

Test Report

EN 50155: 2007+AC: 2010+AC: 2012 (EMC, Characteristic, Environmental...Test)

Product : **DC/DC Converter**

Trade Name : 

Model Number : TEQ 300-4812WIR; TEQ 300-4813WIR;
TEQ 300-4815WIR; TEQ 300-4816WIR;
TEQ 300-4818WIR; TEQ 300-7212WIR;
TEQ 300-7213WIR; TEQ 300-7215WIR;
TEQ 300-7216WIR; TEQ 300-7218WIR

Prepared for

Traco Electronic AG

Sihlbruggstrasse 111, 6340 Baar
Switzerland

Prepared by

Interocean EMC Technology Corp.

Interocean EMC Technology Tin-Fu Laboratory

No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City,
Taiwan 244, R.O.C.

TEL.: +886 2 2600 6861

FAX.: +886 2 2600 6859

Remark:

The test report consists of 66 pages in total. It shall not be reproduced except in full, without the written approval of IETC. This document may be altered or revised by IETC only, and shall be noted in the revision section of the document.

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

Table of Contents

1	General Information	4
1.1	Description of Equipment Under Test	4
1.2	Specifications Description	5
1.3	Details of Tested Supporting System	6
1.4	Test Facility	7
1.5	Measurement Uncertainty	8
1.6	Summary of Test Results	9
1.7	Measured Mode	10
1.8	Configuration of EUT Setup	10
1.9	Test Step of EUT	10
2	Characteristic Test	11
2.1	Visual Inspection	11
2.2	Performance (Supply Variations)	12
2.3	Performance (Supply Interruption)	13
2.4	Performance (Supply Change Over)	14
2.5	Insulation Test	15
2.6	Supply Overvoltages	16
3	Electromagnetic Compatibility (EMC)	17
3.1	Surges Test	17
3.2	Electrostatic Discharge Test	18
3.3	Transient Burst Susceptibility Test	20
3.4	Radio- Frequency, Electromagnetic Field Immunity Test	21
3.5	Radio- Frequency, Conducted Disturbances Immunity Test	22
3.6	Power Line Conducted Emission	23
3.7	Radiated Emission	31
4	Environmental Tests	39
4.1	Cooling Test	39
4.2	Dry Heat Test	41
4.3	Damp Heat Test	43
4.4	Vibration Test (Operating)	45
4.5	Simulated Long-life Test	50
4.6	Shock Test	55
5	Photographs of EUT	61
5.1	Model No.: TEQ 300-4812WIR	61
5.2	Model No.: TEQ 300-4818WIR	63
5.3	Model No.: TEQ 300-7212WIR	65

Statement of Compliance

Applicant: Traco Electronic AG
Manufacturer: Traco Electronic AG
Product: DC/DC Converter
Model No.: TEQ 300-4812WIR; TEQ 300-4813WIR; TEQ 300-4815WIR;
TEQ 300-4816WIR; TEQ 300-4818WIR; TEQ 300-7212WIR;
TEQ 300-7213WIR; TEQ 300-7215WIR; TEQ 300-7216WIR;
TEQ 300-7218WIR
Tested Power Supply: DC 48 V; DC 110 V
Date of Final Test: Jul. 12, 2016
Revision of Report: Rev. 01

Measurement Procedures and Standards Used :

- ☒ EN 50155: 2007+AC: 2010+AC: 2012 for EMC, Characteristic and Environmental
 - ☒ EN 50121-3-2: 2006+AC: 2008 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: 2010 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 : 2016/10/03

Project Engineer : Evans Chang
Evans Chang

Approved: Roy Chiang
Roy Chiang

1 General Information

1.1 Description of Equipment Under Test

Product	: DC/DC Converter
Model Number	: TEQ 300-4812WIR; TEQ 300-4813WIR; TEQ 300-4815WIR; TEQ 300-4816WIR; TEQ 300-4818WIR; TEQ 300-7212WIR; TEQ 300-7213WIR; TEQ 300-7215WIR; TEQ 300-7216WIR; TEQ 300-7218WIR
Applicant	: Traco Electronic AG Sihlbruggstrasse 111, 6340 Baar Switzerland
Manufacturer	: Traco Electronic AG Sihlbruggstrasse 111, 6340 Baar Switzerland
Power Supply	: Please refer to section 1.2
Date of Test	: Jun. 06 ~ 15, 2016 (For EMC and Characteristic Test) Jul. 07 ~ 12, 2016 (For Environmental Test)
Additional Description	: 1) The test models are “ TEQ 300-4812WIR; TEQ 300-4818WIR; TEQ 300-7212WIR ” and included in this report. 2) The differences for all models included in this report, the details please refer to section 1.2. 3) For more detail specification about EUT, please refer to the user’s manual.

1.2 Specifications Description

Model Name	Input Range	Vin Nominal	Output Voltage	Output Current
	VDC		VDC	A
TEQ 300-4812WIR	18 ~ 75	48	12	25
TEQ 300-4813WIR	18 ~ 75	48	15	20
TEQ 300-4815WIR	18 ~ 75	48	24	12.5
TEQ 300-4816WIR	18 ~ 75	48	28	10.8
TEQ 300-4818WIR	18 ~ 75	48	48	6.3
TEQ 300-7212WIR	43 ~ 160	110	12	25
TEQ 300-7213WIR	43 ~ 160	110	15	20
TEQ 300-7215WIR	43 ~ 160	110	24	12.5
TEQ 300-7216WIR	43 ~ 160	110	28	10.8
TEQ 300-7218WIR	43 ~ 160	110	48	6.3
All models maybe followed by any alphanumeric character, "-" or blank for market purpose.				

1.3 Details of Tested Supporting System

1.3.1 Load (Model No.: TEQ 300-4812WIR)

Full Load : 300 W (12 V, 25 A)

1.3.2 Load (Model No.: TEQ 300-4818WIR)

Full Load : 302.4 W (48 V, 6.3 A)

1.3.3 Load (Model No.: TEQ 300-7212WIR)

Full Load : 300 W (12 V, 25 A)

1.3.4 Test Cable

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

1.4 Test Facility

- Site Description** : ☒Conducted 1 ☒OATS 1 ☒EMS Room
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Location** : No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA
Designation No.: TW1020 (Test Firm Registration #: 651092)
Designation No.: TW1113 (Test Firm Registration #: 959554)
 - Industry Canada (IC)
OUR FILE: 46405-4437
Registration No. (OATS 1): Site# 4437A-1
Registration No. (OATS 3): Site# 4437A-3
Registration No. (Chamber 3): Site# 4437A-5
Registration No. (OATS 5): Site# 4437A-6
 - 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
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS 13438 / CISPR 22
SL2-IN-E-0026 for CNS 14757-2 / IEC 62040-2
SL2-R1-E-0026 for CNS 13439 / CISPR 13
SL2-R2-E-0026 for CNS 13439 / CISPR 13
SL2-L1-E-0026 for CNS 14115 / CISPR 15
 - Taiwan Accreditation Foundation (TAF)
Accreditation No.: 1113
 - Vehicle Safety Certification Center (VSCC)
Approval No.: TW16-11
 - TÜV NORD
Certificate No: TNTW0801R

1.5 Measurement Uncertainty

Item	Value
Conduction 1:	
Conducted Emission - AMN (9 kHz to 30 MHz)	2.98 dB
Conducted Emission - AAN (ISN-T4) (150 kHz to 30 MHz)	3.70 dB
Conducted Emission - AAN (ISN-T8) (150 kHz to 30 MHz)	3.70 dB
Conducted Emission - CP (9 kHz to 30 MHz)	3.06 dB
Conducted Emission - VP (9 kHz to 30 MHz)	2.42 dB
Radiated Emission - LAS (2 m Loop) (9 kHz to 30 MHz)	3.26 dB
Conduction 2:	
Disturbance Power (30 MHz to 300 MHz)	4.04 dB
OATS 1:	
Radiated Emission Test (30 MHz to 1 GHz)	4.84 dB
Radiated Emission Test (1 GHz to 6 GHz)	4.84 dB
OATS 3:	
Radiated Emission Test (30 MHz to 1 GHz)	4.70 dB
OATS 5:	
Radiated Emission Test (30 MHz to 1 GHz)	4.70 dB
Chamber 3:	
Radiated Emission Test (9 kHz to 30 MHz)	3.12 dB
Radiated Emission Test (30 MHz to 1 GHz)	4.86 dB
Radiated Emission Test (1 GHz to 6 GHz)	4.78 dB
Induced Current Density (20 kHz to 10 MHz)	1.82 dB
Conducted Immunity Room:	
Conducted Immunity Test / CDN-M2	1.30 dB
Conducted Immunity Test / CDN-M3	1.30 dB
Conducted Immunity Test / EM Clamp	3.16 dB

1.6 Summary of Test Results

Report Clause	Phenomenon	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
2	Characteristic Test				
2.1	Visual Inspection	12.2.1	-	Applicable	IETC LAB
2.2	Performance (Supply Variations)	12.2.2 5.1.1.1	-	Applicable	IETC LAB
2.3	Performance (Supply Interruption)	12.2.2 5.1.1.2 5.1.3	-	Applicable	IETC LAB
2.4	Performance (Supply Change Over)	12.2.2 5.1.3	-	Applicable	IETC LAB
2.5	Insulation Test	12.2.9	-	Applicable	IETC LAB
2.6	Supply Overvoltages	12.2.6	-	Applicable	IETC LAB
3	Electromagnetic Compatibility (EMC)				
3.1	Surges Test	12.2.7.1	EN 50121-3-2 EN 61000-4-5	Applicable	IETC LAB
3.2	Electrostatic Discharge Test	12.2.7.2	EN 50121-3-2 EN 61000-4-2	Applicable	IETC LAB
3.3	Transient Burst Susceptibility Test	12.2.7.3	EN 50121-3-2 EN 61000-4-4	Applicable	IETC LAB
3.4	Radio- Frequency, Electromagnetic Field Immunity Test	12.2.8.1	EN 50121-3-2 EN 61000-4-3	Applicable	IETC LAB
3.5	Radio- Frequency, Conducted Disturbances Immunity Test	12.2.8.1	EN 50121-3-2 EN 61000-4-6	Applicable	IETC LAB
3.6	Power Line Conducted Emission Measurement	12.2.8.2	EN 50121-3-2 EN 55011	Applicable	IETC LAB
3.7	Radiated Emission Measurement	12.2.8.2	EN 50121-3-2 EN 55011	Applicable	IETC LAB
4	Environmental Tests				
4.1	Cooling Test	12.2.3	EN 60068-2-1	Applicable	TAIWAY TESTING LAB
4.2	Dry Heat Test	12.2.4	EN 60068-2-2	Applicable	TAIWAY TESTING LAB
4.3	Damp Heat Test	12.2.5	EN 60068-2-30	Applicable	TAIWAY TESTING LAB
4.4	Random Vibration Test	12.2.11	EN 61373	Applicable	ALAB
4.5	Increased Random Vibration Test	12.2.11	EN 61373	Applicable	ALAB
4.6	Shock Test	12.2.11	EN 61373	Applicable	ALAB

1.7 Measured Mode

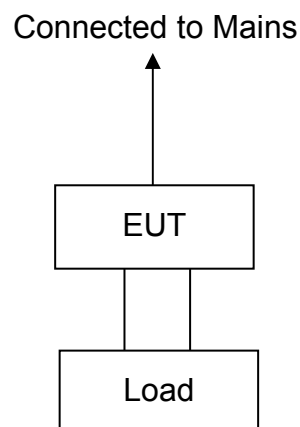
1.7.1 The test modes for preliminary test are as following:

- Mode 1: Full Load (Model No.: TEQ 300-4812WIR)
- Mode 2: Full Load (Model No.: TEQ 300-4818WIR)
- Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

1.7.2 After preliminary test, EUT was selected the worst-case for the final testing.
The test modes are:

- For Emission: Mode 1 ~ 3
- For Immunity: Mode 3

1.8 Configuration of EUT Setup



1.9 Test Step of EUT

- 1.9.1 Setup the EUT and peripheral as above.
- 1.9.2 Turn on the power of all equipment.
- 1.9.3 Check the function is normal.
- 1.9.4 Executed the test.

2 Characteristic Test

2.1 Visual Inspection

2.1.1 Inspection Requirement

The visual inspection shall be carried out to ensure that the equipment construction meets its specified requirements.

2.1.2 Test Procedures

Test Procedures were referred to EN 50155 sub-clause 12.2.1

2.1.3 Inspection Result

The visual inspection result before test: **PASS.**

The visual inspection result after test: **PASS.**

2.2 Performance (Supply Variations)

2.2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Oscilloscope	Tektronix	MDO 3034	C011004	2016/08/24
DC Power Supply	Chroma	62024P-80-60	62024PA00552	2016/10/25
DC Power Supply	Chroma	62024P-80-60	62024PA00468	2016/12/17
Voltage Regulators	IETC	IETC-VR	IETC-VR-001	N.C.R.

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: 25.2°C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Test Voltage		Test time	Result
70 % U_n	77 V	10 min	No deviation
U_n	110 V	10 min	No deviation
115 % U_n	126.5 V	10 min	No deviation
125 % U_n	137.5 V	10 min	No deviation
125 % U_n	137.5 V	<1 sec	No deviation
140 % U_n	154 V	<1 sec	No deviation
60 % U_n	66 V	<0.1 sec	No deviation
140 % U_n	154 V	<0.1 sec	No deviation

2.3 Performance (Supply Interruption)

2.3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Oscilloscope	Tektronix	MDO 3034	C011004	2016/08/24
DC Power Supply	Chroma	62024P-80-60	62024PA00552	2016/10/25
DC Power Supply	Chroma	62024P-80-60	62024PA00468	2016/12/17
Voltage Regulators	IETC	IETC-VR	IETC-VR-001	N.C.R.

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 Procedures

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

2.3.4 Test Result

Temperature: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

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

During the test EUT with 1000µF cap.

2.4 Performance (Supply Change Over)

2.4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Oscilloscope	Tektronix	MDO 3034	C011004	2016/08/24
DC Power Supply	Chroma	62024P-80-60	62024PA00552	2016/10/25
DC Power Supply	Chroma	62024P-80-60	62024PA00468	2016/12/17
Voltage Regulators	IETC	IETC-VR	IETC-VR-001	N.C.R.

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

2.4.2 Test Requirement

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

Test acceptance requirements:

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

2.4.3 Test Procedures

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

2.4.4 Test Result

Temperature: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

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

During the test EUT with 3000µF cap.

2.5 Insulation Test

2.5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Withstand Voltage/insulation tester	EXTECH	7142	1344529	2016/09/25

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

2.5.2 Test Requirement

(1) Insulation Measurement Test: 500 VDC

- 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: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

1. Insulation Measurement Test: 500 VDC

Test Item			Insulation Measurement Test (Before)	Resistance	Insulation Measurement Test (After)	Resistance
POWRE (Input)	TO	POWRE (Output)	>10 G	Ω	>10 G	Ω

2. Voltage Withstand Test: 1000 VAC

Test Item			Result	
POWRE (Input)	TO	POWRE (Output)	6.12	mA

2.6 Supply Overvoltages

2.6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Oscilloscope	Tektronix	MDO 3034	C011004	2016/08/24
DC Power Supply	Chroma	62024P-80-60	62024PA00552	2016/10/25
DC Power Supply	Chroma	62024P-80-60	62024PA00468	2016/12/17
Voltage Regulators	IETC	IETC-VR	IETC-VR-001	N.C.R.

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. $\pm 10\%$)
1.4 U _n	0.1 s	1.0 s	1 Ω

Test acceptance requirements: No failure shall occur

☐ A.C. supplied equipment:

Voltage Level min.	Duration D min.	Series Resistor ^a (Tol. $\pm 10\%$)
1.4 U _n	1.0 s	1 Ω

^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: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Voltage level (minimum)	Duration d (maximum)	Duration D (maximum)	Series Resistor (Tol. $\pm 10\%$)	Result / Observation
154 VDC	0.1 s	1.0 s	1 Ω	No deviation

3 Electromagnetic Compatibility (EMC)

3.1 Surges Test

3.1.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Pro Systems	KeyTek	EMC Pro	0003234	2017/02/26

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: ± 1.0 kV (peak), 1.2/50 μ s, 42 Ω , 0.5 μ F
☐ Line (Neutral) to earth: ± 2.0 kV (peak), 1.2/50 μ s, 42 Ω , 0.5 μ F
☒ Battery referenced ports:
 ☒ Line to Neutral: ± 1.0 kV (peak), 1.2/50 μ s, 42 Ω , 0.5 μ F
☒ Line (Neutral) to earth: ± 2.0 kV (peak), 1.2/50 μ s, 42 Ω , 0.5 μ F

Performance criterion: **B**

3.1.3 Test Procedures

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

3.1.4 Test Result

PASS.

Temperature: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

- ☒ ± 0.5 kV (peak) Battery referenced port: Line to Neutral
 Performance criterion: ☒ **A** ☐ **B** ☐ **C**
☒ ± 1.0 kV (peak) Battery referenced port: Line to Neutral
 Performance criterion: ☒ **A** ☐ **B** ☐ **C**
☒ ± 2.0 kV (peak) Battery referenced port: Line to Neutral
 Performance criterion: ☒ **A** ☐ **B** ☐ **C**
☒ ± 0.5 kV (peak) Battery referenced port: Line (Neutral) to earth
 Performance criterion: ☒ **A** ☐ **B** ☐ **C**
☒ ± 1.0 kV (peak) Battery referenced port: Line (Neutral) to earth
 Performance criterion: ☒ **A** ☐ **B** ☐ **C**
☒ ± 2.0 kV (peak) Battery referenced port: Line (Neutral) 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	2017/04/21

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

PASS.

Temperature: 25.2 °C ; Humidity: 43 % ; Atmospheric: 986 hPa ; Test Engineer: Evans

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Air discharge ± 2 kV, ± 4 kV, ± 8 kV:

☒ **A** ☐ **B** ☐ **C**

Contact discharge ± 2 kV, ± 4 kV, ± 6 kV:

☒ **A** ☐ **B** ☐ **C**

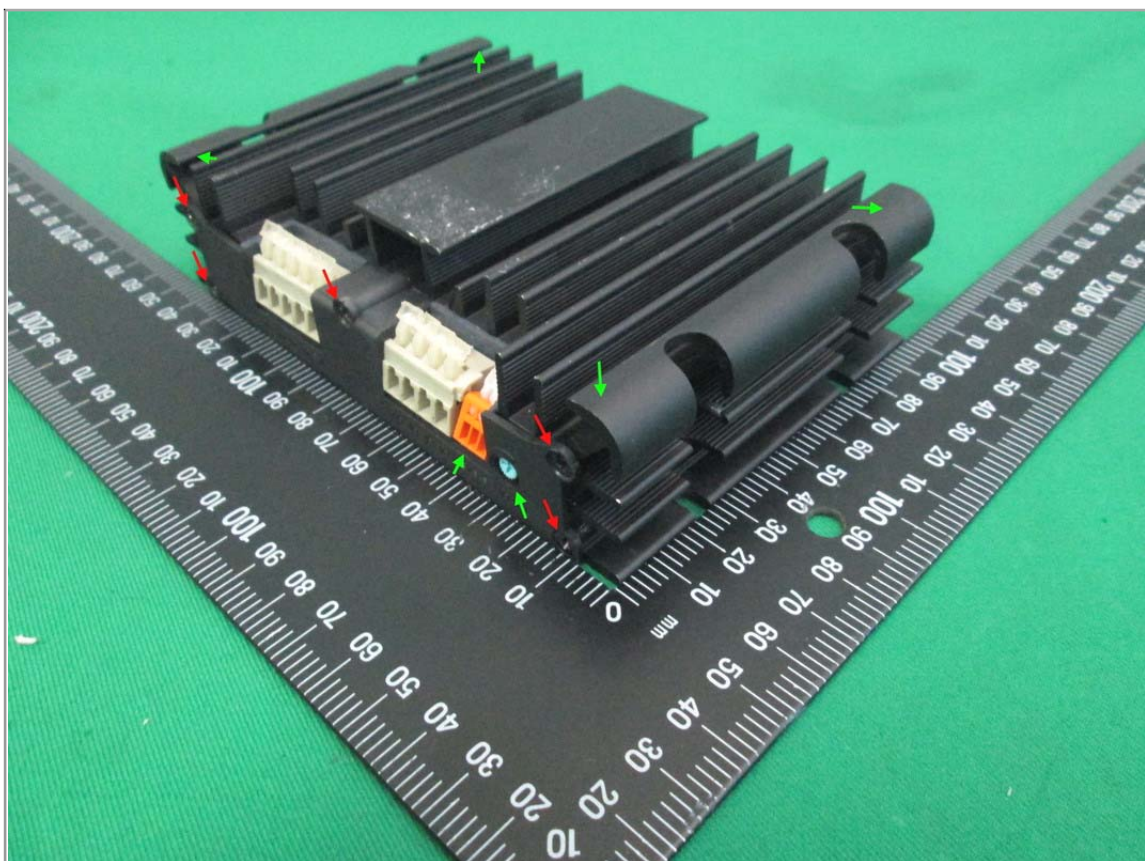
Indirect discharge (HCP) ± 2 kV, ± 4 kV, ± 6 kV:

☒ **A** ☐ **B** ☐ **C**

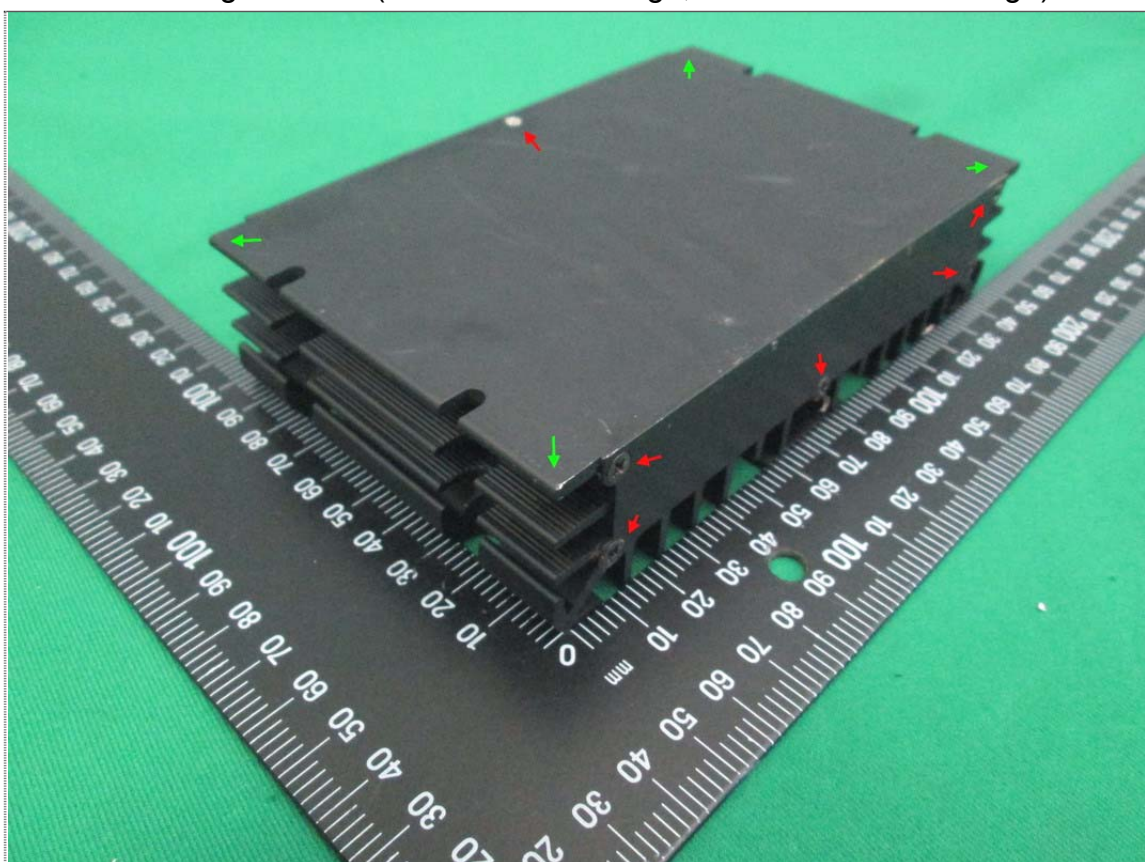
Indirect discharge (VCP) ± 2 kV, ± 4 kV, ± 6 kV:

☒ **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.



Discharge Point-1 (Green: Air Discharge; Red: Contact Discharge)



Discharge Point-2 (Green: Air Discharge; 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	2017/03/06

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 for 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

PASS.

Temperature: 25 °C ; Humidity: 42 % ; Atmospheric: 986 hPa ; Test Engineer: Vic

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

☒ ± 2.0 kV Battery referenced port: Line

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

☒ ± 2.0 kV Battery referenced port: Neutral

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

☒ ± 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	KEYSIGHT	N5171B	MY53051802	2017/03/09
Power Amplifier	R&K	A080M102-5555R	B30850	2017/04/28
Power Amplifier	R&K	A701M402-4747R	B30850	2017/04/28
Log Antenna	Schwarzbeck	VULP 9118 G Special	9118GS912	2017/04/28
Horn Antenna	Schwarzbeck	BBHA 9120 E	BBHA9120E 586	2017/04/28

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 (1 kHz),
(Note: For equipment mounted in network communication center a severity level of 10 V/m may be used.)

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

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

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

PASS.

Temperature: 25.4 °C ; Humidity: 52 % ; Atmospheric: 986 hPa ; Test Engineer: Mark

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

☒ Frequency range: **80 to 1000** MHz, Field strength: **20** V/m, 80 % AM (1 kHz)

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

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

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

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

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

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	Marconi Instruments	2024	112246/087	2017/04/21
RF Power Amplifier	R&K	A009K101-5050R	B30850	2017/02/05
Attenuator	Microwave Device Inc.	MA-5250/6N	001052	2017/02/05
C.D.N	FCC	FCC-801-M3-25A	2045	2017/02/05
C.D.N	SCHAFFNER	M216	16394	2017/02/05
EM Injection Clamp	SCHAFFNER	KEMZ 801	17037	2017/02/05

3.5.1 Instrument

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 (1 kHz)

☐ Auxiliary AC power ports.

☒ Battery referenced ports.

☐ Signal and control ports.

Performance criterion: **A**

3.5.3 Test Procedures

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

3.5.4 Test Result

PASS.

Temperature: 26 °C ; Humidity: 45 % ; Atmospheric: 986 hPa ; Test Engineer: Vic

Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

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

☒ 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	ESCS 30	100127	2016/10/25
RF Cable	HARBOUR	RG58/U	CBL48	2016/07/27
L.I.S.N.	Schwarzbeck	NNLK8121	8121417	2017/03/20
L.I.S.N.	Schaffner	MN2050D	1598	2016/08/27
Measurement Software	AUDIX-e3			

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 to 0.50	99
0.50 to 30	93

3.6.3 Test Procedures

Test Procedures were referred to EN 55011 sub-clause 7

3.6.4 Test Result

PASS.

The final test data is shown as following pages.

Factor = Insertion Loss + Cable Loss

Level = Reading + Factor

Margin = Level - Limit

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-4812WIR

POLARIZATION: Line

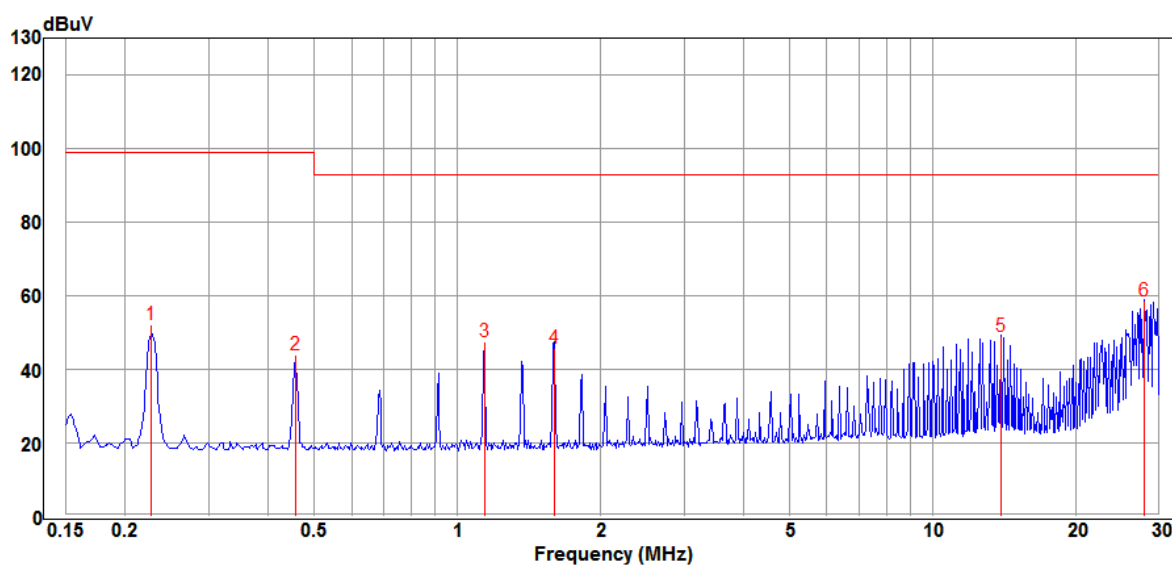
RATING: DC 48 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

Data:12

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	52.04	0.26	52.30	99.00	-46.70	QP
2	0.459	43.82	0.26	44.08	99.00	-54.92	QP
3	1.141	47.40	0.27	47.67	93.00	-45.33	QP
4	1.602	45.40	0.30	45.70	93.00	-47.30	QP
5	13.915	48.16	0.83	48.99	93.00	-44.01	QP
6	27.855	57.13	1.33	58.46	93.00	-34.54	QP

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-4812WIR

POLARIZATION: Neutral

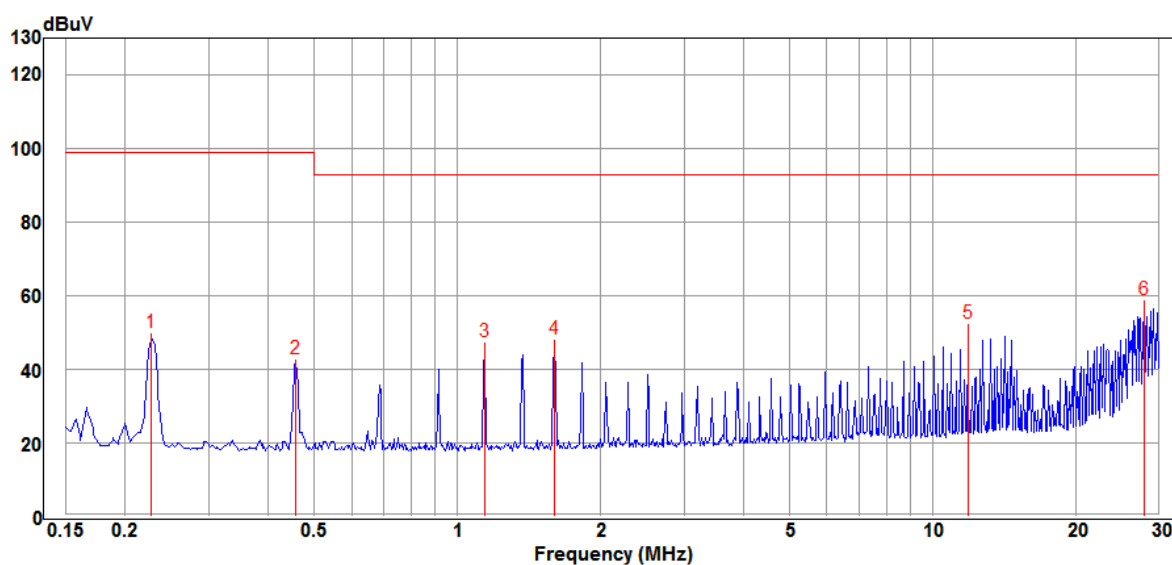
RATING: DC 48 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

Data:11

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	49.89	0.24	50.13	99.00	-48.87	QP
2	0.459	42.53	0.25	42.78	99.00	-56.22	QP
3	1.141	47.27	0.27	47.54	93.00	-45.46	QP
4	1.602	47.83	0.30	48.13	93.00	-44.87	QP
5	11.870	51.65	0.80	52.45	93.00	-40.55	QP
6	27.855	57.76	1.35	59.11	93.00	-33.89	QP

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-4818WIR

POLARIZATION: Line

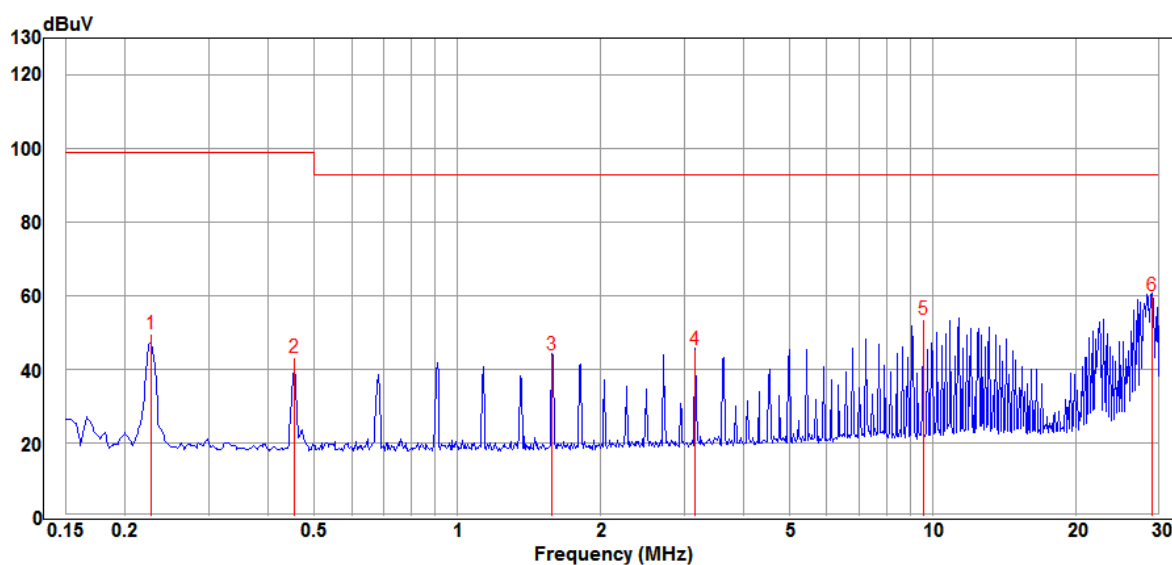
RATING: DC 48 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

Data:7

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	49.32	0.26	49.58	99.00	-49.42	QP
2	0.454	42.95	0.26	43.21	99.00	-55.79	QP
3	1.585	43.68	0.30	43.98	93.00	-49.02	QP
4	3.173	45.03	0.35	45.38	93.00	-47.62	QP
5	9.552	52.84	0.58	53.42	93.00	-39.58	QP
6	28.908	58.62	1.35	59.97	93.00	-33.03	QP

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-4818WIR

POLARIZATION: Neutral

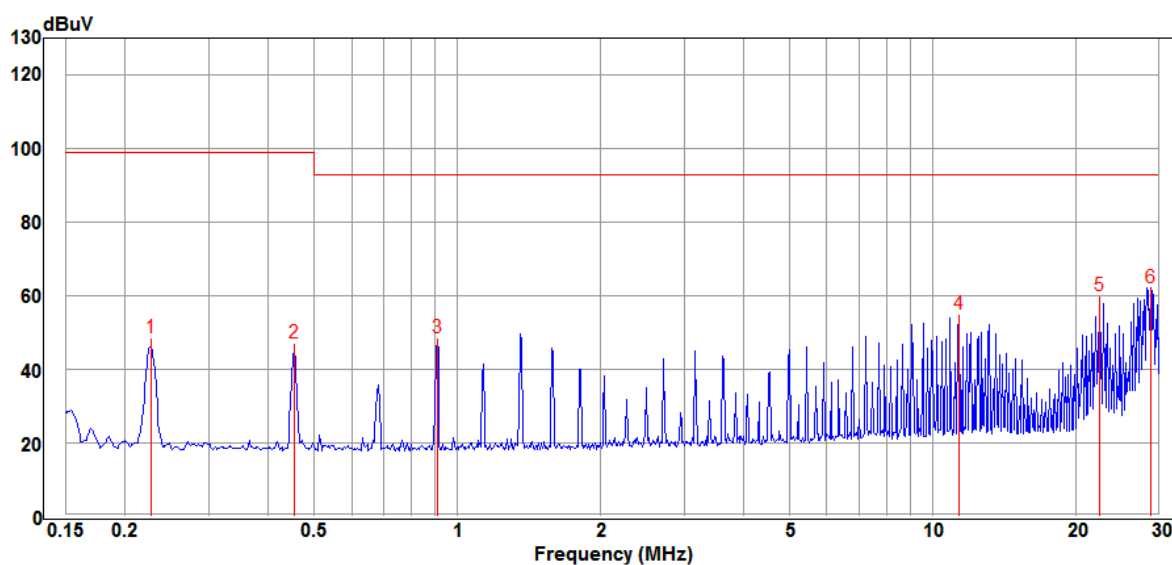
RATING: DC 48 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

Data:8

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	48.30	0.24	48.54	99.00	-50.46	QP
2	0.454	46.74	0.25	46.99	99.00	-52.01	QP
3	0.909	48.24	0.26	48.50	93.00	-44.50	QP
4	11.377	54.23	0.76	54.99	93.00	-38.01	QP
5	22.416	58.89	1.21	60.10	93.00	-32.90	QP
6	28.755	60.85	1.37	62.22	93.00	-30.78	QP

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-7212WIR

POLARIZATION: Line

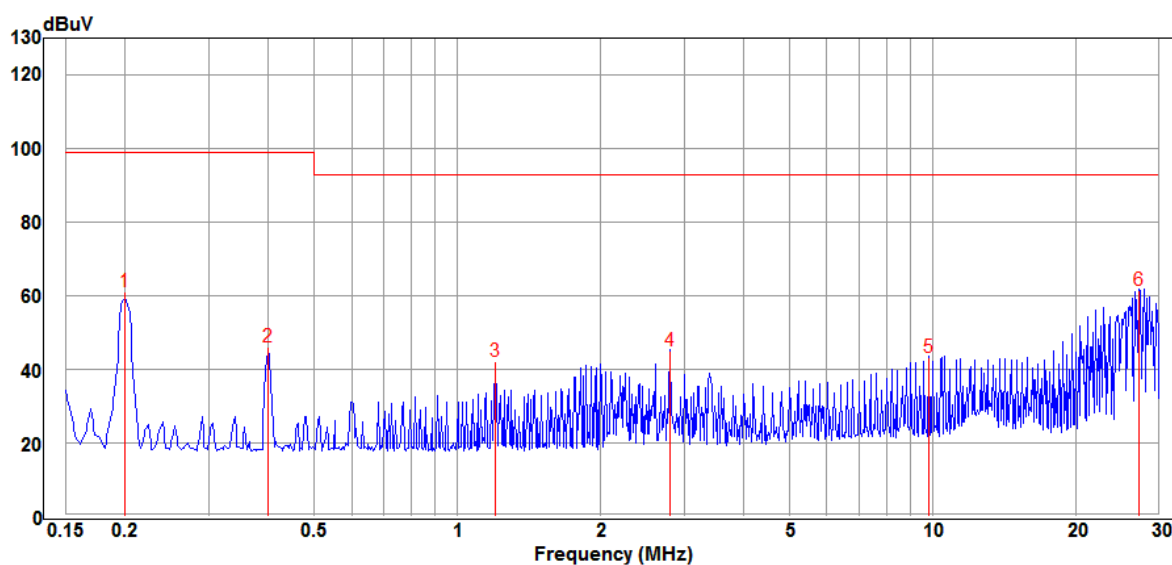
RATING: DC 110 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Data:21

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.201	60.69	0.26	60.95	99.00	-38.05	QP
2	0.400	45.99	0.26	46.25	99.00	-52.75	QP
3	1.203	41.82	0.29	42.11	93.00	-50.89	QP
4	2.809	44.65	0.34	44.99	93.00	-48.01	QP
5	9.809	42.62	0.60	43.22	93.00	-49.78	QP
6	27.127	60.08	1.31	61.39	93.00	-31.61	QP

Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-7212WIR

POLARIZATION: Neutral

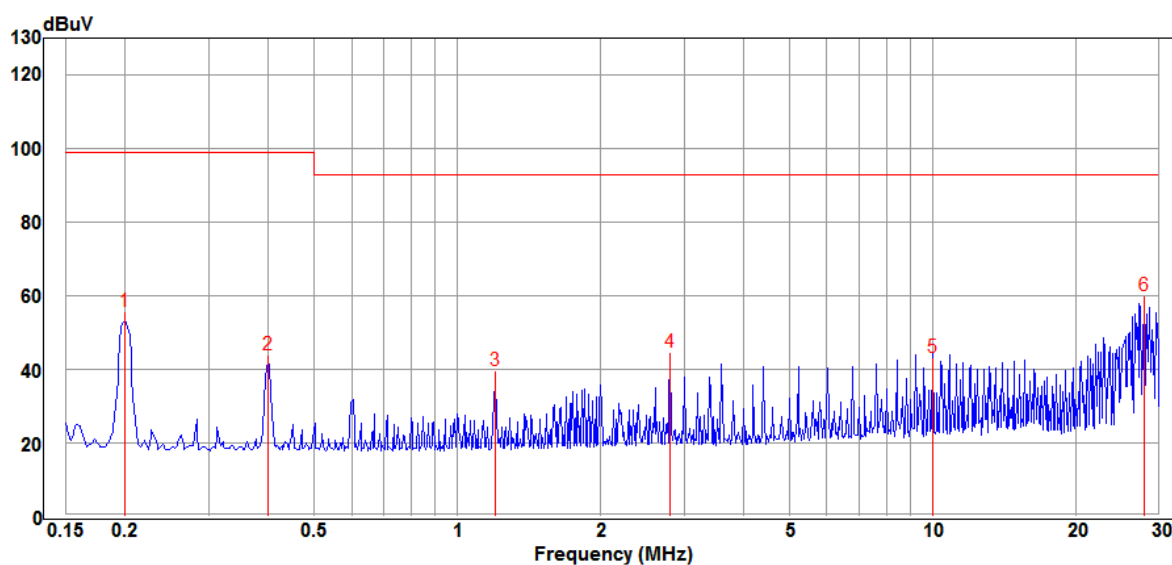
RATING: DC 110 V

TEMP/HUM: 27.4°C / 56%

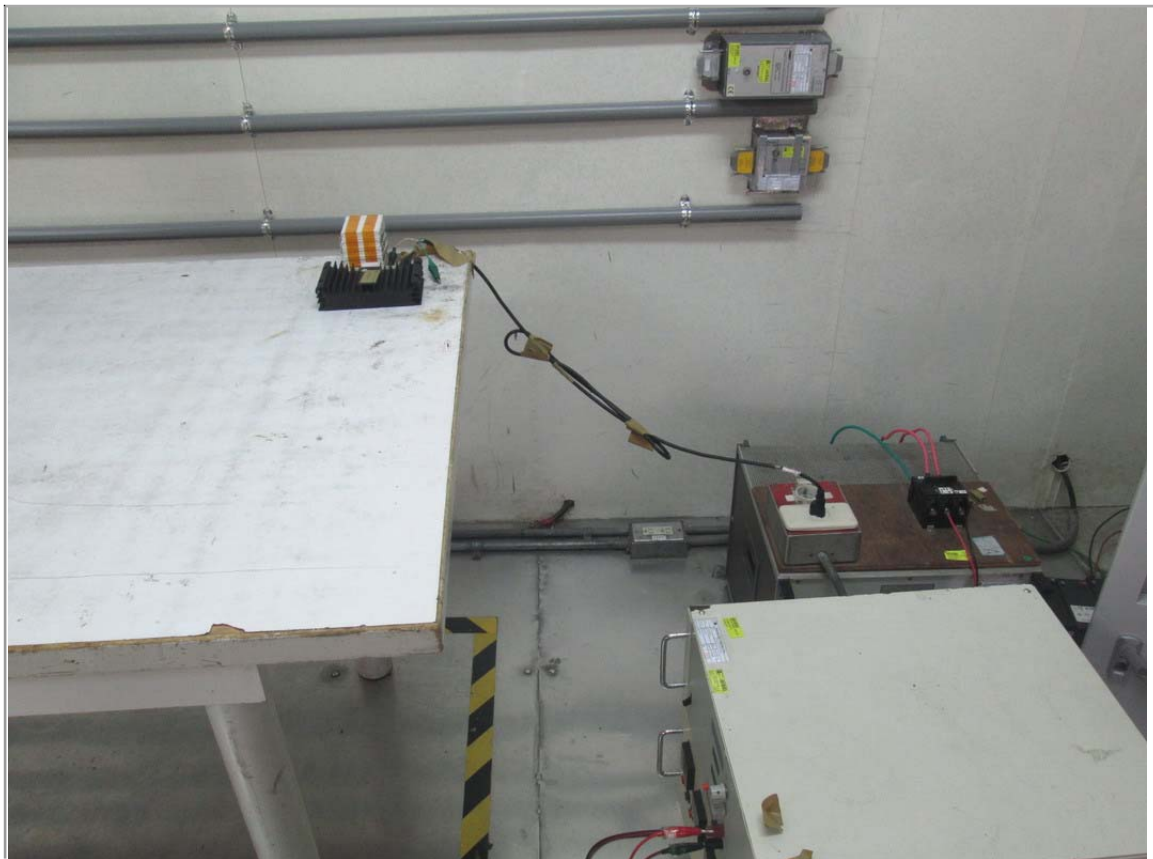
COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Data:22

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.201	55.66	0.24	55.90	99.00	-43.10	QP
2	0.400	43.73	0.25	43.98	99.00	-55.02	QP
3	1.203	39.45	0.28	39.73	93.00	-53.27	QP
4	2.809	44.33	0.34	44.67	93.00	-48.33	QP
5	10.019	42.71	0.63	43.34	93.00	-49.66	QP
6	27.855	58.57	1.35	59.92	93.00	-33.08	QP



Front View



Rear View

3.7 Radiated Emission

3.7.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESVS10	826148/011	2016/10/07
Biconical Antenna	Schwarzbeck	VHA 9103 & BBA 9106	VHA 9103-2418	2016/07/05
Log Antenna	Schwarzbeck	UHALP 9108-A	9108-A 0739	2016/07/19
Pre-Amplifier	Agilent	8447D	2944A09703	2017/04/27
RF Cable	EMCI	EMC8D-NM-NM-25000	140105	2016/08/14
RF Cable	Mini-Circuits	CBL-3FL-NMNM	CBL56	2016/08/28
Measurement Software	AUDIX-e3			

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 to 230	40.0
230 to 1000	47.0

3.7.3 Test Procedures

Test Procedures were referred to EN 55011 sub-clause 7

3.7.4 Test Result

PASS.

The final test data is shown as following pages.

Factor = Antenna Factor + Cable Loss - Preamplifier Gain

Level = Reading + Factor

Margin = Level - Limit

Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-4812WIR

TEST DISTANCE : 10 m

RATING: DC 48 V

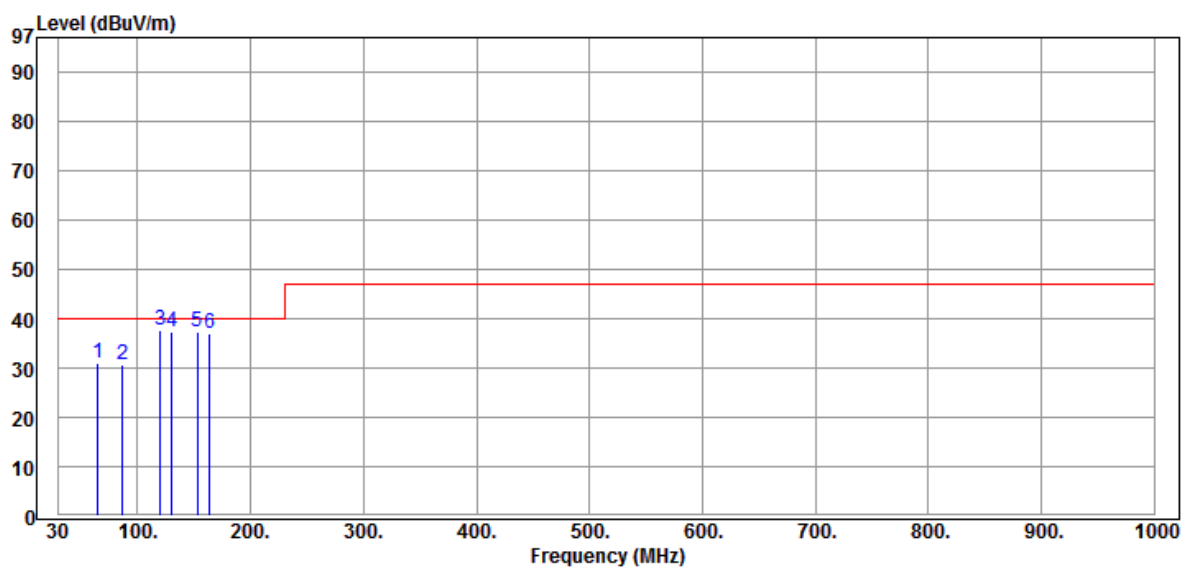
POLARIZATION : HORIZONTAL

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

TEMP/HUM : 25.3°C/58%

Data:25

2016-06-14



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	64.660	53.50	-22.49	31.01	40.00	-8.99	QP
2	86.540	53.20	-22.62	30.58	40.00	-9.42	QP
3	119.960	54.20	-16.52	37.68	40.00	-2.32	QP
4	129.990	53.00	-15.69	37.31	40.00	-2.69	QP
5	152.800	52.00	-14.66	37.34	40.00	-2.66	QP
6	164.030	50.90	-13.86	37.04	40.00	-2.96	QP

Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-4812WIR

TEST DISTANCE : 10 m

RATING: DC 48 V

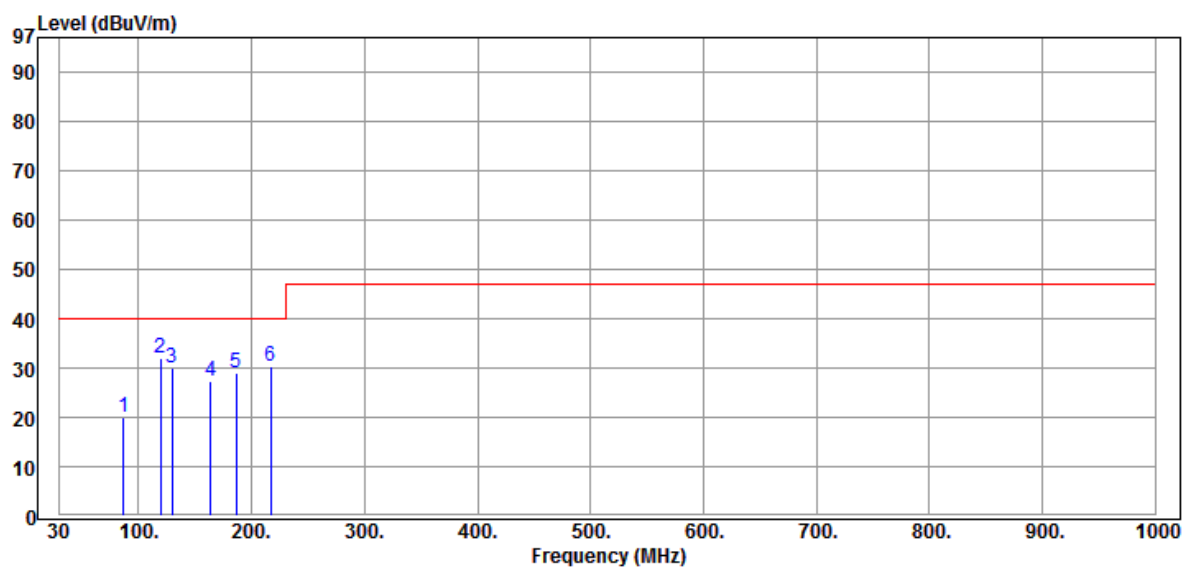
POLARIZATION : VERTICAL

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

TEMP/HUM : 25.3°C/58%

Data:26

2016-06-14



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	86.720	42.60	-22.59	20.01	40.00	-19.99	QP
2	119.320	48.50	-16.60	31.90	40.00	-8.10	QP
3	129.300	45.69	-15.74	29.95	40.00	-10.05	QP
4	163.570	41.10	-13.90	27.20	40.00	-12.80	QP
5	186.660	42.30	-13.21	29.09	40.00	-10.91	QP
6	216.660	42.59	-12.39	30.20	40.00	-9.80	QP

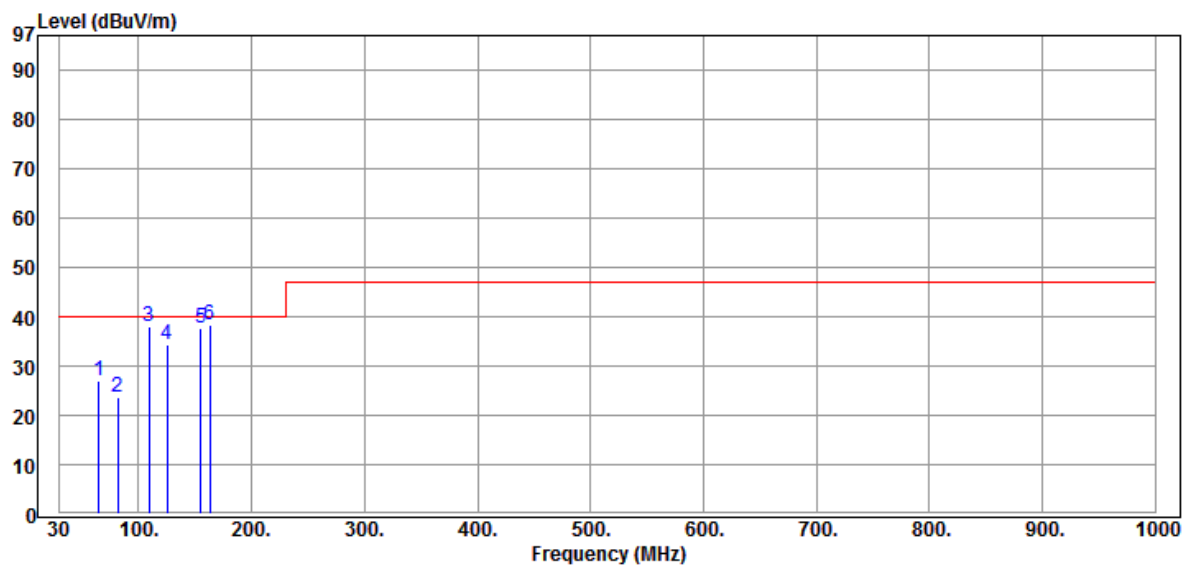
Radiated Emission Measurement Data

CLIENT: Traco Electronic AG
EUT: DC/DC Converter
MODEL: TEQ 300-4818WIR
RATING: DC 48 V
COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

OPERATOR : Ceres
TEST SITE : OATS 1
TEST DISTANCE : 10 m
POLARIZATION : HORIZONTAL
TEMP/HUM : 25.3℃/58%

Data:24

2016-06-14



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	64.660	49.40	-22.49	26.91	40.00	-13.09	QP
2	81.810	46.89	-23.30	23.59	40.00	-16.41	QP
3	108.920	56.00	-18.01	37.99	40.00	-2.01	QP
4	125.200	50.40	-16.08	34.32	40.00	-5.68	QP
5	154.740	52.29	-14.54	37.75	40.00	-2.25	QP
6	162.830	52.40	-13.97	38.43	40.00	-1.57	QP

Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-4818WIR

TEST DISTANCE : 10 m

RATING: DC 48 V

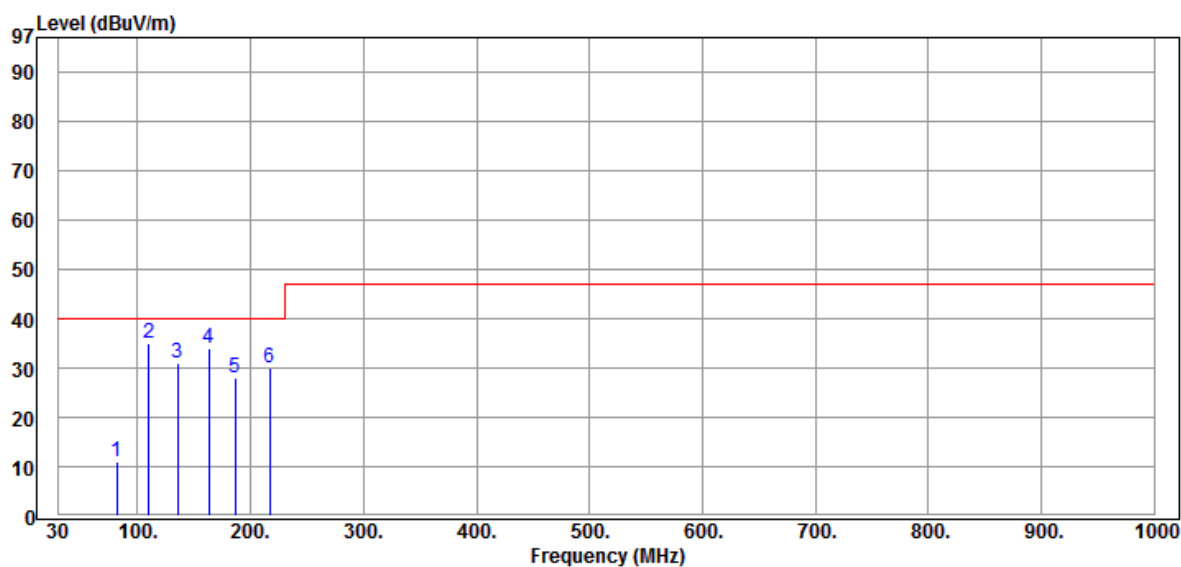
POLARIZATION : VERTICAL

COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

TEMP/HUM : 25.3°C/58%

Data:23

2016-06-14



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	81.300	34.31	-23.39	10.92	40.00	-29.08	QP
2	109.840	52.89	-17.84	35.05	40.00	-4.95	QP
3	135.510	46.41	-15.42	30.99	40.00	-9.01	QP
4	163.020	47.90	-13.95	33.95	40.00	-6.05	QP
5	186.660	41.20	-13.21	27.99	40.00	-12.01	QP
6	216.660	42.29	-12.39	29.90	40.00	-10.10	QP

Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-7212WIR

TEST DISTANCE : 10 m

RATING: DC 110 V

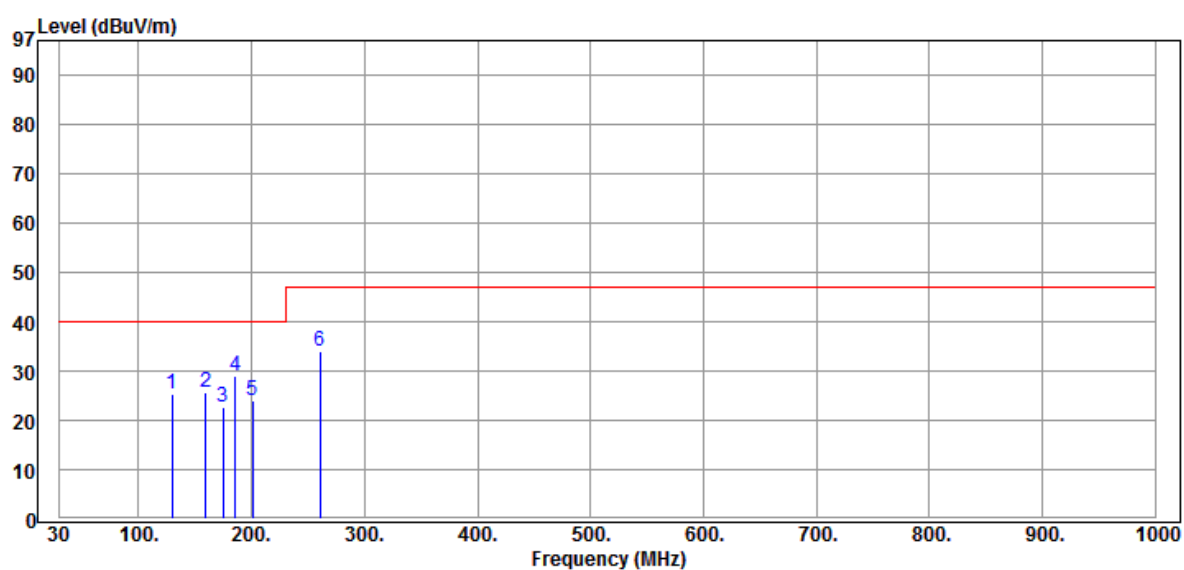
POLARIZATION : HORIZONTAL

COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

TEMP/HUM : 28.8°C/43%

Data:16

2016-06-08



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	129.530	41.19	-15.72	25.47	40.00	-14.53	QP
2	159.550	39.80	-14.27	25.53	40.00	-14.47	QP
3	174.540	35.90	-13.24	22.66	40.00	-17.34	QP
4	185.660	42.21	-13.21	29.00	40.00	-11.00	QP
5	200.900	36.80	-12.95	23.85	40.00	-16.15	QP
6	260.900	45.00	-10.91	34.09	47.00	-12.91	QP

Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-7212WIR

TEST DISTANCE : 10 m

RATING: DC 110 V

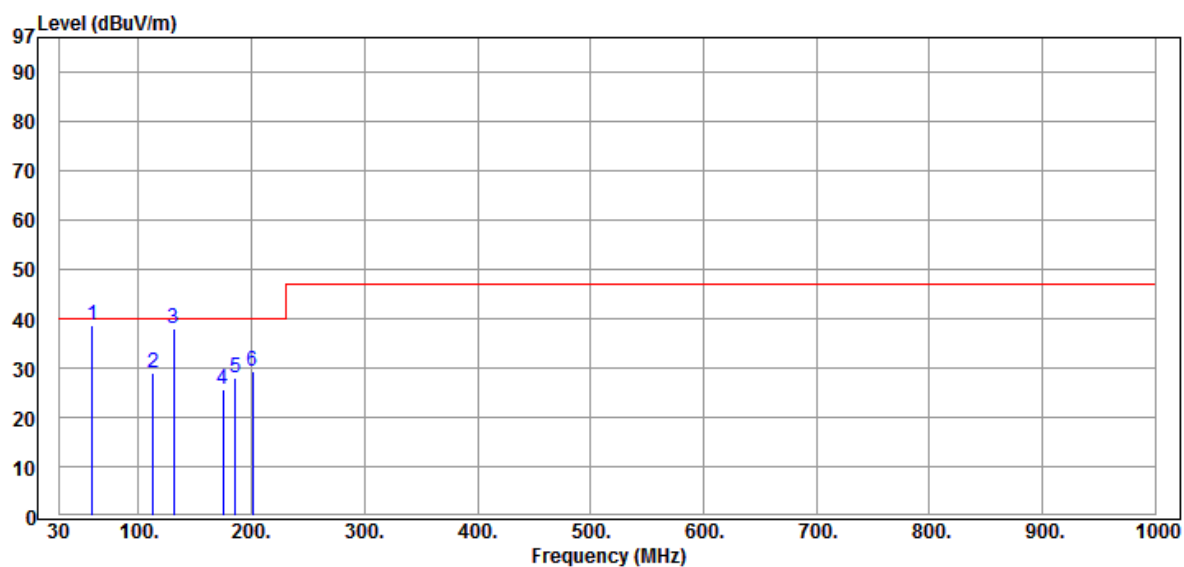
POLARIZATION : VERTICAL

COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

TEMP/HUM : 28.8°C/43%

Data:15

2016-06-08



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	59.220	60.20	-21.66	38.54	40.00	-1.46	QP
2	112.600	46.40	-17.48	28.92	40.00	-11.08	QP
3	131.090	53.70	-15.64	38.06	40.00	-1.94	QP
4	174.540	38.90	-13.24	25.66	40.00	-14.34	QP
5	185.650	41.21	-13.21	28.00	40.00	-12.00	QP
6	200.900	42.40	-12.95	29.45	40.00	-10.55	QP



Front View



Rear View

4 Environmental Tests

4.1 Cooling Test

4.1.1 Test Equipment

Chamber: Program Temperature/Humidity Testing Chamber, Model: GTH-800-40-CP-AR.
Recorder & Controller: CLCD-9700.

4.1.2 Test Ambience

Temperature: $21^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Humidity: $52\% \pm 5\%(\text{RH})$

4.1.3 Specimen & Model Quantity

Specimen: DC/DC Converter
Model: TEQ 300-7212WIR
Quantity: 1 set

4.1.4 Test Condition

Temperature: Operating -40°C , at last 2 hours.
Storage -40°C , at last 16 hours.

Performance Check: The performance check was carried out before, during and after the Cooling test.

4.1.5 Test Result

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.2.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the Cooling test.
5. According to test result, the specimen pass the EN 50155 Class TX Cooling test.



Fig. 1: Cooling, Dry Heat and Damp Heat Test

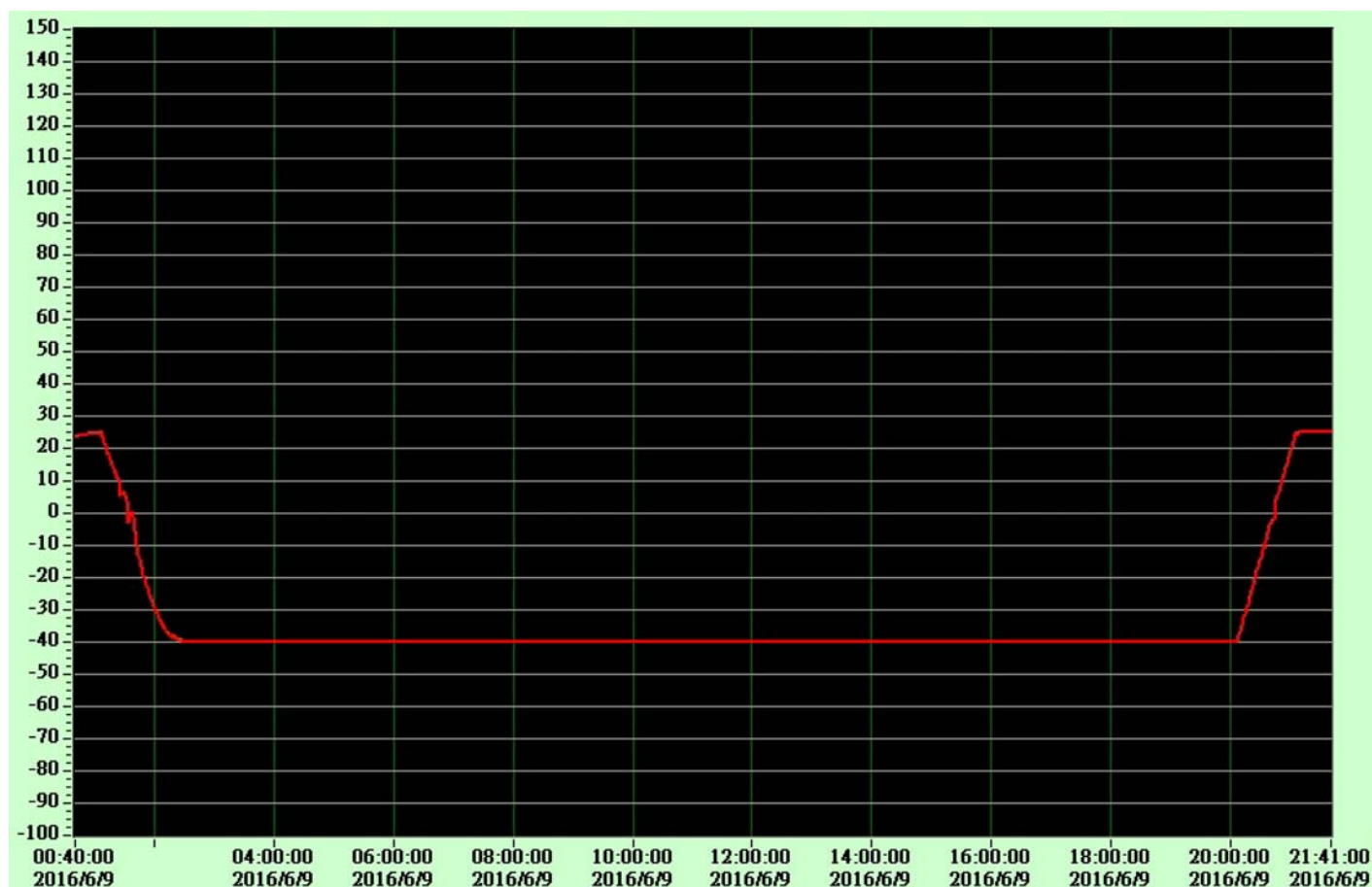


Fig. 2: Cooling Test Record

4.2 Dry Heat Test

4.2.1 Test Equipment

Chamber: Program Temperature/Humidity Testing Chamber, Model: GTH-800-40-CP-AR.
Recorder & Controller: CLCD-9700.

4.2.2 Test Ambience

Temperature: $21^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity: $52\% \pm 5\%(\text{RH})$

4.2.3 Specimen & Model Quantity

Specimen: DC/DC Converter

Model: TEQ 300-7212WIR

Quantity: 1 set

4.2.4 Test Condition

Temperature: Operating 85°C , at last 6 hours.

Performance Check: The performance check was carried out before, during and after the Dry heat test.

4.2.5 Test Result

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.3.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the Dry heat test.
5. According to test result, the specimen pass the EN 50155 Class TX Dry heat test.



Fig. 1: Cooling, Dry Heat and Damp Heat Test

Operating

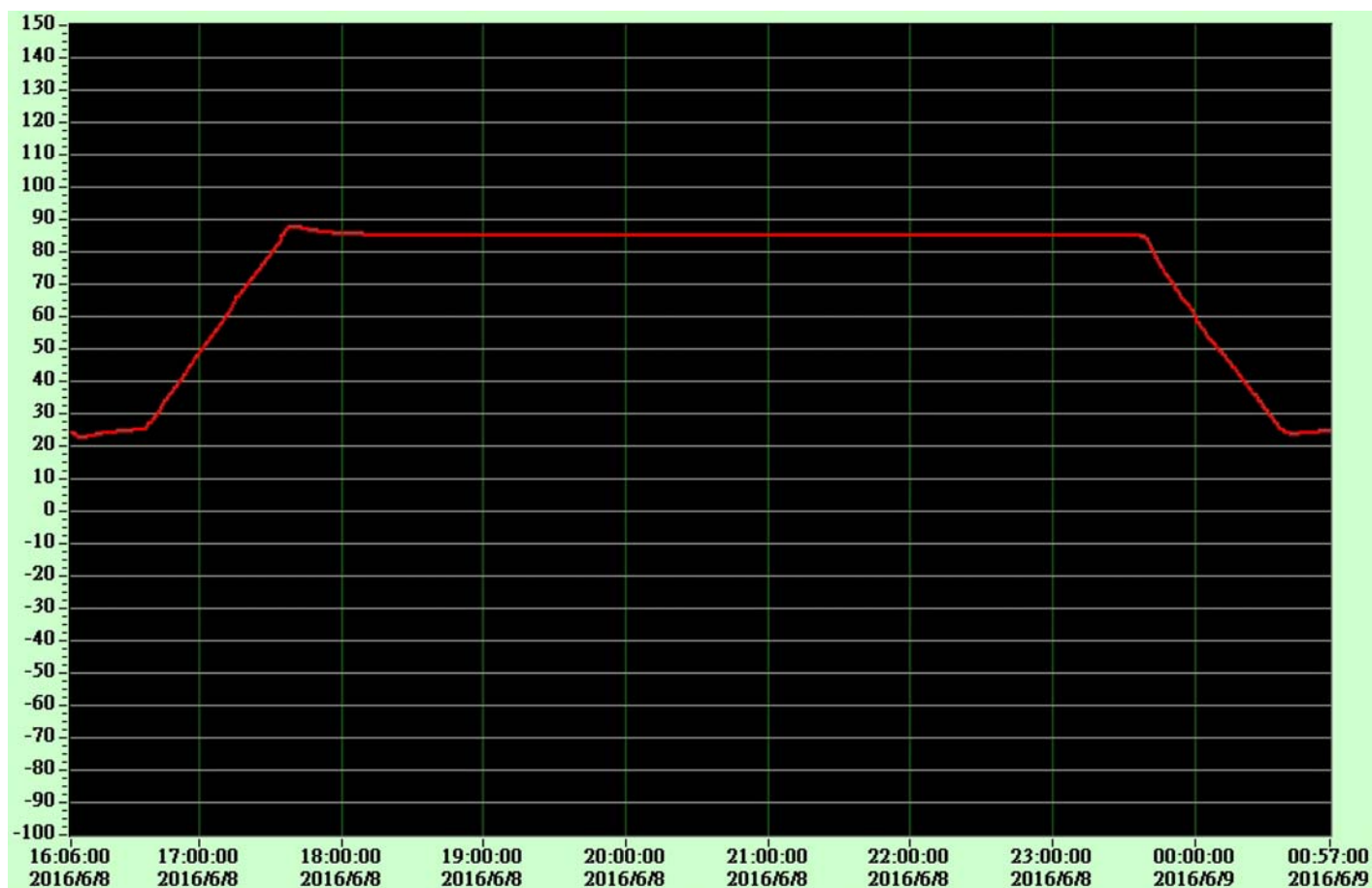


Fig. 3: Dry Heat Test Record

4.3 Damp Heat Test

4.3.1 Test Equipment

Chamber: Program Temperature/Humidity Testing Chamber, Model: GTH-800-40-CP-AR.
Recorder & Controller: CLCD-9700.

4.3.2 Test Ambience

Temperature: $21^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity: $52\% \pm 5\%(\text{RH})$

4.3.3 Specimen & Model Quantity

Specimen: DC/DC Converter

Model: TEQ 300-7212WIR

Quantity: 1 set

4.3.4 Test Condition

Temperature / Humidity: $25^{\circ}\text{C} \sim 55^{\circ}\text{C}$, $95\% \pm 5\% \text{RH}$ without condensation, 48 hours.

Performance Check: The performance check was carried out before, during and after the Damp heat test.

4.3.5 Test Result

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.4.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the Damp heat test.
5. According to test result, the specimen pass the EN 50155 Class TX Damp heat test.

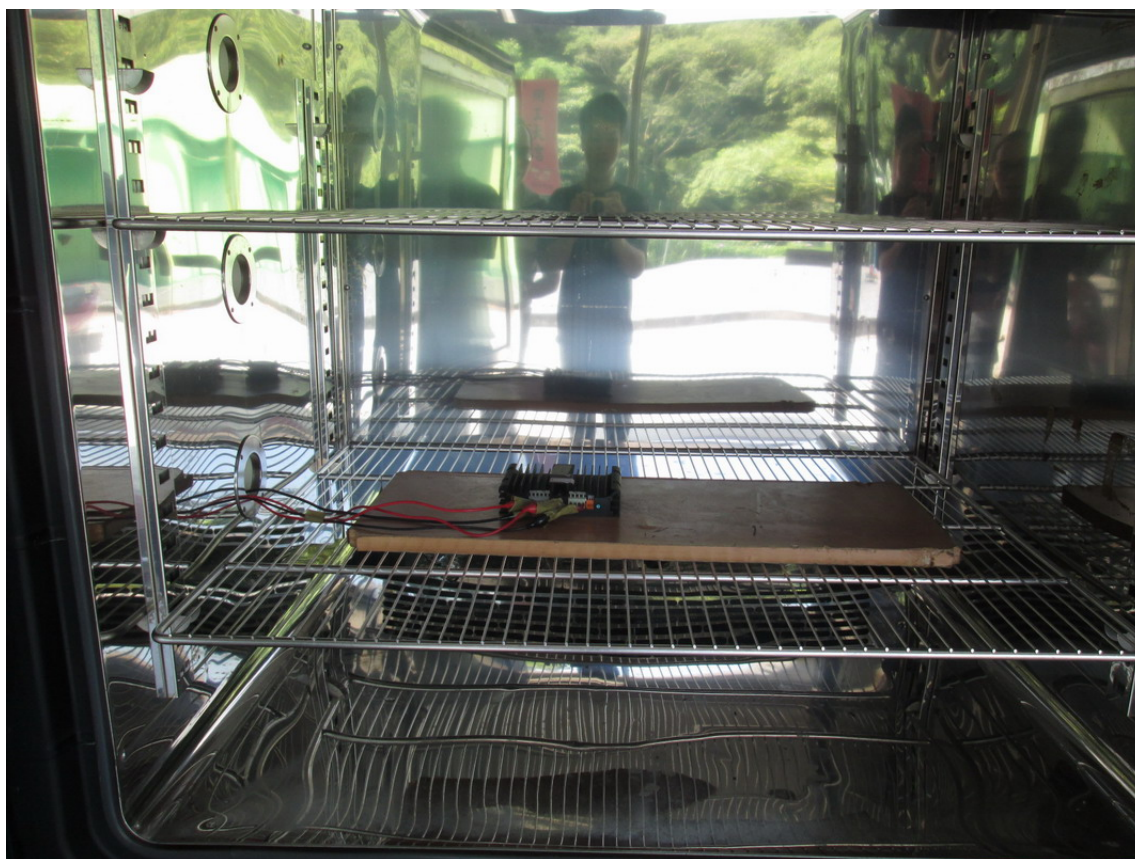


Fig. 1: Cooling, Dry Heat and Damp Heat Test

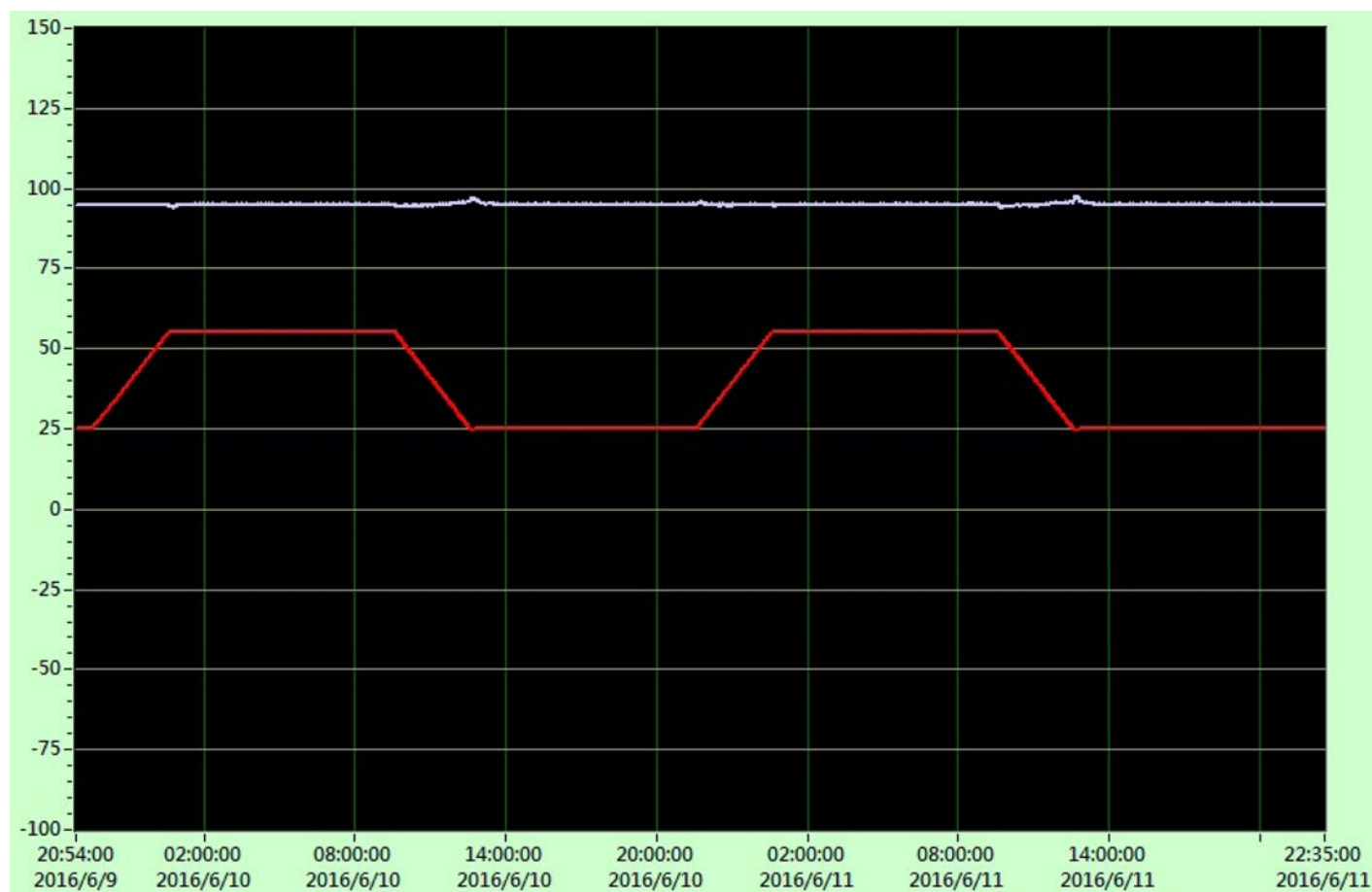


Fig. 4: Damp Heat Test Record

4.4 Vibration Test (Operating)

4.4.1 Test Equipment

Apparatus name: Electromagnetism Vibration Test System

Brand: A-LAB

Model: AL-KDVI

4.4.2 Laboratory Ambience Condition

Temperature: 25 °C

Humidity: 60 %RH

4.4.3 Reference Document

The test was performed with reference to EN50155: 2007 (refer to EN61373: 2010 Category 1 Class B)

4.4.4 Test Condition

Random wave

Frequency (Hz)	ASD $((m/s^2)^2/Hz)$	Acceleration (m/s^2) RMS	Duration (h : min)	Direction (Axis)	Condition
5 20 150	0.0144 0.0144 -6dB	0.7	00:10 00:10	X Y	Operation
5 20 150	0.0301 0.0301 -6dB	1.01	00:10	Z	Operation

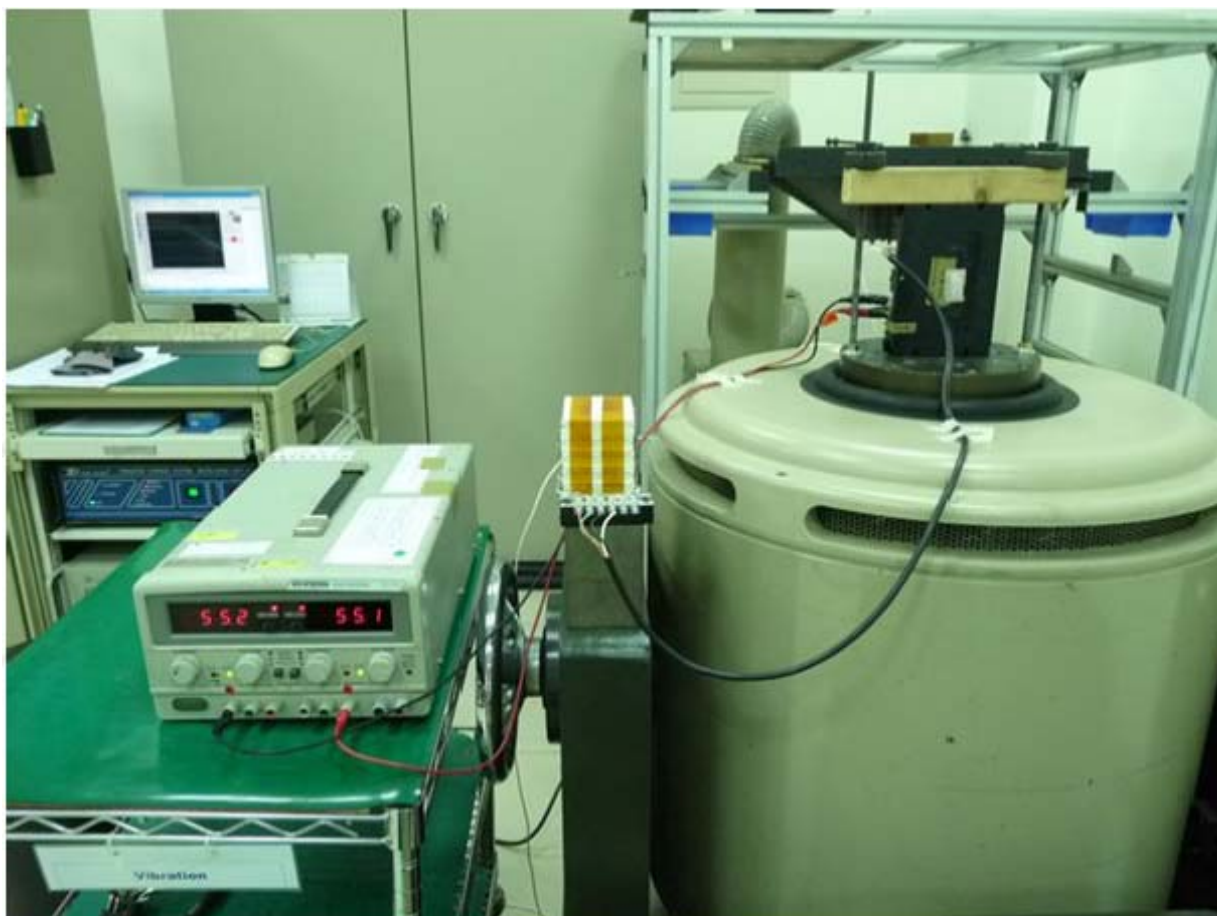
- Operation: DC 110V input.

4.4.5 Test Result

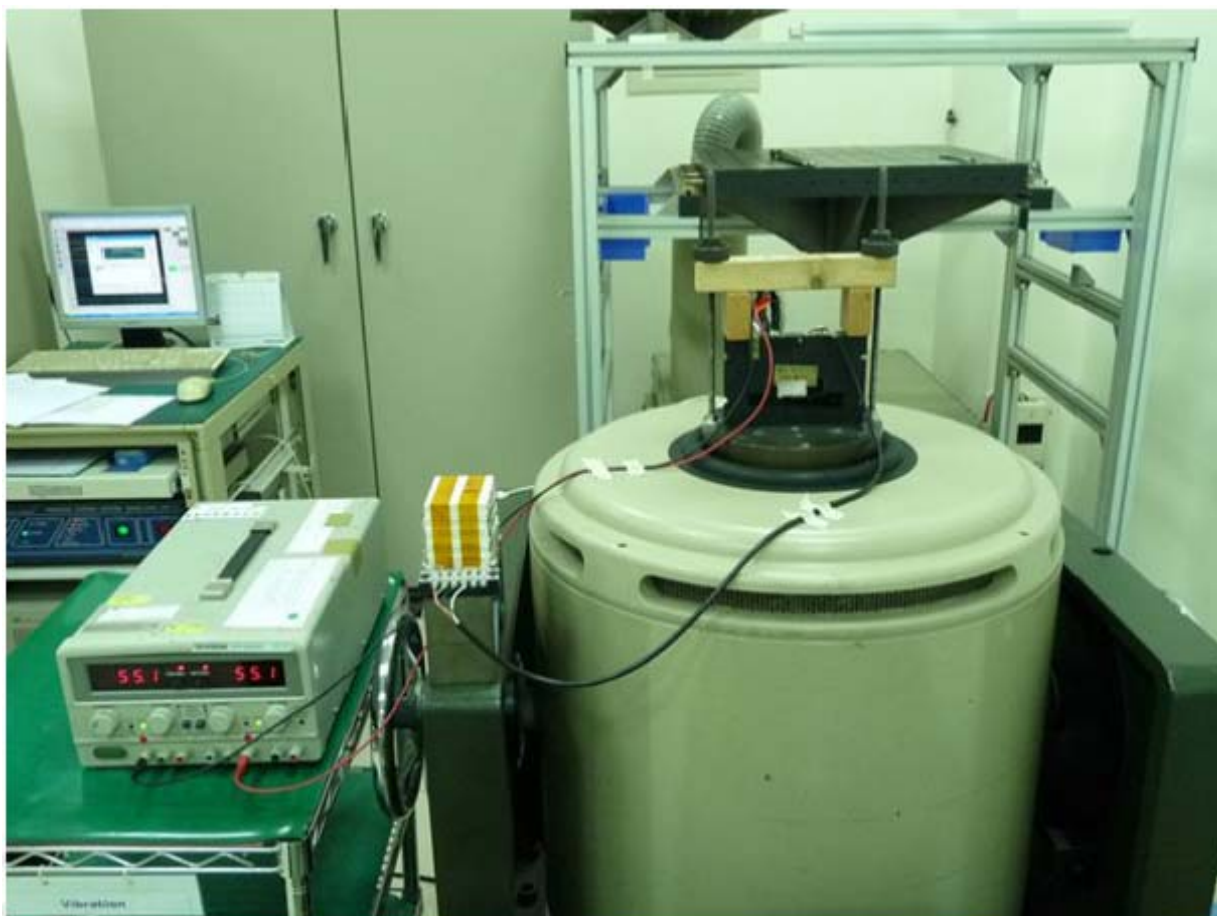
Model Name	PASS	FAIL	No Judgment
TEQ 300-7212WIR	V	—	—

Test Criteria: The function was normal after the test.

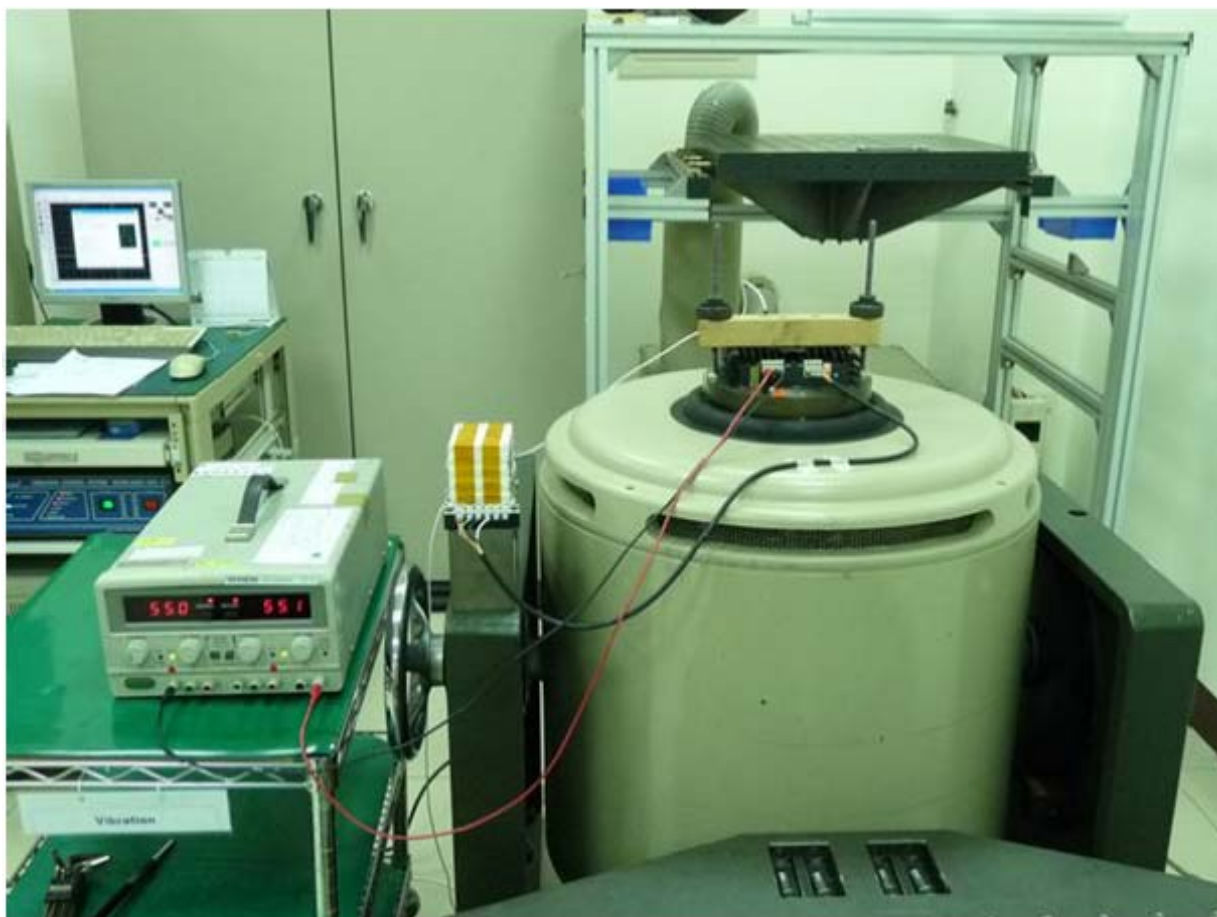
4.4.6 Test Photo



X axis



Y axis



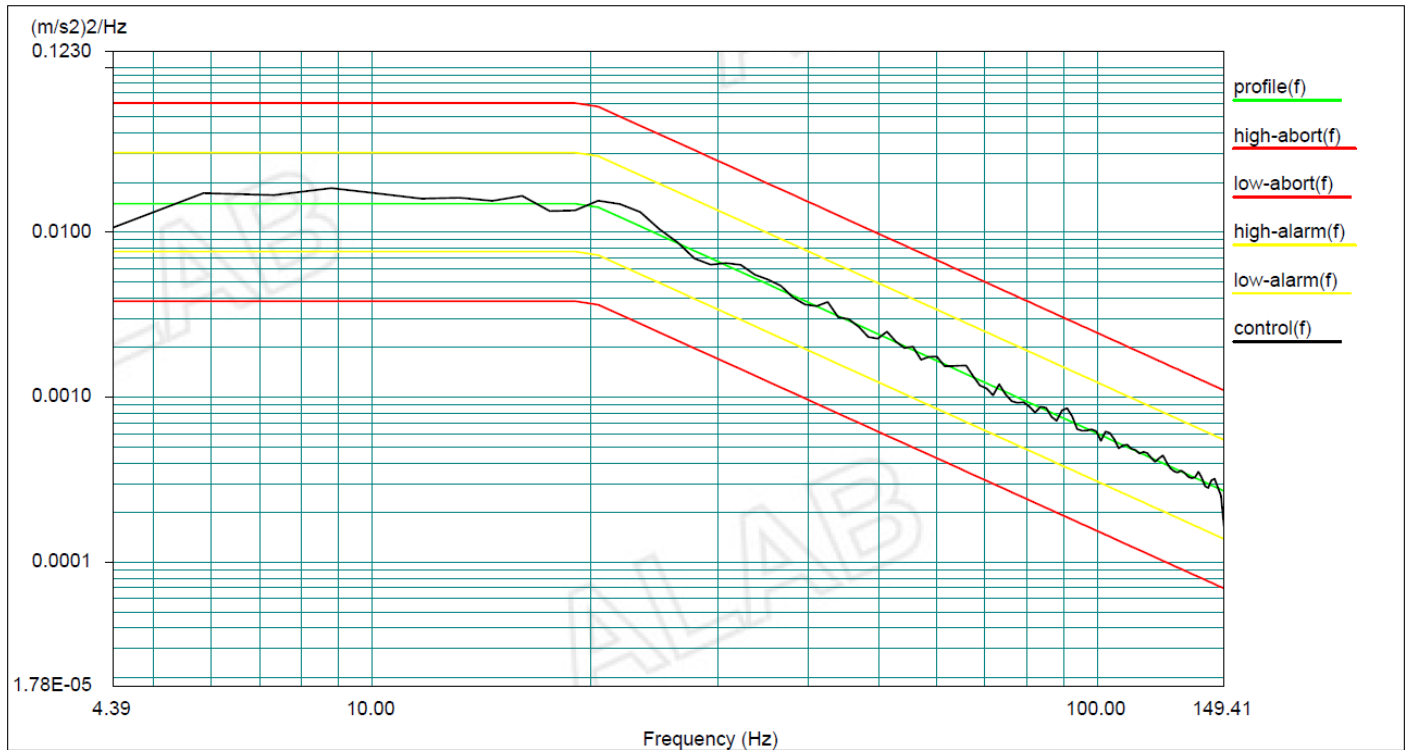
Z axis



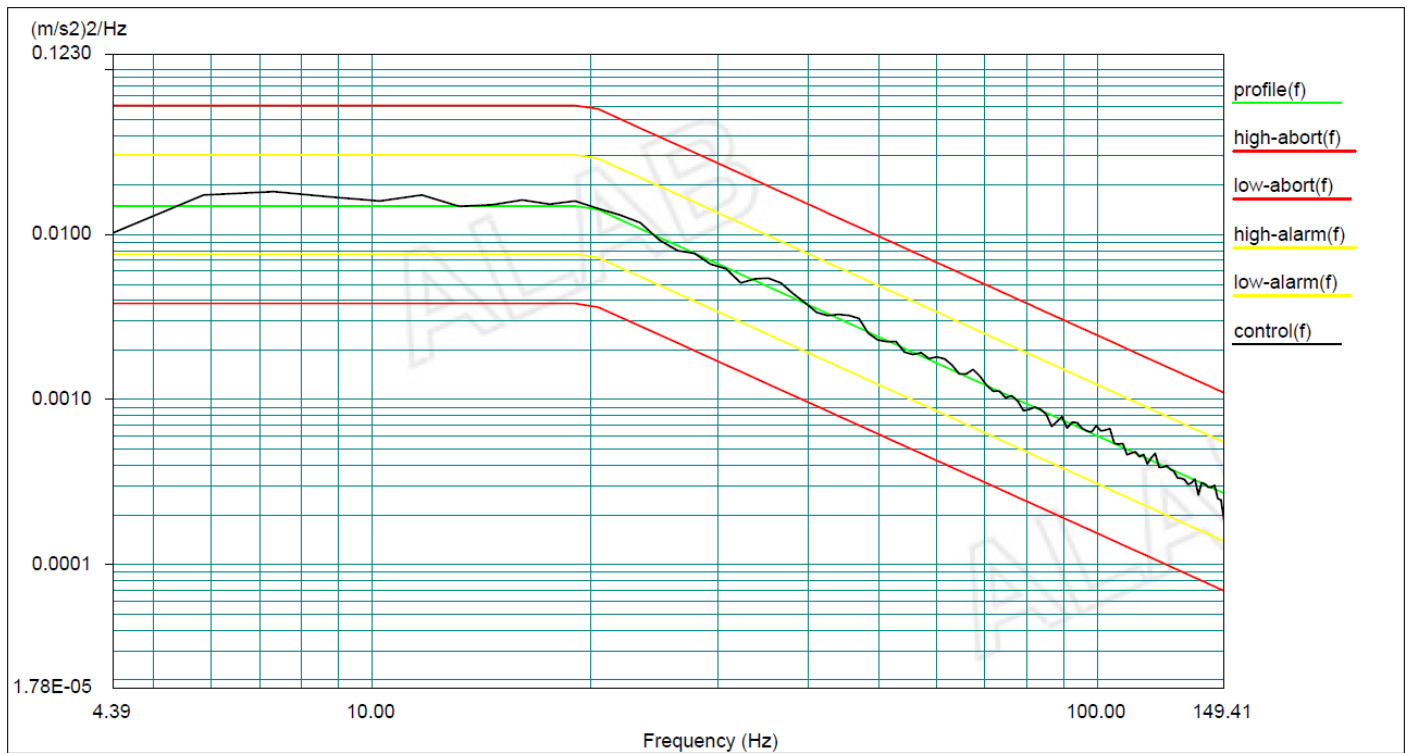
After Test

4.4.7 Test Profile

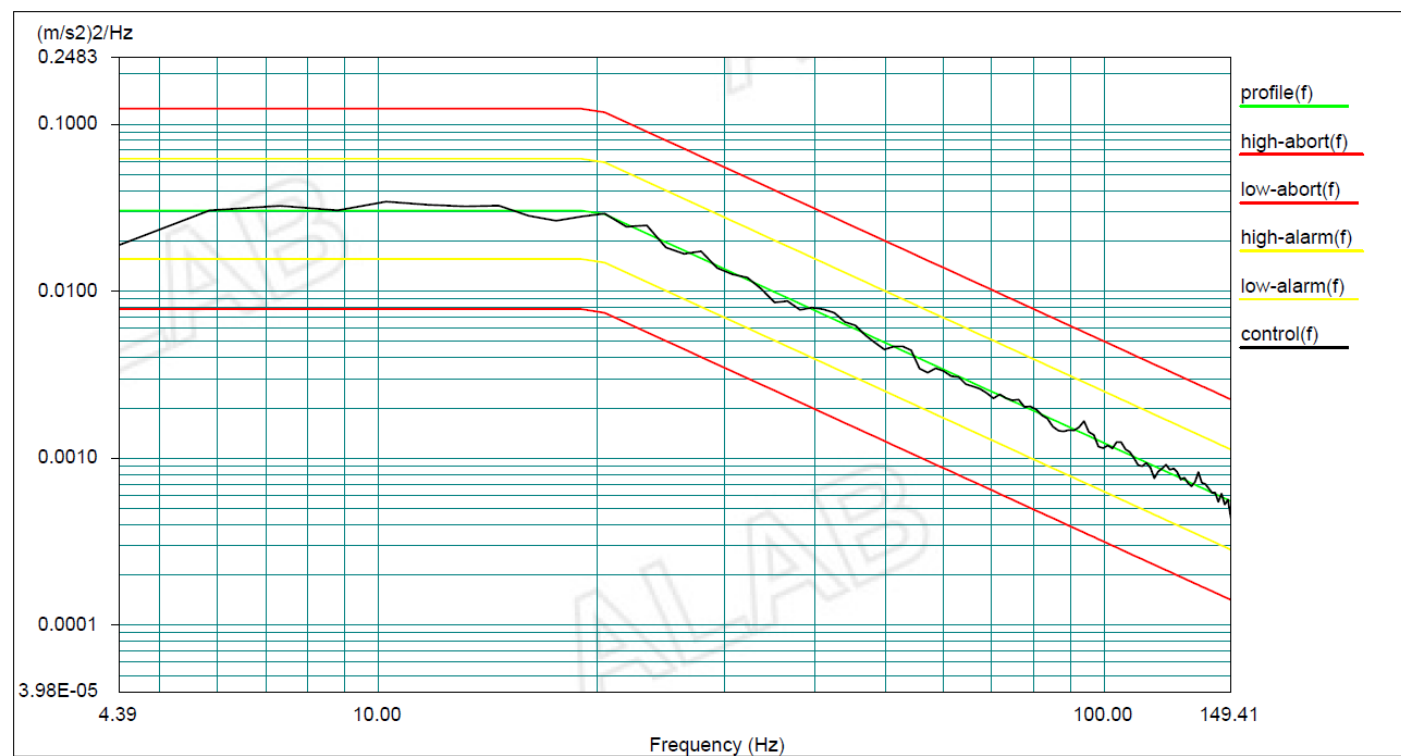
X axis



Y axis



Z axis



4.5 Simulated Long-life Test

4.5.1 Test Equipment

Apparatus name: Electromagnetism Vibration Test System

Brand: A-LAB

Model: AL-KDVI

4.5.2 Laboratory Ambience Condition

Temperature: 25 °C

Humidity: 60 %RH

4.5.3 Reference Document

The test was performed with reference to EN50155: 2007 (refer to EN61373: 2010 Category 1 Class B)

4.5.4 Test Condition

Random wave

Frequency (Hz)	ASD $((m/s^2)^2/Hz)$	Acceleration (m/s^2) RMS	Duration (h : min)	Direction (Axis)	Condition
5 20 150	0.461 0.461 -6dB	3.96	05:00 05:00	X Y	Operation
5 20 150	0.964 0.964 -6dB	5.72	05:00	Z	Operation

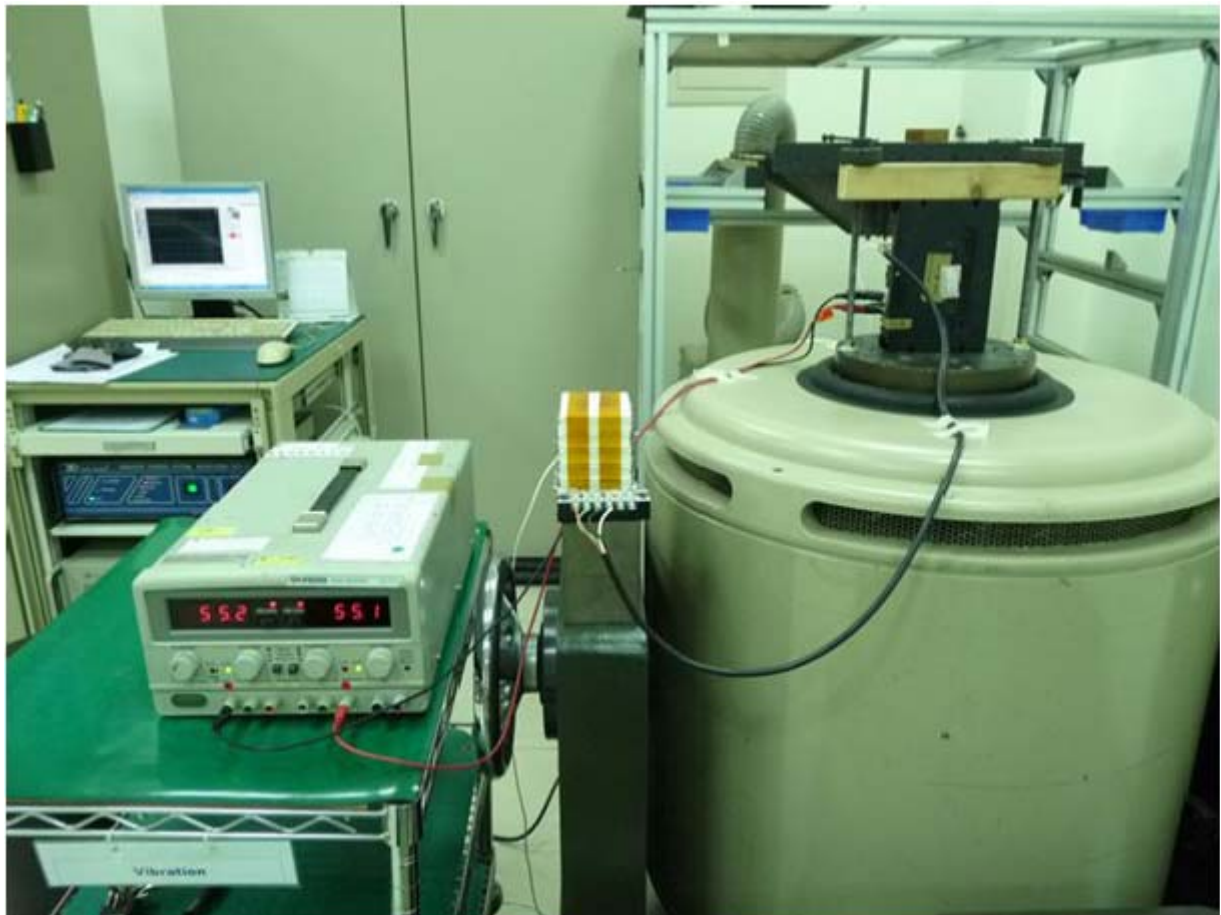
- Operation: DC 110V input.

4.5.5 Test Result

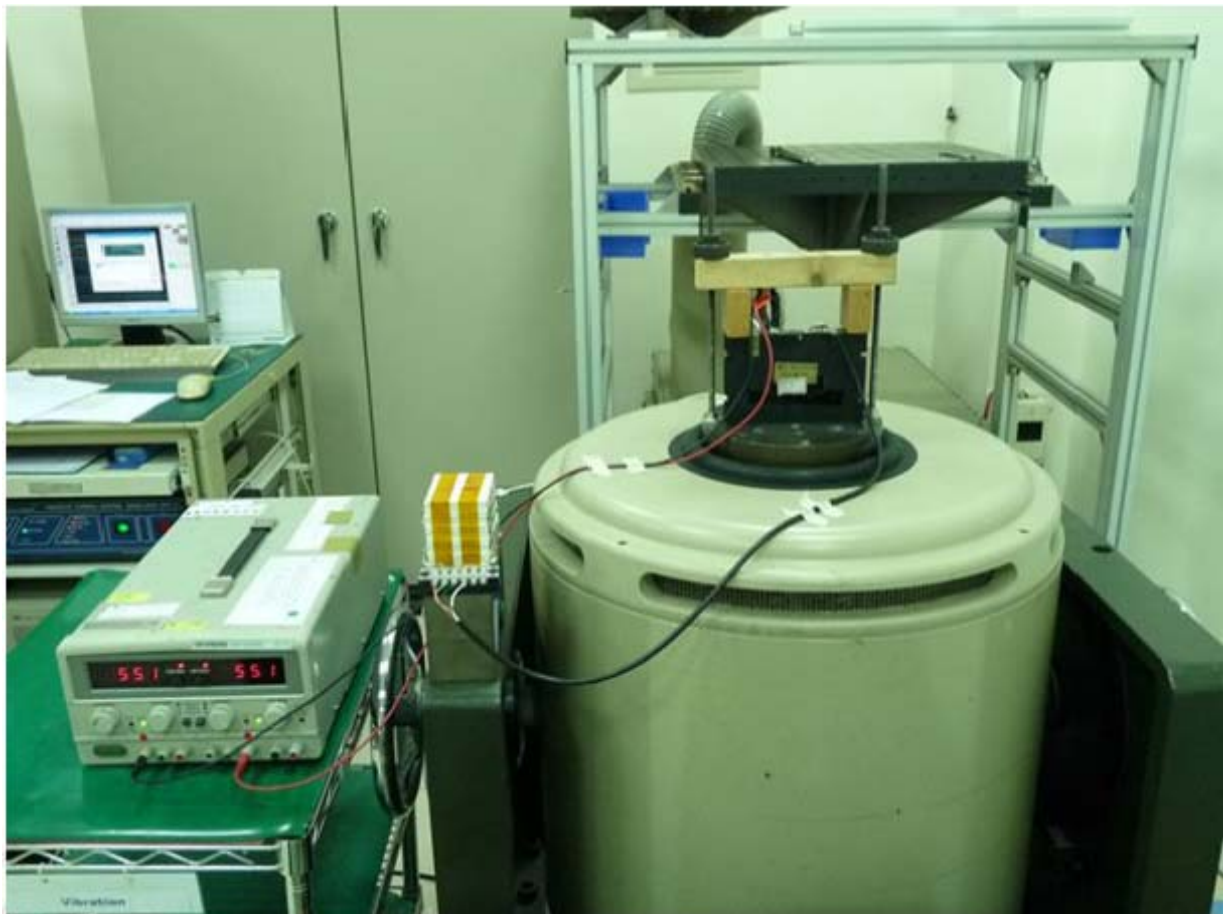
Model Name	PASS	FAIL	No Judgment
TEQ 300-7212WIR	V	—	—

Test Criteria: The function was normal after the test.

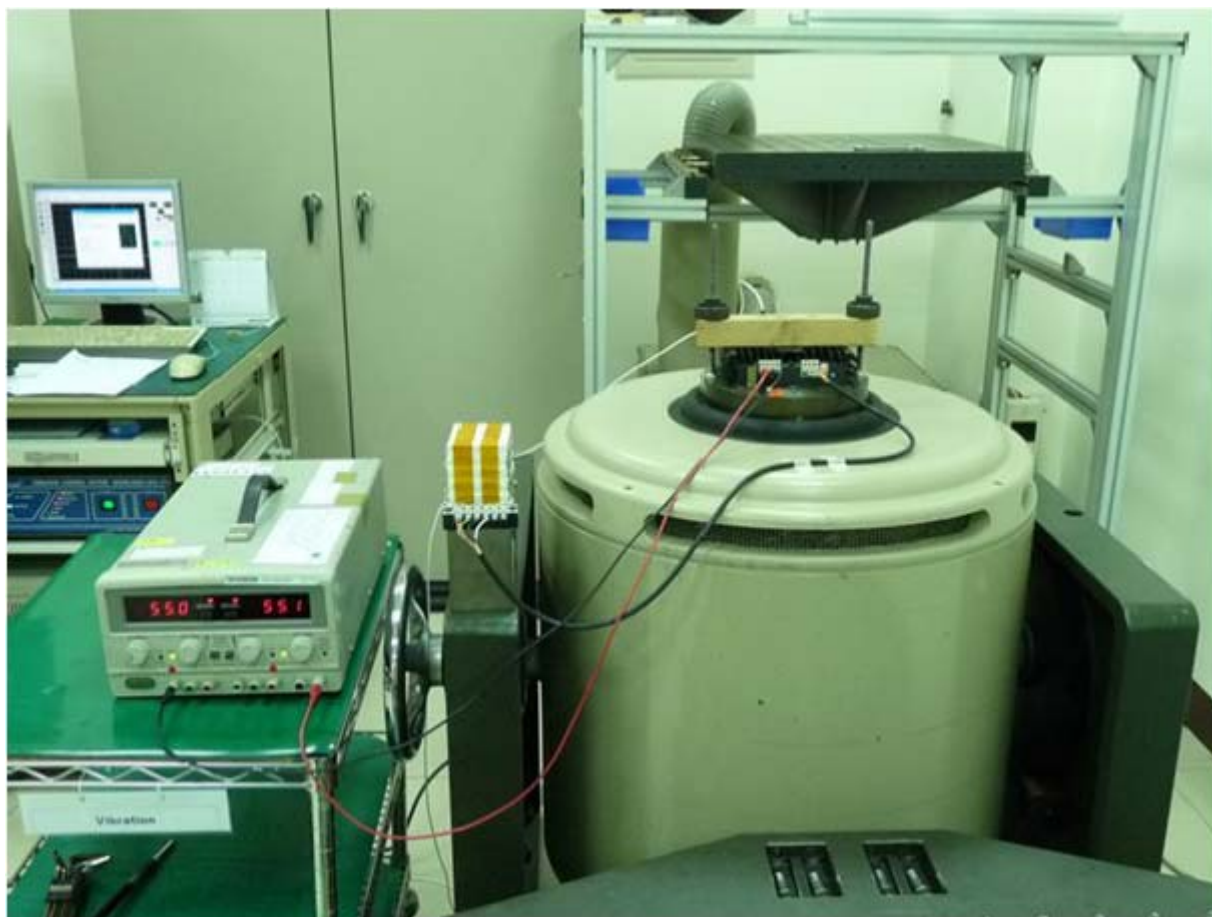
4.5.6 Test Photo



X axis



Y axis



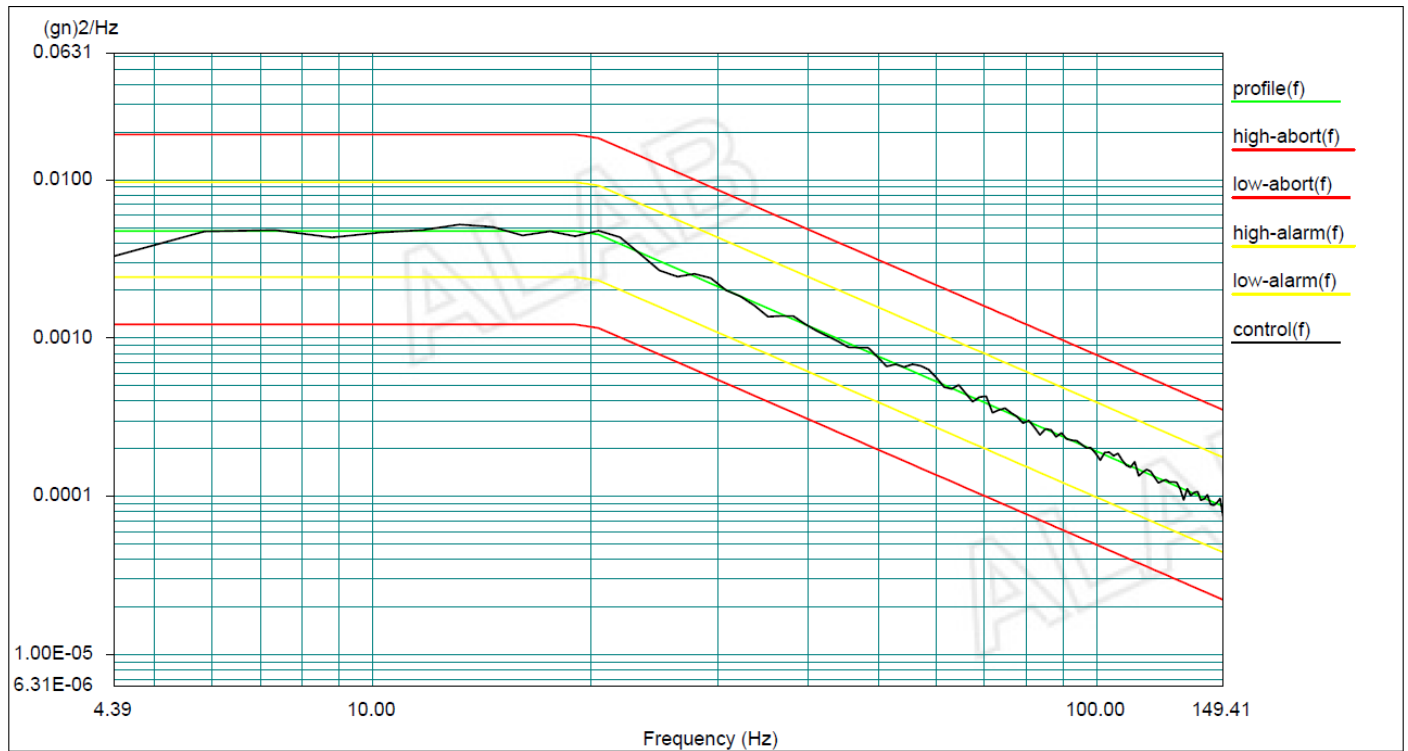
Z axis



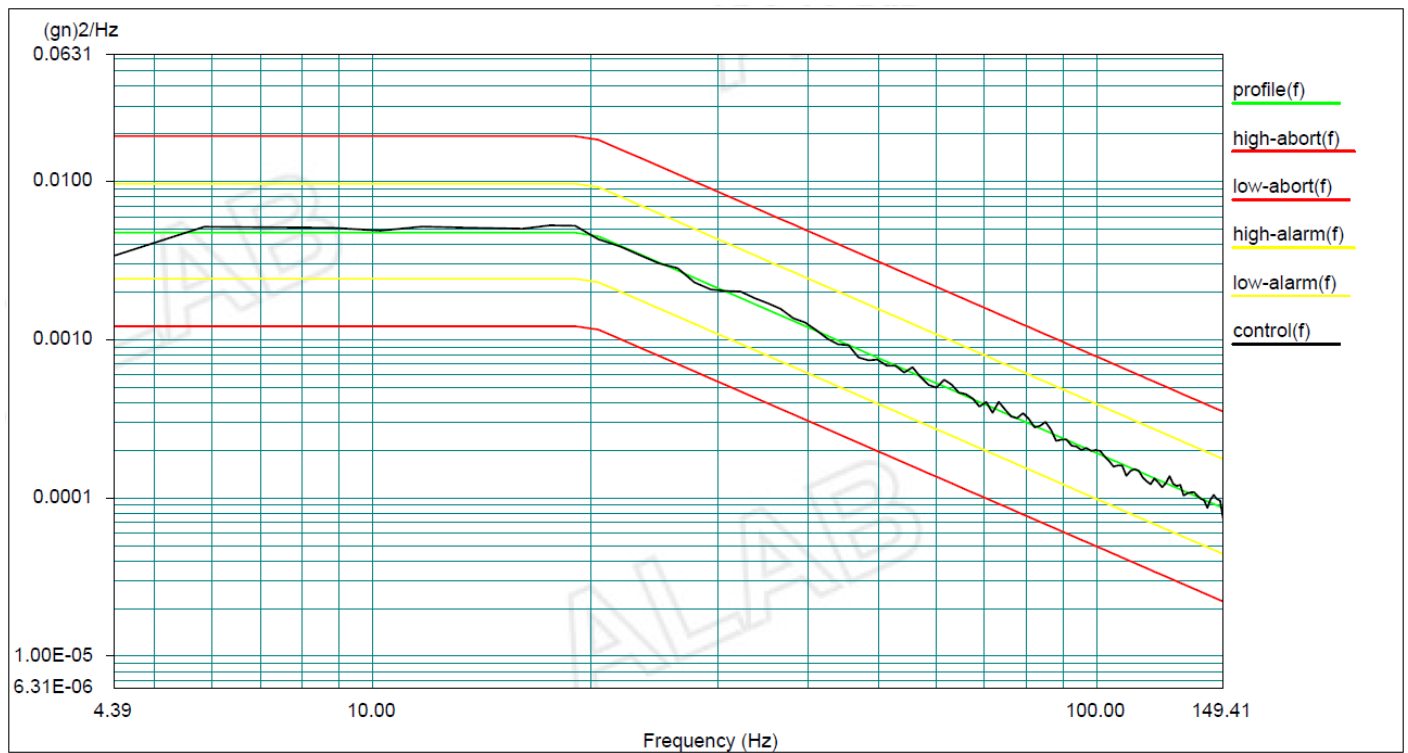
After Test

4.5.7 Test Profile

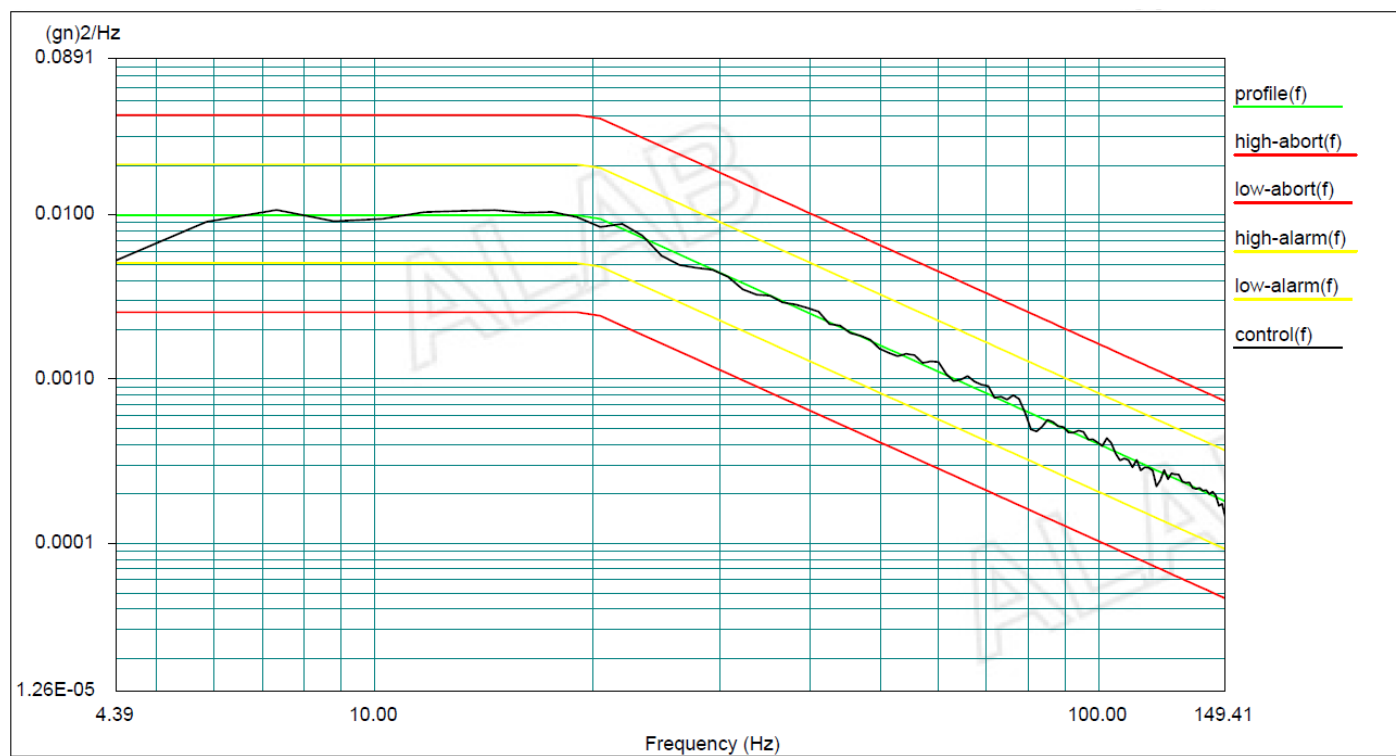
X axis



Y axis



Z axis



4.6 Shock Test

4.6.1 Test Equipment

Apparatus name: Shock Testing System

Brand: A-LAB

Model: AL-LBMS

4.6.2 Laboratory Ambience Condition

Temperature: 25 °C

Humidity: 60 %RH

4.6.3 Reference Document

The test was performed with reference to EN50155: 2007 (refer to EN61373: 2010 Category 1 Class B)

4.6.4 Test Condition

Random wave

Pulse Shapes	Acceleration (m/s ²)	Pulse width (ms)	Direction (axis)	Total Shocks	Condition
Half Sine	50	30	±X, ±Y	18	Operation
Half Sine	30	30	±Z	18	Operation

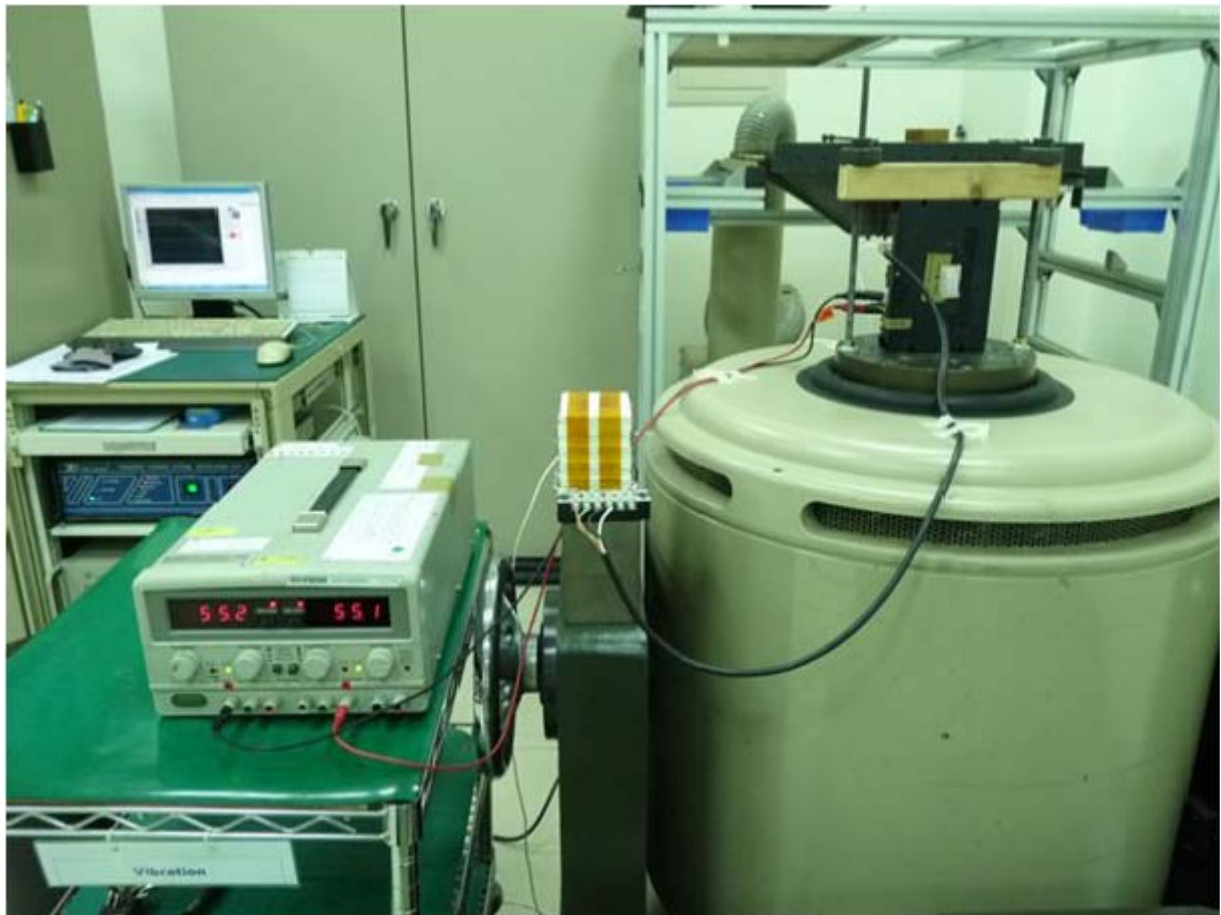
- Operation: DC 110V input.

4.6.5 Test Result

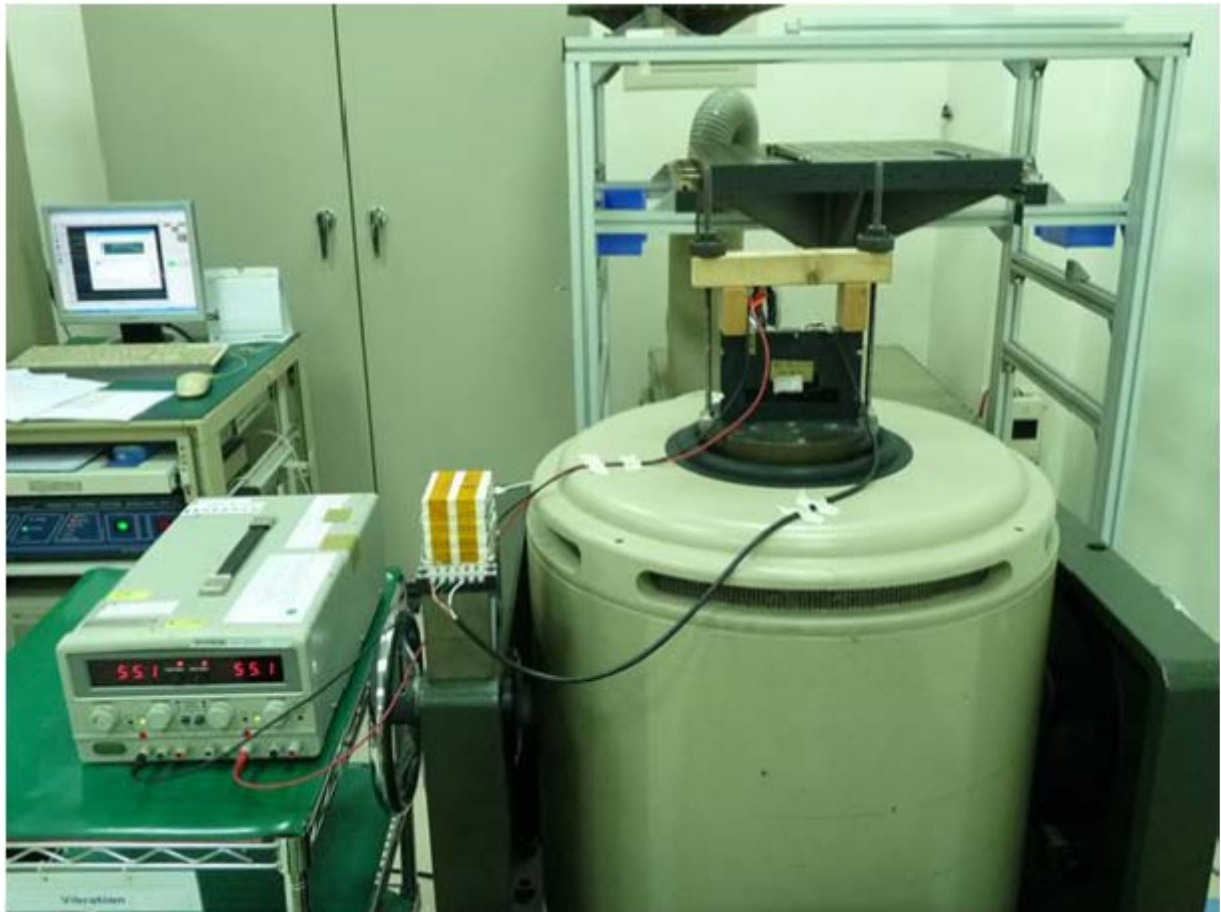
Model Name	PASS	FAIL	No Judgment
TEQ 300-7212WIR	V	—	—

Test Criteria: The function was normal after the test.

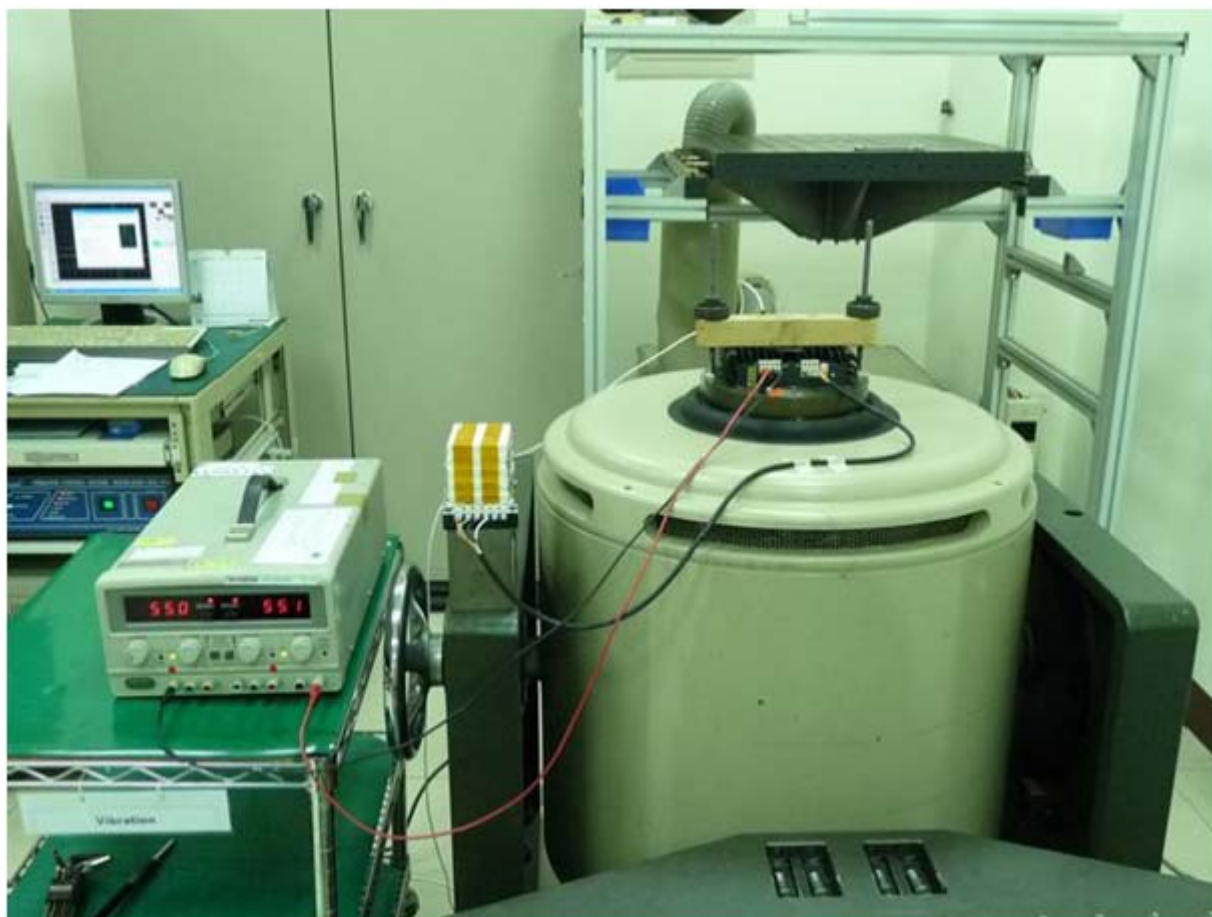
4.6.6 Test Photo



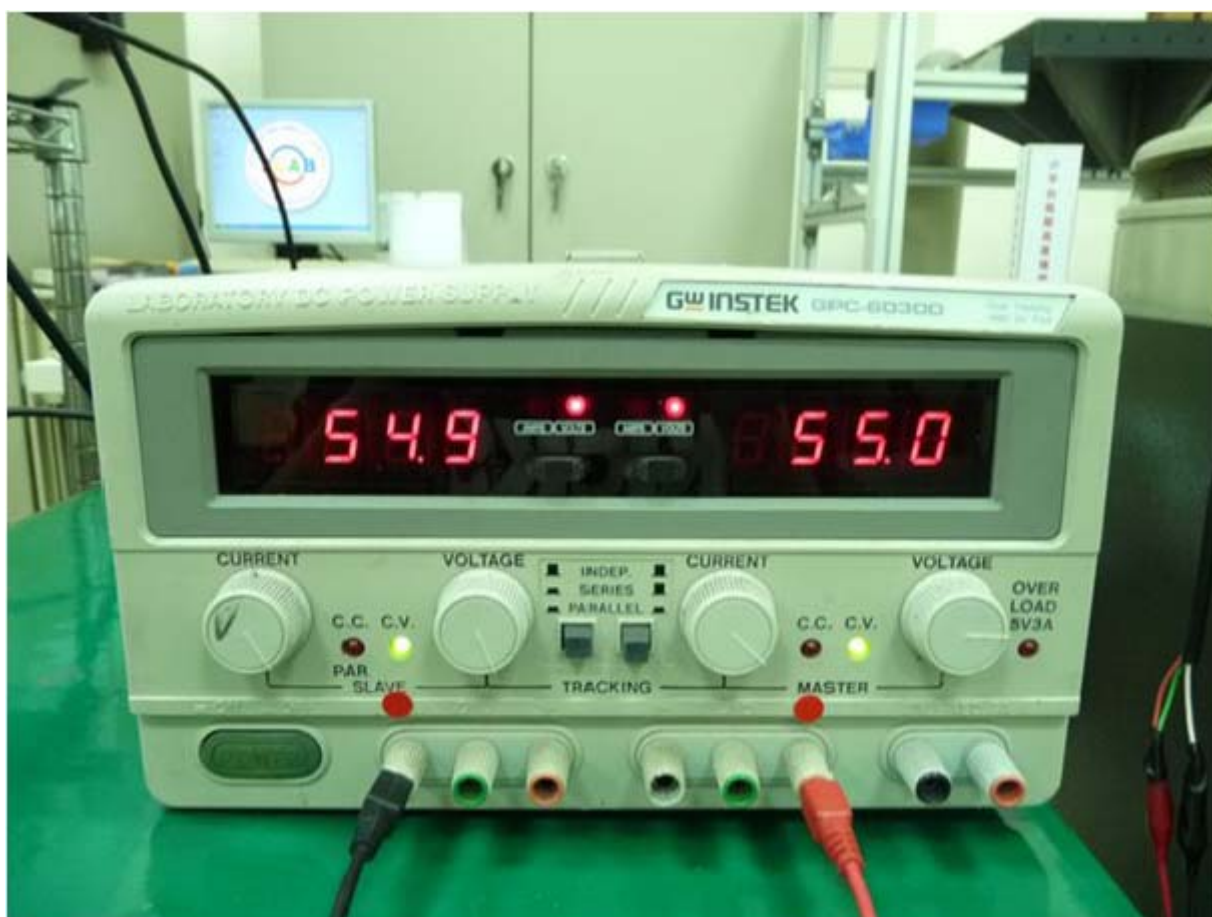
X axis



Y axis



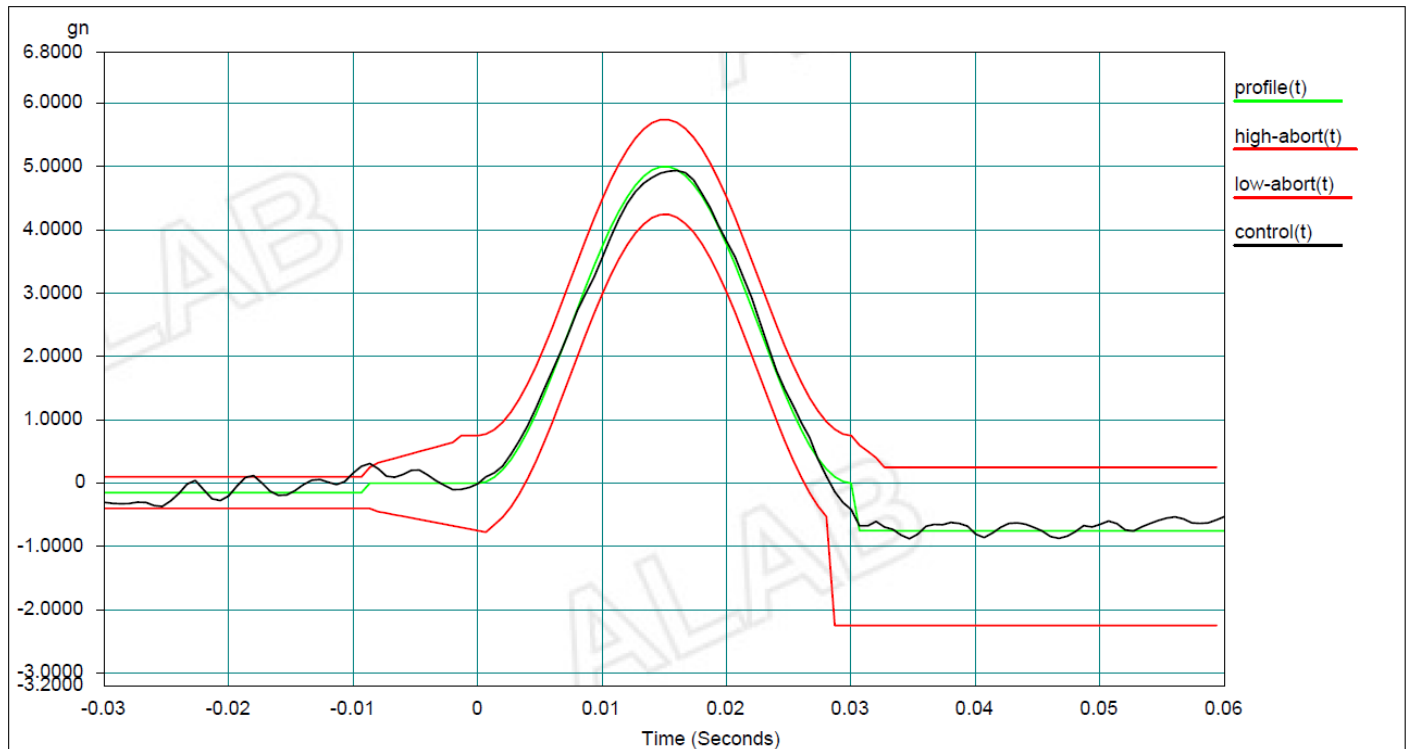
Z axis



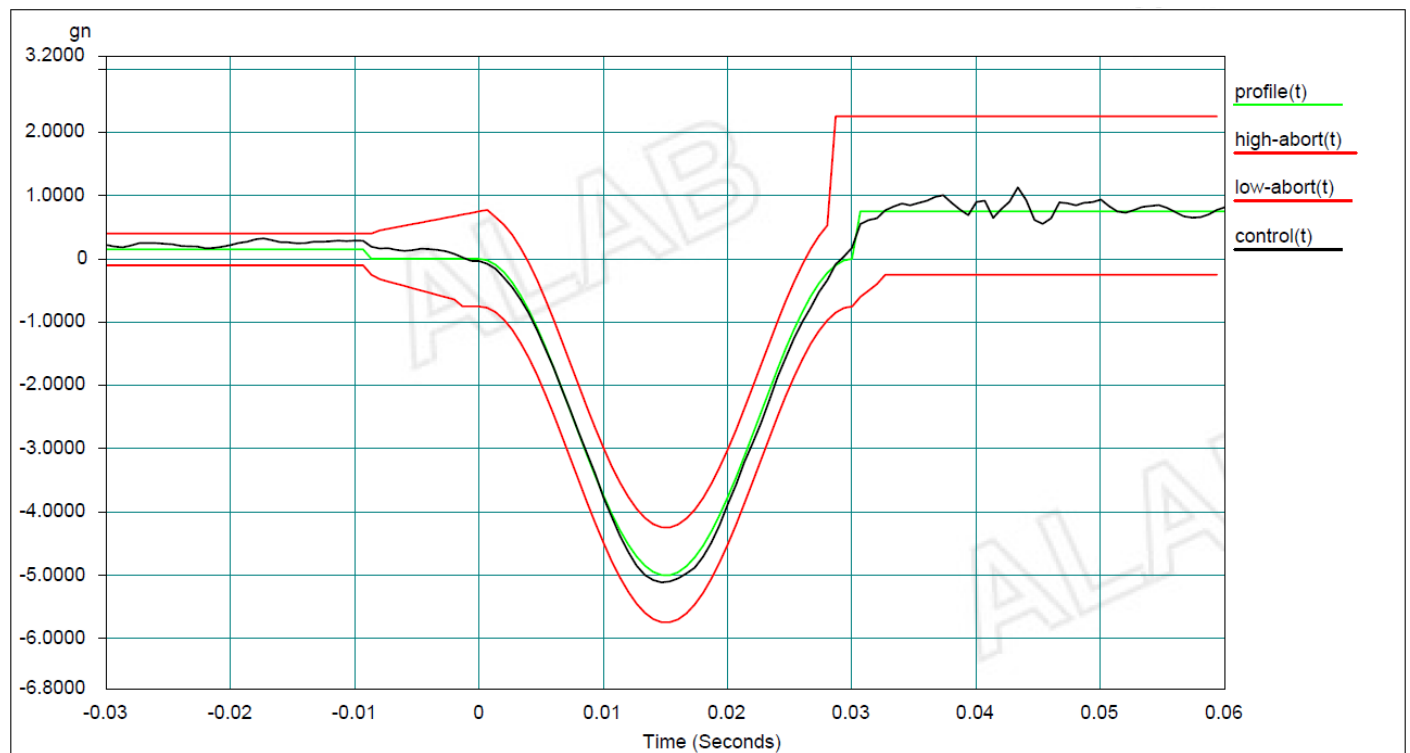
After Test

4.6.7 Test Profile

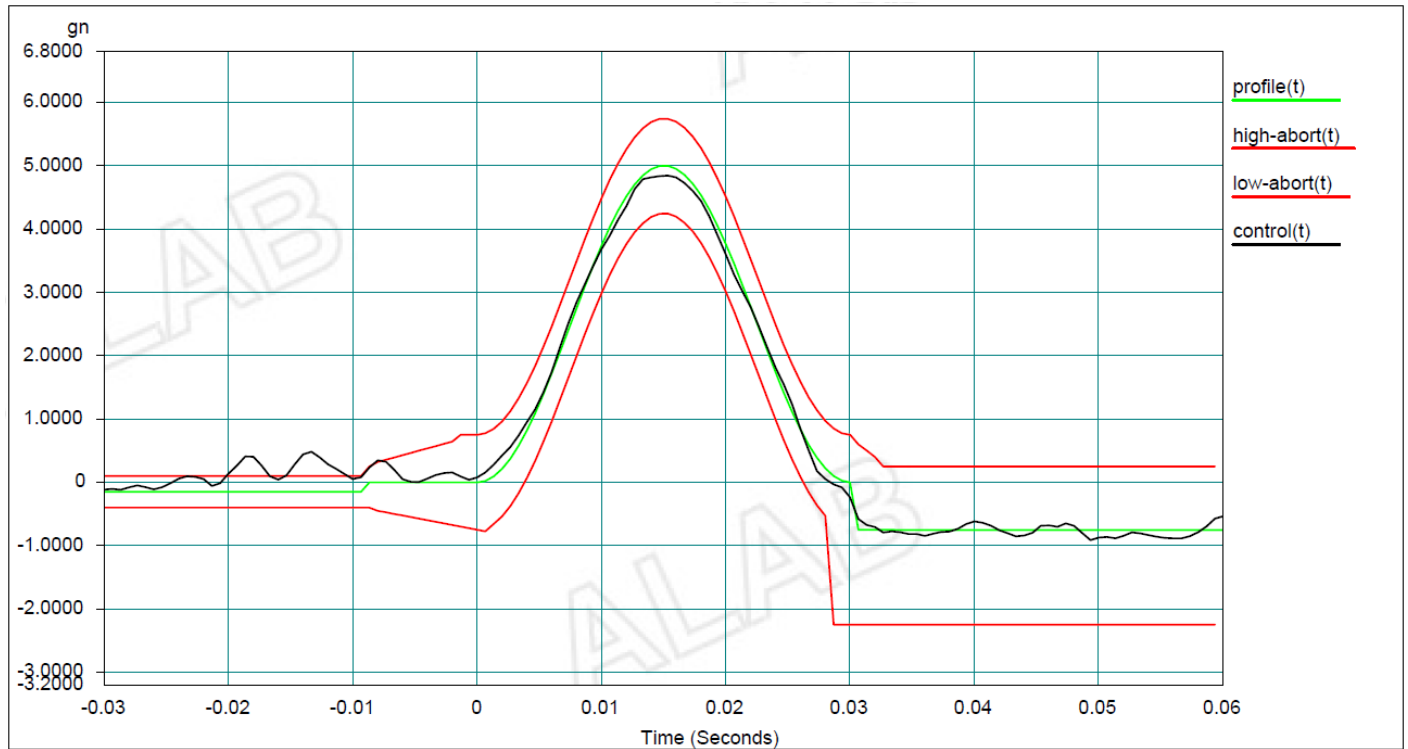
+X axis



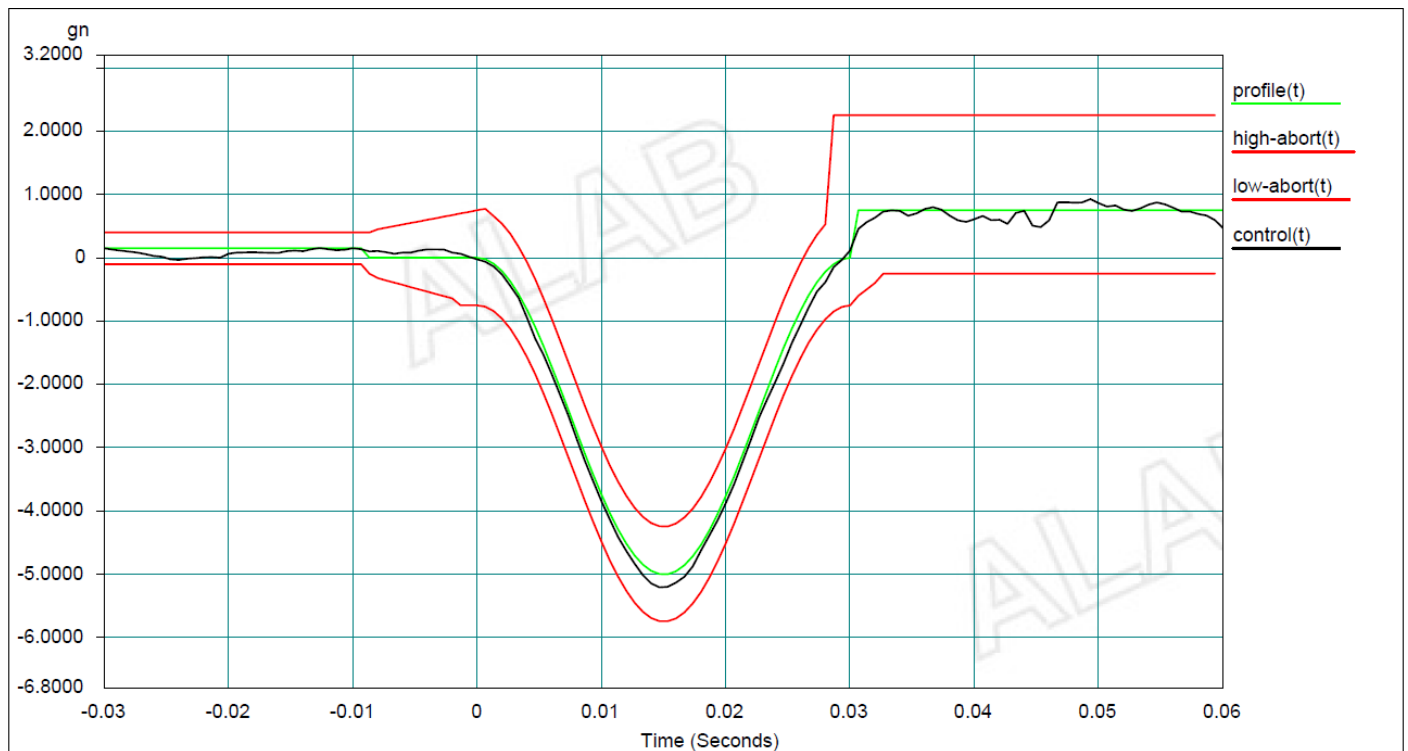
- X axis

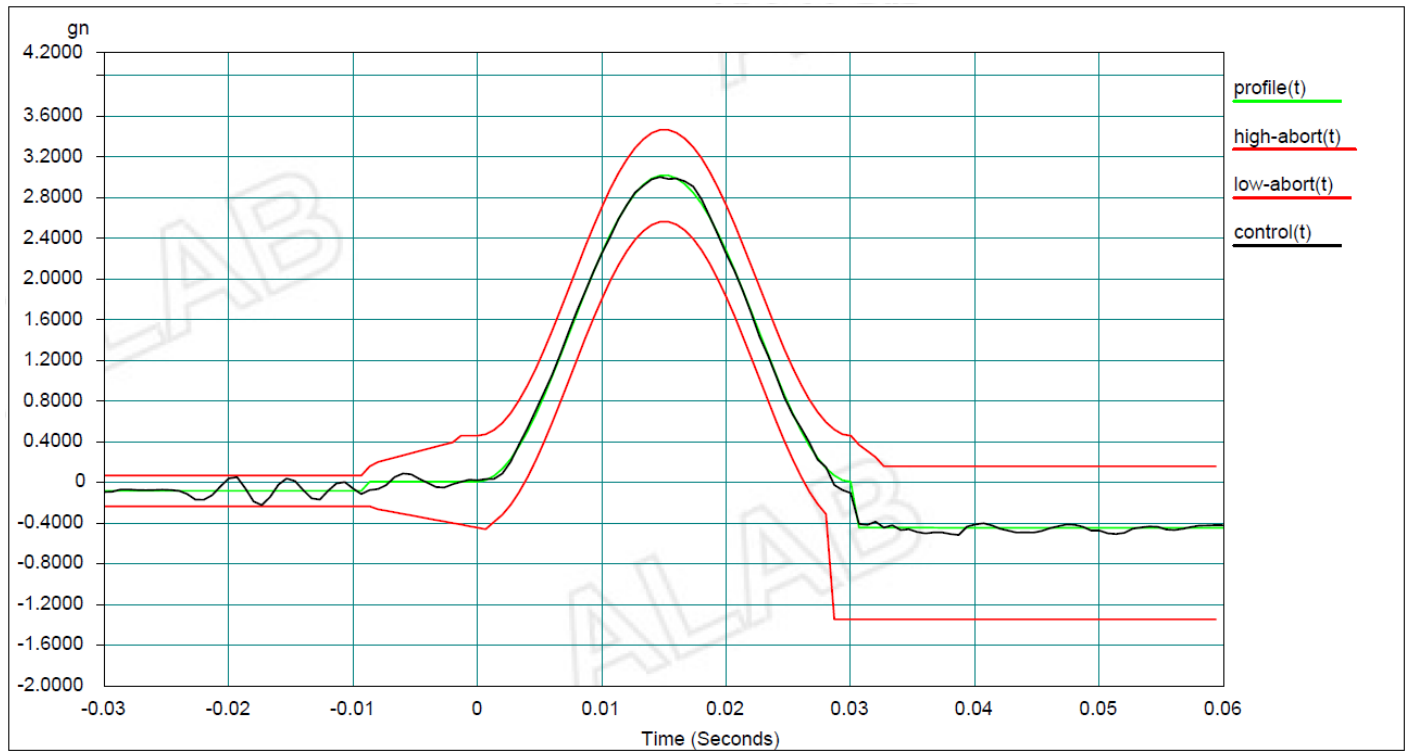
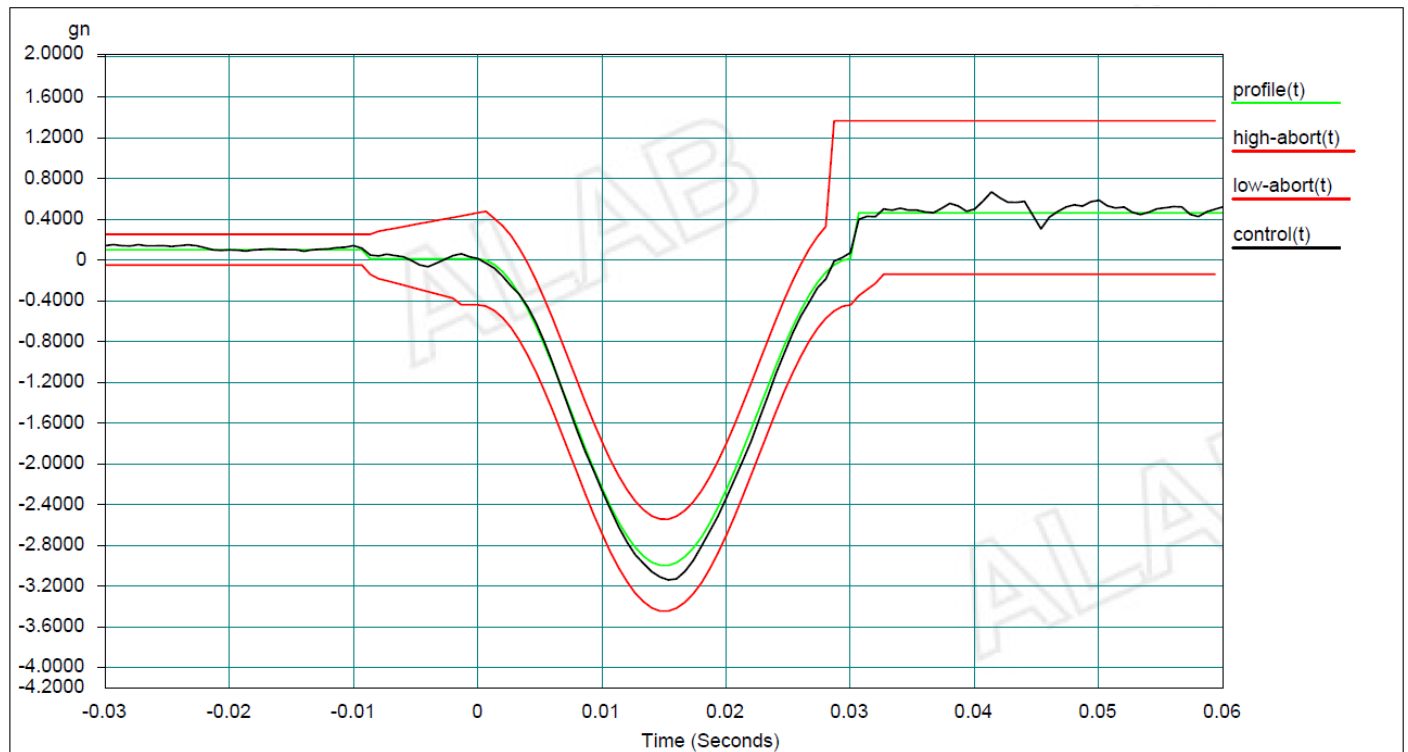


+Y axis



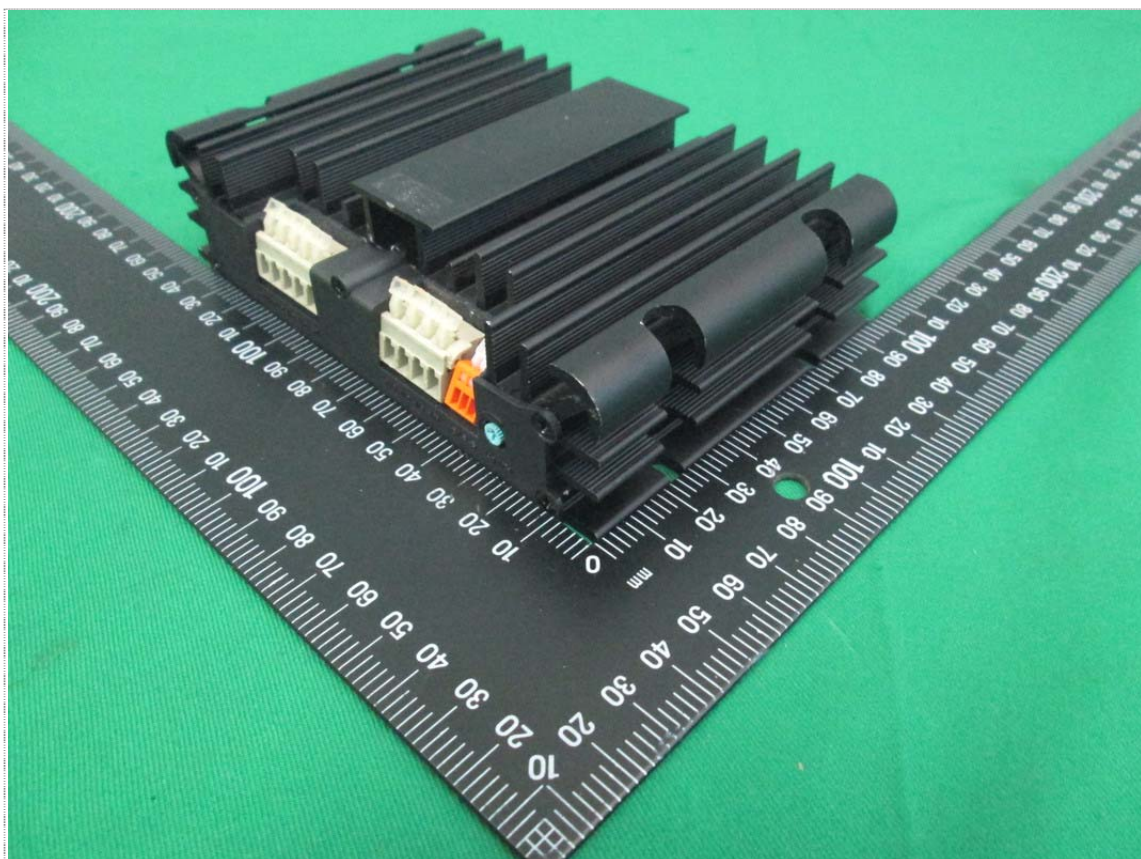
-Y axis



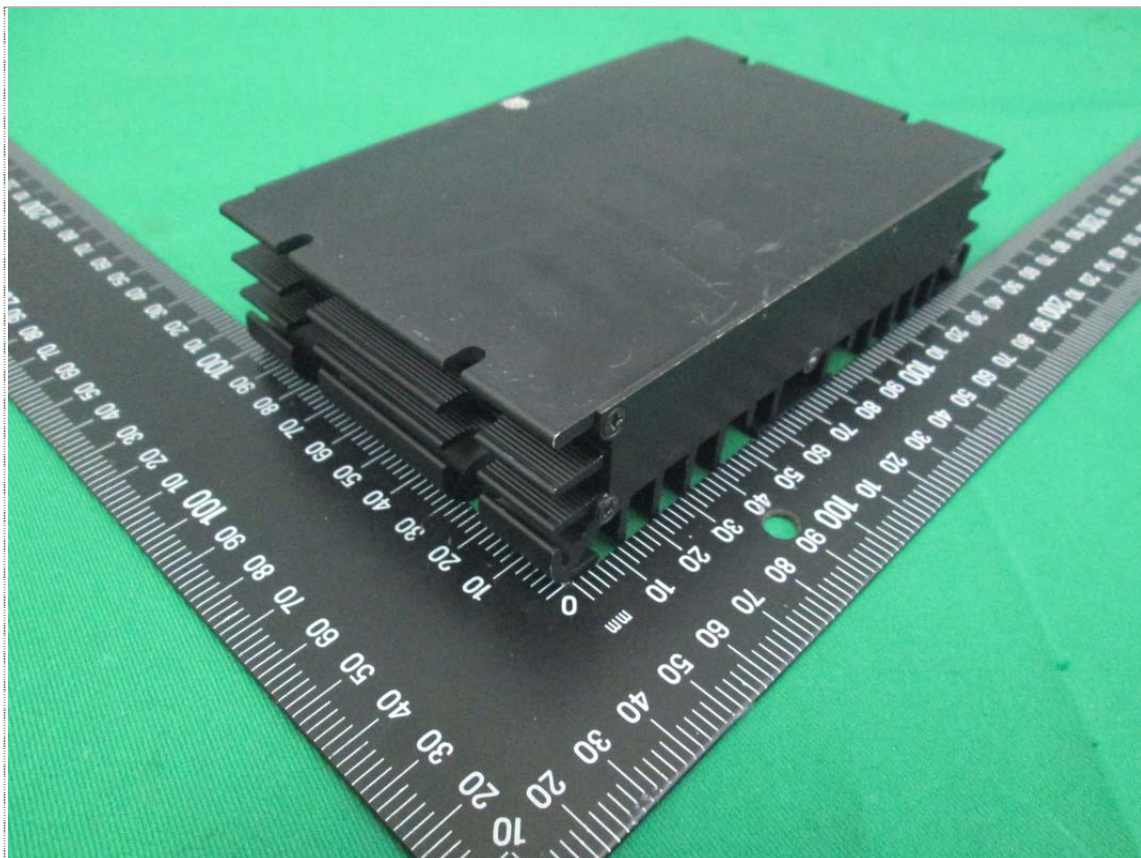
+Z axis**-Z axis**

5 Photographs of EUT

5.1 Model No.: TEQ 300-4812WIR



Front View of EUT

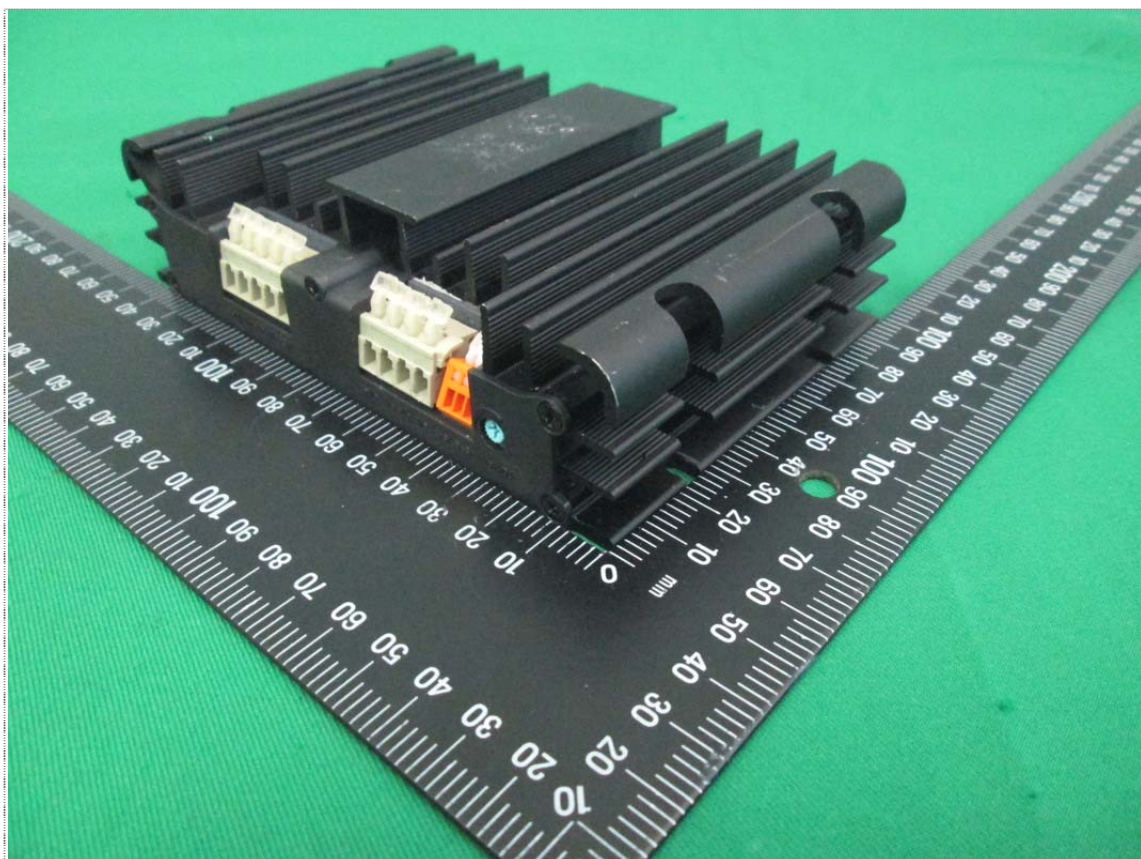


Rear View of EUT

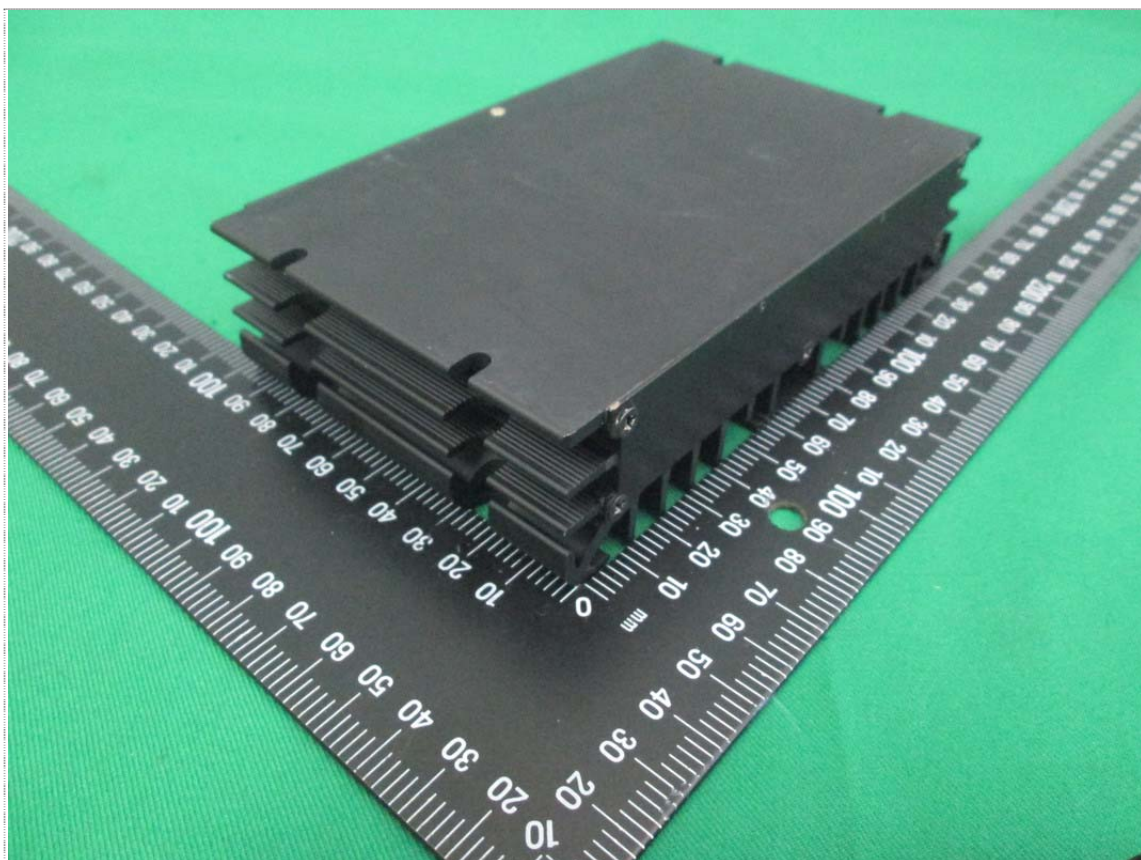


View of I/O Port

5.2 Model No.: TEQ 300-4818WIR



Front View of EUT

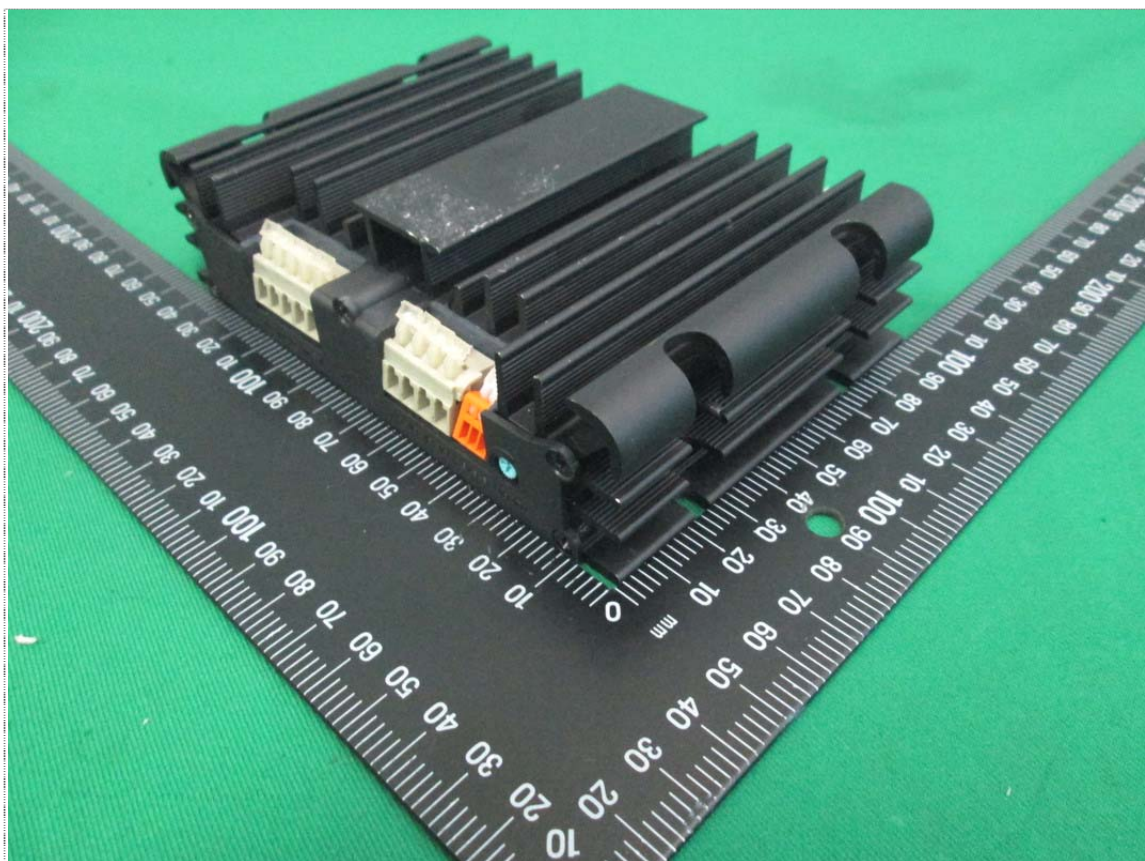


Rear View of EUT

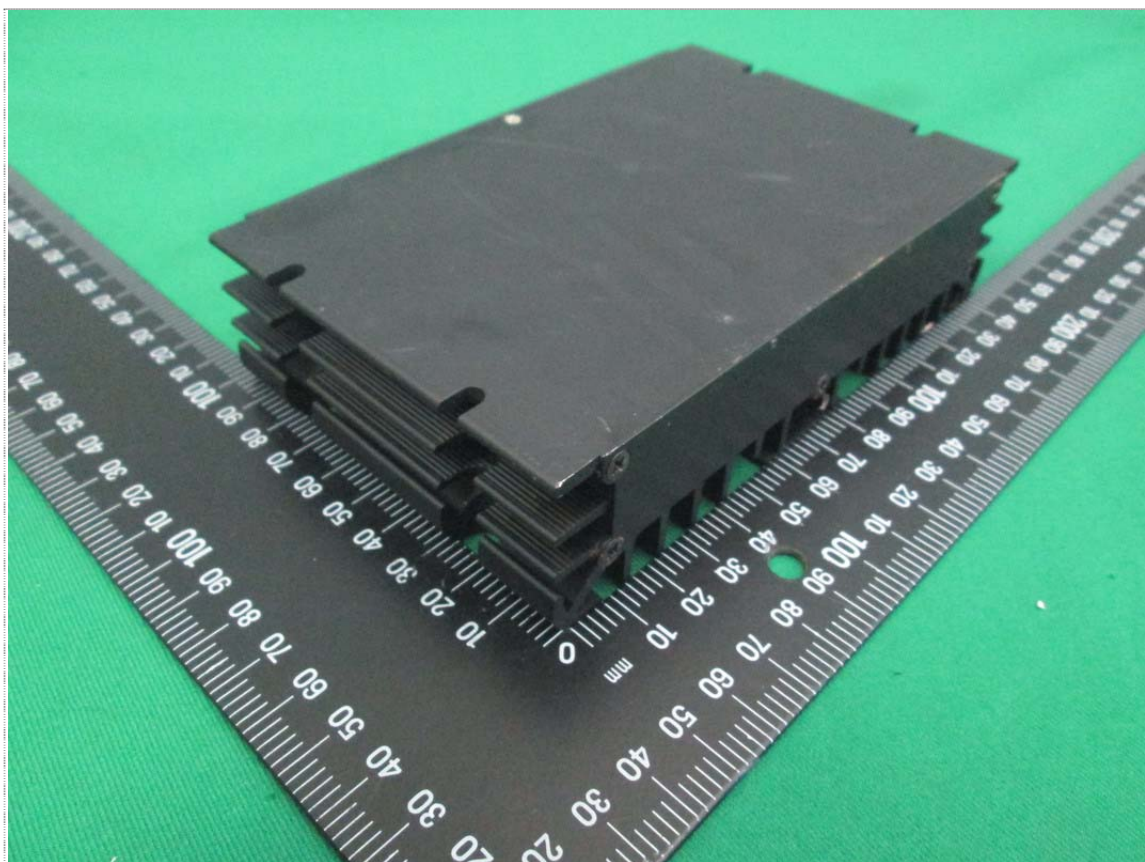


View of I/O Port

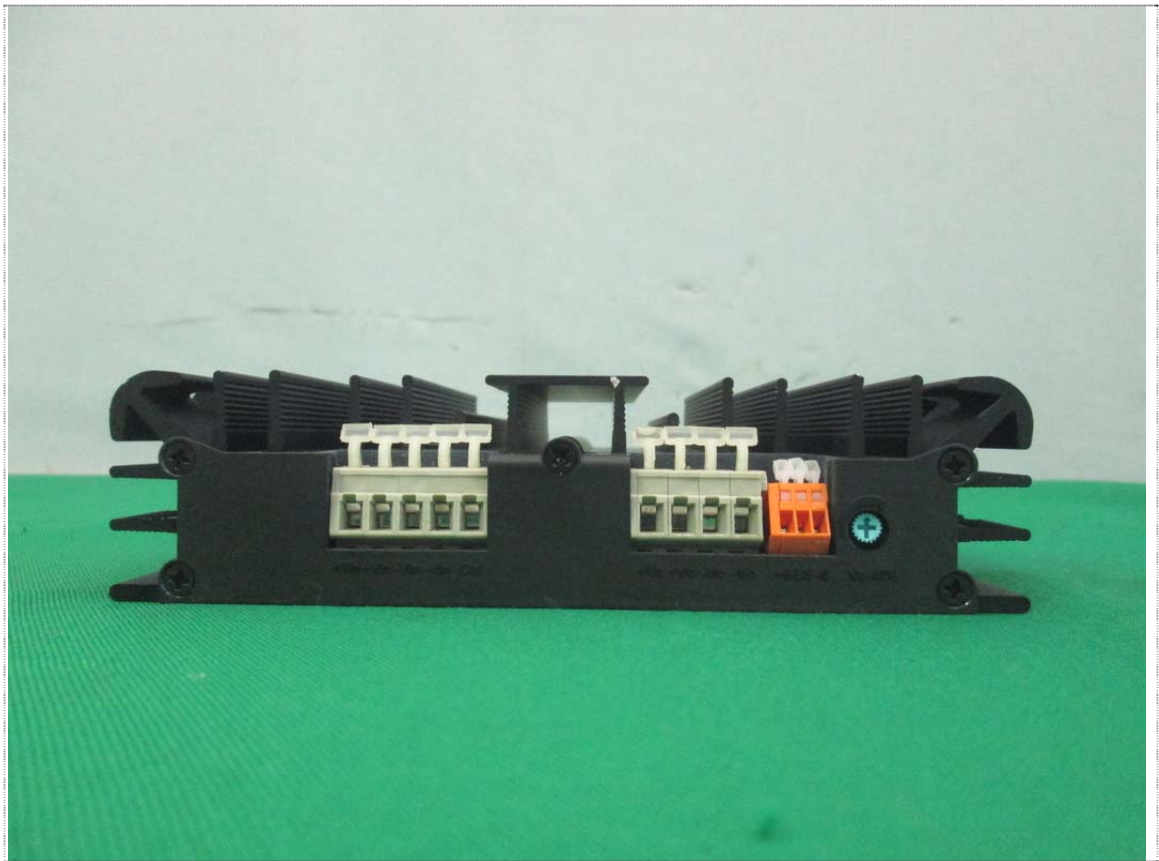
5.3 Model No.: TEQ 300-7212WIR



Front View of EUT



Rear View of EUT



View of I/O Port