EN 50155

TEST REPORT

For

TRACO ELECTRONIC AG

Sihlbruggstrasse 111 CH-6340 Baar Switzerland

Model: **TEQ 40-7212WIR**

Report Type	Product Name:
Original Report	DC/DC converter

Report Number : RXZ211206001EM01

Report Date : 2022-01-XXX

Prepared By: Bay Area Compliance Laboratories Corp.
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Statement of Compliance

Manufacturer	TRACO ELECTRONIC AG
	Sihlbruggstrasse 111 CH-6340 Baar Switzerland
Brand(Trade) Name	TRACO POWER
Product (Equipment) Name	DC/DC converter
Model Name	TEQ 40-7212WIR
Serial Model Name	See table in page 3 for all models

Measurement Procedures and Standards Used:

Railway:

☒ EN 50155:2017

☒ EN 50121-3-2:2016+A1:2019

☒ EN 60068-2-1:2007

☒ EN 60068-2-2:2007

☒ EN 60068-2-30:2005

☒ EN 61373:2010

The measurement results in this report were performed at Bay Area Compliance Laboratories Corp (New Taipei Laboratory).

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Report Issued Date: 2022-01-XXX28

Project Engineer: Ivan **Reviewed By:** Gimmy Tsai

Model List Table					
Model Number	Input Range VDC	Output Voltage VDC	Model Number	Input Range VDC	Output Voltage VDC
TEQ 40-2411WIR	9.5 ~ 36	5	TEQ 20-2411WIR	9 ~ 36	5
TEQ 40-2412WIR	9.5 ~ 36	12	TEQ 20-2412WIR	9 ~ 36	12
TEQ 40-2413WIR	9.5 ~ 36	15	TEQ 20-2413WIR	9 ~ 36	15
TEQ 40-2415WIR	9.5 ~ 36	24	TEQ 20-2415WIR	9 ~ 36	24
TEQ 40-2422WIR	9.5 ~ 36	±12	TEQ 20-2422WIR	9 ~ 36	±12
TEQ 40-2423WIR	9.5 ~ 36	±15	TEQ 20-2423WIR	9 ~ 36	±15
TEQ 40-2425WIR	9.5 ~ 36	±24	TEQ 20-4811WIR	18 ~ 75	5
TEQ 40-4811WIR	18 ~ 75	5	TEQ 20-4812WIR	18 ~ 75	12
TEQ 40-4812WIR	18 ~ 75	12	TEQ 20-4813WIR	18 ~ 75	15
TEQ 40-4813WIR	18 ~ 75	15	TEQ 20-4815WIR	18 ~ 75	24
TEQ 40-4815WIR	18 ~ 75	24	TEQ 20-4822WIR	18 ~ 75	±12
TEQ 40-4822WIR	18 ~ 75	±12	TEQ 20-4823WIR	18 ~ 75	±15
TEQ 40-4823WIR	18 ~ 75	±15	TEQ 20-7211WIR	43 ~ 160	5
TEQ 40-4825WIR	18 ~ 75	±24	**TEQ 20-7212WIR**	43 ~ 160	12
TEQ 40-7211WIR	43 ~ 160	5	TEQ 20-7213WIR	43 ~ 160	15
TEQ 40-7212WIR	43 ~ 160	12	TEQ 20-7215WIR	43 ~ 160	24
TEQ 40-7213WIR	43 ~ 160	15	TEQ 20-7222WIR	43 ~ 160	±12
TEQ 40-7215WIR	43 ~ 160	24	TEQ 20-7223WIR	43 ~ 160	±15
TEQ 40-7222WIR	43 ~ 160	±12			
TEQ 40-7223WIR	43 ~ 160	±15			
TEQ 40-7225WIR	43 ~ 160	±24			

Revision History

Revision	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ211206001EM01	2022-01-XXX	Original Report	Eva Kao

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 General Statements

Applicant	TRACO ELECTRONIC AG
	Sihlbruggstrasse 111 CH-6340 Baar Switzerland
Manufacturer	TRACO ELECTRONIC AG
	Sihlbruggstrasse 111 CH-6340 Baar Switzerland
Brand(Trade) Name	TRACO POWER
Product (Equipment)	DC/DC converter
Model Name	TEQ 40-7212WIR
Serial Model Name	See page 3 model list
Model Discrepancy	The major electrical and mechanical constructions of series models are identical to the basic model, except different Market segmentation. The model, TEQ 40-7212WIR is the testing sample, and the final test data are shown on this test report.
Highest Operating Frequency	Less than 108MHz
Received Date	Dec. 15, 2021
Date of Test	Dec. 15, 2021~Jan. 27, 2022

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☐ **AC 230V/50Hz** ☐ **Adapter** **Brand Name:** **Model:** **I/P:** **O/P:** ☐ **By AC Power Core**
	☒ **DC 110V** ☐ **Battery** ☒ **DC Power Supply** ☐ **External from USB Cable** ☐ **External DC Adapter**
	☐ **Host System via Sever power**
	☐ **PoE**

*All measurement and test data in this report was gathered from production sample serial number: RXZ211206001-01 (Assigned by BACL, New Taipei Laboratory).

Objective

This report is prepared on behalf of TRACO ELECTRONIC AG in accordance with EN 50155, Railway applications - Rolling stock - Electronic equipment.

1.3 Test Methodology

All measurements contained in this report were conducted in accordance with EN 50155: Railway applications - Rolling stock - Electronic equipment

1.4 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) and Bay Area Compliance Laboratories Corp. (Linkou Laboratory) to collect test data is located on

☒ 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒ 68-3, lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.)

Bay Area Compliance Laboratories Corp. Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation.

2. EUT TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing according to EN 50155 Standard.

No special accessory, No modification was made to the EUT and No special equipment used during testing.

2.2 Test Mode

Pretest Mode	Model	Description
Mode 1	TEQ 40-7212WIR	Normal Operation(Full load)
Mode 2	TEQ 20-7212WIR	Normal Operation(Full load)

Conducted Test		
Final Test Mode	Model	Description
Mode 1	TEQ 40-7212WIR	Normal Operation(Full load)
Mode 2	TEQ 20-7212WIR	Normal Operation(Full load)

Radiated Test		
Final Test Mode	Model	Description
Mode 1	TEQ 40-7212WIR	Normal Operation(Full load)
Mode 2	TEQ 20-7212WIR	Normal Operation(Full load)

EMS Test		
Final Test Mode	Model	Description
Mode 1	TEQ 40-7212WIR	Normal Operation(Full load)

2.3 Description of operation:

Input from DC supply source and adjusted setting with110Vdc, and output terminal full loading with dip cement resistor.

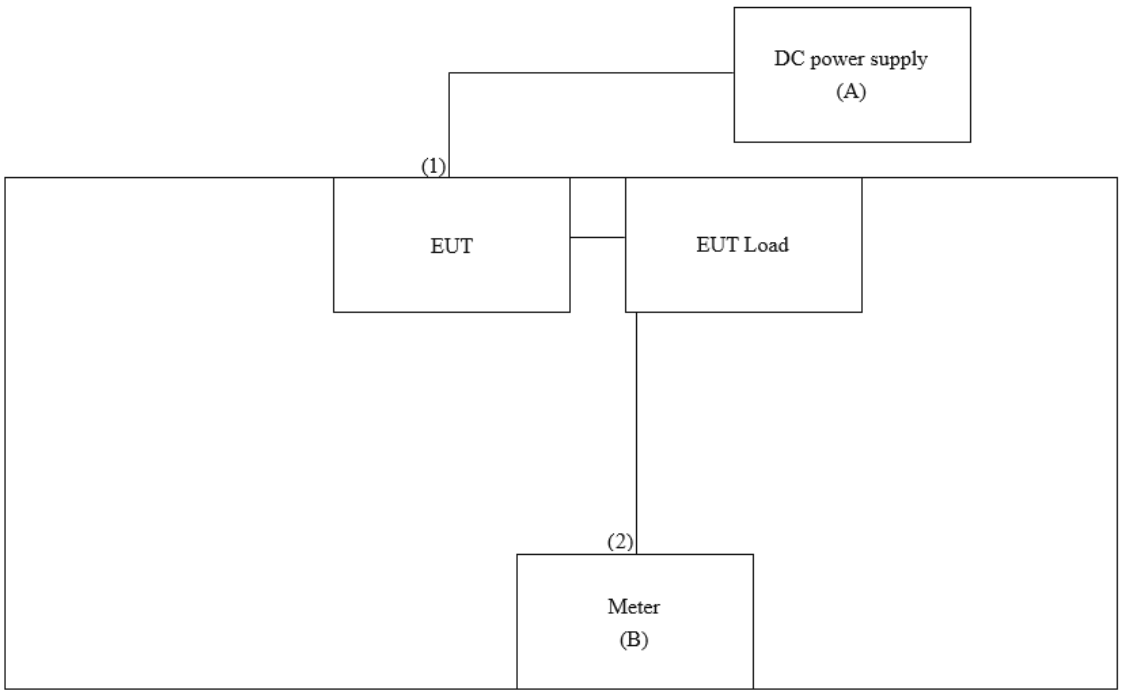
2.4 Local Support Equipment List and Details

No.	Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
A	DC Power Supply	KIKUSUI	PWR400M	N/A	N/A	SJ002716
B	Meter	YFE	YF-370A	N/A	N/A	151221292

2.5 External I/O Cabling List and Details

No.	Description	Shielded Type	Ferrite Core	Length
1	Power Cable	Non-Shielded	N/A	0.8m
2	Meter cable	Non-Shielded	N/A	1.4m

2.6 Block Diagram of Test Setup



1. EUT Power input link DC power supply output
2. Turn on EUT and power equipment.
3. Insert Load and meter
4. Start test

3. PERFORMANCE CRITERIA

The electronic equipment performance requirements (e.g. functional, electrical, mechanical, appearance, interfaces) shall be defined.

The standard specifies a set of default performance classes of requirements; different classes may be requested at tender stage.

3.1 Performance Criteria for EN 50155

Performance criterion A

The apparatus shall continue to operate as intended during and after the test/event. No degradation of performance or loss of function is allowed.

Changes of actual operating state or stored data are not allowed.

If agreed between the involved parties, the normal performance level (all functions are working as specified) can be replaced by a minimum performance level.

Performance Criterion B

The apparatus shall continue to operate as intended after the test/event.

During the test/event, degradation of performance is however allowed.

Changes of actual operating state or stored data are not allowed.

Performance Criterion C

During the test/event temporary loss of function is allowed.

The equipment could:

Automatically restart. The normal performance shall be obtained within a maximum defined time. After this time the equipment shall retain the previous operating state and shall work as intended. The loss of significant data is not allowed; or

Manually restart or process controlled restart. In this case this shall be agreed between user and supplier and/or clearly defined in the user manual. In this case the user manual shall be available to the user at the tender stage.

NOTE Significant stored data are application dependent and stated into the Performance specifications.

3.2 Performance Criteria for EN 50121-3-2

Performance criterion A

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data are allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

4. SUMMARY OF TEST RESULTS

Rules	Description of Test	Results	Test Lab.
EN 50155§13.4.1	Visual inspection	Compliant	BACL
EN 50155§13.4.2	Performance test	Compliant	BACL
EN 50155§13.4.3	Power supply test	Compliant	BACL
EN 50155§13.4.9	Insulation test	Compliant	BACL
EN 50155§13.4.4	Low temperature start-up test	Compliant	BACL
EN 50155§13.4.5	Dry heat test	Compliant	BACL
EN 50155§13.4.7	Cyclic damp heat test (see NOTE 2)	Compliant	BACL
EN 50155§13.4.8	EMC test	Compliant	BACL
EN 50155§13.4.11	Vibration and shock test	Compliant	BACL

BACL=Bay Area Compliance Labs Corp.

5. EN 50155 Visual inspection

5.1 Test Requirement

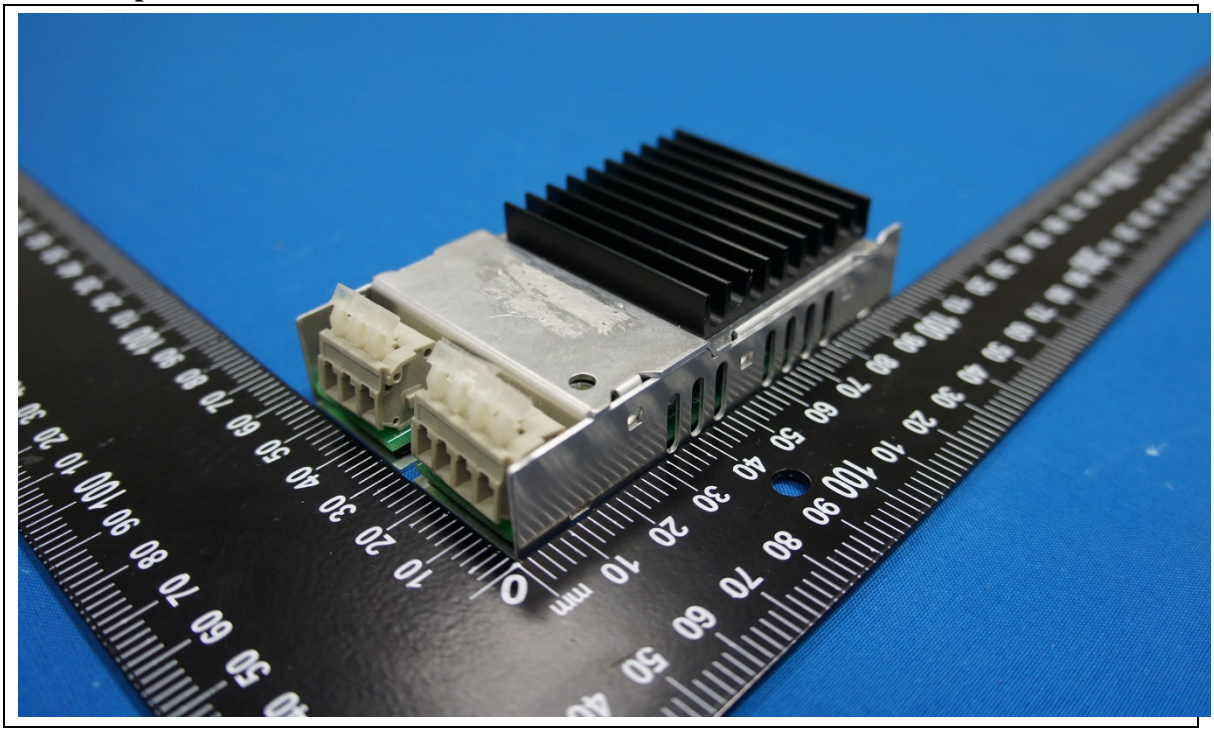
The visual inspection shall be carried out to ensure that the equipment construction meets its specified requirements.

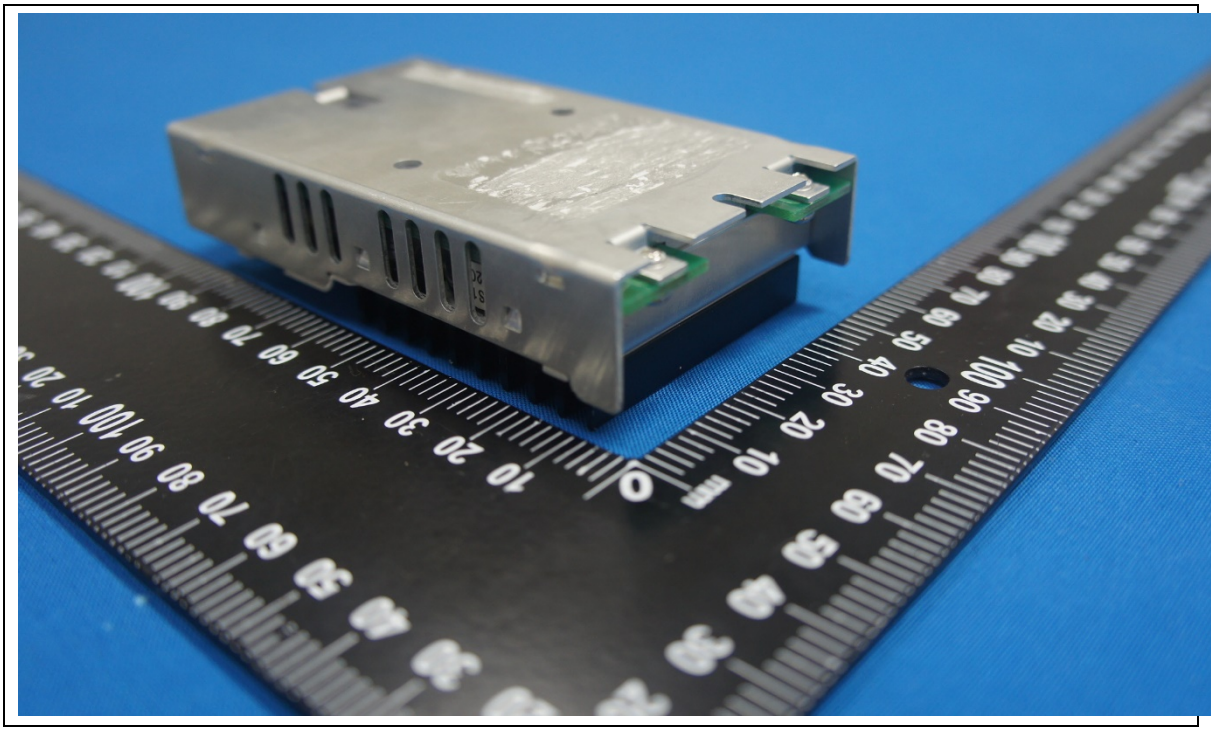
The performance test verifies the functional requirements of the Electronic Equipment. The performance test is carried out according to the Performance test specification and Performance test procedure written by the supplier either for type test or for routine test.

5.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.1 and 13.4.2

5.3 EUT photo





5.4 Test Result

Test Item	Before Test check damage or deterioration	After Test check damage or deterioration	Test engineer	Test Result
Visual inspection	No deviation	No deviation	Jack W.	Pass
Performance test	No deviation	No deviation	Jack W.	Pass
Power supply test	No deviation	No deviation	Jack W.	Pass
Insulation test	No deviation	No deviation	Jack W.	Pass
Low temperature start-up test	No deviation	No deviation	Jack W.	Pass
Dry heat test	No deviation	No deviation	Jack W.	Pass
Cyclic damp heat test	No deviation	No deviation	Jack W.	Pass
EMC test	No deviation	No deviation	Ivan H.	Pass
Vibration and shock test	No deviation	No deviation	Jack W.	Pass

6. EN 50155 Performance test

6.1 Test Requirement

The performance test verifies the functional requirements of the Electronic Equipment, see 4.1. The performance test is carried out according to the Performance test specification and Performance test procedure written by the supplier either for type test or for routine test.

The performance test shall be carried out at the ambient temperature.

The performance test shall consist of a comprehensive series of measurements of the characteristics of the equipment to check that its performance is in accordance with the functional requirements of the particular equipment concerned, including any special requirements of its individual specification, and general requirements of this standard.

6.2 Test Procedure

Reference to EN 50155 clause 13.4.2

6.3 EUT Performance description

Operating temperature classes

	Class	Equipment operating temperature range (°C)
☐	OT1	–25 to +55
☐	OT2	–40 to +55
☐	OT3	–25 to +70
☒	OT4	–40 to +70
☐	OT5	–25 to +85
☐	OT6	–40 to +85

Switch-on extended Operating temperature classes

	Class	Equipment operating temperature range (°C)	Thermal test cycle
☐	ST0	No switch-on extended operating temperature	Test cycle A
☒	ST1	OTx +15 °C	Test cycle B
☐	ST2	OTx +15 °C	Test cycle C

6.4 Test Result

Test Item	Before Test check damage or deterioration	After Test check damage or deterioration	Test engineer	Test Result
Visual inspection	No deviation	No deviation	Jack W.	Pass
Performance test	No deviation	No deviation	Jack W.	Pass
Power supply test	No deviation	No deviation	Jack W.	Pass
Insulation test	No deviation	No deviation	Jack W.	Pass
Low temperature start-up test	No deviation	No deviation	Jack W.	Pass
Dry heat test	No deviation	No deviation	Jack W.	Pass
Cyclic damp heat test	No deviation	No deviation	Jack W.	Pass
EMC test	No deviation	No deviation	Ivan H.	Pass
Vibration and shock test	No deviation	No deviation	Jack W.	Pass

7. EN 50155 Power Supply Test

7.1 Test Requirement

Continuous Voltage range

Nominal voltage Un	Limits	Performance criterion
Minimum continuous voltage	0.7 Un	A
Maximum continuous voltage	1.25 Un	A

Temporary DC power supply fluctuation

Nominal voltage Un	Times	Cycle	Limits	Performance criterion
Minimum continuous voltage	0.1 s	10	0.6 Un	A
Maximum continuous voltage	0.1 s	10	1.4 Un	A
Minimum continuous voltage	1 s	10	1.25 Un	B
Maximum continuous voltage	1 s	10	1.4 Un	B

Interruption voltage supply classes

Class	Requirements
S1	In case of voltage interruption, no performance criterion is requested but the equipment shall continue to operate as specified after the voltage interruption.
S2	In case of voltage interruption up to 10 ms the equipment shall behave according to performance criterion A.
S3	In case of voltage interruption up to 20 ms the equipment shall behave according to performance criterion A.

Supply change-over

Class	Requirements
C1	At 0.6 *U*n duration 100 ms (without interruptions). Performance criterion A
C2	During a supply break of 30 ms starting at Un. Performance criterion B

7.2 Test Procedure

Reference to EN 50155 clause 14.4.3

7.3 Test Result

Power supply test

Project No.	RXZ211206001	Temperature	21.6
Customer	TRACO ELECTRONIC AG	Relative Humidity	51
EUT Name	DC/DC Converter	ATM Pressure	99.3kpa
Model/Type	TEQ 40-7212WIR	Test Voltage	110 Vdc
Test Mode	--	Test engineer	Jack

Variations of Voltage supply	Level	Voltage	Test Time	Test Result	Comments
Minimum voltage	0.7 Un	77 Vdc	10 min	Pass	
Nominal voltage	Un	110 Vdc	10 min	Pass	
Maximum voltage	1.25 Un	137.5 Vdc	10 min	Pass	

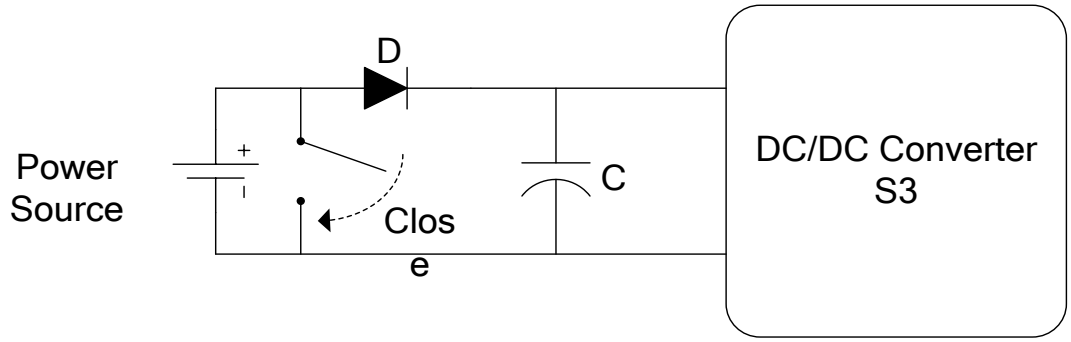
Voltage fluctuations	Level	Voltage	Test Time	Test Result	Comments
High voltage	1.4 Un	154 Vdc	0.1 s	Pass	
Low voltage	0.6 Un	66 Vdc	0.1 s	Pass	
High voltage	1.4 Un	154 Vdc	1 s	Pass	

Interruptions of voltage supply	Level	Voltage	Test Time	Test Result	Comments
Class S1: Voltage interruptions	Un	110 Vdc	0 s	Pass	
Class S2: Voltage interruptions	0 Un	0 Vdc	10 ms	Pass	
Class S3: Voltage interruptions	0 Un	0 Vdc	20 ms	Pass	

Supply change over	Level	Voltage	Test Time	Test Result	Comments
Class C1: 60% residual voltage	0.6 Un	66 Vdc	100 ms	Pass	
Class C2: 0% residual voltage	0 Un	0 Vdc	30 ms	Pass	

Remark for power supply test, we take the 110V model for reprehensive the full model, and the S3/C2 PASS the test, but in the series of model with 24Vin and 48Vin the test level, unit with the S3/C2 should modify with the component see description as below model reference:

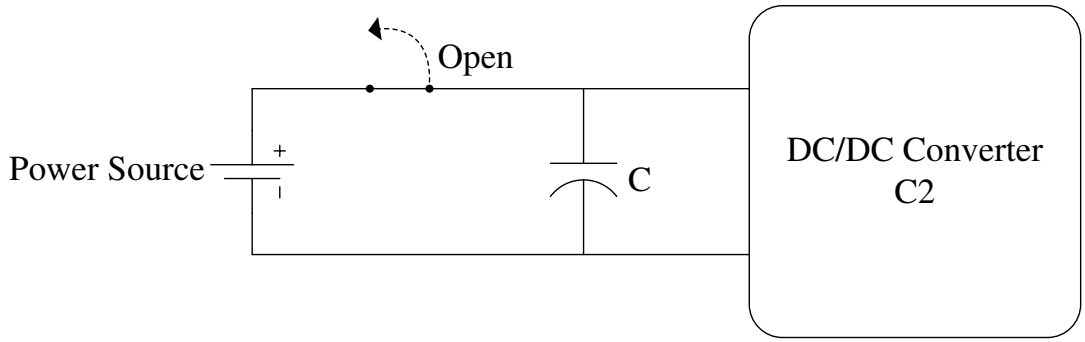
Recommended external components for Interruptions of voltage supply Class S3



Model Reference	D1	Cin
TEQ 20 - 24Vin	200V / 3A	1330µF
TEQ 20 - 48Vin	200V / 3A	330µF

Model Reference	D1	Cin
TEQ 40 - 24Vin	80V / 5A	2670µF
TEQ 40 - 48Vin	120V / 5A	660µF

Recommended external components for supply change-over Class C2



Model Reference	Cin
TEQ 20 - 24Vin	2680µF
TEQ 20 - 48Vin	660µF

Model Reference	Cin
TEQ 40 - 24Vin	5500µF
TEQ 40 - 48Vin	1330µF

8. EN 50155 Insulation test

8.1 Test Requirement

Test voltages of insulation test

Nominal battery voltage and/or I/O voltage	Test times	Test voltage
All ports	60 S	500 V DC

Test voltages of voltage withstand test

Nominal battery voltage and/or I/O voltage	Test times	Test voltage
< 72 V DC or 50 V AC rms	60 S	500 V AC or 750 V DC
72 V DC ≤ V DC < 125 V DC or from 50 to 90 V AC rms	60 S	1000 V AC or 1500 V DC
125 V DC ≤ V DC < 315 V DC or from 90 to 225 V AC rms	60 S	1500 V AC or 2200 V DC

8.2 Test Performance criterion

Insulation measurement test:

The minimum value of the insulation resistance after the withstand test shall be higher than 20 MΩ. The equipment shall work as intended and within its specified limits after the insulation test.

Voltage withstand test:

Neither disruptive discharge nor flashover shall occur. After the withstand test, the equipment shall work as intended and within its specified limits.

8.3 Test Procedure

Reference to EN 50155 clause 13.4.9

8.4 Test Result

Insulation test

Project No.	RXZ211206001	Temperature	22degree C
Customer	TRACO ELECTRONIC AG	Relative Humidity	63%
EUT Name	DC/DC Converter	ATM Pressure	--
Model/Type	TEQ 40-7212WIR	Test Voltage	110 Vdc
Test Mode	--	Test engineer	Jack

Insulation Test Requirement:

1. Insulation Test Requirement:

Insulation measurement Test	Level	Test Time	before withstand	after withstand	Test Result	Comments
Primary side to secondary side	500 Vdc	1 min	>10GΩ	>10GΩ	Pass	--
Primary side to secondary side	500 Vdc	1 min	>10GΩ	>10GΩ	Pass	After 1500Vdc voltage withstand test

The insulation resistance test shall be carried out at 500 Vdc and the values recorded.

The test shall then be repeated after the voltage withstand test.

There shall be no fundamental deterioration from the initial measurement.

2. Voltage Withstand test:

Voltage Withstand test	Level	Test Time	Leakage current	Test Result	Comments
Primary side to secondary side	2200 Vdc	1 min	0 mA	Pass	No flashover
Primary side to secondary side	1500 Vdc	1 min	0 mA	Pass	No flashover
Primary side to secondary side	3000 Vdc	1 min	0 mA	Pass	No flashover Note 1

500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac).

1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and

1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac).

Neither disruptive discharge nor flashover shall occur

Note 1: According to applicant request, voltage withstand test ,test additional voltage.

Insulation test

Project No.	RXZ211206001	**Temperature**	22degree C
Customer	TRACO ELECTRONIC AG	**Relative Humidity**	63%
EUT Name	DC/DC Converter	**ATM Pressure**	--
Model/Type	TEQ 20-7212WIR	**Test Voltage**	110 Vdc
Test Mode	--	**Test engineer**	Jack

1. Voltage Withstand test:					
Voltage Withstand test	**Level**	**Test Time**	**Leakage current**	**Test Result**	**Comments**
Primary side to secondary side	2250Vdc	1 min	0 mA	Pass	No flashover.
Note: According to applicant request, voltage withstand test ,test additional voltage. Neither disruptive discharge nor flashover shall occur					

9. EN 50155 Low temperature start-up test

9.1 Test Requirement

Low temperature start-up test

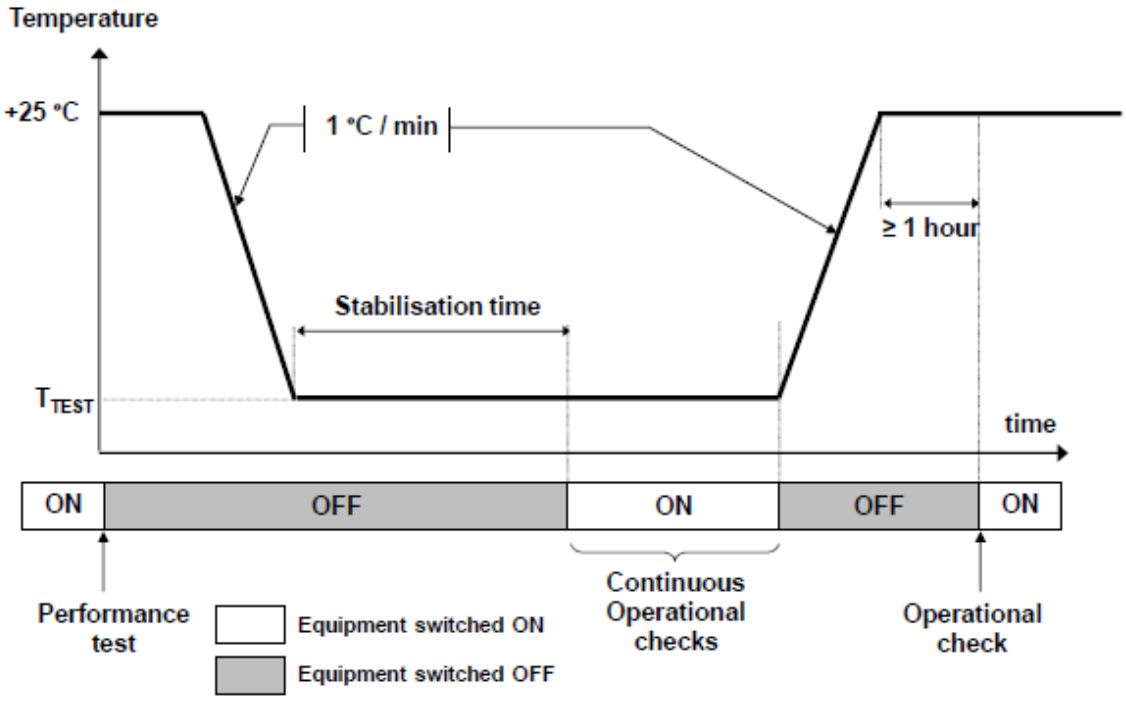


Figure 12 — Low temperature start-up test

9.2 Test Performance criterion

During and after the test, the equipment shall work as intended and within its specified limits (performance criterion A).

9.3 Test Procedure

This test is carried out in accordance with EN 60068-2-2 (test Be), using natural ventilation.

Equipment shall be tested according to its operating temperature class; low operating temperature (TTEST) shall be taken from EN 50155 Table 1 of this standard.

Equipment is placed, without any voltage applied, in a test chamber.

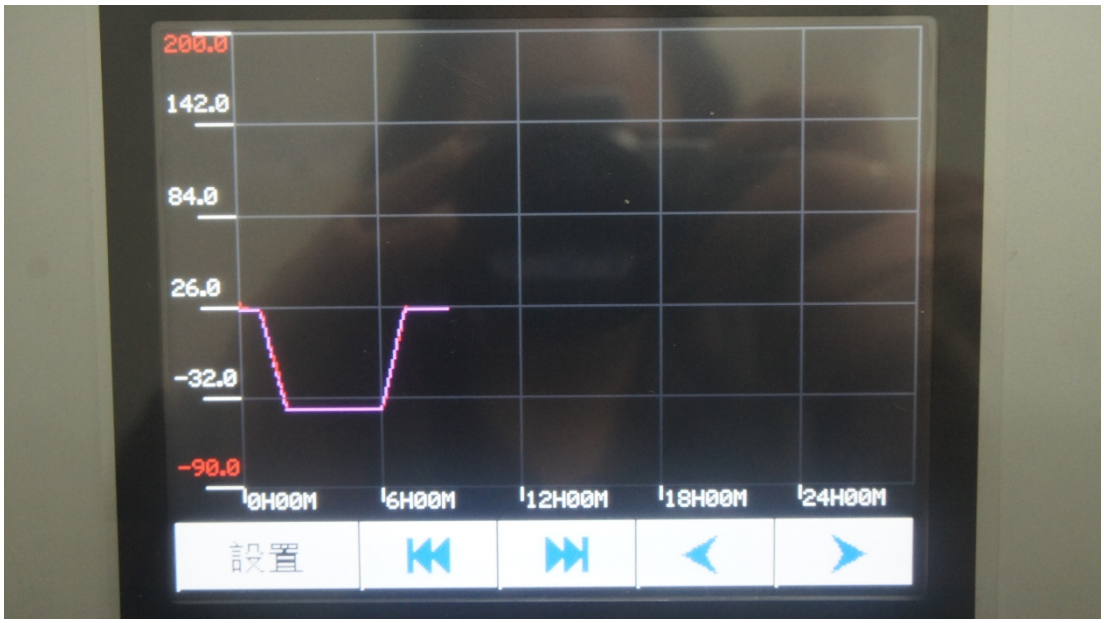
The equipment shall be first conditioned by leaving it, after thermal stabilization of the chamber, for a sufficient period of time in which to achieve thermal stabilization. In any case, the stabilization time period shall not be less than 2 h.

At the end of this period the equipment shall be switched on and a performance test shall be carried out, keeping the equipment at the low temperature.

After recovery, this operational check shall be repeated at normal room temperature.

9.4 Test Result

Low temperature start-up test Record 13.4.4
Document Name: 13.4.4 (Low temperature start-up test) Test Time: 01/11/2022 Y Axis:Temperature(°C) X Axis:Hours



Date: 2022/01/11	Temperature:22°C	Engineer Jack
EUT Model/Type: TEQ 40-7212WIR	Humidity:68%	Standard: EN 50155
Voltage/Frequence:110Vdc		
Visual inspection requirement:		
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.		

Inspection item	**Result**
EUT external	OK
EUT function	OK

10. EN 50155 Dry heat thermal test-

10.1 Test Requirement

Dry heat thermal test — Cycle A

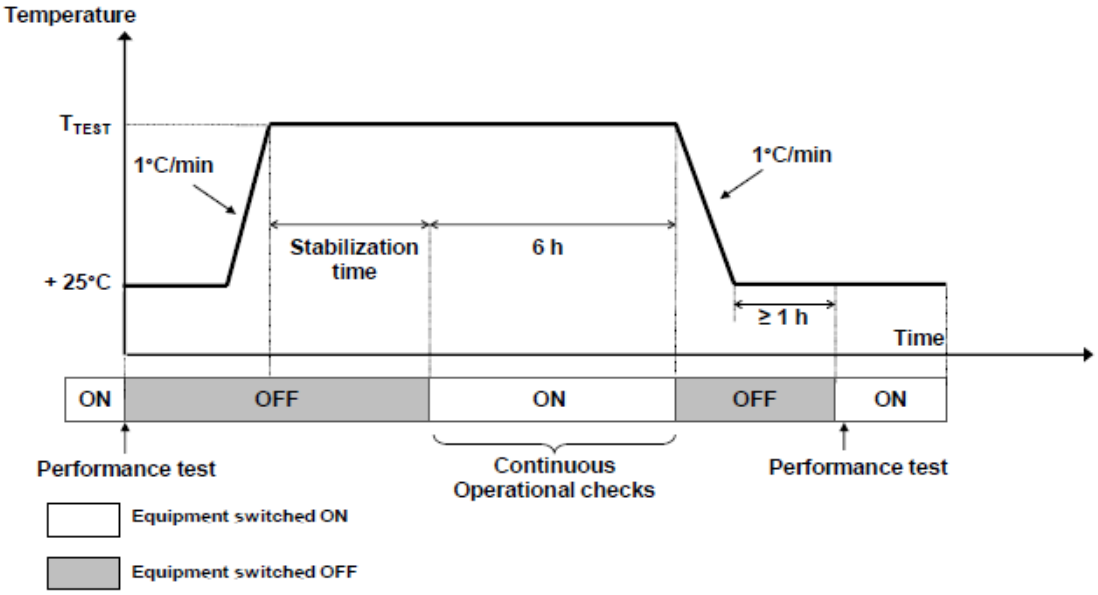


Figure 13 — Dry heat thermal test — Cycle A

Dry heat thermal test — Cycle B

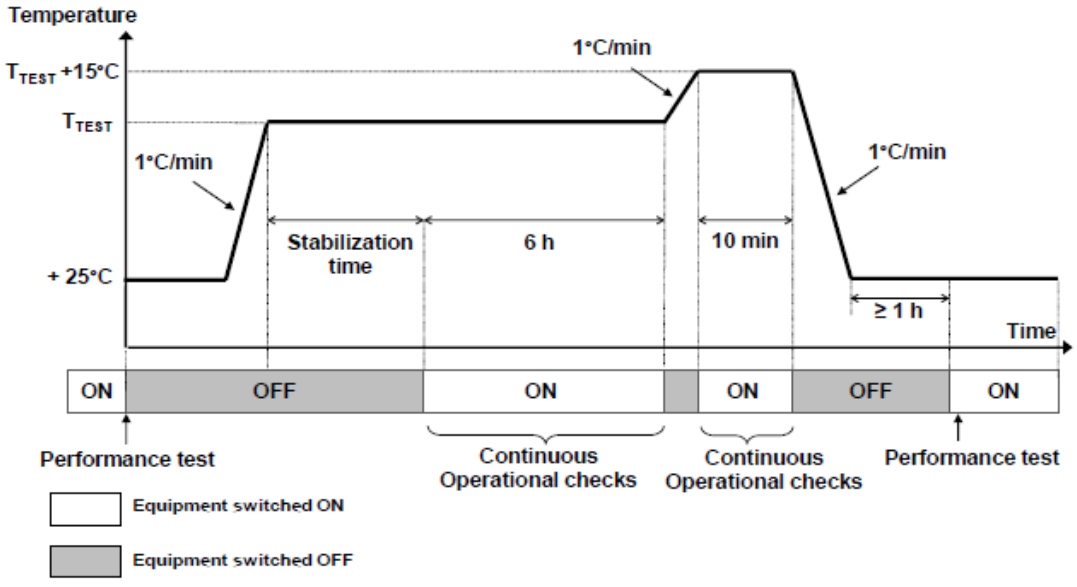


Figure 14 — Dry heat thermal test — Cycle B

10.2 Test Performance criterion

During and after the test, the equipment shall work as intended and within its specified limits (performance criterion A).

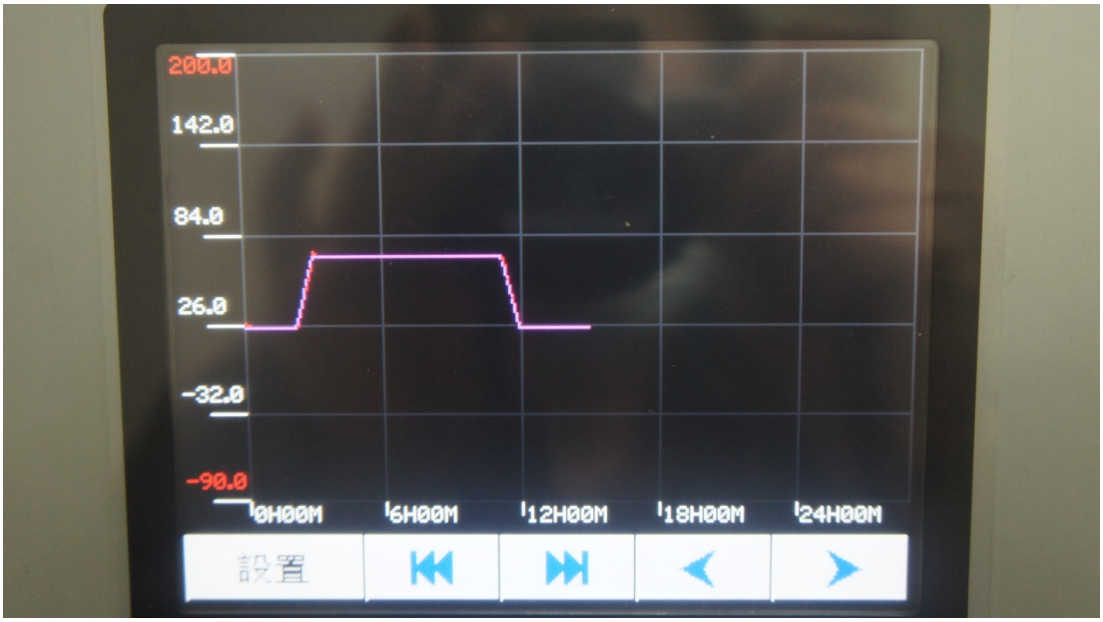
10.3 Test Procedure

The switched off equipment is placed in a chamber where the temperature is progressively raised to the maximum operating temperature (TTEST) (see Figure 13). Once the temperature of the whole equipment (internal and external) has stabilized, in any case the stabilization time shall not be less than 2 h, then the equipment is switched on and left for a time period of 6 h with continuous operational checks carried out at the maximum operating temperature (TTEST). The equipment is then allowed to cool to ambient temperature and a further performance test is carried out after the stabilization time.

The switched off equipment is placed in a chamber where the temperature is progressively raised to the maximum operating temperature (TTEST) (see Figure 14). Once the temperature of the whole equipment (internal and external) has stabilized, in any case the stabilization time shall not be less than 2 h, then the equipment is switched on and left for a time period of 6 h with continuous operational checks carried out at the maximum operating temperature (TTEST). Once this test is complete, a continuous operational check is carried out with the 10 min over-temperature value (see Figure 14 for details). The equipment is then allowed to cool to ambient temperature and a further performance test is carried out after the stabilization time.

10.4 Test Result

Dry Heat Thermal Test Record 13.4.5.2-cycle A
Document Name: 13.4.5.2 (Dry Heat Thermal Test) Test Time: 01/12/2022 Y Axis:Temperature(°C) X Axis:Hours



Date: 2022/01/12	Temperature:22 °C	**Engineer** Jack
EUT Model/Type: TEQ 40-7212WIR	Humidity:68%	Standard: EN 50155
Voltage/Frequence:110Vdc		
Visual inspection requirement:		
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.		

Inspection item	**Result**
EUT external	OK
EUT function	OK

Dry Heat Thermal Test Record 13.4.5.3-cycle B

Document Name: 13.4.5 .3(Dry Heat Thermal Test)

Test Time: 01/13/2022

Y Axis:Temperature(°C)/ Humidity(%RH)

X Axis:Hours

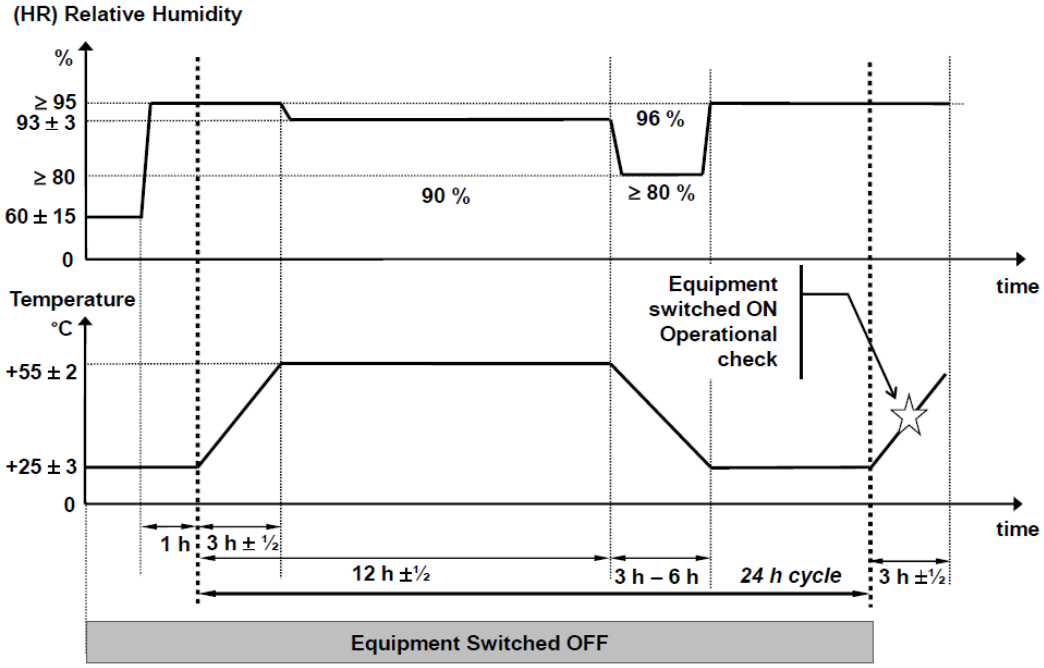
Date: 2022/01/13	Temperature:22 °C	Engineer Jack
EUT Model/Type: TEQ 40-7212WIR	Humidity:68%	Standard: EN 50155
Voltage/Frequence:110Vdc		
Visual inspection requirement:		
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.		

Inspection item	**Result**
EUT external	OK
EUT function	OK

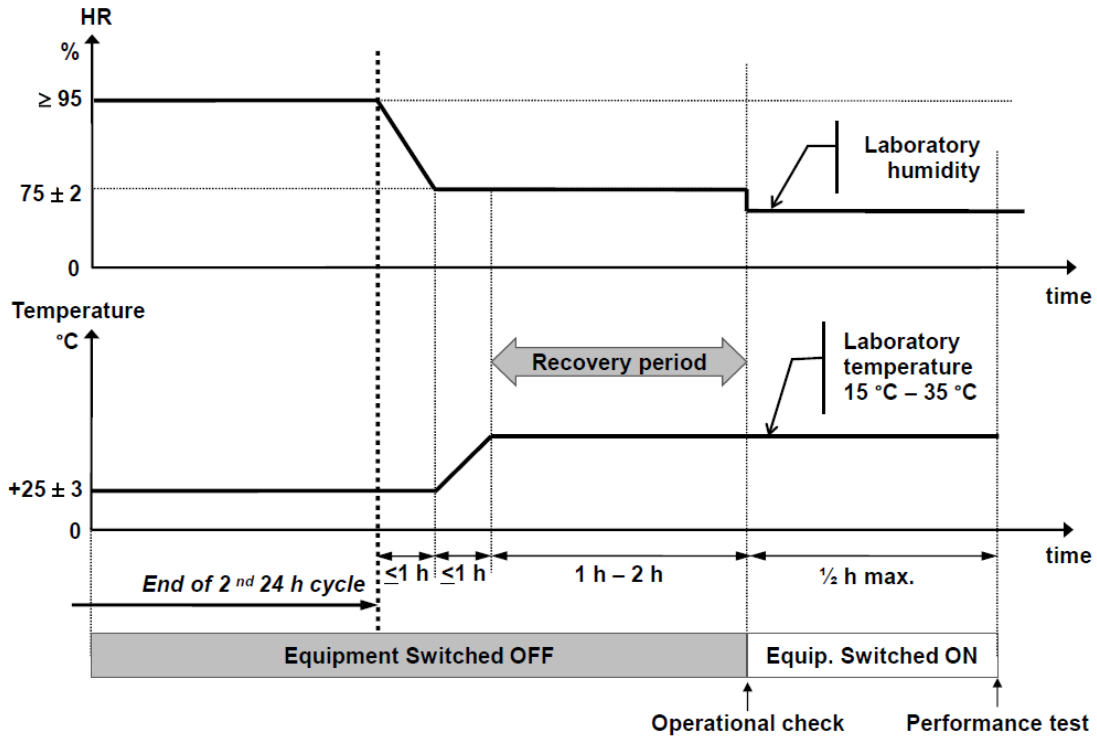
11. EN 50155 Cyclic damp heat test

11.1 Test Requirement

Cyclic damp heat test: Description of the first 24-h cycle



Cyclic damp heat test: Recovery period



11.2 Test Performance criterion

The results of all insulation and performance test (results after the first and second cycles) shall be within the specified tolerances and operation performance respectively.

Before and after the test (initial and final voltage withstand and insulation), the equipment shall work as intended and within its specified limits (performance criterion A).

11.3 Test Procedure

Return to ambient temperature is carried out under controlled recovery conditions.

Initial measurements:

A. Performance test;

B. Insulation test (voltage withstand test with the 80 % of the initial test voltage of insulation measurement test).

The results of all insulation and performance test shall be within the specified tolerances and operation performance respectively.

Intermediate measurements:

C. An operational check shall be carried out at the rise in temperature during the beginning of the 2nd cycle (during the appearance of condensation on the product at (35 ± 2) °C).

If condensation has not occurred by the beginning of the second cycle, (low thermal inertia of test piece), speed of temperature variation can be increased (but not exceed 1 °C/min, and with a maintained relative humidity).

Return to ambient temperature is carried out under controlled recovery conditions.

When the equipment is switched on an operational check is carried out.

Check and final measurements:

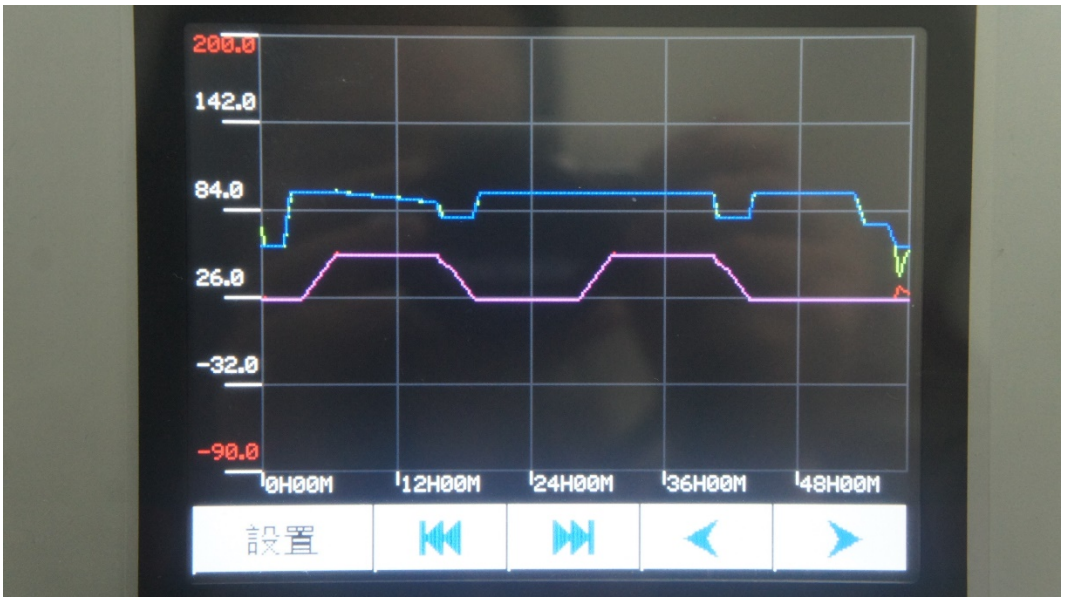
D. Performance test;

Check and measurements on dry equipment:

E. Insulation test (voltage withstand test with the 80 % of the initial test voltage of insulation measurement test).

11.4 Test Result

Cyclic Damp Heat Test Record (13.4.7)
Document Name: 13.4.7 Cyclic damp heat test Test Time: 01/22/2022 –01/25/2022 Y Axis:Temperature(°C)/ Humidity(%RH) X Axis:Hours



Date: 2022/01/25	Temperature:22 °C	Engineer Jack
EUT Model/Type: TEQ 40-7212WIR	Humidity:63%	Standard: EN 50155
Voltage/Frequence:110Vdc		
Visual inspection requirement:		
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.		

Inspection item	**Result**
EUT external	OK
EUT function	OK

Cyclic damp heat test			
Project No.	RXZ211206001	**Temperature**	22°C
Customer	TRACO ELECTRONIC AG	**Relative Humidity**	63%
EUT Name	DC/DC Converter	**ATM Pressure**	--
Model/Type	TEQ 40-7212WIR	**Test Voltage**	110 Vdc
Test Mode	--	**Test engineer**	Jack

Insulation Test Requirement before first run:

Insulation measurement Test	**Level**	**before withstand**	**after withstand**	**Test Result**	**Comments**
Primary side to secondary side	500 Vdc	>10GΩ	>10GΩ	Pass	Test 1 min.

The insulation resistance test shall be carried out at 500 Vdc and the values recorded.
The test shall then be repeated after the voltage withstand test.
There shall be no fundamental deterioration from the initial measurement.

Voltage Withstand test	**Level**	**Test Time**	**Leakage current**	**Test Result**	**Comments**
Primary side to secondary side	1500Vdc	1 min	0 mA	Pass	No flashover

500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac).
1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and 1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac).
Neither disruptive discharge nor flashover shall occur

Insulation Test Requirement after second run:					
Insulation measurement Test	**Level**	**before withstand**	**after withstand**	**Test Result**	**Comments**
Primary side to secondary side	500 Vdc	>10GΩ	>10GΩ	Pass	Test 1 min.
The insulation resistance test shall be carried out at 500 Vdc and the values recorded. The test shall then be repeated after the voltage withstand test. There shall be no fundamental deterioration from the initial measurement.					
Voltage Withstand test	**Level**	**Test Time**	**Leakage current**	**Test Result**	**Comments**
Primary side to secondary side	1500Vdc	1 min	0 mA	Pass	No flashover
500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac). 1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and 1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac). Neither disruptive discharge nor flashover shall occur					

12. EN 50121-3-2 Conducted Disturbance

12.1 Test Requirement

Requirements for conducted emissions from the mains power ports

Frequency range MHz	Coupling device	Detector Type/bandwidth	limits dB(μV)
0.15 – 0.5	AMN	Quasi Peak / 9kHz	99
0.5 – 30			93

12.2 Test System Setup

The conducted disturbances tests were performed in the conduction test site, using the setup in accordance with EN 50121-3-2 measurement procedures.

The external I/O cables were draped along the test table and bundled as required.

12.3 Test Procedure

During the conducted emissions test, the adapter was connected to the main outlet of the first LISN and the other support equipment were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions readings from the EUT.

12.4 Test Data

Main ports

Job No.:	RXZ211206001	Phase.:	Line
Standard:	limit\EN50155\EN 50155	Power:	DC 110V
Test item:	QP.csv Conduction Test	Test By:	Ray Lin
Temp.(℃)/Hum.(%RH):	23.0℃/56%		
Company:	See Ch1.1		
Model:	See Ch2.2		
Description:	Mode 1		

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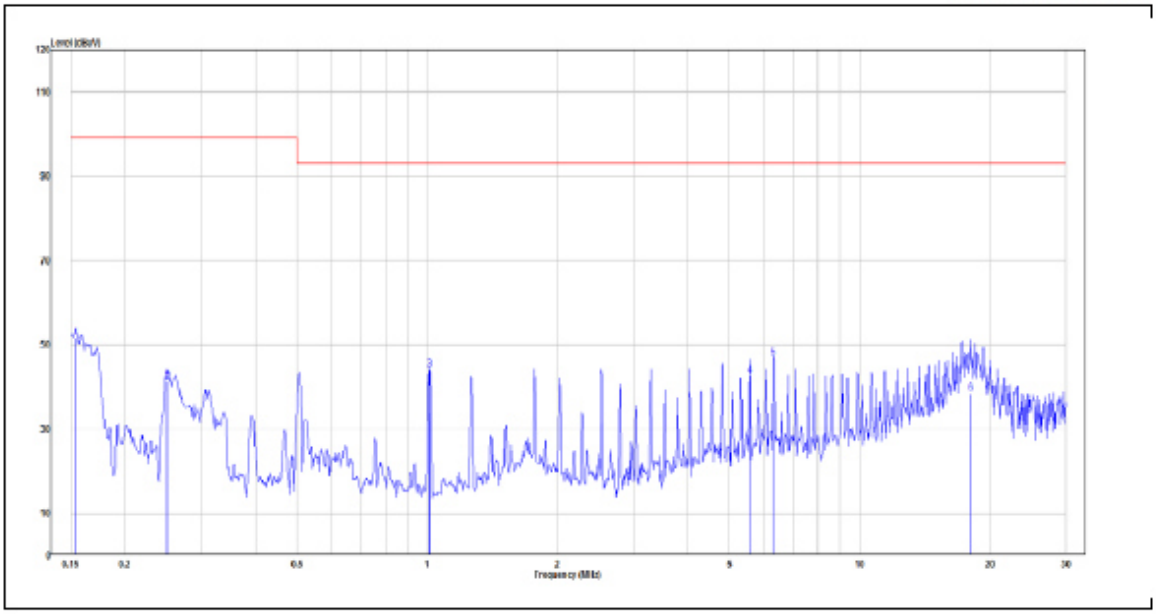

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark	Phase
1	0.154	31.95	19.59	51.54	99.00	-47.46	QP	Line
2	0.251	21.73	19.58	41.31	99.00	-57.69	QP	Line
3	1.010	24.40	19.61	44.01	93.00	-48.99	QP	Line
4	5.564	22.83	19.73	42.56	93.00	-50.44	QP	Line
5	6.319	27.15	19.74	46.90	93.00	-46.10	QP	Line
6	18.039	18.55	19.87	38.42	93.00	-54.58	QP	Line

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	**RXZ211206001**	**Phase.:**	**Neutral**
Standard:	**limit\EN50155\EN 50155 QP.csv**	**Power:**	**DC 110V**
Test item:	**Conduction Test**	**Test By:**	**Ray Lin**
Temp.(℃)/Hum.(%RH):	**23.0℃ / 56%**		
Company:	**See Ch1.1**		
Model:	**See Ch2.2**		
Description:	**Mode 1**		

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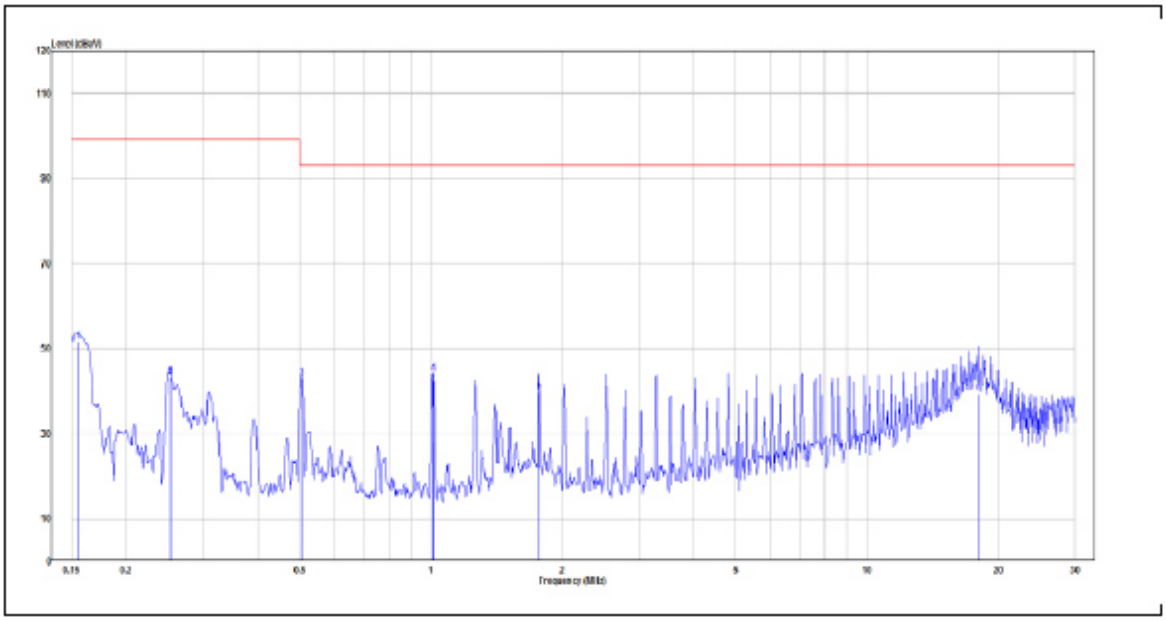

No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)		
1	0.156	31.91	19.59	51.50	99.00	-47.50	QP	Neutral
2	0.252	23.76	19.58	43.34	99.00	-55.66	QP	Neutral
3	0.505	23.38	19.59	42.97	93.00	-50.03	QP	Neutral
4	1.010	24.37	19.60	43.97	93.00	-49.03	QP	Neutral
5	1.772	20.21	19.63	39.84	93.00	-53.16	QP	Neutral
6	17.944	19.47	19.89	39.36	93.00	-53.64	QP	Neutral

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	RXZ211206001	Phase.:	Line
Standard:	limit\EN50155\EN 50155	Power:	DC 110V
Test item:	QP.csv Conduction Test	Test By:	Ray Lin
Temp.(℃)/Hum.(%RH):	22.8℃/57%		
Company:	See Ch1.1		
Model:	See Ch2.2		
Description:	Mode 2		

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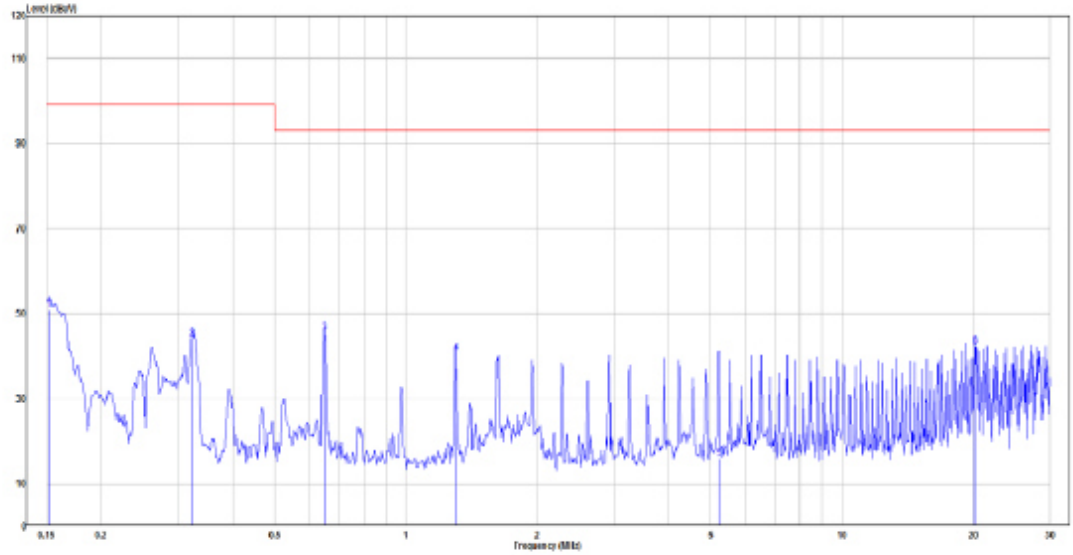

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark	Phase
1	0.152	31.34	19.59	50.94	99.00	-48.06	QP	Line
2	0.323	24.54	19.58	44.12	99.00	-54.88	QP	Line
3	0.651	25.96	19.60	45.55	93.00	-47.45	QP	Line
4	1.303	21.25	19.62	40.87	93.00	-52.13	QP	Line
5	5.221	-3.86	19.72	15.86	93.00	-77.14	QP	Line
6	20.162	22.44	19.88	42.32	93.00	-50.68	QP	Line

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	**RXZ211206001**	**Phase.:**	**Neutral**
Standard:	**limit\EN50155\EN 50155 QP.csv**	**Power:**	**DC 110V**
Test item:	**Conduction Test**	**Test By:**	**Ray Lin**
Temp.(℃)/Hum.(%RH):	**22.8℃/57%**		
Company:	**See Ch1.1**		
Model:	**See Ch2.2**		
Description:	**Mode 2**		

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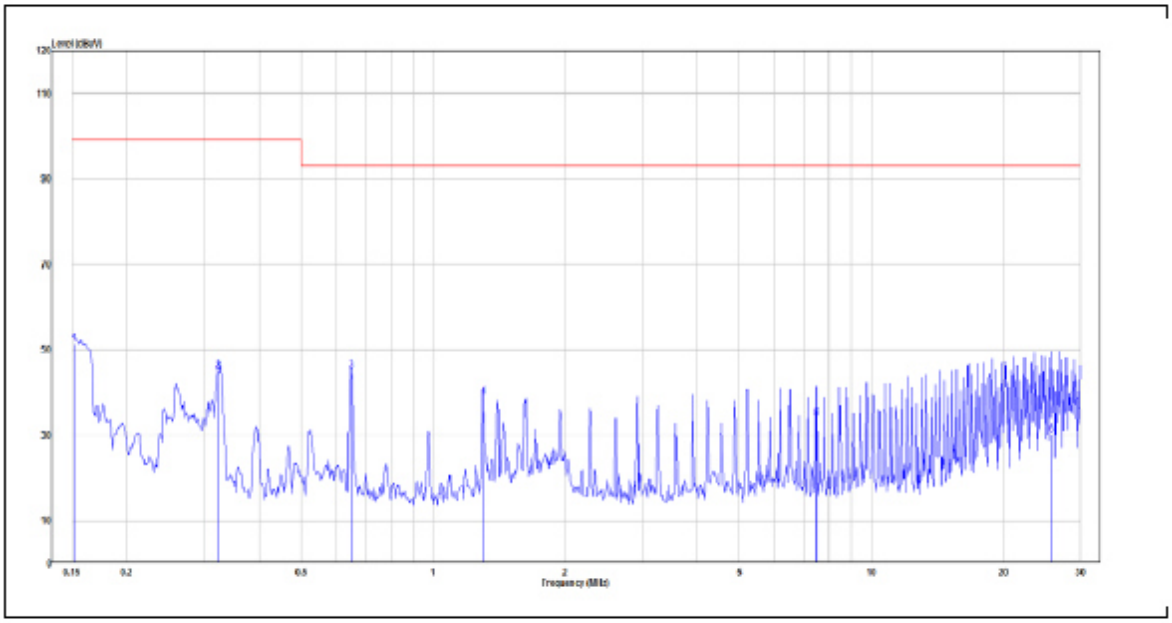


No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)		
1	0.152	31.68	19.59	51.28	99.00	-47.72	QP	Neutral
2	0.323	25.53	19.58	45.11	99.00	-53.89	QP	Neutral
3	0.651	25.47	19.59	45.07	93.00	-47.93	QP	Neutral
4	1.303	19.46	19.61	39.07	93.00	-53.93	QP	Neutral
5	7.486	14.16	19.76	33.92	93.00	-59.08	QP	Neutral
6	25.727	10.03	19.98	30.01	93.00	-62.99	QP	Neutral

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

13. EN 50121-3-2 Radiated Emissions

13.1 Test Requirement

Requirements for radiated emission at frequencies up to 1GHz

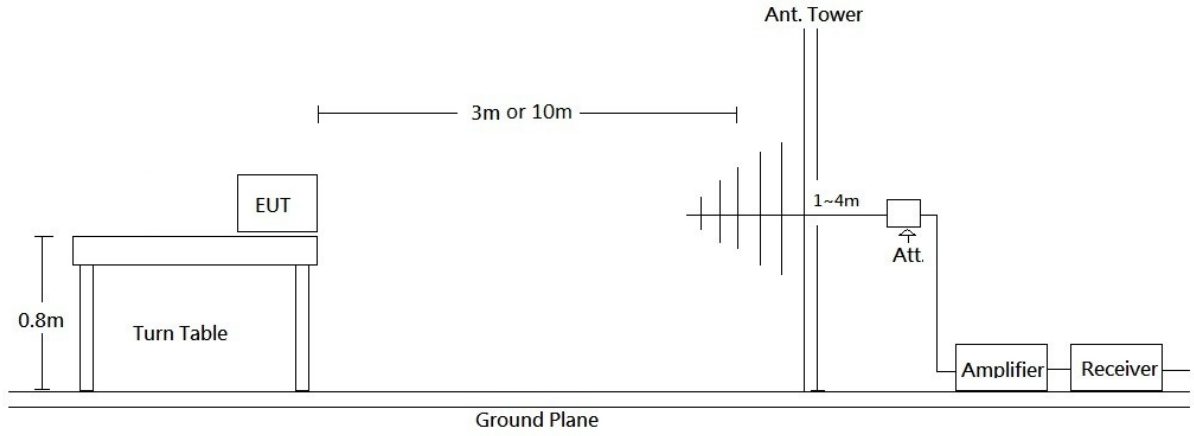
Frequency range MHz	Measurement		OATS/SAC limits dB(μV/m)
	Distance m	Detector type/ bandwidth	
30 – 230	10	Quasi Peak/ 120kHz	40
230 – 1000			47
30 – 230	3		50
230 – 1000			57

Requirements for radiated emissions at frequencies above 1GHz

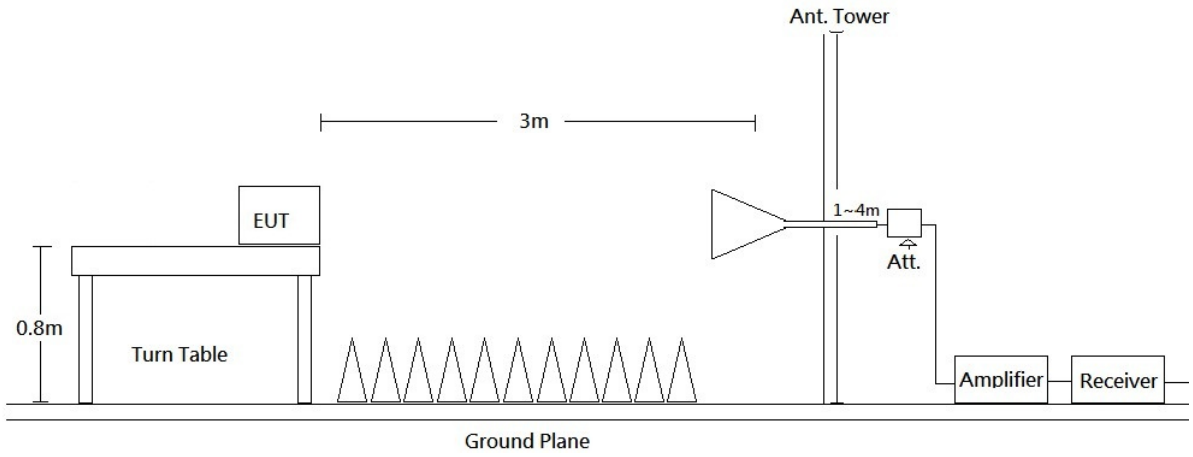
Frequency range MHz	Measurement		OATS/SAC limits dB(μV/m)
	Distance m	Detector type/ bandwidth	
1000 – 3000	3	Average/ 1MHz	56
3000 – 6000			60
1000 – 3000		Peak/ 1MHz	76
3000 – 6000			80

13.2 Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3 or 10 meters Chamber test site, above 1GHz tests were performed in the 3 meters Chamber test site, using the setup in accordance with EN 50155 measurement procedures.

The external I/O cables were draped along the test table and bundled as required.

13.3 Test Procedure

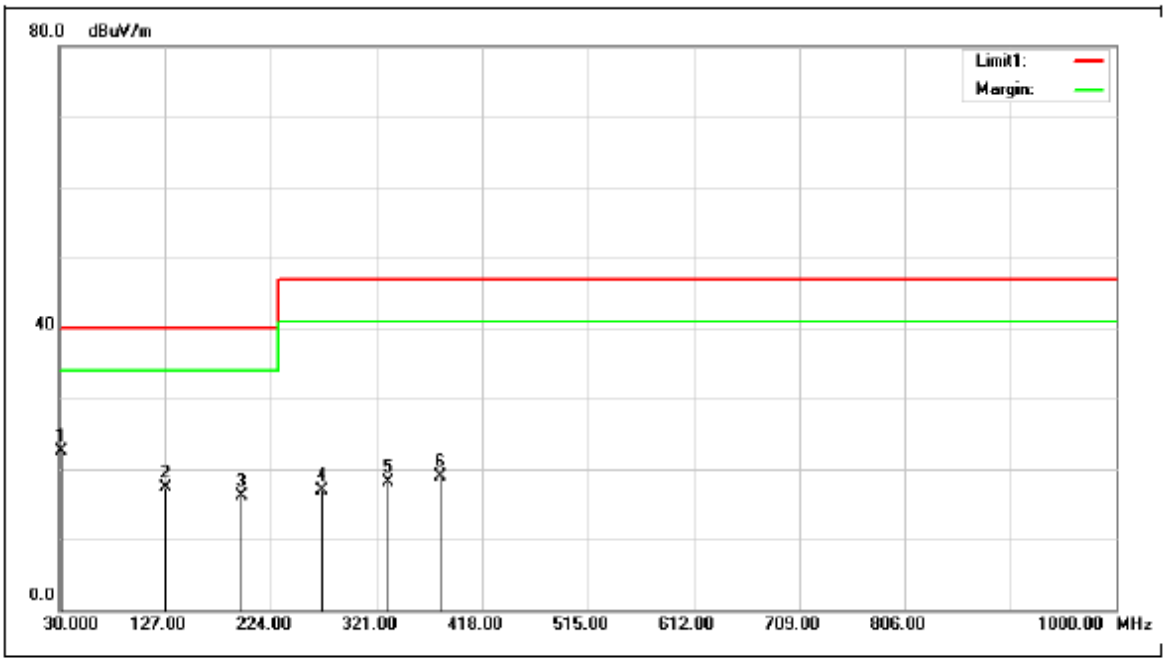
Maximizing procedure was performed on the six (6) highest emissions readings to ensure the EUT is compliant with all installation combinations.

The data was recorded in Quasi-peak detection mode for 30 MHz to 1 GHz, peak and Average detection modes for frequencies above 1 GHz.

13.4 Test Data

Below 1GHz

Job No.:	RXZ211206001	Ant.Polar.:	Horizontal
Standard:	EN 50155 10m Radiation(Below 1G)	Test Distance:	10m
Test item:	Radiation Test	Power:	DC 110V
Temp.(℃)/Hum.(%RH):	26(℃)/60%RH	Date:2021-12-14	Time:AM 10:52:50
Company:	See Ch1.1	Test By:	SYED
Model:	See Ch2.2		
Description:	Model		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	31.9400	28.91	-6.40	22.51	40.00	-17.49	400	154	QP
2	127.9700	28.60	-11.39	17.21	40.00	-22.79	400	167	QP
3	197.8100	27.65	-11.54	16.11	40.00	-23.89	400	286	QP
4	271.5300	28.12	-11.21	16.91	47.00	-30.09	400	332	QP
5	331.6700	28.17	-10.15	18.02	47.00	-28.98	400	79	QP
6	379.2000	27.82	-8.91	18.91	47.00	-28.09	212	359	QP

Note:

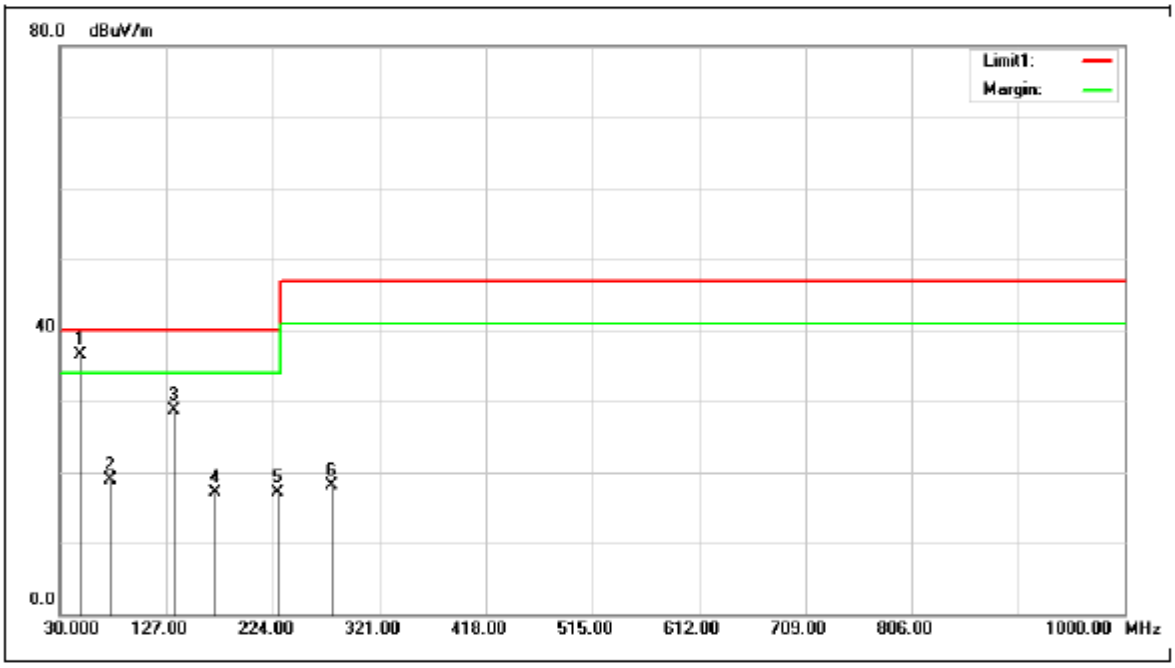
Result = Reading + Correct Factor

Margin = Result –Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Below 1GHz

Job No.:	RXZ211206001	Ant.Polar.:	Vertical
Standard:	EN 50155 10m Radiation(Below 1G)	Test Distance:	10m
Test item:	Radiation Test	Power:	DC 110V
Temp.(℃)/Hum.(%RH):	26(℃)/60%RH	Date:2021-12-14	Time:AM 10:52:50
Company:	See Ch1.1	Test By:	SYED
Model:	See Ch2.2		
Description:	Model		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	48.4300	53.49	-16.92	36.57	40.00	-3.43	100	0	QP
2	75.5900	35.82	-16.99	18.83	40.00	-21.17	100	254	QP
3	133.7900	39.88	-11.11	28.77	40.00	-11.23	100	241	QP
4	171.6200	29.74	-12.54	17.20	40.00	-22.80	100	152	QP
5	227.8800	30.07	-13.02	17.05	40.00	-22.95	100	105	QP
6	277.3500	28.83	-10.73	18.10	47.00	-28.90	100	150	QP

Note:

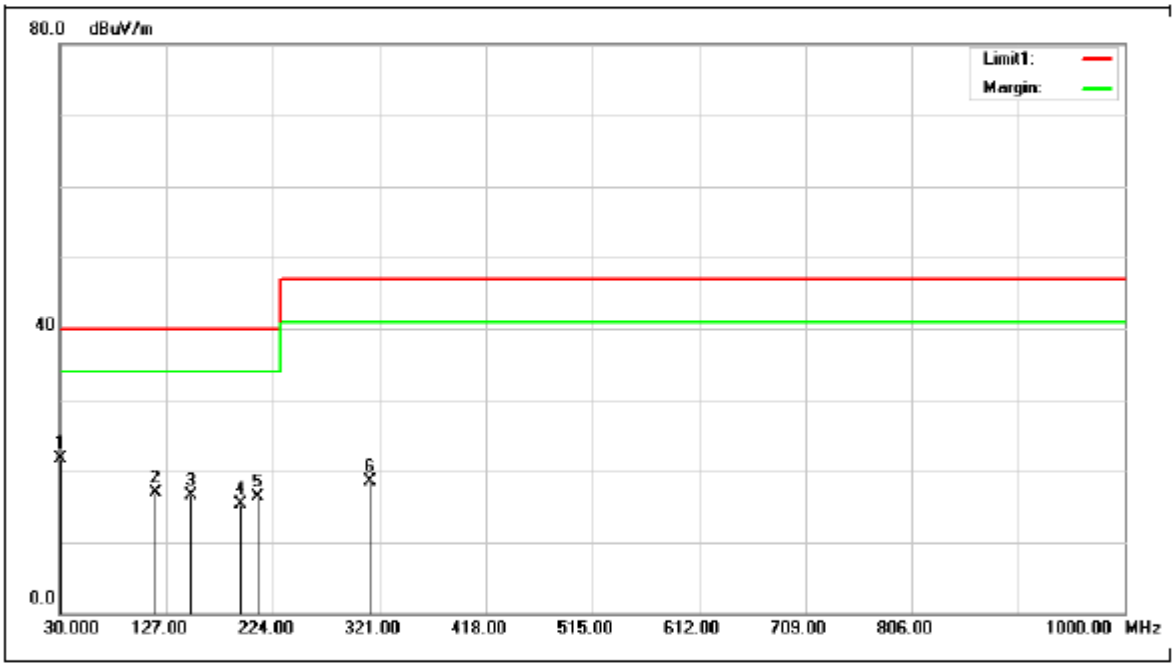
Result = Reading + Correct Factor

Margin = Result –Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Below 1GHz

Job No.:	RXZ211206001	Ant.Polar.:	Horizontal
Standard:	EN 50155 10m Radiation(Below 1G)	Test Distance:	10m
Test item:	Radiation Test	Power:	DC 110V
Temp.(℃)/Hum.(%RH):	26(℃)/60%RH	Date:2021-12-14	Time:AM 10:36:40
Company:	See Ch1.1	Test By:	SYED
Model:	See Ch2.2		
Description:	Mode2		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	30.9700	27.84	-6.19	21.65	40.00	-18.35	399	241	QP
2	117.3000	28.37	-11.48	16.89	40.00	-23.11	399	316	QP
3	149.3100	29.06	-12.48	16.58	40.00	-23.42	399	226	QP
4	194.9000	27.66	-12.27	15.39	40.00	-24.61	165	359	QP
5	210.4200	30.45	-14.19	16.26	40.00	-23.74	399	235	QP
6	312.2700	28.92	-10.48	18.44	47.00	-28.56	399	245	QP

Note:

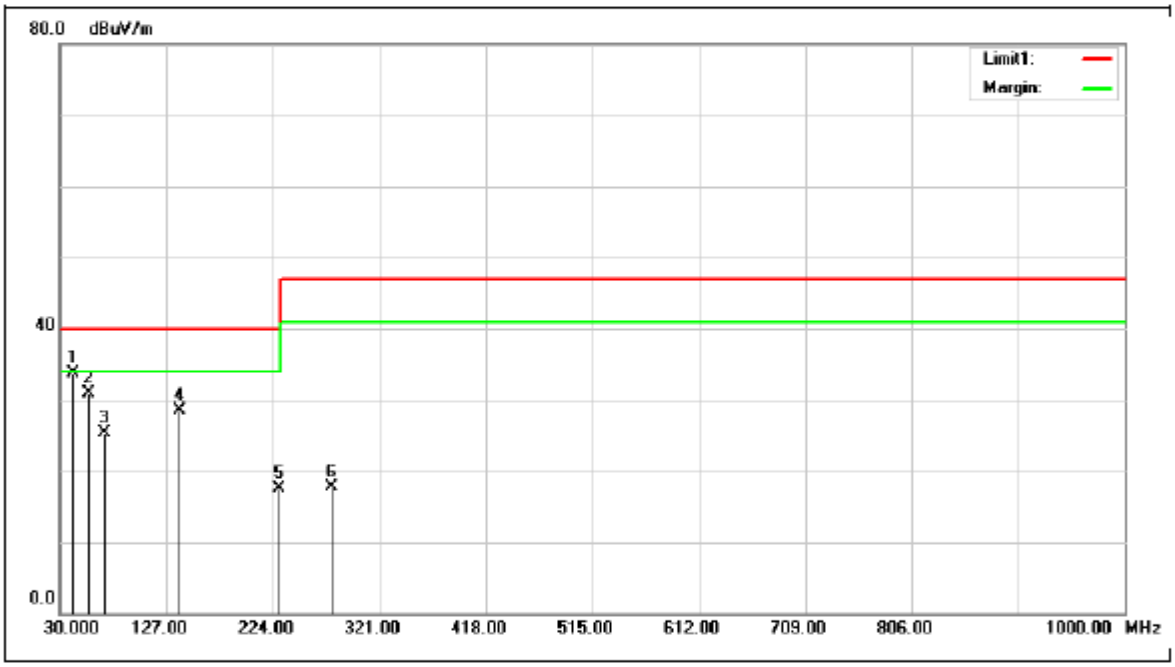
Result = Reading + Correct Factor

Margin = Result –Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Below 1GHz

Job No.:	**RXZ211206001**	**Ant.Polar.:**	**Vertical**
Standard:	**EN 50155 10m Radiation(Below 1G)**	**Test Distance:**	**10m**
Test item:	**Radiation Test**	**Power:**	**DC 110V**
Temp.(℃)/Hum.(%RH):	**26(℃)/60%RH**	**Date:2021-12-14**	**Time:AM 10:36:39**
Company:	**See Ch1.1**	**Test By:**	**SYED**
Model:	**See Ch2.2**		
Description:	**Mode2**		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	42.6100	47.04	-13.35	33.69	40.00	-6.31	359	359	QP
2	56.1900	48.82	-17.94	30.88	40.00	-9.12	100	91	QP
3	70.7400	42.24	-17.01	25.23	40.00	-14.77	399	90	QP
4	138.6400	39.66	-11.20	28.46	40.00	-11.54	100	43	QP
5	229.8200	30.48	-12.97	17.51	40.00	-22.49	399	238	QP
6	277.3500	28.52	-10.73	17.79	47.00	-29.21	100	170	QP

Note:

Result = Reading + Correct Factor

Margin = Result –Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

14. EN 50121-3-2 Electrostatic Discharge

14.1 Test Requirement

Enclosure port

Contact discharge	Air discharge	Performance criterion
Test voltage (kV)	Test voltage (kV)	
±2	±2	B
±4	±4	B
±6	±8	B

14.2 Electrostatic Discharge Test System

The TESEQ ESD Gun used for testing, is capable of applying Electrostatic Discharges in both contact discharge modes from 2 kV to 6 kV and air discharge modes from 2 kV to 8 kV in both positive and negative polarities, in accordance with EN 61000-4-2 testing standard and methods.

14.3 Test Procedure

The test procedure shall in accordance with EN 61000-4-2. Electrostatic discharges shall be applied only to point and surfaces of the EUT which are expected to be touched during normal operation, including user access operations specified in the user manual, for example cleaning or adding consumables when the EUC is powered. The application of discharges to the contacts of open connectors is not required.

When applying direct discharges to a portable or handheld battery-powered EUT with a display screen, it may not be possible to observe the screen for a given EUT orientation. If observation of the screen is necessary during this, the EUT may be mounted vertically using non-metallic supports.

14.4 Application of Electrostatic Discharges

The test was conducted in the following order: Direct Contact Discharge, Air Discharge, Indirect Contact Horizontal Coupling Plane Discharge, and Indirect Contact Vertical Coupling Plane Discharge. The Electrostatic Discharge test levels were set and discharged appropriately. The Electrostatic Discharges are applied to the conductive surface of the EUT, and along all seams and control surfaces on the EUT. When a discharge occurs and an error is caused, the type of error, discharge level and location is recorded.

14.5 Test Data

EN 61000-4-2 ESD Test Record

Standard	EN 50155			
Customer	See Ch1.1	Project No.		RXZ211206001
EUT Name	See Ch1.1	Test Mode		MODE 1
Model/Type	See Ch2.2	Test Voltage		110Vdc
Test Date	2021/12/23			
Temperature	21.1 ℃	Contact	Discharge	Test Points + 10 Times / - 10 Times
Relative Humidity	46 %	Air		Test Points + 10 Times / - 10 Times
ATM Pressure	100.4 kPa	HCP		Test Points + 10 Times / - 10 Times
Engineer	Ivan	VCP		Test Points + 10 Times / - 10 Times

Table 1: Electrostatic Discharge (Air Discharge)

Air Discharge										
Test Level	2 kV		4 kV		8 kV		15 kV		Perform Criterion	B
Location	+	-	+	-	+	-	+	-	Observation	
1	A	A	A	A	A	A	■	■		
2	A	A	A	A	A	A	■	■		
3	A	A	A	A	A	A	■	■		
4	A	A	A	A	A	A	■	■		
Result	A								Judgment	PASS

Table 2: Electrostatic Discharge (Contact Discharge)

Contact Discharge										
Test Level	2 kV		4 kV		6 kV		8 kV		Perform Criterion	B
Location	+	-	+	-	+	-	+	-	Observation	
1	A	A	A	A	A	A	■	■		
2	A	A	A	A	A	A	■	■		
3	A	A	A	A	A	A	■	■		
4	A	A	A	A	A	A	■	■		
5	A	A	A	A	A	A	■	■		
Result	A								Judgment	PASS

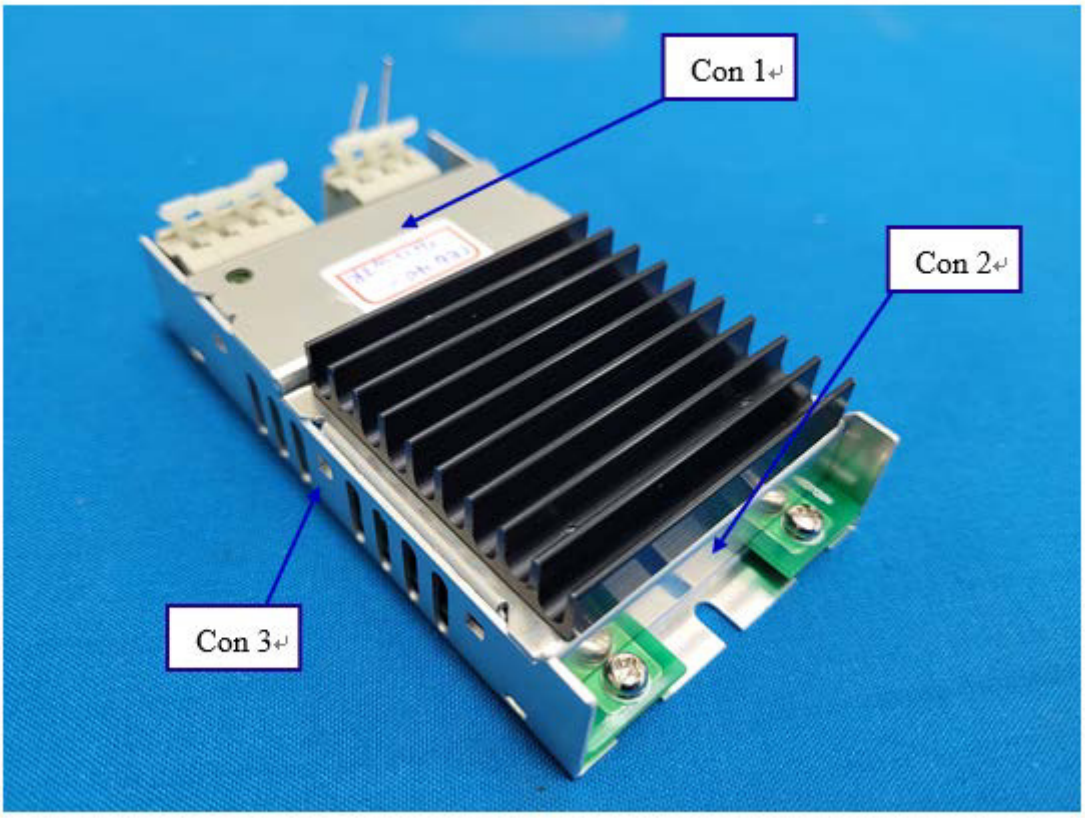
Table 3: Electrostatic Discharge (Indirect Contact HCP)

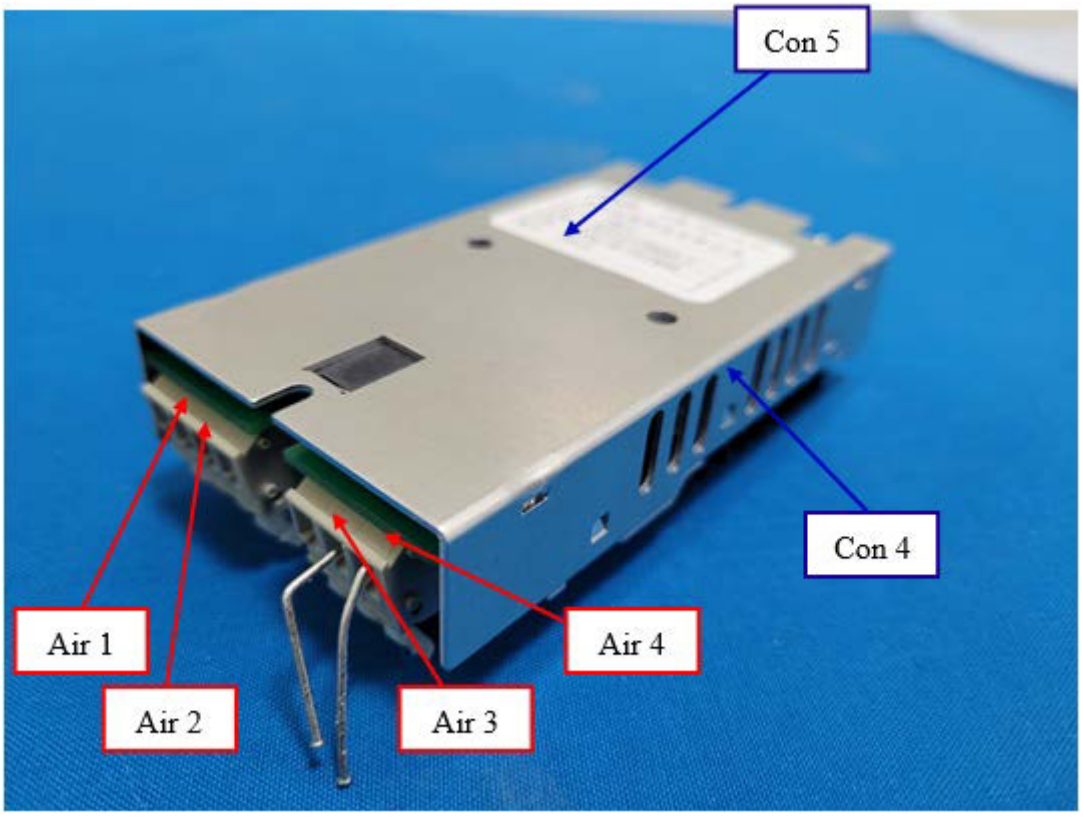
HCP Discharge										
Test Level	**2 kV**		**4 kV**		**6 kV**		**8 kV**		**Perform Criterion**	**B**
Location	**+**	**-**	**+**	**-**	**+**	**-**	**+**	**-**	**Observation**	
Front	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Back	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Left	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Right	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Result	**A**								**Judgment**	**PASS**

Table 4: Electrostatic Discharge (Indirect Contact VCP)

VCP Discharge										
Test Level	**2 kV**		**4 kV**		**6 kV**		**8 kV**		**Perform Criterion**	**B**
Location	**+**	**-**	**+**	**-**	**+**	**-**	**+**	**-**	**Observation**	
Front	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Back	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Left	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Right	**A**	**A**	**A**	**A**	**A**	**A**	■	■		
Result	**A**								**Judgment**	**PASS**

Test Points please see arrows of below photo.





EN 50121-3-2 Continuous Radiated Disturbances

14.6 Test Requirement

Enclosure port

Frequency (MHz)	Frequency Step	Test field strength (V/m)	Modulation	Dwell times (s)	Performance criterion
80 to 1000	1%	20	AM 80% 1kHz	3	A
1400 to 2000	1%	10	AM 80% 1kHz	3	A
2000 to 2700	1%	5	AM 80% 1kHz	3	A
5100 to 6000	1%	3	AM 80% 1kHz	3	A

14.7 Continuous Radiated Disturbances Test System

KEYSIGHT signal generator and 500W power amplifier are used to provide a signal at the appropriate power and frequency to a bi-conical antenna to obtain the required electromagnetic field at the position of the EUT in accordance with the EN 61000-4-3 EMC standard and methods.

14.8 Application of Continuous Radiated Disturbances

The electromagnetic field is established at the front edge of the EUT. The test is performed with the most susceptible side of the EUT facing the field-generating antenna. If an error is detected, the field is reduced until the error is not repeatable; the field is then manually increased until the error begins to occur. At this threshold level, the frequency and error created are noted before continuing the scan.

14.9 Test Data

EN 61000-4-3 RS Test Record

Standard	EN 50155		
Customer	See Ch1.1	Project No.	RXZ211206001
EUT Name	See Ch1.1	Test Mode	MODE 1
Model/Type	See Ch2.2	Test Voltage	110Vdc
Test Date	2022/01/07	Freq. Step	1 %
Temperature	20.3 ℃	Dwell Time:	3 Sec
Relative Humidity	68 %	Modulated	1 kHz, AM 80%
Engineer	Joy Huang		

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	V	20V/m	80 to 1000	A	N/A
90°	V	20V/m	80 to 1000	A	N/A
180°	V	20V/m	80 to 1000	A	N/A
270°	V	20V/m	80 to 1000	A	N/A
Perform Criterion		A	Judgment	PASS	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	V	10V/m	1400 to 2000	A	N/A
90°	V	10V/m	1400 to 2000	A	N/A
180°	V	10V/m	1400 to 2000	A	N/A
270°	V	10V/m	1400 to 2000	A	N/A
Perform Criterion		A	Judgment	PASS	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**V**	5V/m	2000 to 2700	**A**	**N/A**
90°	**V**	5V/m	2000 to 2700	**A**	**N/A**
180°	**V**	5V/m	2000 to 2700	**A**	**N/A**
270°	**V**	5V/m	2000 to 2700	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**V**	3V/m	5100 to 6000	**A**	**N/A**
90°	**V**	3V/m	5100 to 6000	**A**	**N/A**
180°	**V**	3V/m	5100 to 6000	**A**	**N/A**
270°	**V**	3V/m	5100 to 6000	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**H**	20V/m	80 to 1000	**A**	**N/A**
90°	**H**	20V/m	80 to 1000	**A**	**N/A**
180°	**H**	20V/m	80 to 1000	**A**	**N/A**
270°	**H**	20V/m	80 to 1000	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**H**	10V/m	1400 to 2000	**A**	**N/A**
90°	**H**	10V/m	1400 to 2000	**A**	**N/A**
180°	**H**	10V/m	1400 to 2000	**A**	**N/A**
270°	**H**	10V/m	1400 to 2000	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**H**	5V/m	2000 to 2700	**A**	**N/A**
90°	**H**	5V/m	2000 to 2700	**A**	**N/A**
180°	**H**	5V/m	2000 to 2700	**A**	**N/A**
270°	**H**	5V/m	2000 to 2700	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

Position	Antenna Position	Field Strength	Frequency(MHz)	Result	Observation
0°	**H**	3V/m	5100 to 6000	**A**	**N/A**
90°	**H**	3V/m	5100 to 6000	**A**	**N/A**
180°	**H**	3V/m	5100 to 6000	**A**	**N/A**
270°	**H**	3V/m	5100 to 6000	**A**	**N/A**
Perform Criterion		**A**	**Judgment**	**PASS**	

15. EN 50121-3-2 Electrical Fast Transients

15.1 Test Requirement

Ports for signal lines and control lines

Environmental phenomenon	Test specification	Performance Criterion
Fast transients common mode	±2kV 5/50ns 5kHz repetition frequency	A

DC power ports

Environmental phenomenon	Test specification	Performance Criterion
Fast transients common mode	±2kV 5/50ns 5kHz repetition frequency	A

AC power ports

Environmental phenomenon	Test specification	Performance Criterion
Fast transients common mode	±2kV 5/50ns 5kHz repetition frequency	A

15.2 Electrical Fast Transients Test System

An EMTEST immunity test System is used for all testing. It is capable of applying fast transients to the power line at any phase angle with respect to the power line voltage wave form and to attached cables via a capacitive coupling clamp in accordance with the EN 61000-4-4 EMC standard and methods.

15.3 Application of Electrical Fast Transients

The EUT was arranged for Power Line Coupling with a coupling/decoupling network and for I/O Line Coupling through a capacitive clamp, where applicable. (Note: The I/O coupling test using a capacitive clamp is performed on the I/O interface cables that are longer in length than 3 meters.) A metal ground plane 2.4 meter by 2.0 meter was placed between the floor and the table and is connected to the earth by a 2.0 meter ground rod. The ground rod is connected to the test facility's electrical earth. The distance between the CDN and any other conductive surface was 50cm. The EUT was subjected to Electrical Fast Transients Tests required by EN 50155 and all levels specified in EN 61000-4-4 with a period of 60 second.

15.4 Test Data

EN 61000-4-4 EFT Test Record

Standard	EN 50155		
Customer	See Ch1.1	Project No.	RXZ211206001
EUT Name	See Ch1.1	Test Mode	MODE 1
Model/Type	See Ch2.2	Test Voltage	110Vdc
Test Date	2021/12/30	Repetition Frequency	5 kHz
Temperature	19.7 ℃		
Relative Humidity	61 %		
Engineer	Ivan		

Port	Voltage (kV)	Inject Line	Polarity	Result	Perform Criterion	B
					Observation	
Power	2	Positive	+	A	N/A	
			-	A	N/A	
Power	2	Negative	+	A	N/A	
			-	A	N/A	
Power	2	Positive and negative	+	A	N/A	
			-	A	N/A	
Result	A				Judgment	PASS

16. EN 50121-3-2 Surges

16.1 Test Requirement

DC power ports

Environmental phenomenon	Test specification	Performance criterion
Surges	±2kV (Common mode) 1.2/50μs, 42 Ω, 0,5 μF ±1kV (Differential mode) 1.2/50μs, 42 Ω, 0,5 μF	B
When the power supply is isolated from earth, an output impedance of 42 Ω (40 Ω and 2 Ω generator) and a coupling capacitance of 0,5 μF are recommended.		

AC power ports

Environmental phenomenon	Test specification	Performance criterion
Surges	±2kV (Common mode) 1.2/50μs, 42 Ω, 0,5 μF ±1kV (Differential mode) 1.2/50μs, 42 Ω, 0,5 μF	B

16.2 Surges Test System

An EMTEST immunity test System is used for all testing.

16.3 Application of Surges

The EUT was setup in accordance with the setup described in EN 61000-4-5 and the test was performed according to the procedures described in the standard.

16.4 Test Data

EN 61000-4-5 Surge Test Record

Standard	EN 50155		
Customer	See Ch1.1	Project No.	RXZ211206001
EUT Name	See Ch1.1	Test Mode	MODE 1
Model/Type	See Ch2.2	Test Voltage	110Vdc
Test Date	2021/12/30	Inject Line	L – N
Temperature	19.7 ℃		
Relative Humidity	61 %		
Engineer	Ivan Hsieh		

Port	Polarity	Inject Line	Pulse Position (degree)	Voltage (kV)				Perform Criterion	B
				0.5	1	2	4	Observation	
Power	+	L – N	N/A	A	A	■	■	N/A	
	–		N/A	A	A	■	■	N/A	
Result			A					Judgment	PASS

17. EN 50121-3-2 Continuous Conducted Disturbance

17.1 Test Requirement

Signal ports and telecommunication ports

Frequency (MHz)	Frequency Step	Test field strength (V)	Modulation	Dwell times (s)	Performance criterion
0.15 to 80	1%	10	AM 80% 1kHz	3	A

DC power port

Frequency (MHz)	Frequency Step	Test field strength (V)	Modulation	Dwell times (s)	Performance criterion
0.15 to 80	1%	10	AM 80% 1kHz	3	A

AC power port

Frequency (MHz)	Frequency Step	Test field strength (V)	Modulation	Dwell times (s)	Performance criterion
0.15 to 80	1%	10	AM 80% 1kHz	3	A

17.2 Continuous Conducted Disturbance Test

HP 8648C signal generator and a SPANAWAVE PAS-00023-25 power amplifier was used to perform the test.

17.3 Application of Continuous Conducted Disturbance

The EUT was setup according to the EN 61000-4-6 and the test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF input ports of the coupling devices are terminated by a 50Ω load resistor. When a CDN is not applicable the injection method should be used and a monitor probe is used to monitor the current injected.

17.4 Test Data

EN 61000-4-6 CS Test Record

Standard	EN 50155		
Customer	See Ch1.1	Project No.	RXZ211206001
EUT Name	See Ch1.1	Test Mode	MODE 1
Model/Type	See Ch2.2	Test Voltage	110Vdc
Test Date	2022/01/07	Freq. Step	1 %
Temperature	20.1 ℃	Dwell Time:	3 Sec
Relative Humidity	68 %	Modulated	1 kHz, AM 80%
Engineer	Joy Huang		

Coupling Cable	Coupling Device	Field Strength	Frequency Range (MHz)	Perform Criterion	Result	Observation
Power	CDN M2	10 V	0.15 - 80	A	A	N/A
Result	A			Judgment		PASS

18. EN 50121-3-2 Power Frequency Magnetic Fields

18.1 Applicable Standard

The preferential range of test levels, respectively for continuous and short duration application of the magnetic field, applicable to distribution networks at 50 Hz and 60 Hz. The magnetic field strength is expressed in A/m; 1 A/m corresponds to a free space induction of 1.26 μT.

Test levels for continuous field

Magnetic field strength (A/m)	Performance criterion
100	A
1000	A

18.2 Power Frequency Magnetic Field Test

The test level as described in EN 61000-4-8 titled "Table 1 – Test Levels for continuous field" was chosen. A single turn induction coil of 1 m x 1 m in size was used to generate the magnetic field.
The EUT was subjected to the Power Frequency Magnetic Field Test required by all levels specified in standard. During testing a minimum 1 minutes dwell time was used for each orientation

18.3 Application of Magnetic Field

The EUT was setup according to the EN 61000-4-8 and the test shall be done as the procedure described in the standard.

18.4 Test Data

EN 61000-4-8 Power Magnetic Test Record

Standard	EN 50155		
Customer	See Ch1.1	Project No.	RXZ211206001
EUT Name	See Ch1.1	Test Mode	MODE 1
Model/Type	See Ch2.2	Test Voltage	110Vdc
Test Date	2021/12/30		
Temperature	19.7 ℃		
Relative Humidity	62 %		
Engineer	Ivan		

Axis	Strength(A/m)	Frequency(Hz)	Duration(s)	Perform Criterion	Result	Judgment
X	100	50	60	A	A	PASS
Y	100	50	60	A	A	PASS
Z	100	50	60	A	A	PASS
X	1000	50	1	A	A	PASS
Y	1000	50	1	A	A	PASS
Z	1000	50	1	A	A	PASS
X	100	60	60	A	A	PASS
Y	100	60	60	A	A	PASS
Z	100	60	60	A	A	PASS
X	1000	60	1	A	A	PASS
Y	1000	60	1	A	A	PASS
Z	1000	60	1	A	A	PASS
Remark						

19. EN 50155 Vibration and Shock test

19.1 Test Requirement

Functional random Vibration Test

	Category	Orientation	RMS m/s2
☐	1 Class A Body mounted	Vertical Transverse Longitudinal	0.750 0.370 0.500
☒	1 Class B Body mounted	Vertical Transverse Longitudinal	1.01 0.450 0.700
☐	2 Bogie mounted	Vertical Transverse Longitudinal	5.40 4.70 2.50
☐	3 Axle mounted	Vertical Transverse Longitudinal	38.0 34.0 17.0

Simulated long-life testing at increased random vibration levels

	Category	Orientation	RMS 5 h test period m/s2
☐	1 Class A Body mounted	Vertical Transverse Longitudinal	4.25 2.09 2.83
☒	1 Class B Body mounted	Vertical Transverse Longitudinal	5.72 2.55 3.96
☐	2 Bogie mounted	Vertical Transverse Longitudinal	30.6 26.6 14.2
☐	3 Axle mounted	Vertical Transverse Longitudinal	144 129 64.3

Shock testing conditions

	Category	Orientation	**Peak acceleration** A m/s^2	**Nominal duration** D ms
☒	1 Class A and class B Body mounted	Vertical Transverse Longitudinal	30 30 50	30 30 30
☐	2 Bogie mounted	All	300	18
☐	3 Axle mounted	All	1 000	6

19.2 Test Performance criterion

The results of all insulation and performance test (results after the first and second cycles) shall be within the specified tolerances and operation performance respectively.

Before and after the test (initial and final voltage withstand and insulation), the equipment shall work as intended and within its specified limits (performance criterion A).

19.3 Test Procedure

The complete cubicle or rack together with its auxiliaries and mounting arrangements (including its shock-absorbing devices if the equipment is designed for mounting on such devices) shall be subjected to the tests indicated in EN 61373.

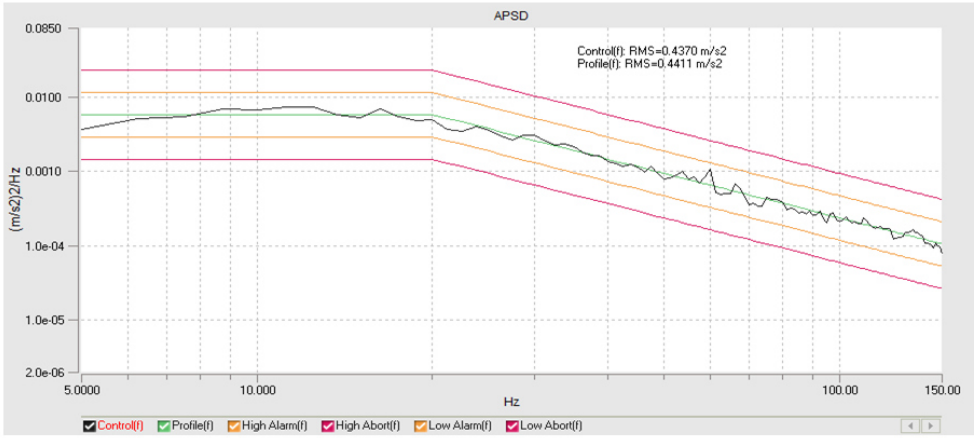
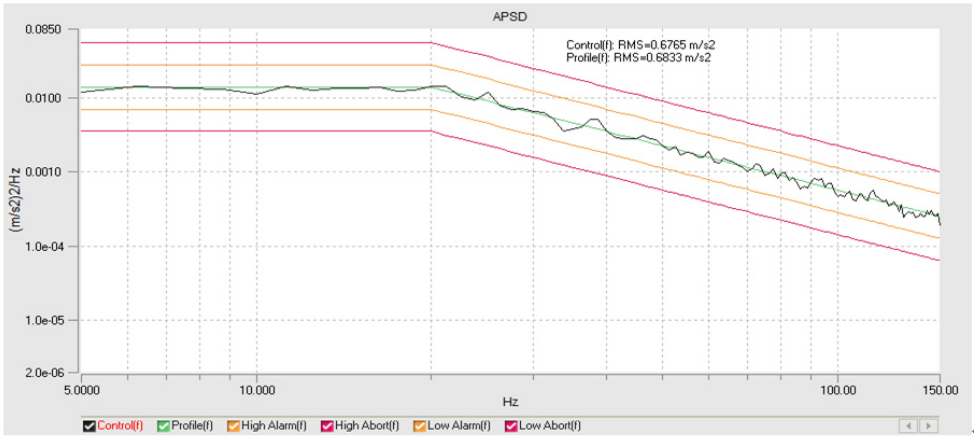
During the simulated long life testing the equipment shall not be operating; during the other tests the equipment shall be functional and its performance shall be monitored.

19.4 Test Result

Date: 2022/01/18~01/21	Temperature:22 °C	**Engineer** Jack
EUT Model/Type: TEQ 40-7212WIR	Humidity:61%	Standard: EN 50155
Voltage/Frequence:110Vdc		
Visual inspection requirement:		
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.		

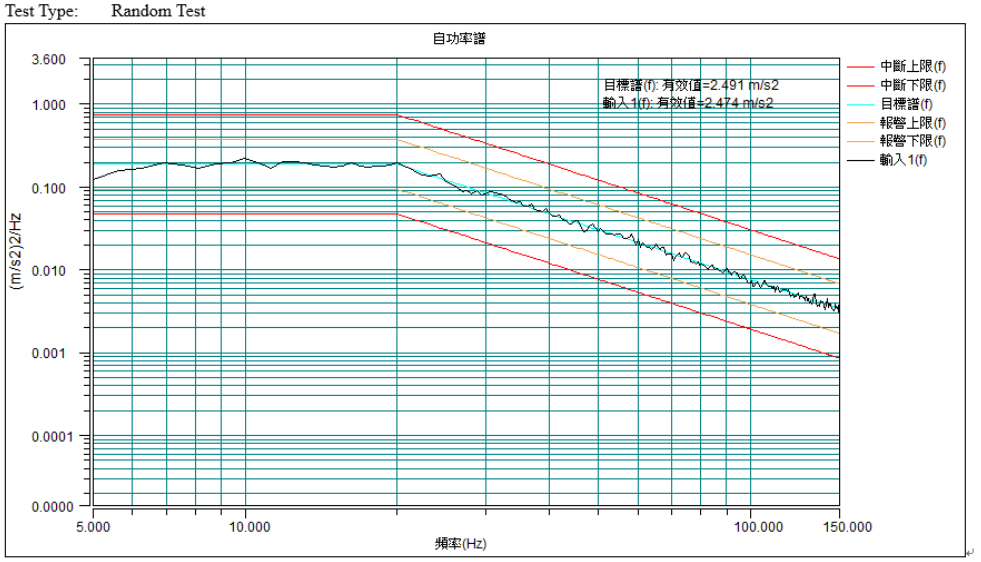
Inspection item	**Result**
EUT external	OK
EUT function	OK

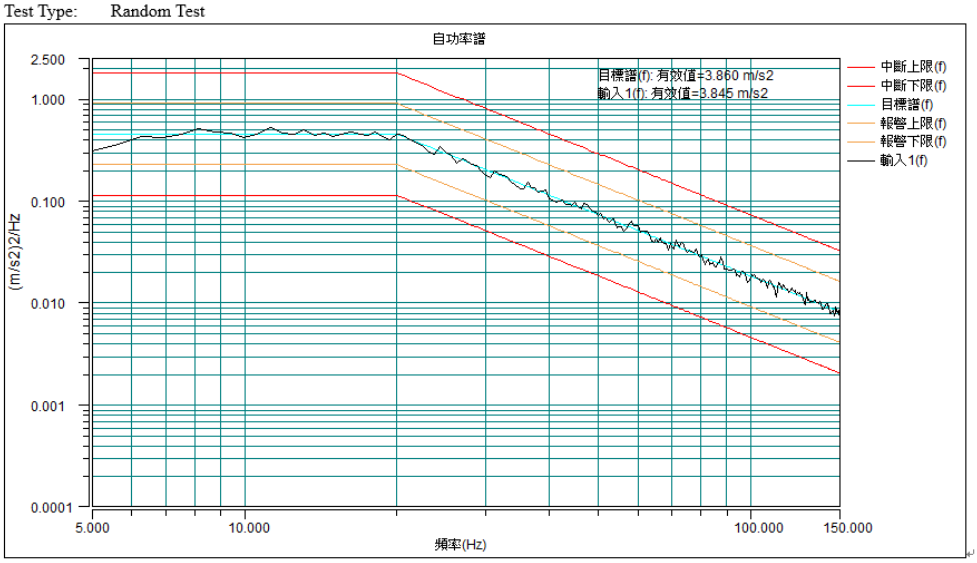
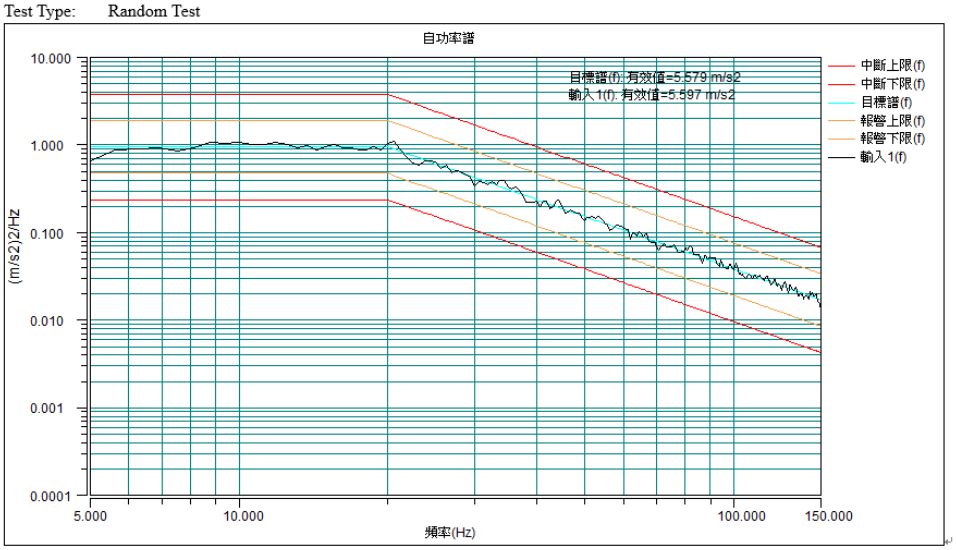
Functional random Vibration Test (Test Profile:)

X Axis Transverse	Test Name: functional random-vertical.ucn Object name: Object Type: Test Type: Random Test Project Name: functional random-Trasverse.ucn  Current Level: 100.00 % Demand RMS: 0.441 m/s2 Control RMS: 0.437 m/s2 Frame Time: 0.8000 (s) Lines: 200 dF: 1.3 Hz DOF: 120 Current Level Time: 00:10:00 Remaining Time:00:00:00 Record saved Time: 2022-1-19 AM 09:23:56 Report time: 2022-1-19 AM 09:23:57
Y Axis Longitudinal	Test Name: functional random- Longitudinal.ucn Object name: Object Type: Test Type: Random Test Project Name: functional random-Longitudinal.ucn  Current Level: 100.00 % Demand RMS: 0.683 m/s2 Control RMS: 0.676 m/s2 Frame Time: 0.8000 (s) Lines: 200 dF: 1.3 Hz DOF: 120 Current Level Time: 00:10:00 Remaining Time:00:00:00 Record saved Time: 2022-1-19 PM 03:09:52 Report time: 2022-1-19 PM 03:09:52

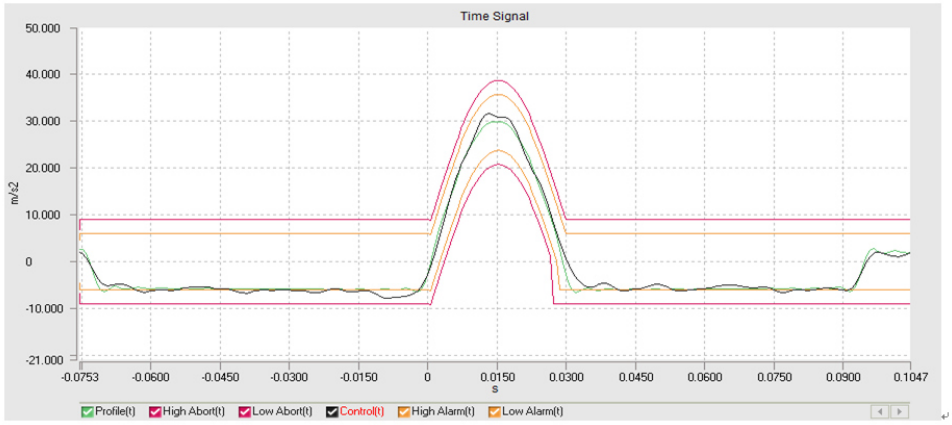
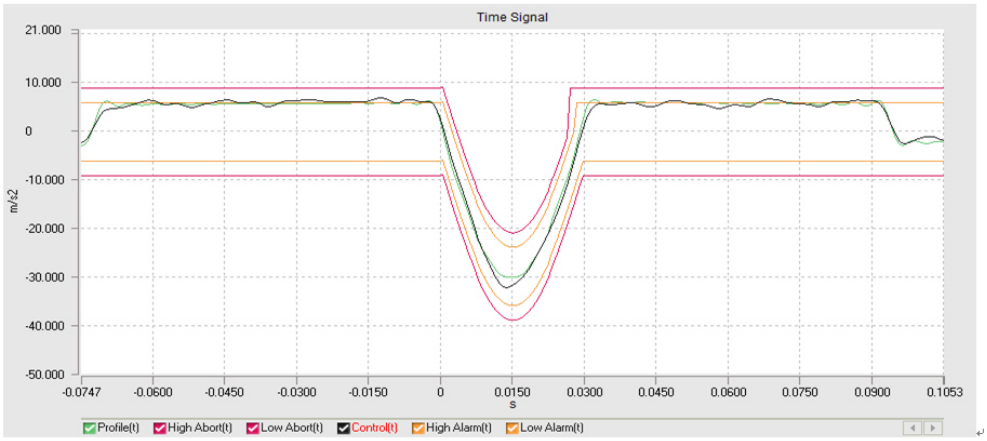
Z Axis/ Vertical	Test Name: functional random-vertical.ucn Object name: Object Type: Test Type: Random Test Project Name: functional random-vertical.ucn  Current Level: 100.00 % Demand RMS: 0.988 m/s2 Control RMS: 0.987 m/s2 Frame Time: 0.8000 (s) Lines: 200 dF: 1.3 Hz DOF: 120 Current Level Time: 00:10:00 Remaining Time: 00:00:00 Record saved Time: 2022-1-18 PM 01:30:41 Report time: 2022-1-18 PM 01:30:42

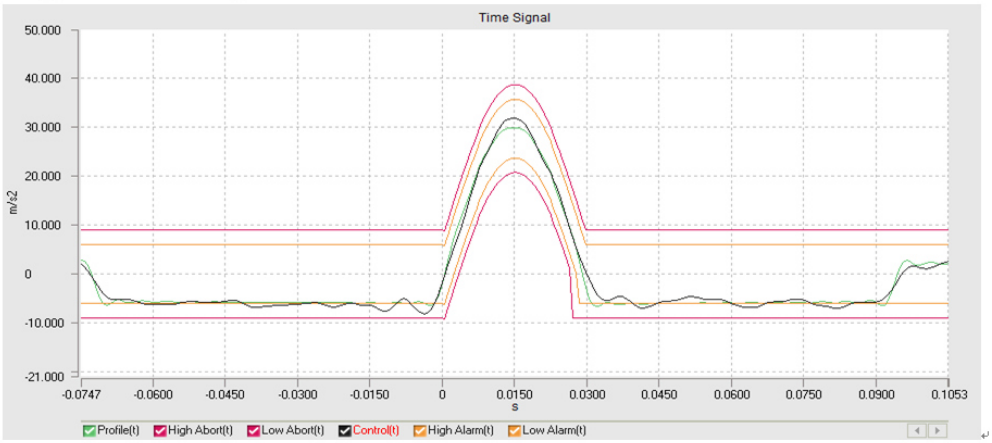
Simulated long-life testing at increased random vibration levels(Test Profile:)

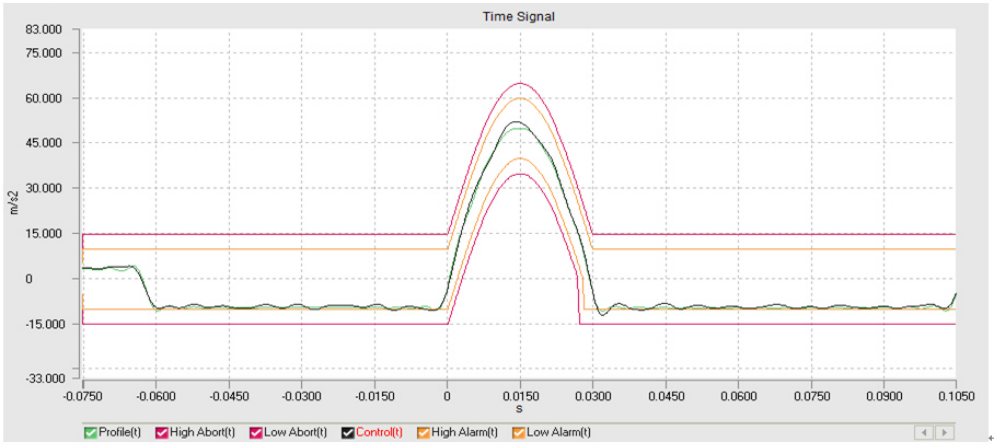
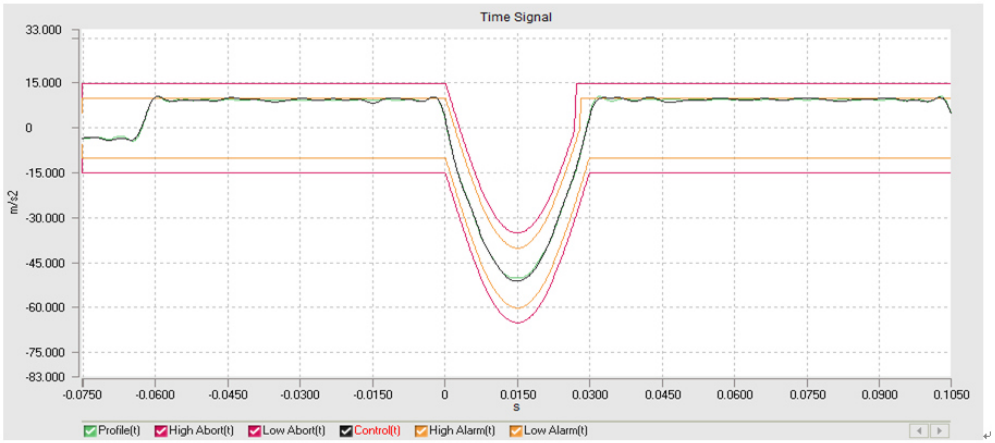
X Axis Transvers	Test Name: simulated transverse _X Test Type: Random Test  Current Level: 100 % Demand RMS: 2.49086 m/s2 Control RMS: 2.47416 m/s2 Frame Time: 1.600000 (s) Lines: 400 dF: 0.625000 Hz DOF: 150 Current Level Time: 05:00:00 Remaining Time: 00:00:00 Record saved Time: 2022-1-20 AM 09:22:25 Report time: 2022-1-20 AM 09:22:25

Y Axis Longitudinal	Test Name: simulated longitudinal _Y Test Type: Random Test  Current Level: 100 % Demand RMS: 3.85966 m/s2 Control RMS: 3.84467 m/s2 Frame Time: 1.600000 (s) Lines: 400 dF: 0.625000 Hz DOF: 150 Current Level Time: 05:00:00 Remaining Time: 00:00:00 Record saved Time:2022-1-20 AM 09:18:07 Report time: 2022-1-20 AM 09:18:08
Z Axis/ Vertical	Test Name: simulated vertical _Z Test Type: Random Test  Current Level: 100 % Demand RMS: 5.57903 m/s2 Control RMS: 5.59708 m/s2 Frame Time: 1.600000 (s) Lines: 400 dF: 0.625000 Hz DOF: 150 Current Level Time: 05:00:00 Remaining Time: 00:00:00 Record saved Time: 2022-1-20 AM 09:37:13 Report time: 2022-1-20 AM 09:37:13

Shock testing conditions

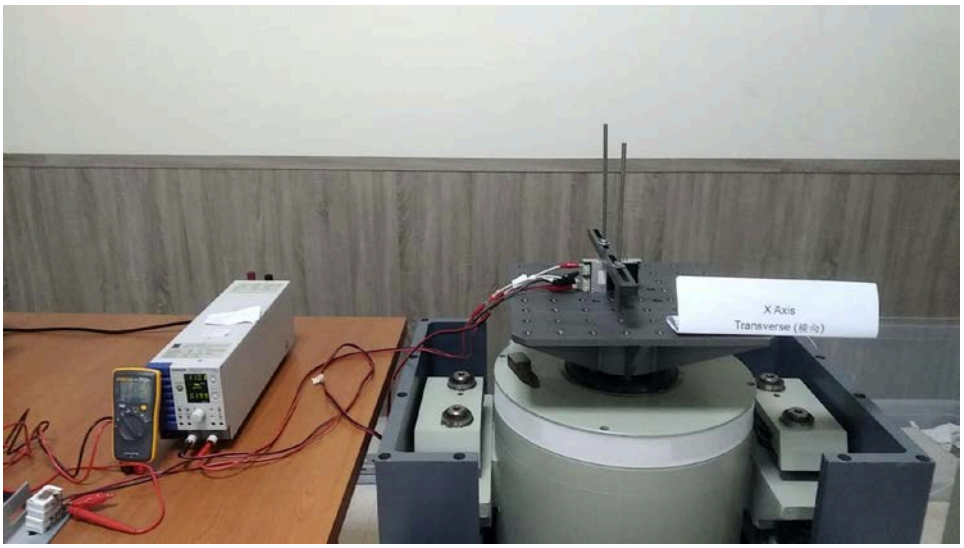
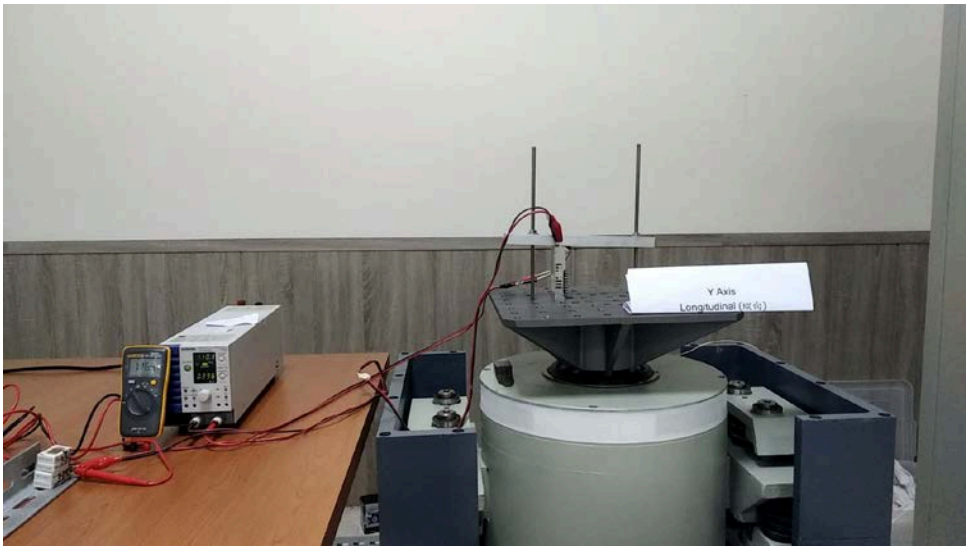
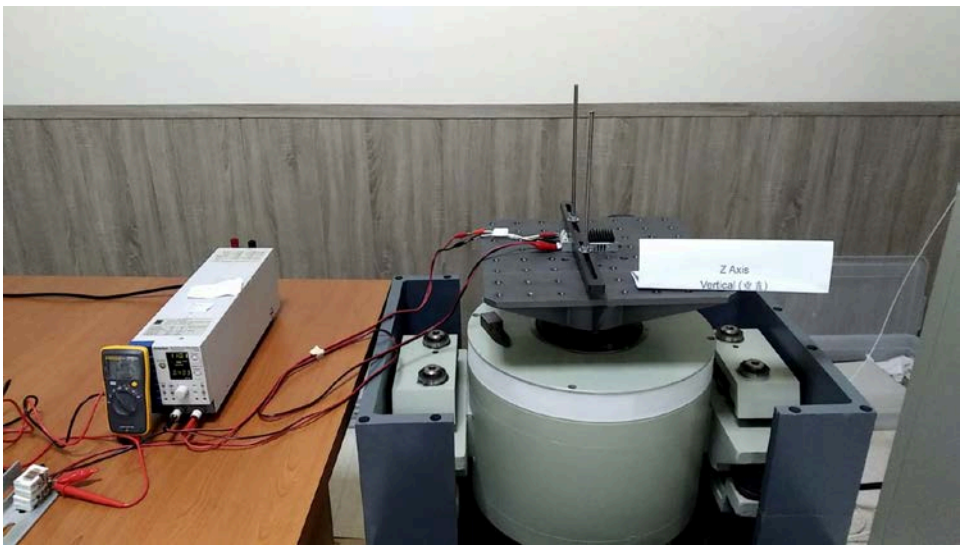
+Z Axis/ -Z Axis Vertical	Test Name: 30ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 30ms2 30ms.ucn  Shock Type: Half Sine Mag: 30.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 30.000 m/s2 Control peak: 31.684 m/s2 Block Size: 1024 Frame Time: 0.6827 s dT: 0.000666667 s Current Pulses: 3 Output pulses: 15 Remain pulses: 0 Data was saved as a file at time: 2022-1-19 PM 04:55:21 Begin Time: 2022-1-19 PM 04:49:25 End Time: 2022-1-19 PM 04:51:25 VIBRATION SOURCE TECHNOLOGY CO., LTD.
+Z Axis/ -Z Axis Vertical	Test Name: 30ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 30ms0 30ms.ucn  Shock Type: Half Sine Mag: 30.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 30.000 m/s2 Control peak: 32.100 m/s2 Block Size: 1024 Frame Time: 0.6827 s dT: 0.000666667 s Current Pulses: 3 Output pulses: 15 Remain pulses: 0 Data was saved as a file at time: 2022-1-19 PM 05:09:51 Begin Time: 2022-1-19 PM 05:07:39 End Time: 2022-1-19 PM 05:09:51 VIBRATION SOURCE TECHNOLOGY CO., LTD.

+X Axis/ -X Axis Transvers	Test Name: 30ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 30ms2 30ms.ucn  Shock Type: Half Sine Mag: 30.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 30.000 m/s2 Control peak: 31.976 m/s2 Block Size: 1024 Frame Time: 0.6827 s dT: 0.000666667 s Current Pulses: 3 Output pulses: 15 Remain pulses: 0 Data was saved as a file at time: 2022-1-19 PM 05:21:47 Begin Time: 2022-1-19 PM 05:19:48 End Time: 2022-1-19 PM 05:21:47 VIBRATION SOURCE TECHNOLOGY CO., LTD.
+X Axis/ -X Axis Transvers	Test Name: 30ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 30ms2 30ms.ucn  Shock Type: Half Sine Mag: 30.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 30.000 m/s2 Control peak: 30.947 m/s2 Block Size: 1024 Frame Time: 0.6827 s dT: 0.000666667 s Current Pulses: 3 Output pulses: 15 Remain pulses: 0 Data was saved as a file at time: 2022-1-19 PM 05:38:03 Begin Time: 2022-1-19 PM 05:36:04 End Time: 2022-1-19 PM 05:38:03 VIBRATION SOURCE TECHNOLOGY CO., LTD.

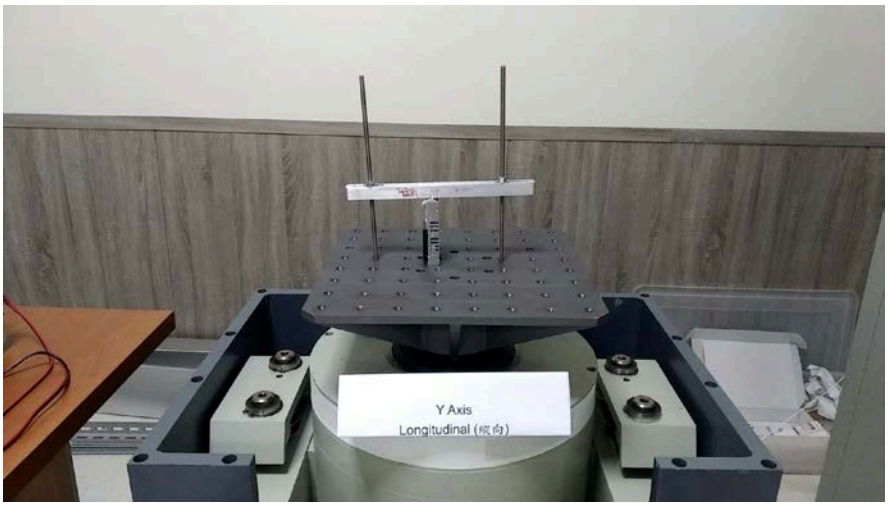
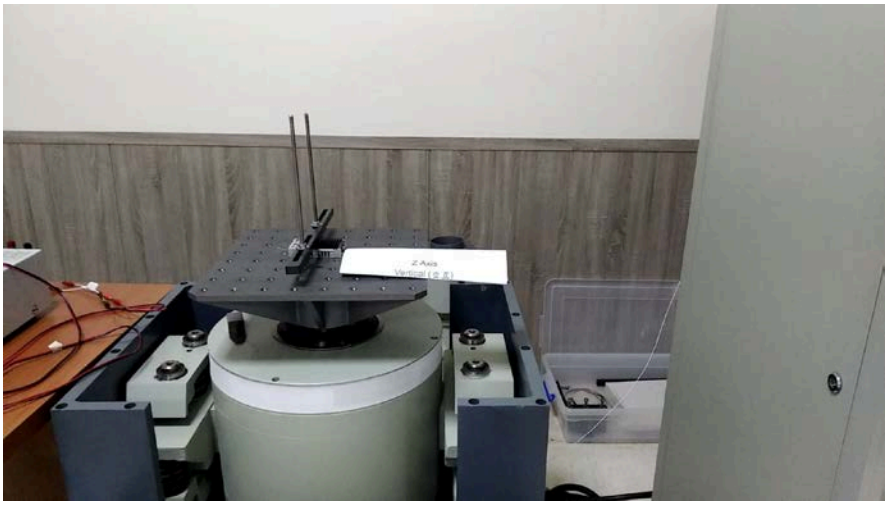
+Y Axis/ -Y Axis Longitudinal	Test Name: 50ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 50ms2 30ms.ucn  Shock Type: Half Sine Mag: 50.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 50.000 m/s2 Control peak: 52.347 m/s2 Block Size: 2048 Frame Time: 0.6827 s dT: 0.000333333 s Current Pulses: 3 Output pulses: 12 Remain pulses: 0 Data was saved as a file at time: 2022-1-21 PM 03:07:06 Begin Time: 2022-1-21 PM 03:04:57 End Time: 2022-1-21 PM 03:07:06 VIBRATION SOURCE TECHNOLOGY CO., LTD.
+Y Axis/ -Y Axis Longitudinal	Test Name: 50ms2 30ms Object name: Object Type: Test Type: Shock Test Project Name: 50ms2 30ms.ucn  Shock Type: Half Sine Mag: 50.00 m/s2 Pulse Duration: 30 ms Current level: 100 % Demand peak: 50.000 m/s2 Control peak: 50.952 m/s2 Block Size: 2048 Frame Time: 0.6827 s dT: 0.000333333 s Current Pulses: 3 Output pulses: 11 Remain pulses: 0 Data was saved as a file at time: 2022-1-21 PM 03:18:47 Begin Time: 2022-1-21 PM 03:16:54 End Time: 2022-1-21 PM 03:18:47 VIBRATION SOURCE TECHNOLOGY CO., LTD.

19.5 Test Setup Photo

Functional random Vibration Test

X Axis Transverse	
Y Axis Longitudinal	
Z Axis/ Vertical	

Simulated long-life testing at increased random vibration levels

Y Axis Longitudinal	
X Axis Transvers	
Z Axis/ Vertical	

Shock testing conditions

+Z Axis/ -Z Axis Vertical	
+X Axis/ -X Axis Transvers	
+Y Axis/ -Y Axis Longitudinal	

20. MEASUREMENT UNCERTAINTY

Item	Value (dB)
Conduction Room	
Power Line Conduction Emission (9 kHz ~ 30 MHz)	2.36
Telecom. Port Conducted Emission/ISN-T2	4.36
Telecom. Port Conducted Emission/ISN-T4	3.85
Telecom. Port Conducted Emission/ISN-T8	3.39
Telecom. Port Conducted Emission/CVP	3.50
Telecom. Port Conducted Emission/Current Probe	2.50
Disturbance Power Emission	3.68
966A Chamber	
Radiated Emission Test at 3m(30 MHz ~1 GHz)/Horizonal	3.88
Radiated Emission Testat 3m(30 MHz ~1 GHz)/Veritcal	5.22
Radiated Emission Test at 3m(1 GHz ~ 18 GHz)/Horizonal	5.60
Radiated Emission Test at 3m(1 GHz ~ 18 GHz)/Veritcal	6.12
Radiated Emission Test at 3m(18 GHz ~ 40 GHz)/Horizonal	4.97
Radiated Emission Test at 3m(18 GHz ~ 40 GHz)/Veritcal	4.99
Radiated Electromagnetic disturbance/Loop Antenna(9 kHz ~ 30 MHz)	2.80
966B Chamber	
Radiated Emission Test at 3m(30 MHz ~1 GHz)/Horizonal	3.88
Radiated Emission Testat 3m(30 MHz ~1 GHz)/Veritcal	5.21
Radiated Emission Test at 3m(1 GHz ~ 18 GHz)/Horizonal	5.59
Radiated Emission Test at 3m(1 GHz ~ 18 GHz)/Veritcal	6.09
Radiated Emission Test at 3m(18 GHz ~ 40 GHz)/Horizonal	4.96
Radiated Emission Test at 3m(18 GHz ~ 40 GHz)/Veritcal	4.96
Radiated Electromagnetic disturbance/Loop Antenna(9 kHz ~ 30 MHz)	2.80

*The expanded uncertainty in this report is expressed by multiplying the combined standard uncertainty by the coverage factor k (k=2). The corresponding coverage probability (or confidence level) is about 95%.

21. TEST EQUIPMENT LIST AND DETAILS

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2020/12/30	2021/12/29
LISN	Rohde & Schwarz	ENV216	101248	2021/6/8	2022/6/7
LISN	COM-POWER	LI-550A	211726	2020/12/30	2021/12/29
LISN	COM-POWER	LI-550A	211727	2020/12/30	2021/12/29
DC LISN	COM-POWER	LIN-115	241113	2021/11/25	2022/11/24
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2021/6/9	2022/6/8
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/7/29	2022/7/28
RF Cable	EMEC	EM-CB5D	1	2021/6/11	2022/6/10
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
ISN					
CVP	BACL	CVP	150604	2021/11/25	2022/11/24
ISN	FCC	FCC-TLISN-T8-02-09	111154	2021/7/23	2022/7/22
CDN	COM-POWER	T8SE	34260018	2021/11/2	2022/11/1
Current Probe	HP	8710-1744	N241	2021/6/4	2022/6/3
ISN	COM-POWER	ISN-T8	600129	2021/1/11	2022/1/10
Radiation Emission 3M Room (966-B)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2021/3/16	2022/3/15
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & EMEC	JB3 /EM-ATT18-6-NN	A061204 /ATT-09-003	2021/1/25	2022/1/24
Horn Antenna	EMCO	SAS-571	1983	2021/5/6	2022/5/5
Horn Antenna	ETS-Lindgren	3116	60023	2021/8/18	2022/8/17
Pre Amplifier	Sonoma	310N	130601	2021/1/8	2022/1/7
Preamplifier	EM Electronics Corp.	EM01G18G	60698	2021/4/6	2022/4/5
Microware Preamplifier	EM Electronics Corp.	EM18G40G	60656	2020/12/30	2021/12/29
EMI Test Receiver	Rohde & Schwarz	ESCI	100540	2020/6/16	N/A
Spectrum Analyzer	Rohde & Schwarz	FSV40	101204	2021/6/10	2022/6/9
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2021/2/1	2022/1/31

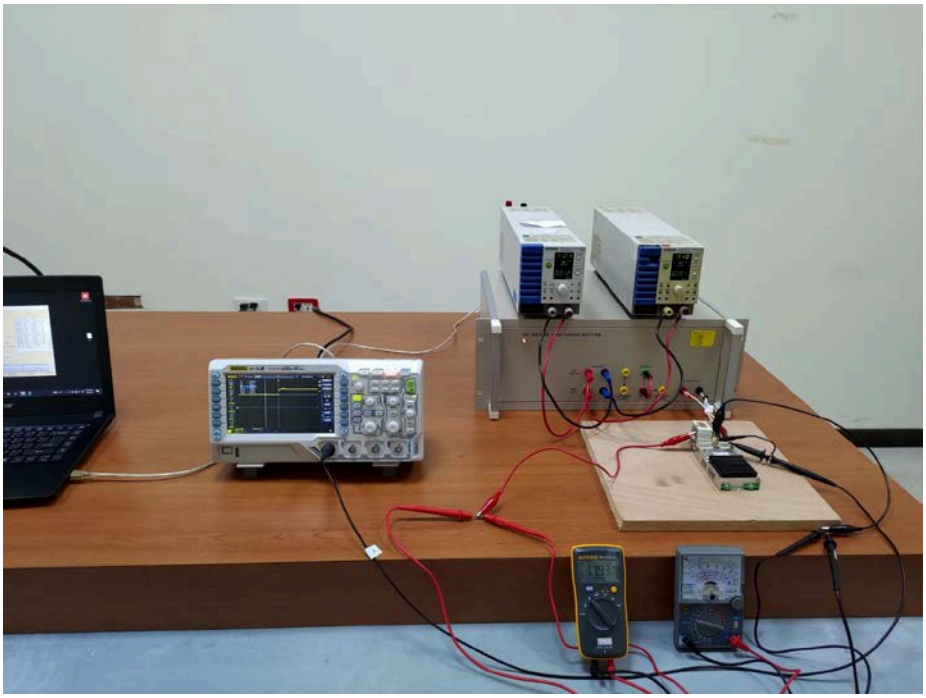
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
VSWR	BACL	966-B	N/A	2020/12/21	2021/12/21
Coaxial Cable	DRAKA	M17/75-RG214	106868	2021/1/26	2022/1/25
Cable	UTIFLEX	UFA295A/(2M)	2M01	2021/1/26	2022/1/25
PSA Series Spectrum Analyzer	AGILENT	E4440A	MY42221851	2020/10/23	N/A
Microflex Cable	UTIFLEX	UFA210B-1-2362-70U70U / (8M)	228332-001	2021/1/26	2022/1/25
Coaxial Cable	EM	EM104	W0068130001	2021/1/26	2022/1/25
EMI Test Receiver	Rohde & Schwaz	ESR3	102098	2021/6/9	2022/6/8
Harmonic & Flickers					
Harmonic& Flicker Analyzer	EM TEST	DPA500N	P1437139801	2021/7/27	2022/7/26
Power Source	EM TEST	ACS500N	P1332121580	2021/7/27	2022/7/26
Software	EM TEST	dpa.control	V5.4.8	N.C.R	N.C.R
ESD					
ESD Simulator	TESEQ	NSG 438A	217	2021/1/8	2022/1/7
RS					
EPM Series Power Meter	Agilent	E4418B	GB43316482	2021/1/8	2022/1/7
AVG Power Sensor	Agilent	E9301A	US39211819	2021/1/8	2022/1/7
Amplifier	AR	150W1000	302657	N.C.R	N.C.R
Amplifier	AR	60S1G6	348713	N.C.R	N.C.R
Antenna	AR	ATL80M1G	348836	N.C.R	N.C.R
Antenna	AR	ATT700M12G	349408	N.C.R	N.C.R
Software	AR	61000-4-3	V1.0	N.C.R	N.C.R
Amplifier Research	AR	500W1000A	324716	N.C.R	N.C.R
Signal Generator	Agilent	N5181A	MY47070759	2021/1/7	2022/1/6
EFT					
Simulators	EM TEST	UCS500N7	P1506148838	2021/1/28	2022/1/27
Capacitive Coupling Clamp	EM TEST	HFK	P1504147756	2021/1/28	2022/1/27
Software	EM TEST	Iec.control	V5.4.1	N.C.R	N.C.R
SURGE					
Simulators	EM TEST	UCS500N7	P1506148838	2021/1/28	2022/1/27

CDN	EM TEST	CNV 508T5	P1526159437	2021/8/10	2022/8/9
Telecom Surge Generator	EM TEST	Tsurge7	P1440141012	2021/1/28	2022/1/27
Software	EM TEST	Iec.control	V5.4.1	N.C.R	N.C.R
CS					
Signal Generator	Agilent	8648C	3623A03603		
Signal Generator	Agilent	8648C	3623A03603	2021/11/24	2022/11/23
Amplifier	Spanawave	PAS-00023-25	AA00939	N.C.R	N.C.R
CDN	Teseq	M016	42151	2021/4/6	2022/4/5
CDN	Teseq	T200A	38316	2021/4/6	2022/4/5
CDN	Teseq	T400A	30443	2021/4/6	2022/4/5
Software	BACL	CS_TEST-XZ	V1.0	N.C.R	N.C.R
CDN	Teseq	T800A	53443	2021/2/26	2022/2/25
PFMF					
Current Transformer	EM TEST	MC2630	P1451145989	2021/3/15	2022/3/14
PFMF Antenna	EM TEST	MS 100N	P1453146285	2021/3/15	2022/3/14
DIP					
Simulators	EM TEST	UCS500N7	P1506148838	2021/1/28	2022/1/27
DIPS Regulator	EM TEST	MV2616	P1450144854	2021/1/28	2022/1/27
Software	EM TEST	Iec.control	V5.4.1	N.C.R	N.C.R

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

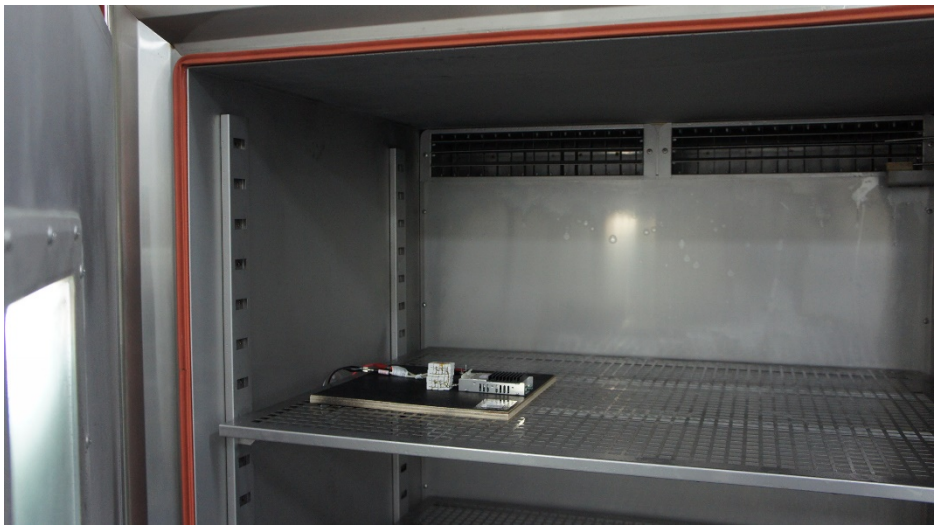
Exhibit A – Test Setup Photographs

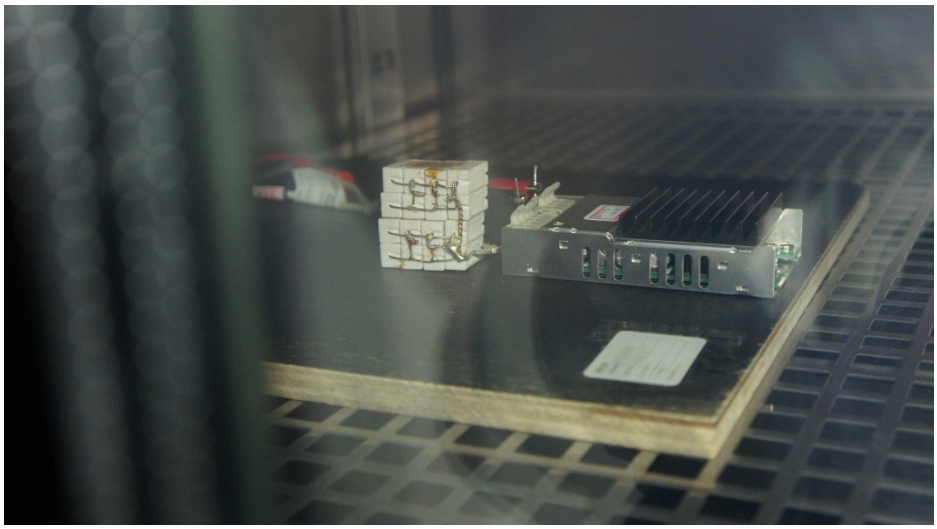
Power Supply test



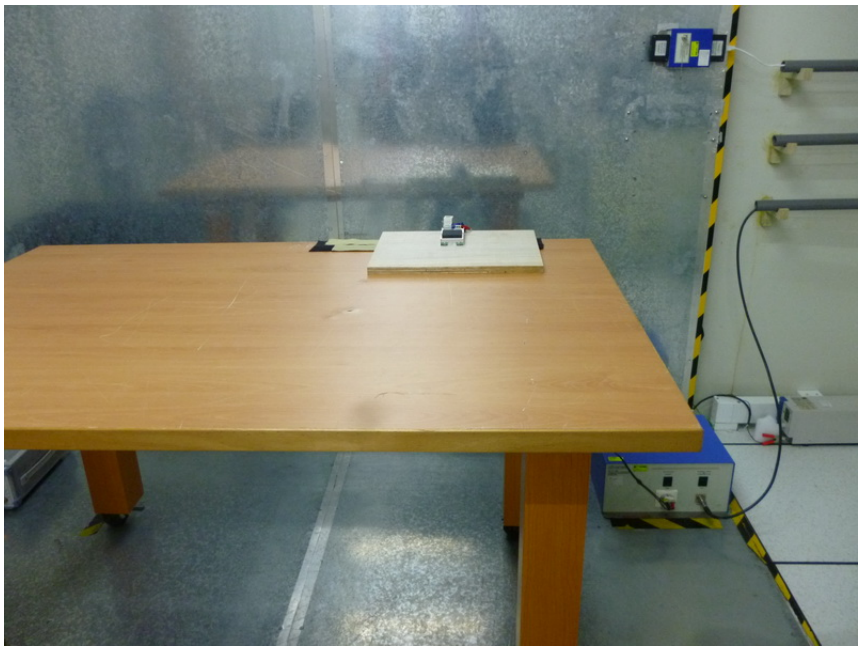
Insulation test

Low temperature start-up test & Dry heat test & Cyclic damp heat test

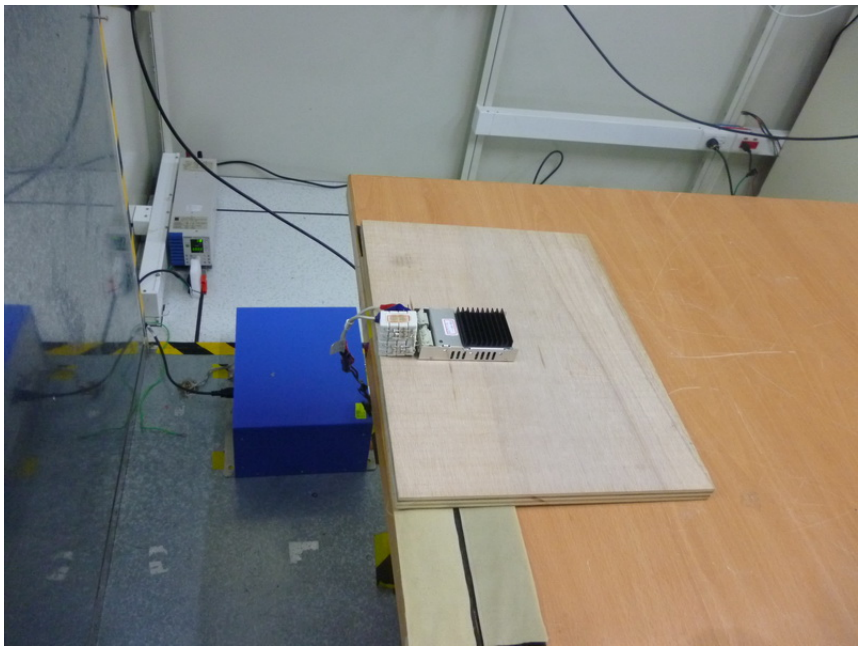




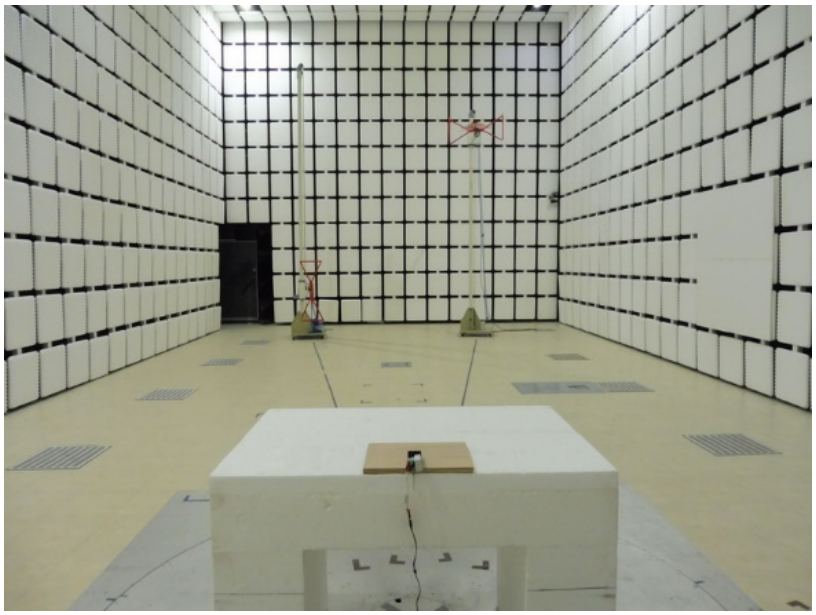
CE Front View



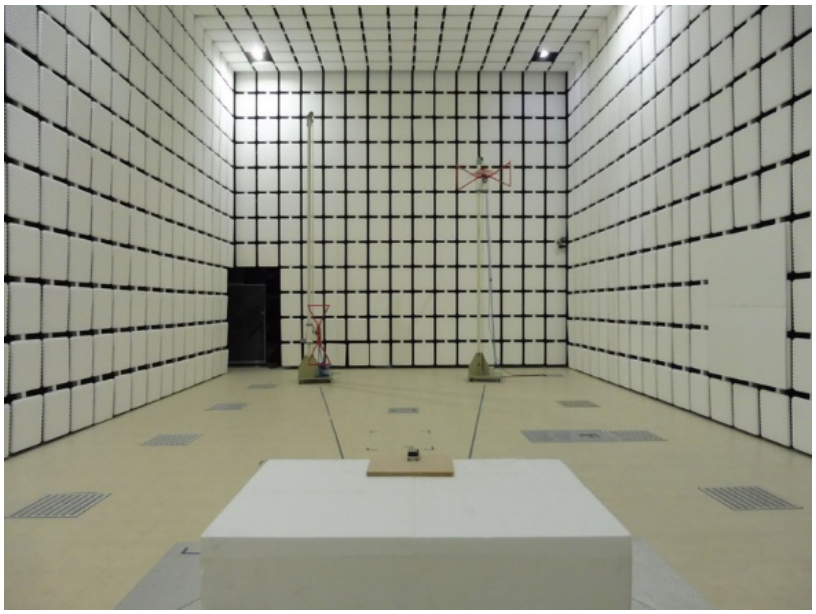
CE Rear View



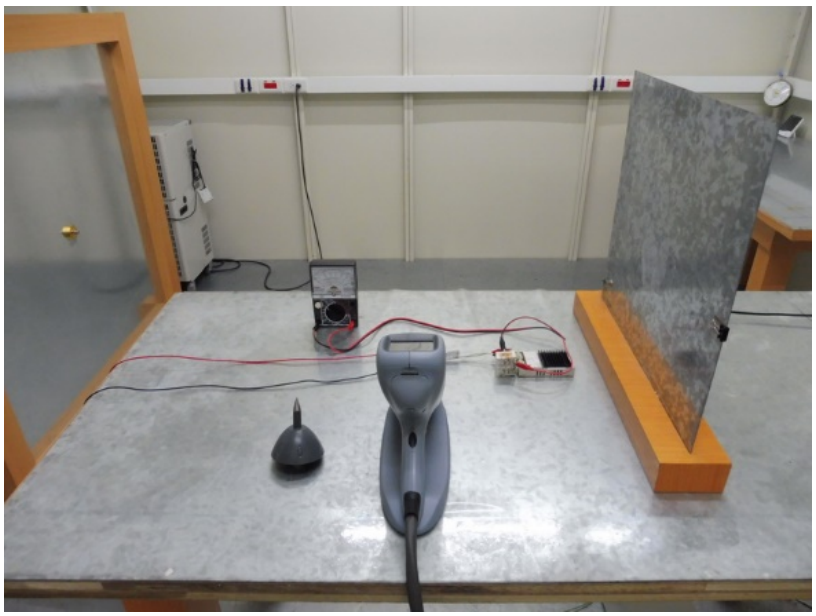
RE Front View (Below 1 GHz)



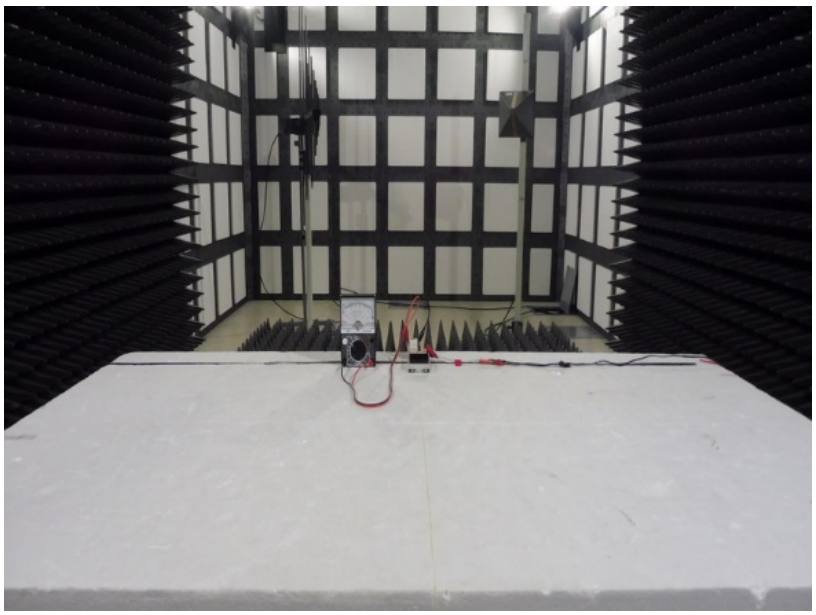
RE Rear View (Below 1 GHz)



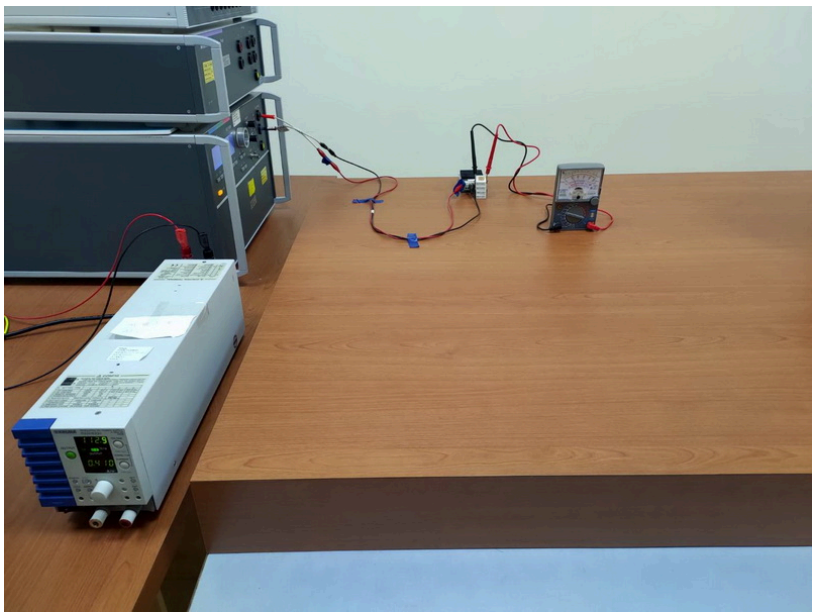
ESD



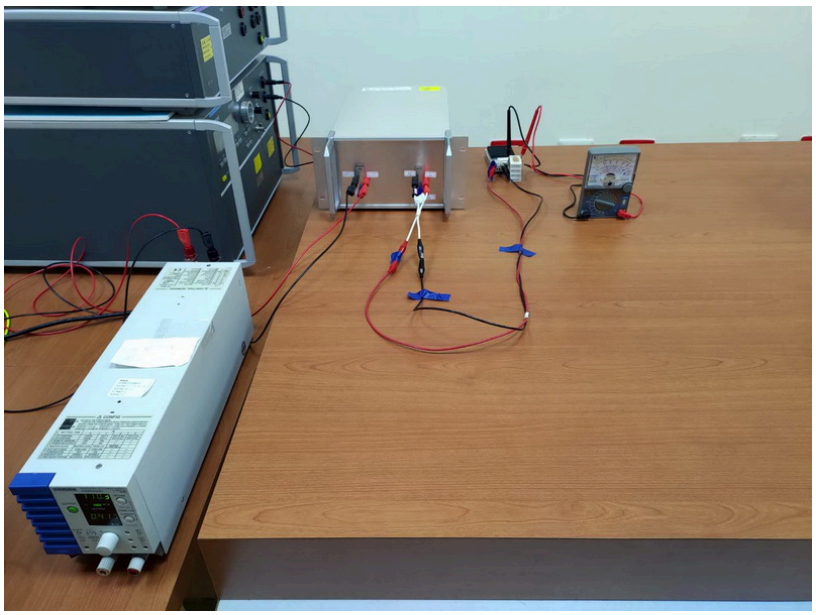
RS



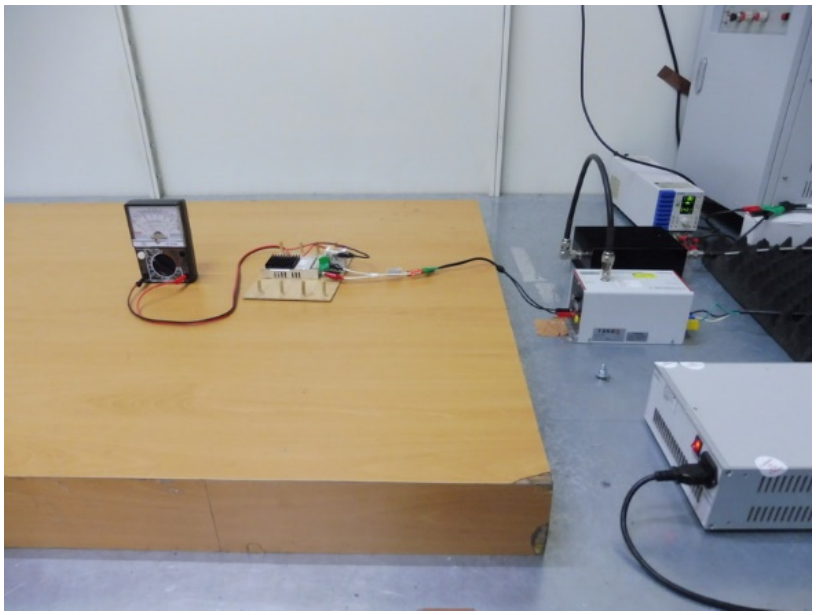
EFT



SURGE

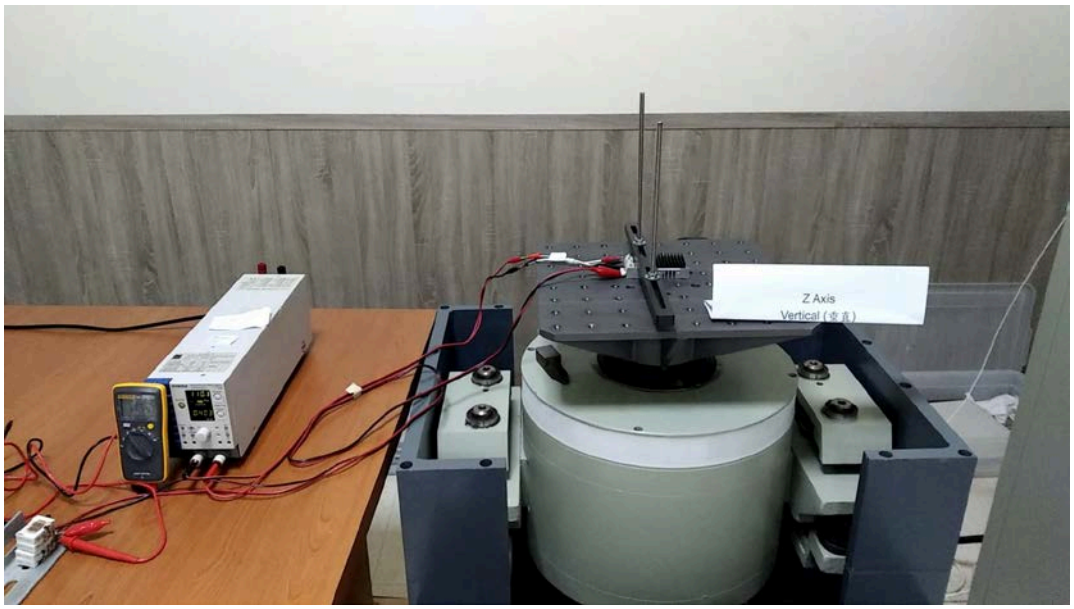


CS

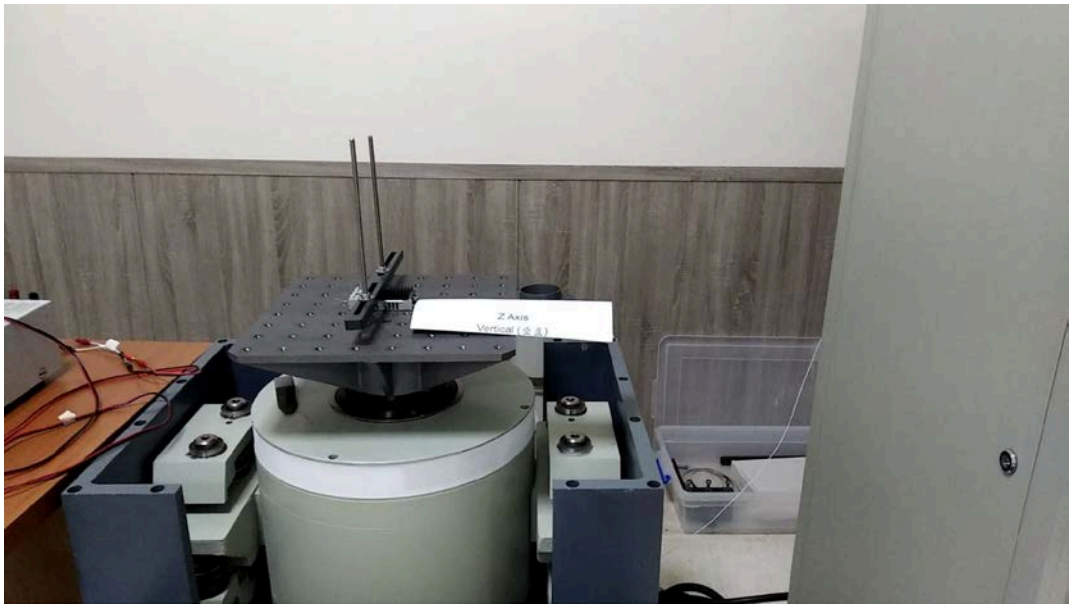


Vibration and shock test

(13.4.11.4 Functional random vibration test)



(13.4.11.2 Simulated long life testing)

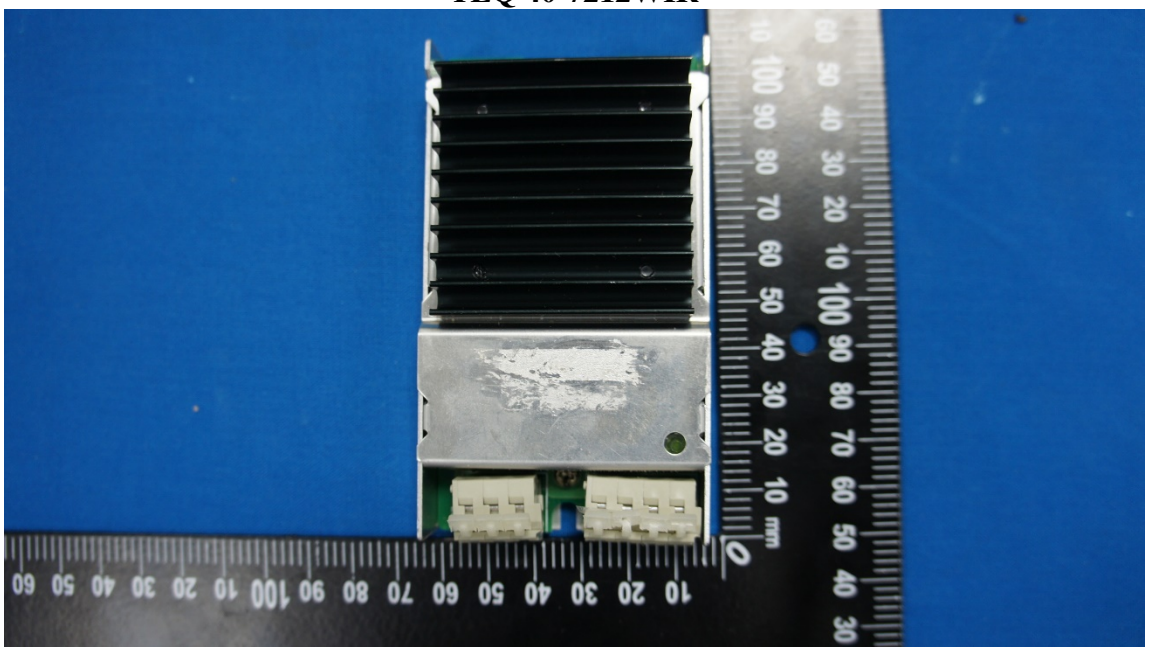


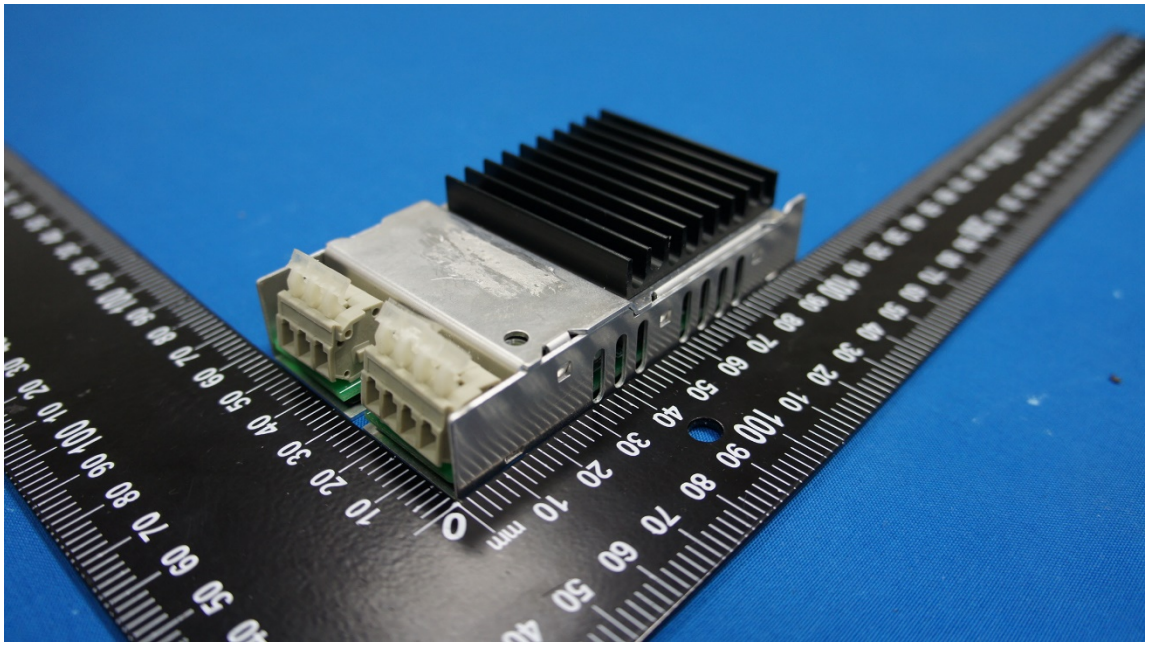
(13.4.11.3 Shock testing)

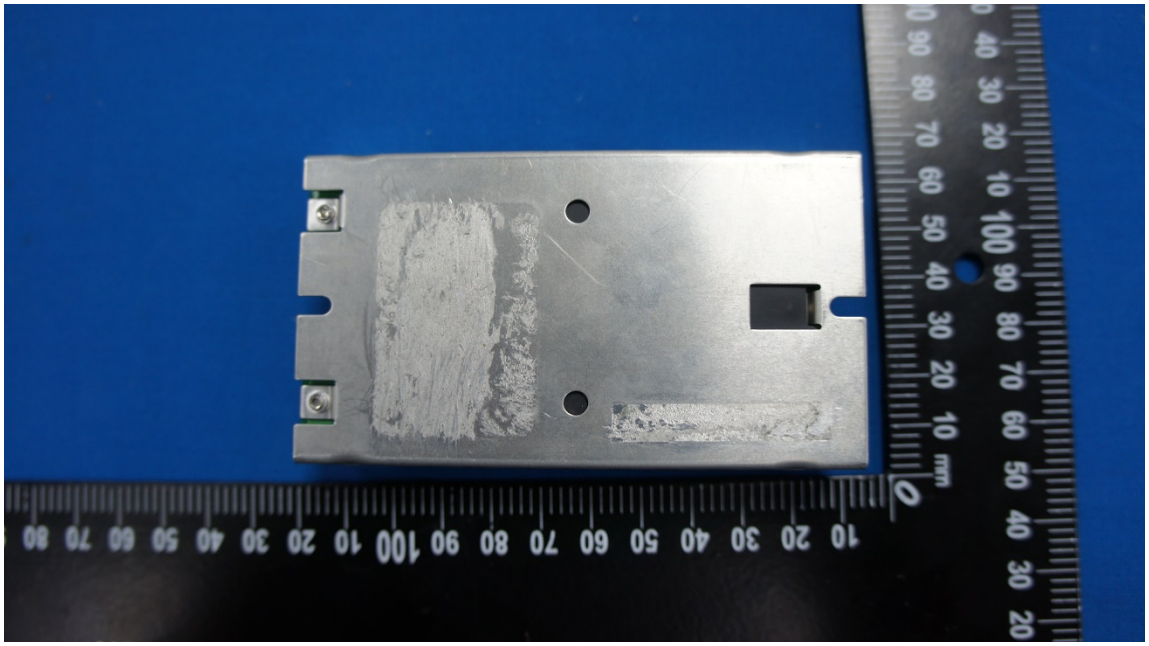
******* END OF REPORT *******

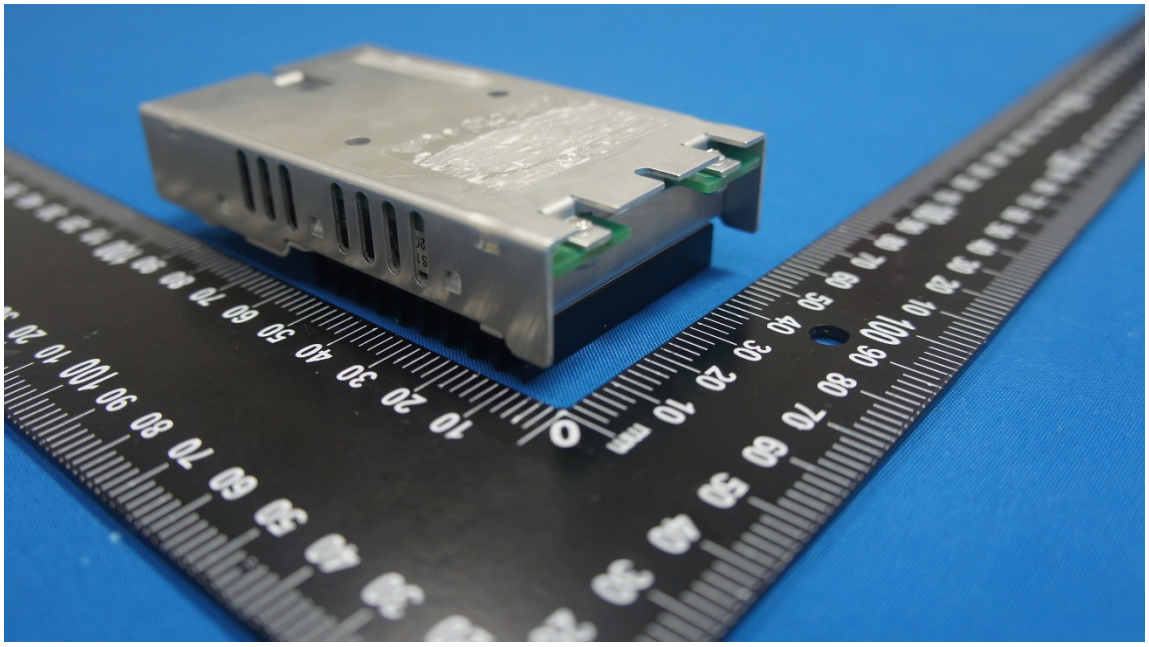
External Photographs

TEQ 40-7212WIR









TEQ 20-7212WIR