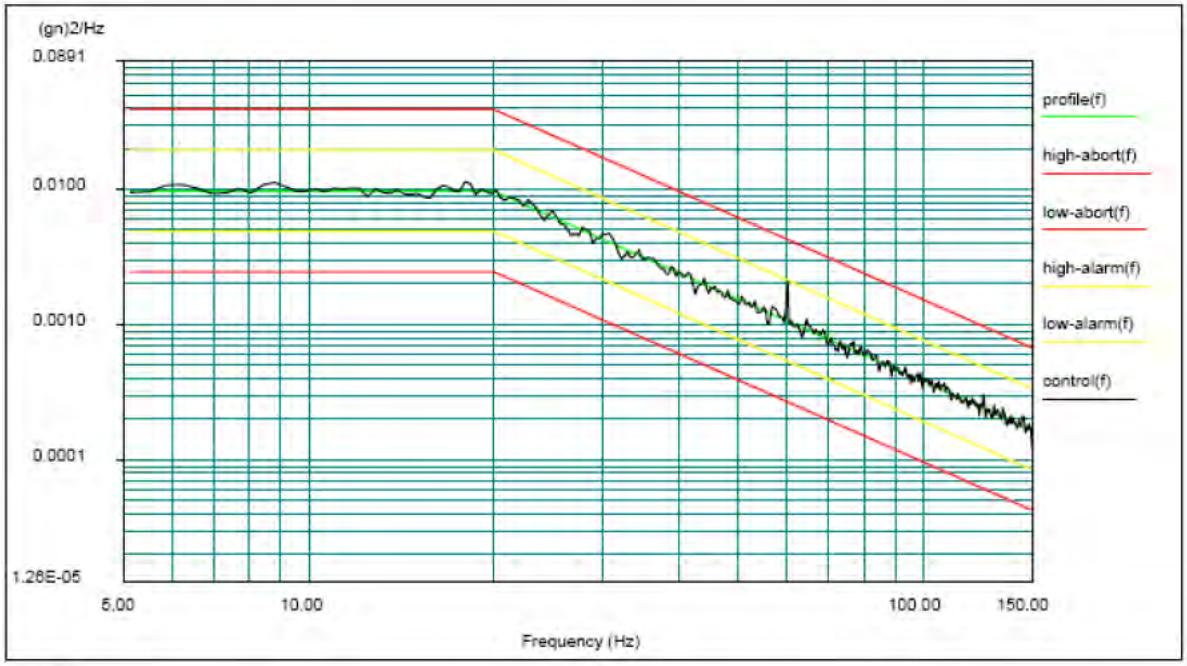
Fig. 2: Vibration Test in Y-Axis

Fig. 3: Vibration Test in Z-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC61373X-nop.prj

Profile Name: X-Axis (non-operating) Test Type: Random Run Folder: .\RunDefault Apr 02, 2012 16-08-11



Level: 100 %

Control RMS: 0.563864 gn Full Level Elapsed Time: 05:00:00 Lines: 400 Frame Time: 2.730667 Seconds

Demand RMS: 0.562334 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.366211 Hz

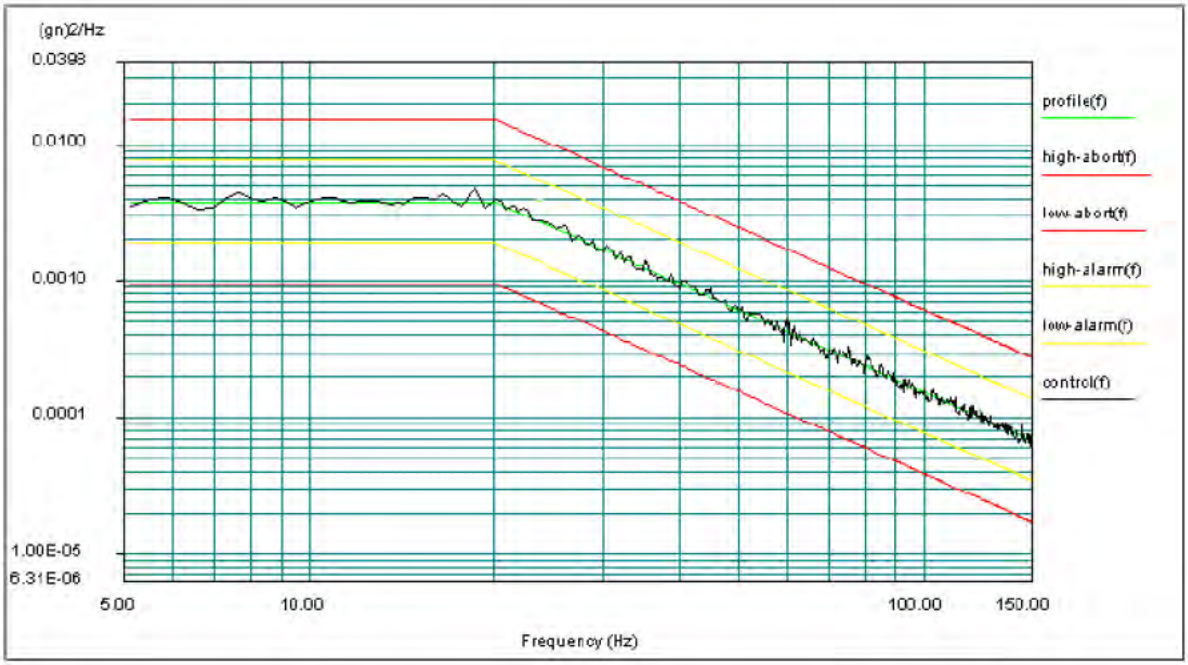
Data saved at 09:09:21 PM, Monday, April 02, 2012

Fig. 7 : Increased Vibration Testing data of X-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC61373Y-nop.prj

Profile Name: Y-Axis (non-operating) Test Type: Random Run Folder: .\RunDefault Apr 02, 2012 10-42-55



Level: 100 %

Control RMS: 0.356820 gn Full Level Elapsed Time: 05:00:00 Lines: 400 Frame Time: 2.730667 Seconds

Demand RMS: 0.352487 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.366211 Hz

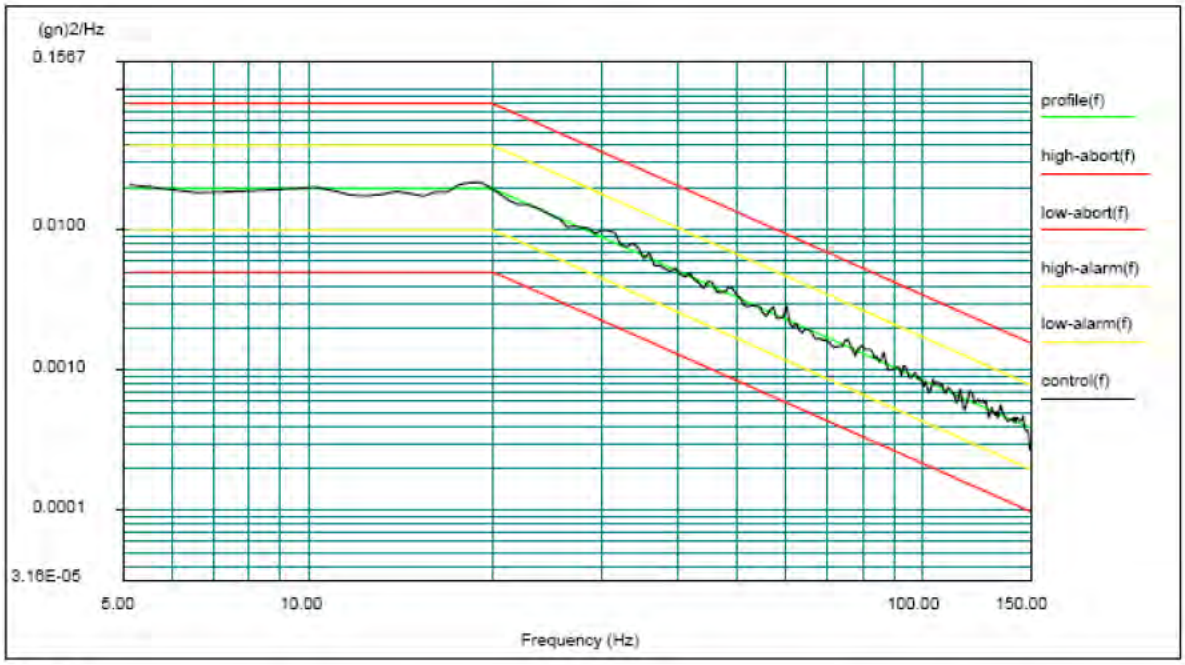
Data saved at 03:46:04 PM, Monday, April 02, 2012

Fig. 8 : Increased Vibration Testing data of Y-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC61373Z-nop(RANDOM).prj

Profile Name: Z-Axis (non-operating) Test Type: Random Run Folder: .\RunDefault Apr 03, 2012 09-59-28



Level: 100 %

Control RMS: 0.808406 gn Full Level Elapsed Time: 05:00:00 Lines: 200 Frame Time: 1.365333 Seconds

Demand RMS: 0.813269 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.732422 Hz

Data saved at 03:02:21 PM, Tuesday, April 03, 2012

Fig. 9 : Increased Vibration Testing data of Z-Axis

4.6 Shock Test

4.6.1 Instrument

Instrument	Manufacturer	Model	Serial No.
U-D vibration machine	N/A	TA240D-208/CSTA.	N/A
Control System	LDS DACTRON	CONTROLLER	N/A
Accelerometer	N/A	DYTRAN 3055B2	N/A

4.6.2 Test ambience

Temperature: 21℃ ± 3℃

Humidity: 65% ± 5%(RH)

4.6.3 Test Requirement

Reference to EN 50155 section 12.2.11

Wave Form: Half Sine Wave

Acceleration Peak: Vertical(Z)3.0612 G (30m/s^2),

Transverse(Y)3.0612 G (30m/s^2),

Longitudinal(X)5.1020 G (50m/s^2).

Duration: 30ms

Shock Times: 3 times for each direction, 6 directions, 18 times in total。

4.6.4 Test Procedures

Reference to EN 61373

4.6.5 Test Result

PASS.

1. Test configurations are shown in Fig.1～Fig.3.
2. The testing data are shown in Fig.10～Fig.15.
3. Test specimen was visually inspected after test. No external physical damage was noted.
4. The function of specimen was normal during and after the shock test.

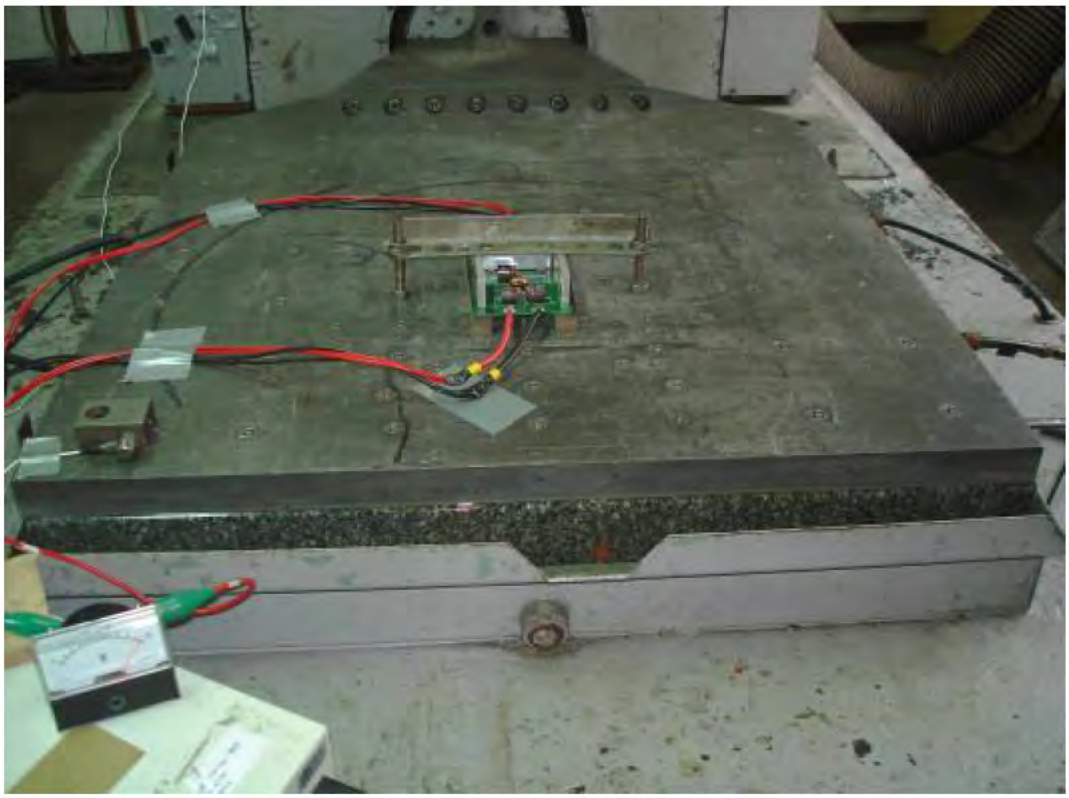


Fig. 1 Shock Test in X-Axis

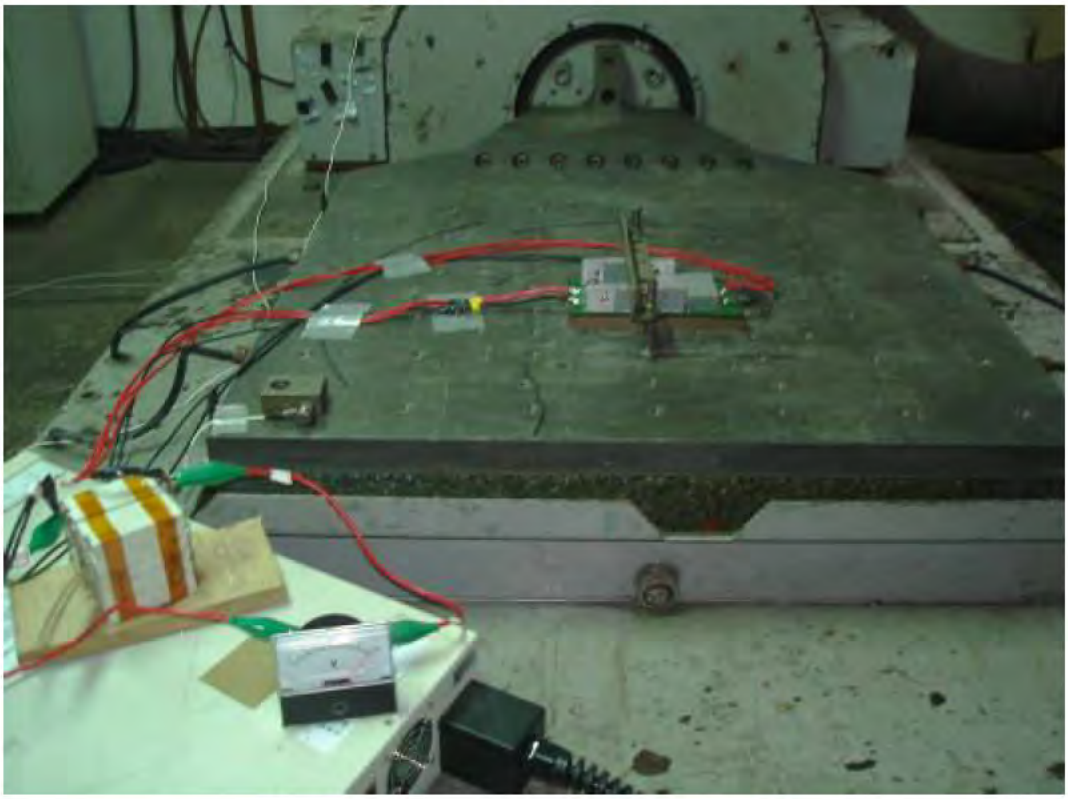


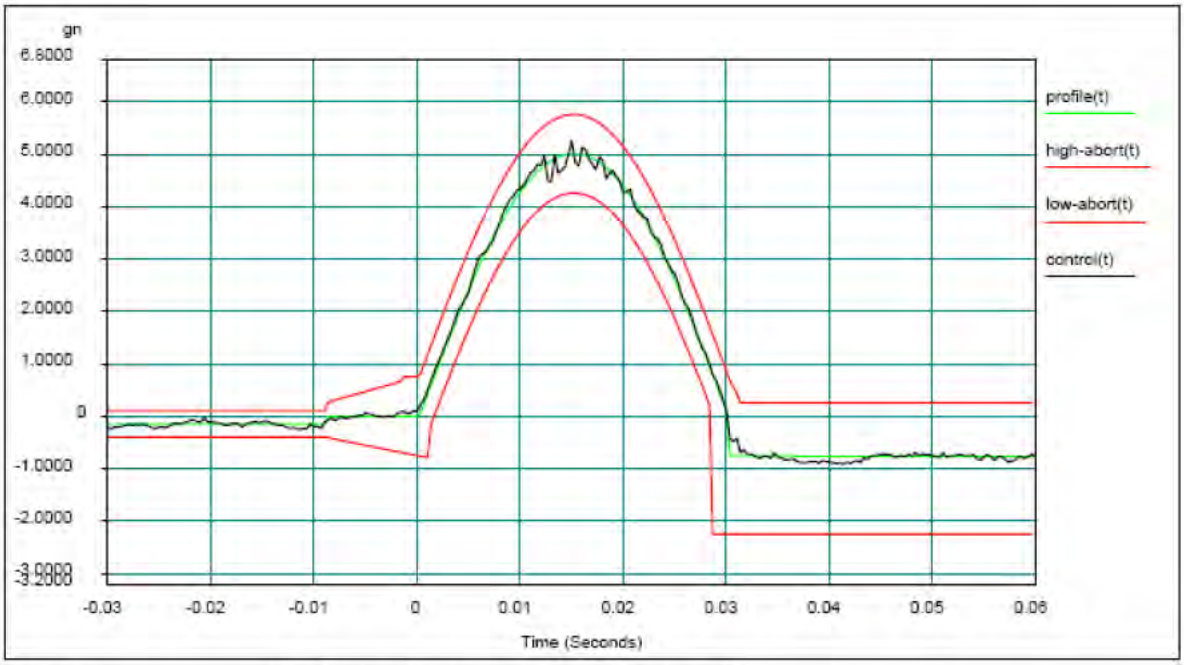
Fig. 2 Shock Test in Y-Axis

Fig. 3 Shock Test in Z-Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(X).prj

Profile Name: 5gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 02, 2012 21-12-03



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 5.243384 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 5.000000 gn Remaining Pulses: 0

Pulse Type: Half Sine Amplitude: 5.000000 gn

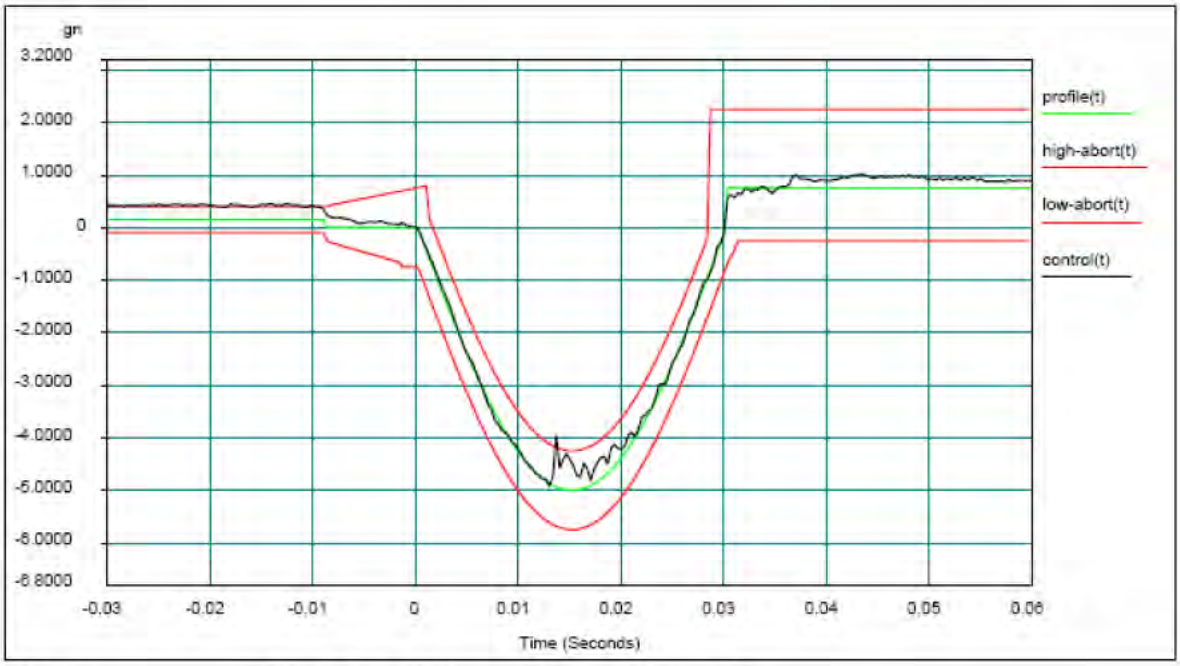
Data saved at 09:12:35 PM, Monday, April 02, 2012

Fig. 10 : Shock Testing data of +X Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(X).prj

Profile Name: 5gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 02, 2012 21-12-52



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 4.952137 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 5.100000 gn Remaining Pulses: 0

Pulse Type: Half Sine Amplitude: 5.100000 gn

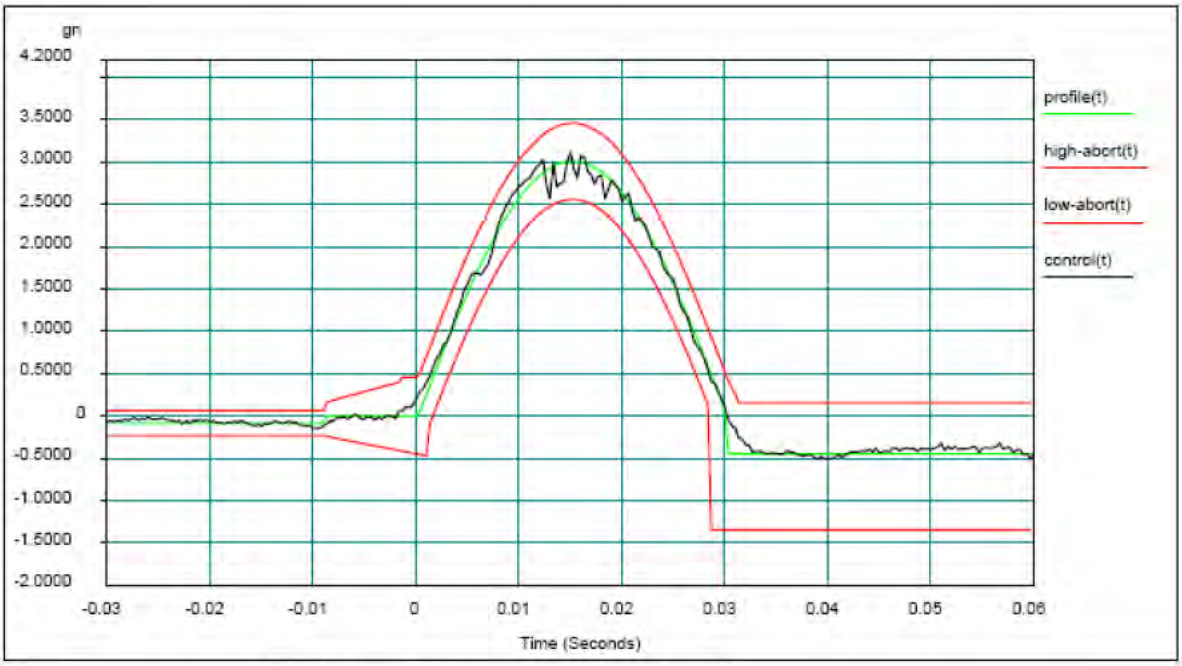
Data saved at 09:13:15 PM, Monday, April 02, 2012

Fig. 11 : Shock Testing data of -X Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(Y,Z)(SHOCK).prj

Profile Name: 3gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 02, 2012 15-48-19



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 3.104562 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 3.060000 gn Remaining Pulses: 0

Pulse Type: Half Sine Amplitude: 3.060000 gn

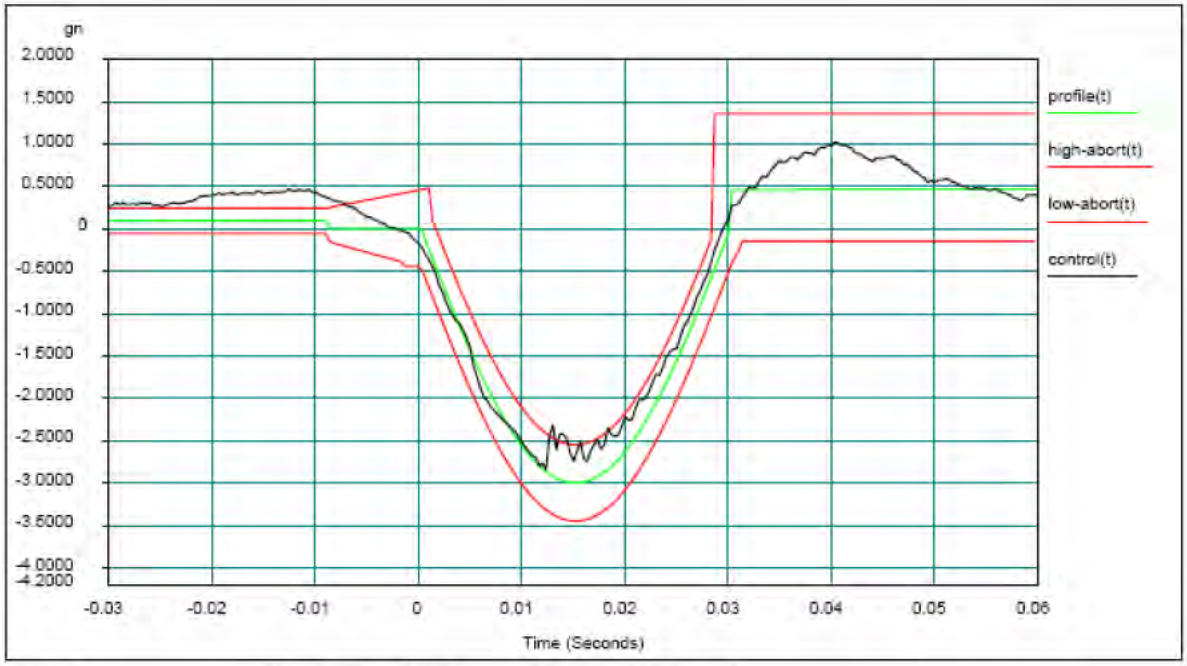
Data saved at 03:48:42 PM, Monday, April 02, 2012

Fig. 12 : Shock Testing data of +Y Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(Y,Z)(SHOCK).prj

Profile Name: 3gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 02, 2012 15-49-38



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 2.870652 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 3.060000 gn Remaining Pulses: 0

Pulse Type: Half Sine Amplitude: 3.060000 gn

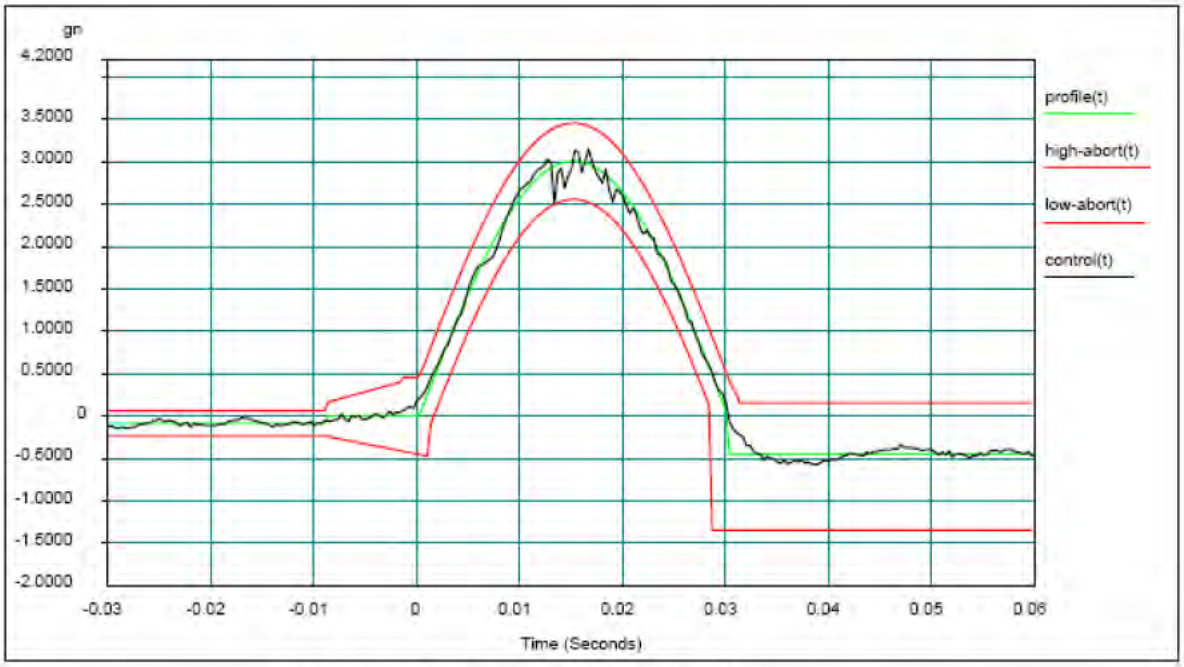
Data saved at 03:50:19 PM, Monday, April 02, 2012

Fig. 13 : Shock Testing data of -Y Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(Y,Z)(SHOCK).prj

Profile Name: 3gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 03, 2012 15-03-16



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 3.123156 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 3.060000 gn Remaining Pulses: 0

Pulse Type: Half Sine Amplitude: 3.060000 gn

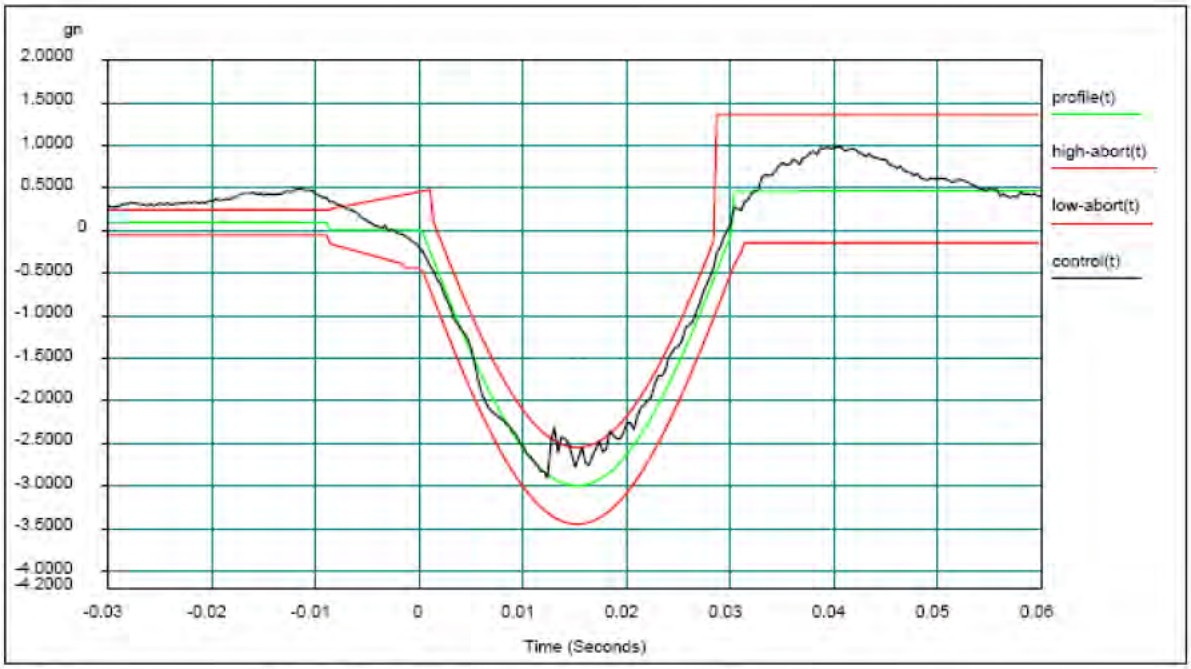
Data saved at 03:03:48 PM, Tuesday, April 03, 2012

Fig. 14 : Shock Testing data of +Z Axis

DC/DC Converter (TEP 200-4818WIR)

Project File Name: IEC67373Sk(Y,Z)(SHOCK).prj

Profile Name: 3gn 30mSec Test Type: Classical Shock Run Folder: .\RunDefault Apr 03, 2012 15-04-12



Level: 100 % Block Size: 4096 Elapsed Pulses: 11

Frame Time: 1.365333 Seconds Control Peak: 2.896731 gn Full Level Elapsed Pulses: 3

dT: 0.000333 Seconds Demand Peak: 3.060000 gn Remaining Pulses: 0

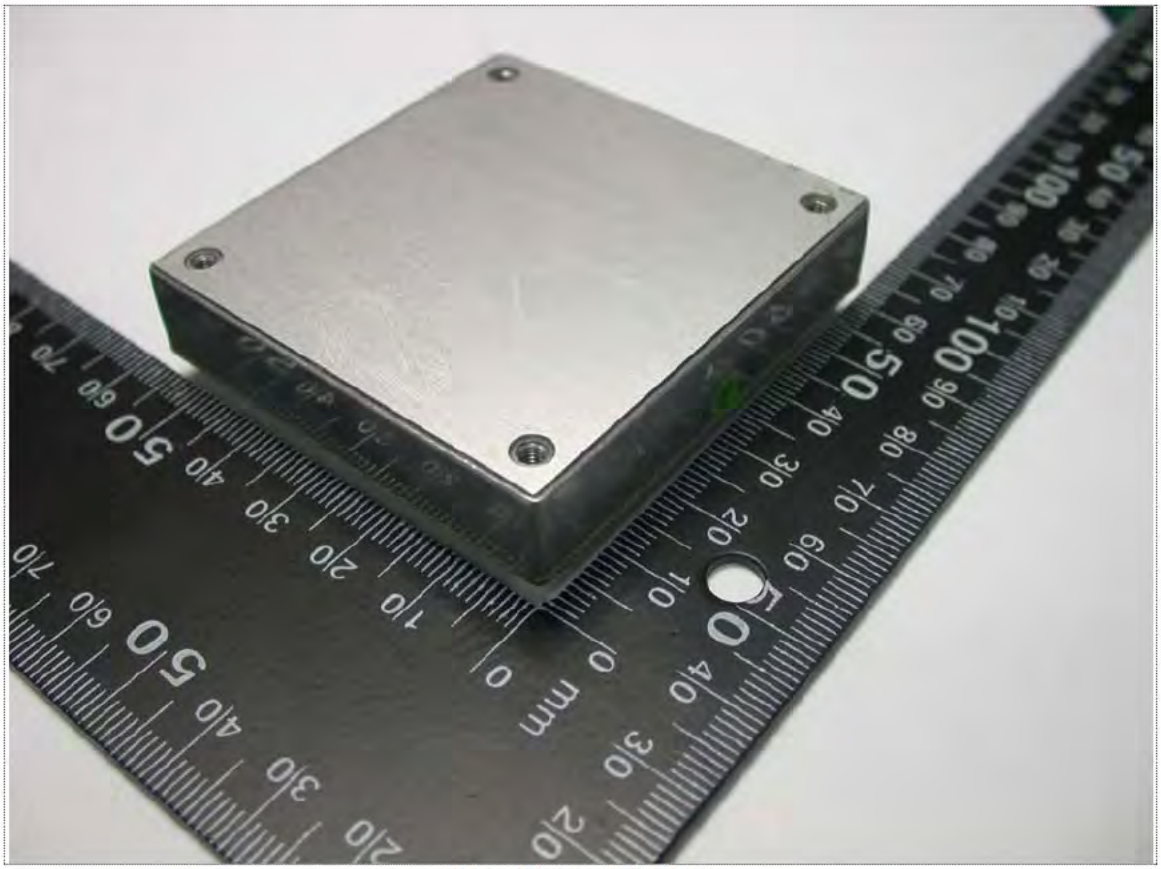
Pulse Type: Half Sine Amplitude: 3.060000 gn

Data saved at 03:04:42 PM, Tuesday, April 03, 2012

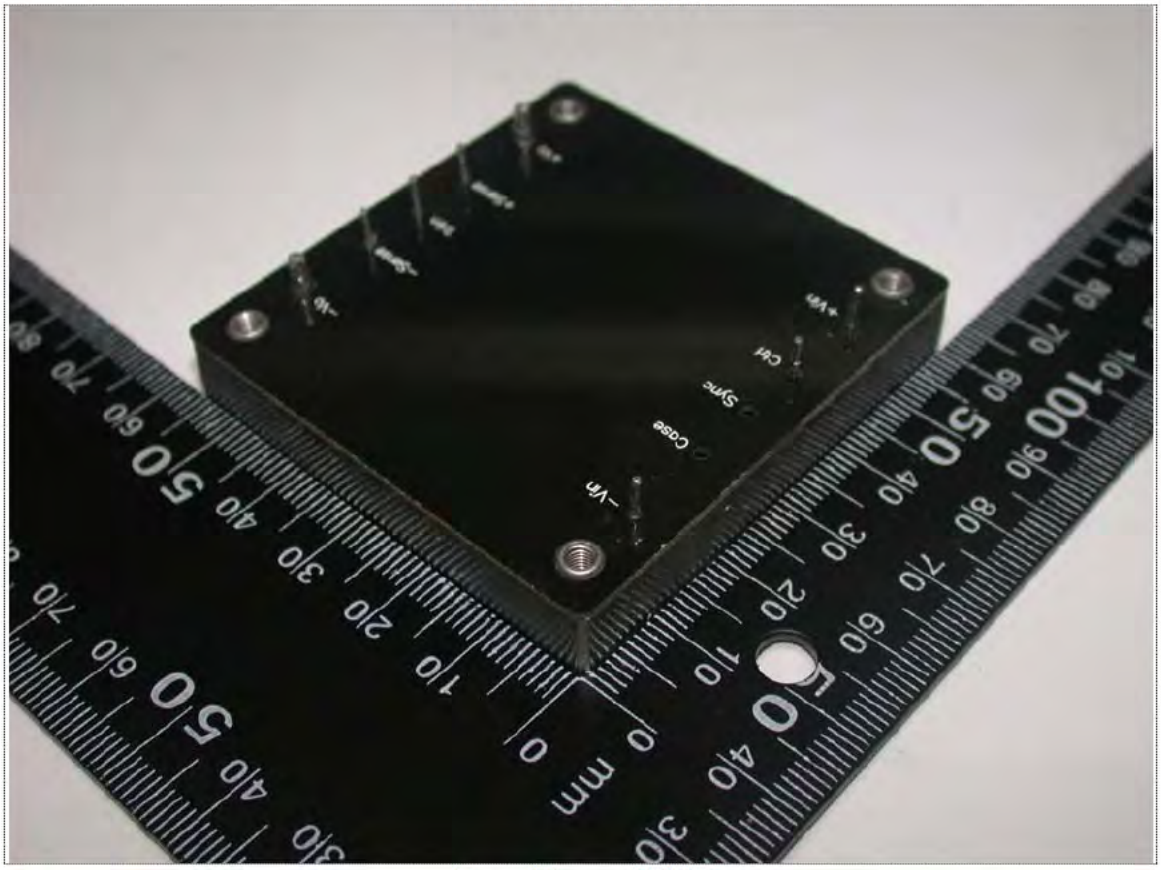
Fig. 15 : Shock Testing data of -Z Axis

5 Photographs of EUT

5.1 Model No.: TEP 200-4818WIR



Front View of EUT



Rear View of EUT