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Reliability Test Report

for BFX-UA300 (K18X001T00)

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Revision Change History

Revision	Description of Change	Date
1.0	Initial Release	09/03/2021
2.0	Updated Release	09/16/2021
3.0	Updated Release	09/30/2021

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Purpose:

1. Provide a formal functional demonstration of the product design reliability.
2. Identify any design discrepancies.
3. Reliability assurance of trial samples which are designed and fabricated in accordance with the customer's product specifications.
4. Conduct robustness testing on early production samples in accordance to customer's product environmental testing specification.

Scope:

This document describes the performance requirements, validation criteria, and the validation tests which focus on BFX-UA300 (K18X001T00) product.

The DUT H/W version is V125 and S/W revision is 19.524.23.

The summary of test items:

NO.	Item	Test Condition	Q'ty	Period	Pass Criteria	Test result
1	Cold Start Test	Power off, Storage, Ta = - 20°C Storage 48 hours then ramp the temperature to 0°C, power on operation test Power on/off 15 times	2 units	2 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
2	Hot Start Test	Power off, Storage, Ta = 70°C Storage 48 hours then ramp the temperature to 50°C power on operation test Power on/off 15 times	2 units	2 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
3	High Temperature & High humidity Test (storage)	1. Temperature 70°C 2. Humidity 90% R.H. 3. Test period 72 hours	2 units	3 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
4	High Temperature & High Humidity Test (OP)	Power on, Operation Ta = 50°C, Humi. = 95% R.H. for 72 hours	2 units	3 days	1. No functional failures both before and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
5	Operational Temperature Cycle Test	1. Power on, Operation 2. 25°C & R.H. 65% for 1 hour 3. 25°C & R.H. 65% to - 5°C for 2 hours 4. - 5°C for 13 hours 5. - 5°C to 25°C & R.H. 65% for 2 hours. 6. 25°C to R.H. 65% for 1 hour 7. 25°C & R.H. 65% to 50°C & RH 95% for 2 hours 8. 50°C & R.H. 95% for 13 hours 9. 50°C & R.H. 95% to 25°C & RH 65% for 2 hours 10. Repeat 1~9 for 2 cycles 11. 25°C & R.H. 65% for 48 hours Total for 120 hours	2 units	5 days	1. No functional failures both during and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
6	Thermal Shock Test (PCB only)	Power off , non-operation Ta= - 20°C (30min) ~ 70°C (30min) 60 cycles Transfer time: 5 min	2 pcs	3 days	1. No functional failures both before and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
7	Power On/Off Test with Temperature	1. Power on: 50 sec 2. Power off: 10 sec 3. Temperature: - 5°C and 50°C 4. Cycle: 2,500 cycles per test condition 5. Total 5,000 cycles	2 units	5 days	1. No functional failures both before and after the test. 2. No performance degradation after the functional test. 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS

8	Salt Spray Test	1. Salt: 5% , Temp.: 35°C and Humidity: 85% 2. Sprayed amount: 0.6~30 ml/hour 3. Test duration: 48 hours	2 units	2 days	No physical defect, corrosion and function failure after this test.	PASS
9	Operational Random Vibration Test	1. Acceleration: 10m /4.4G/2.5G 2. Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G 3. Sweep rate: 0.25 octave/min 4. Duration: 60 min/ axis	2 Units (T1)	2 days	1. No function failures both during and after the test 2. No performance degradation during the function test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
10	Operational Shock Test	1. Acceleration: 30G 2. Test wave: Square Wave 3. Duration: 11ms 4. Direction: 6 faces 5. 3cycles/direction	2 units (T1)	1 day	No functional failures both during and after the test.	PASS
11	Acoustic Noise Test	1. Normal operation mod 2. Standby mode	1 unit	1 day	The noise value should be less than 23 dB (A).	PASS
12	Connector Insertion/ Removal Test	1. Power Jack Connector: 5,000 times 2. HDMI Connector: 5,000 times 3. USB Connector: 5,000 times 4. MIC Connector: 5,000 times 5. AUX Connector: 5,000 times 6. RJ-45 Connector: 2,000 times 7. Test Speed: 10 cycles/min	2 pcs	9 days	1. No functional failures before and after the test. 2. No performance degradation during the functional test.	PASS
13	Button Life Test	Test cycles: 5,000 cycles Test Speed: 10 cycles/min	2 units	4 days	Buttons must withstand mechanical cycling	PASS
14	Power Switch Life Test	Test cycles: 5,000 cycles	2 units	2 days	Power Switch must withstand mechanical cycling	PASS
15	Chassis Static Load Test	1. Applied position: TOP on the enclosure 2. Weight and time: 5Kg/ diameter 9mm area/apply 30 seconds	1 unit	1 day	There is no damage of Mechanical material for examples Cover's crack, breakdown	PASS
16	Surface Coating Abrasion Test	Test loading: 250 g Test cycles: 50 cycles by No.74 the eraser	1 unit	1 day	No visually damage of the enclose surface	PASS
17	Abrasion Resistance of Label Test	Loading force: 1,000 g Test cycles: 800 cycles for the abrasion by the 75% alcohol solvent	1 unit	1 day	There is no abrasion of printing character and number	PASS
18	Logo/Printing Abrasion Test	Loading force: 1,000 g Test cycles: 2,000 cycles for the abrasion by the 75% alcohol solvent	1 unit	1 day	There is no abrasion of case printing and no changeable color	PASS
19	Free Fall Drop Test (Gift Box packaging test)	1. Height for fall test: 1.5 m 2. Fall plate: steel floor 3. Drop 6 faces	2 gift box	1 day	No function failures both during and after packaged drop test.	PASS

Panel Drawing:

Front



Rear



Adapter

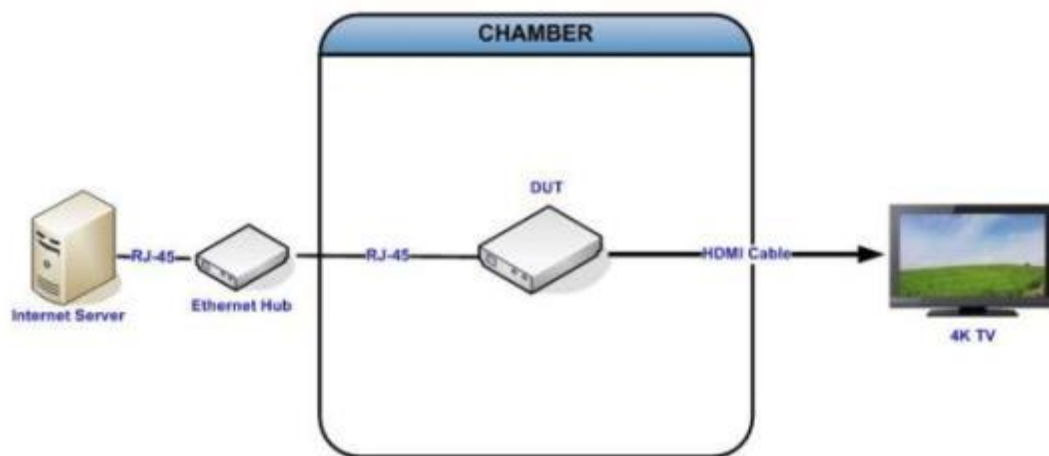
LA-A271KS
Input: 200-240V
50/60Hz, 1.5A
Output: DC 24V/4A



I/O Port



Test setup and function test:



HDMI connects to 4K TV for playing local 4K video.
Ethernet hub is for iperf 50Mbps.

1. Cold Start Test

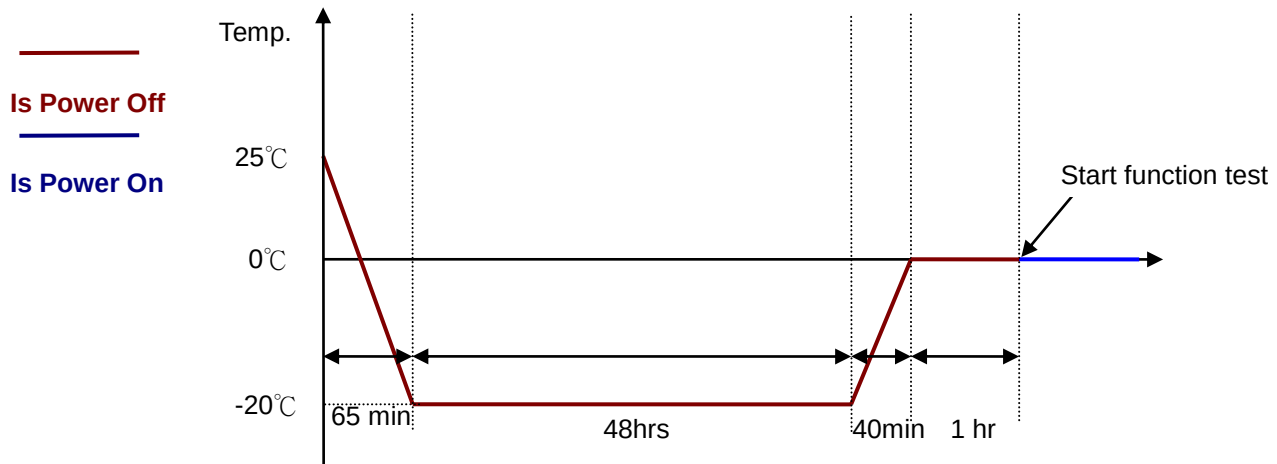
Purpose:

To demonstrate that the product can be stored at low temperature environment.

Quantity: 2 units.

Test Objective: Power off, and store at - 20°C. After 48 hours, ramp to 0°C and function test.

Test Profile:



Test Procedure:

1. Power off.
2. Start test at 25°C.
3. Ramp the temperature to - 20°C and hold for 48 hours.
4. Ramp the temperature to 0°C and hold for 1 hour.
5. Rate: 1°C/minute.
6. Repeat 3 times to power on and activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-01.

Test Result: **PASS**



2. Hot Start Test

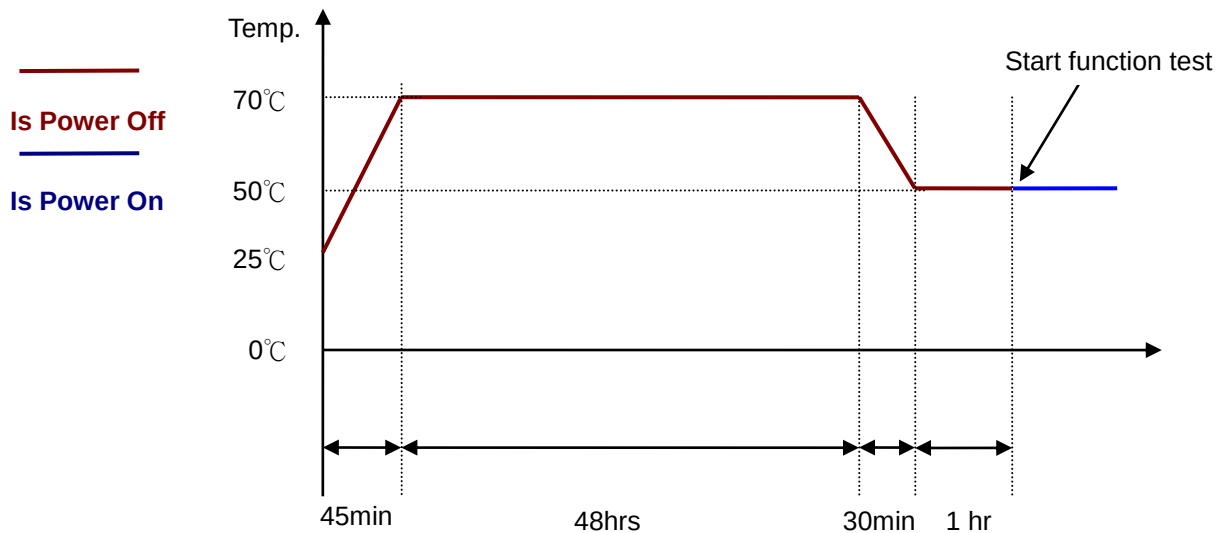
Purpose:

To demonstrate that the product can be stored at high temperature environment.

Quantity: 2 units.

Test Objective: Power off, and store at 70°C. After 48 hours, ramp to 50°C and function test.

Test Profile:



Test Procedure:

1. Power off.
2. Start test at 25°C.
3. Ramp the temperature to 70°C and hold for 48 hours.
4. Ramp the temperature to 50°C and hold for 1 hour.
5. Rate: 1°C/minute.
6. Repeat 3 times to power on and activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-02.

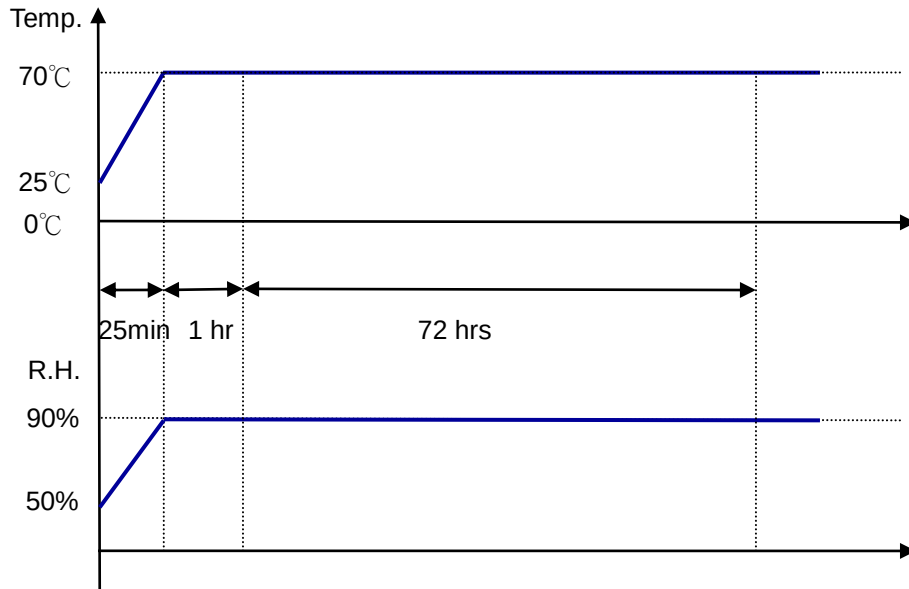
Test Result: **PASS**



3. High Temperature and High humidity Test (Storage)

Purpose:

To demonstrate that products can withstand the high limit temperature and the high limit humidity of an operating environment.

Quantity: 2 units**Test Objective:** Storage in High Temperature and High Humidity: Temp. + 70°C and R.H. 90%,
Duration: 3 days**Test Profile:****Test Procedure:**

1. Power off storage.
2. Start test at 25°C and RH 50%.
3. Ramp the temperature to 70°C and R.H. 90% in 25 minutes, then hold for 1 hour.
4. Hold 70°C, RH 90% for 72 hours.

Pass Criteria:

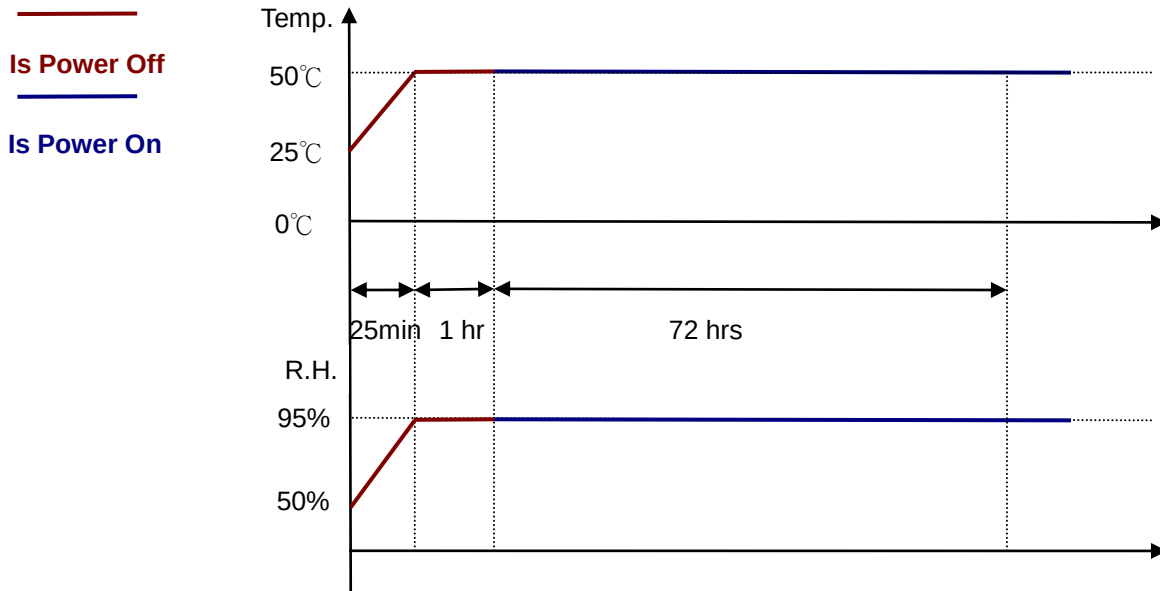
1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30**Test Result:** **PASS**

4. High Temperature and High humidity Test (OP)

Purpose:

To demonstrate that products can withstand the high limit temperature and the high limit humidity of an operating environment.

Quantity: 2 units**Test Objective:** Operating Temperature and Humidity: Temp. + 50°C and R.H. 95%, Duration: 3 days**Test Profile:****Test Procedure:**

1. Power off.
2. Start test at 25°C and RH 50%.
3. Ramp the temperature to 50°C and R.H. 95% in 25 minutes, then hold for 1 hour.
4. Power on the test units.
5. Hold 50°C, RH 95% for 72 hours.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30**Test Result:** **PASS**

5. Operational Temperature Cycle Test

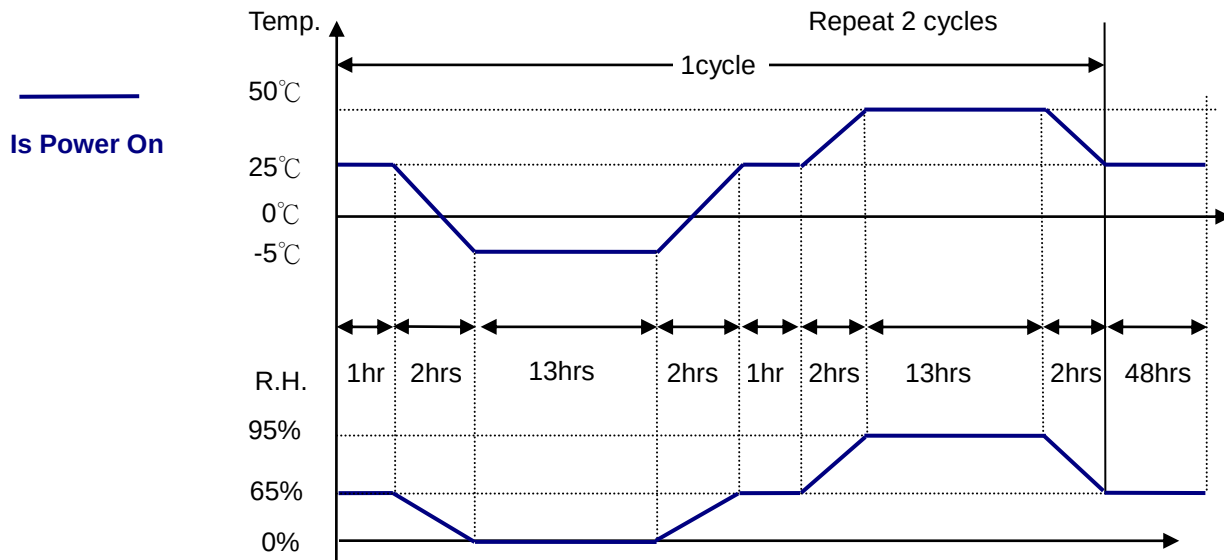
Purpose:

To demonstrate that products can operate in the high/low temperature and high humidity environment.

Quantity: 2 units.

Test Objective: Operating in high/low Temperature and Humidity.

Test Profile:



Test Procedure:

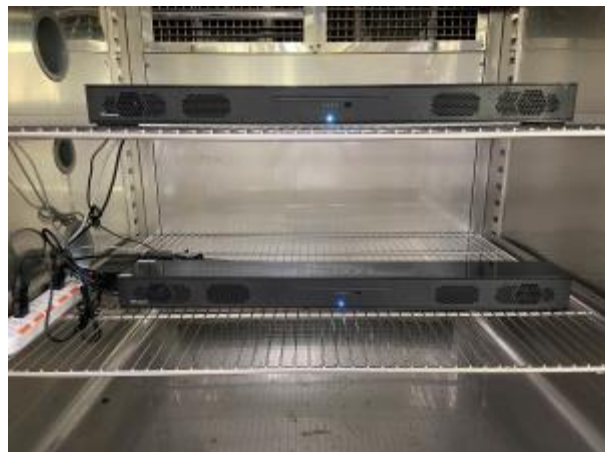
1. Power on, then activated in full function and operation.
 2. 25°C & R.H. 65% for 1 hour
 3. 25°C & R.H. 65% to - 5°C for 2 hours
 4. - 5°C for 13 hours
 5. - 5°C to 25°C & R.H. 65% for 2 hours.
 6. 25°C to R.H. 65% for 1 hour
 7. 25°C & R.H. 65% to 50°C & R.H. 95% for 2 hours
 8. 50°C & R.H. 95% for 13 hours
 9. 50°C & R.H. 95% to 25°C & R.H. 65% for 2 hours
 10. Repeat 1~9 for 2 cycles
 11. 25°C & R.H. 65% for 48 hours
- Total for 120 hours

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30.

Test Result: **PASS**



6. Thermal Shock Test (PCB only)

Purpose:

To demonstrate that the product can be operated after high & low temperature shock environment.

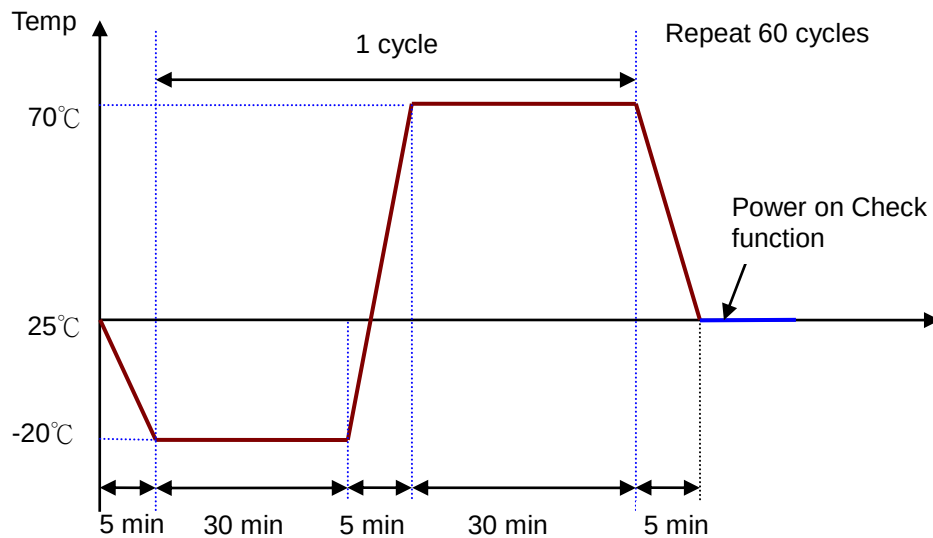
Quantity: 2 units

Test Objective: $T_a = -20^{\circ}\text{C}$ (30minues) ~ 70°C (30minutes), Cycle: 60 cycles,
Transfer time: 5 minutes.

Test Profile:

Is Power Off

Is Power On



Test Procedure:

1. Power off.
2. Start test at 25°C .
3. Ramp the temperature to -20°C and hold for 30 minutes.
4. Ramp the temperature to 70°C and hold for 30 minutes.
5. Transfer time: 5 minutes
6. After repeat 60 cycles. Power on, then activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: MIL -STD-810F Method 503.4 Procedure I

Test Result: **PASS**



7. Power On/Off Test with Temperature

Purpose:

The purpose of this specification is to define the power on / off test. This test is to assure the product will meet customer's specification.

Quantity: 2 units.

Test Objective: 1. Power on: 50 sec.

2. Power off: 10 sec.

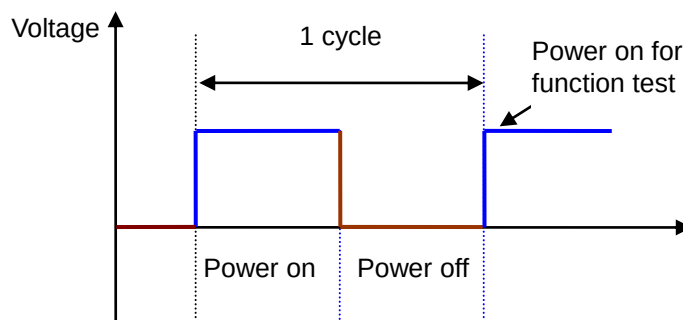
3. Temperature: - 5°C and 50°C .

4. AC Source Voltage: 220V, Frequent: 60Hz.

5. Cycle: 2,500 cycles per test condition.

6. Total 5,000 cycles.

Test Profile:



Test Procedure:

1. Temperature: - 5°C and 50°C .

2. Control the power on/off and input voltage as below.

Power on/off frequency: Power on: 50 seconds / Power off: 10 seconds.

AC Source Voltage: 220V, Frequent: 60Hz.

3. Cycle: 2,500 cycles per test condition.

4. Total: 5,000 cycles.

Pass Criteria:

1. No functional failures both during and after the test.

2. No performance degradation during the functional test.

3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Test Result: **PASS**



8. Salt Spray Test

Purpose:

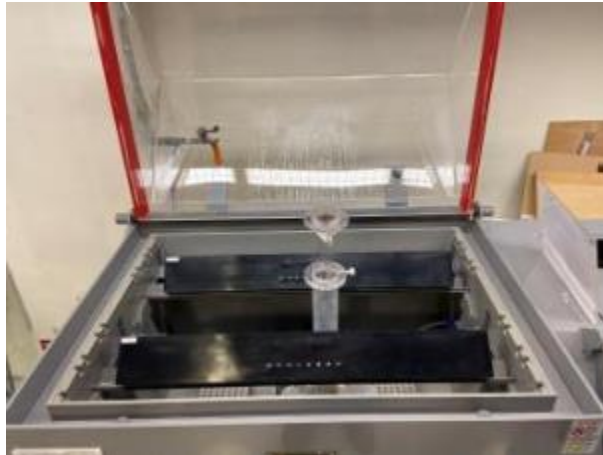
To ensure the DUT can operate properly after exposure in salt spray environment.

Quantity: 2 units

Test Objective:

1. Salt: 5%, Temp. : 35°C and Humidity: 85%.
2. Test duration: 48 hours salt spray exposure.

Test Profile:



Test Procedure:

1. Place the test samples into the salt spray chamber, after the visually inspected and function checked.
2. Ramp the chamber temperature to +35°C, humidity to 85%, salt to 5% and PH to 7.0, then storage the samples for 48 hours.
3. Remove the samples from the chamber for inspection.
4. Clean the samples with distilled water then dry the samples for 8 hours.
5. After the visually inspected and function checked.

Pass Criteria:

1. No failures or major degradation during the functional test.
2. No visual damage to the products during inspection.

Basis for Profile:

In developing this profile, the concepts and ideas expressed in the following sources have been reviewed: IEC 60068-2-11.

Test Result: **PASS**



Sample1



Sample2

9. Operational Random Vibration

Purpose:

To reveal the accumulated effects of stress induced by the random vibration and the resulting mechanical weakness and degradation in specified performance and to use this information, in conjunction with the relevant specification to assess the acceptability of specimens.

To demonstrate the mechanical robustness of specimens.

Quantity: 2 units (T1 housing)

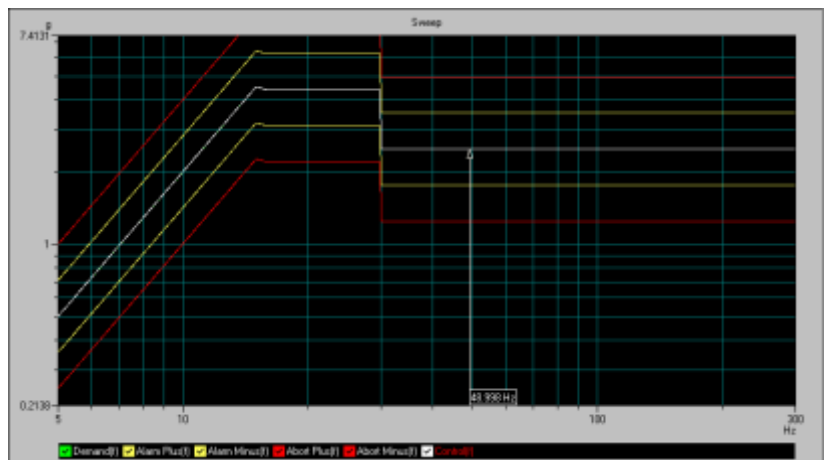
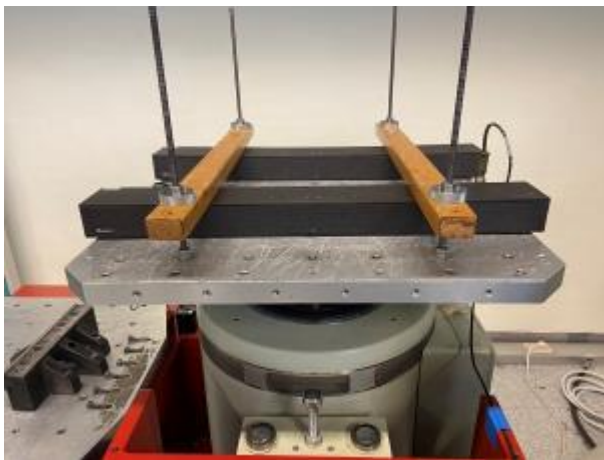
Test Objective: 1. Acceleration: 10mm /4.4G/2.5G

2. Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G

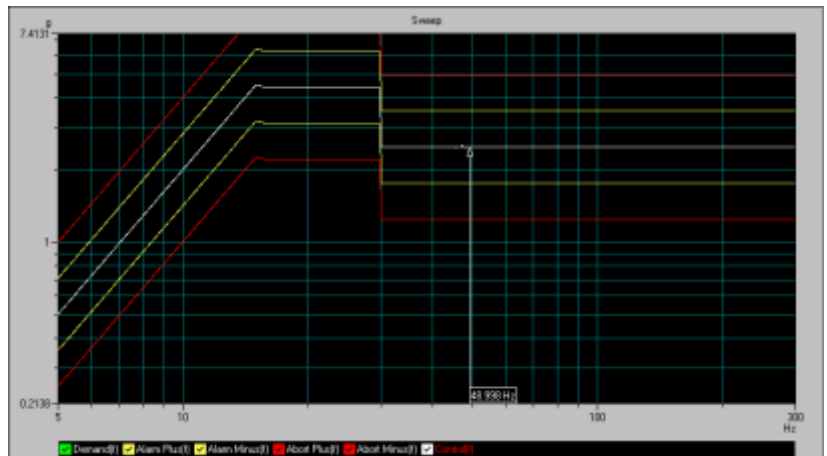
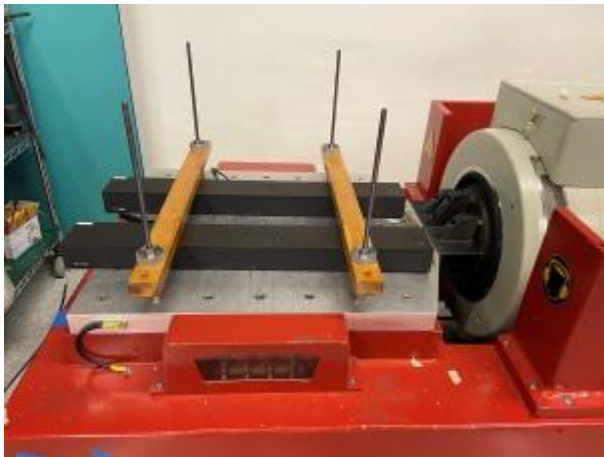
3. Sweep rate: 0.25 octave/min

4. Duration: 60 min/ axis

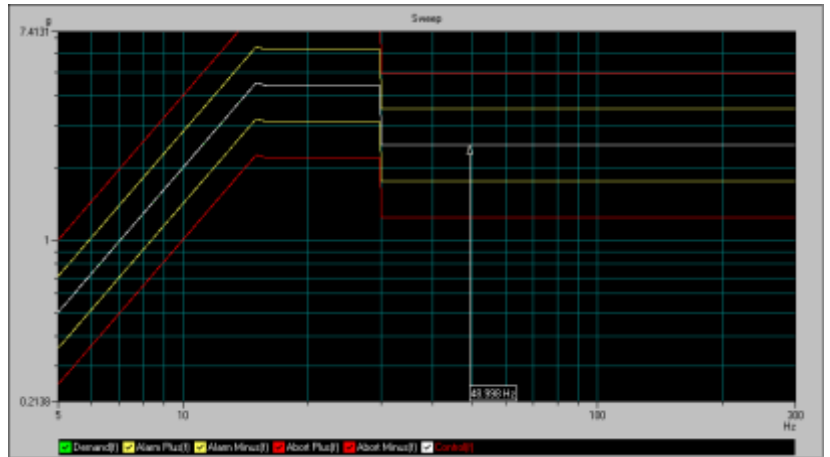
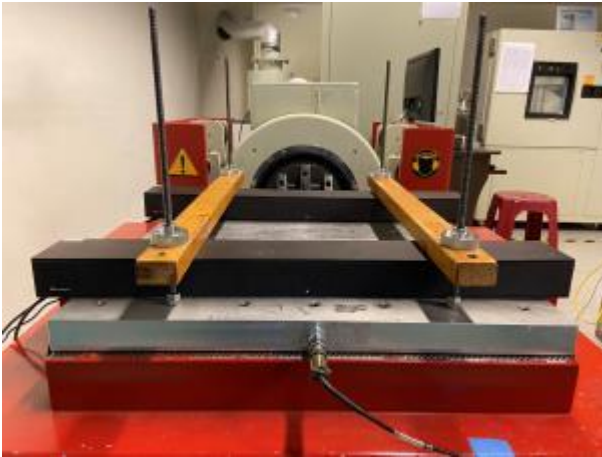
Test Profile:



X axis



Y axis



Z axis

Test Procedure:

Set the product fully function operating.

1. Fix the product on vibration mechanism.
2. Set the test program as above condition:

Acceleration: 10mm /4.4G/2.5G,

Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G

Sweep rate: 0.25 octave/min, Axes: 3.

3. Check the mechanical and function during the test.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products during inspection, such as peeling, crack, missing pixels, discoloration, etc.

Basis for Profile: IEC 60068-2-64.

Test Result: **PASS**



Sample1



Sample2

10. Operation Shock Test

Purpose:

To reveal mechanical weakness and/or degradation in specified performance and to use this information, in conjunction with the relevant specification to decide whether a specimen is acceptable or not. To determine the structural integrity of specimens or as a means of quality control.

Quantity: 2 units (T1 housing)

Test Objective: 1. Acceleration: 30G

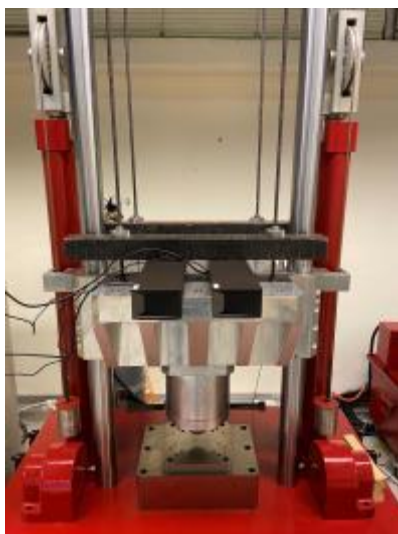
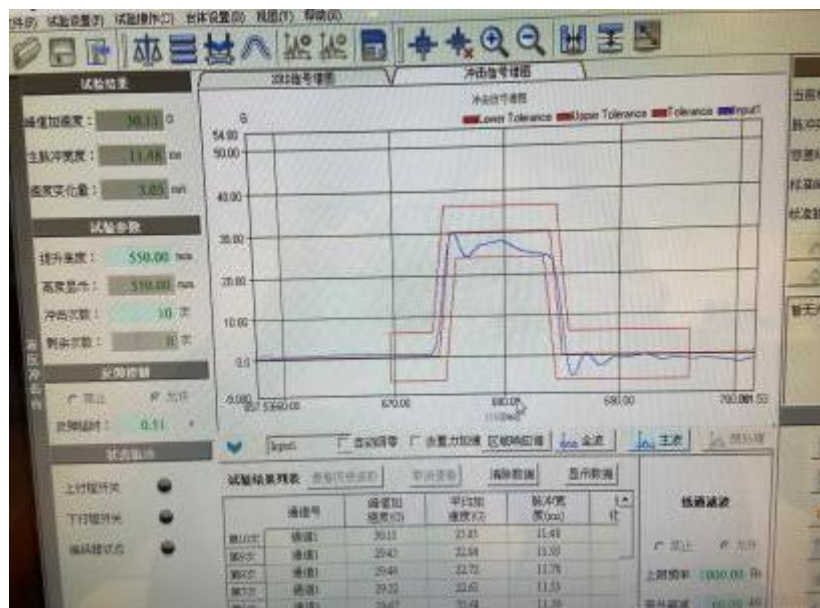
2. Test wave: Square Wave

3. Duration: 11 ms

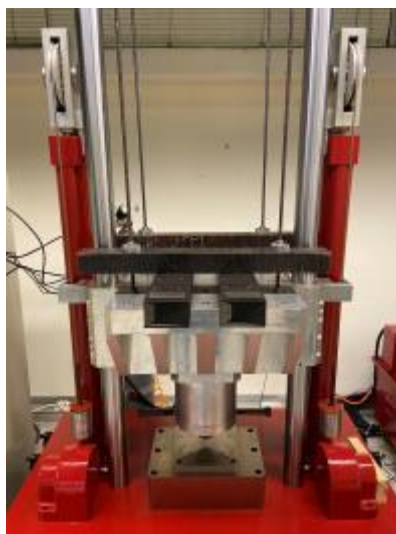
4. Direction: 6 faces

5. 3cycles/direction

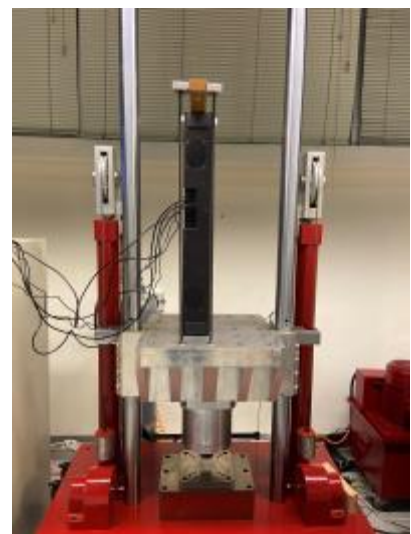
Test Profile:



Bottom side



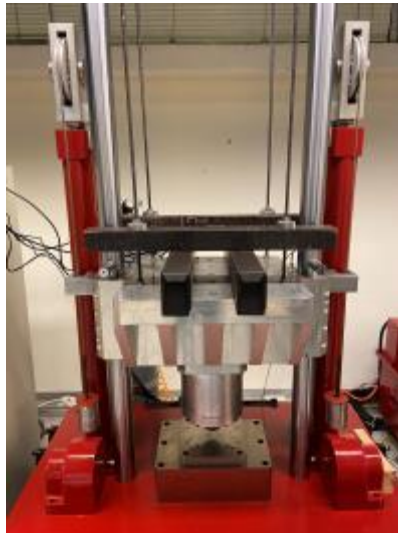
Top side



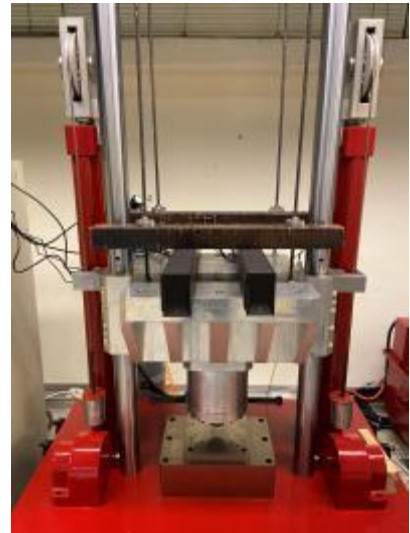
Right side



Left side



Front side



Back side

Test Procedure:

Set the product fully function operating.

1. Fix the product on shock mechanism.
2. Set the test program as above condition:

Acceleration: 30G

Test wave: Square Wave

Duration: 11 ms

4. Test 6 faces, each direction test 3 times.
5. Check the mechanical and function during the test.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products during inspection, such as peeling, crack, missing pixels, discoloration, etc.

Basis for Profile: IEC 60068-2-27.

Test Result: **PASS**



Sample1



Sample2

11. Acoustic Noise Test

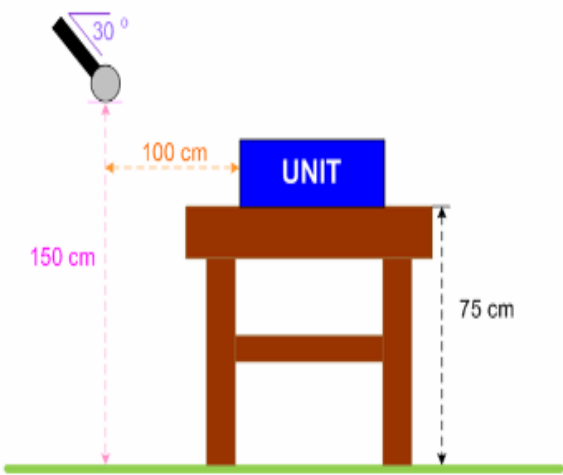
Purpose:

The objective of the test is to characterize the noise emissions of the fan. To meet this objective, the measurements were collected and analyzed in accordance with ISO-7779 standard for acoustic noise measurement techniques.

Quantity: 1 unit

Test Objective: 1. Normal operation mode
2. Standby mode

Test Profile:



Test Procedure:

Set the product fully function operating.

Pass Criteria:

The noise value should be less than 23 dB (A).

Basis for Profile: ISO-7779

Test Result: **PASS**

Channel		Sound pressure level (dB (A))			
		CH1-Rear	CH2-Left	CH3-Front	CH4-Right
K18X001.00	Background noise	16.0	16.1	16.3	16.1
	Normal operation mode	16.0	16.1	16.3	16.1
	Standby mode	16.1	17.3	17.9	16.7

12. Connector Insertion/Removal Test

Purpose:

Verify the extract force of Power Jack/HDMI/USB/MIC/AUX/AJ-45 Connector.

Quantity: 2 pcs.

Test Objective:

1. Power Jack Connector: 5,000 times
2. HDMI Connector: 5,000 times
3. USB (2.0 & 3.0) Connector: 5,000 times
4. MIC Connector: 5,000 times
5. AUX Connector: 5,000 times
6. RJ-45 Connector: 2,000 times
7. Test Speed: 10 cycles /min

Test Profile:



Power Jack



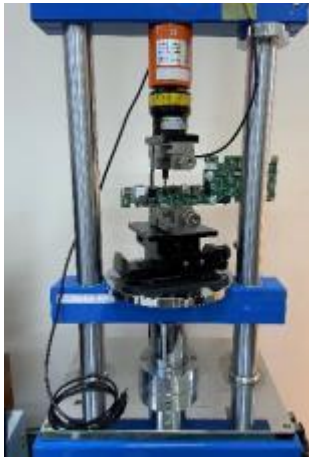
HDMI



USB2.0



USB3.0



MIC



AUX



RJ-45

Test Procedure:

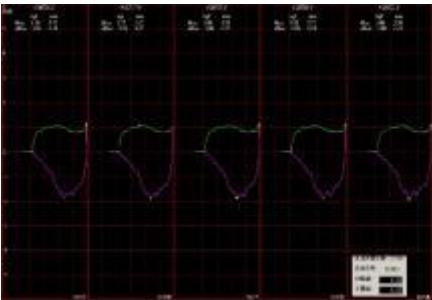
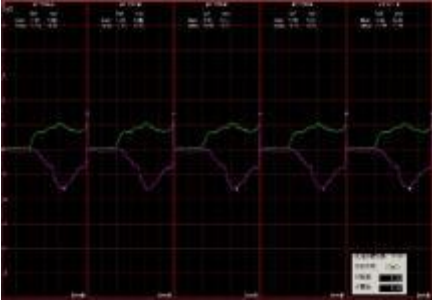
1. Measure the loading of insertion and extraction after the visually inspected and function checked.
2. Fix the test samples into the life-cycle tester.
3. Insert audio cable into the PCB connector with the speed of 10 cycles/min.
4. Extract the audio cable from the PCB connector, with 10 cycles/min speed.
5. Check the function every 1,000 times.

Pass Criteria:

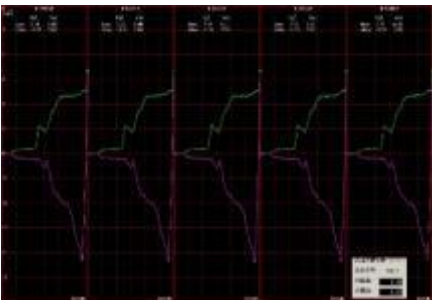
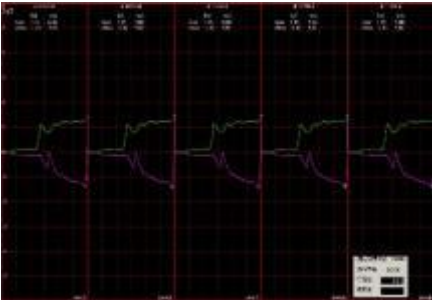
- 1. No functional failures before and after the test.
- 2. No performance degradation during the functional test.

Test Result: **PASS**

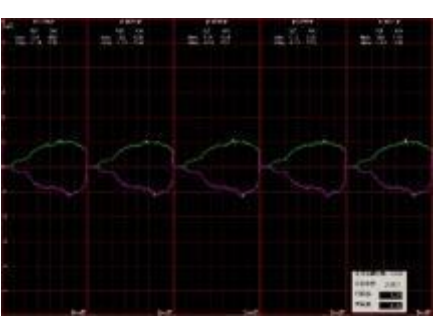
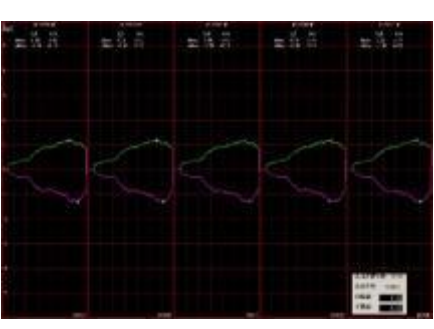
Power Jack Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

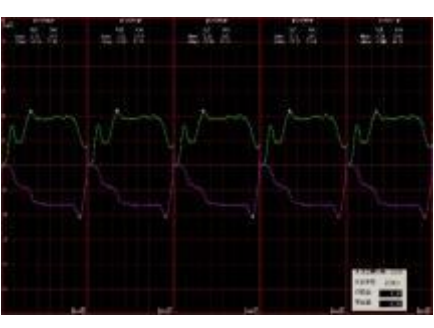
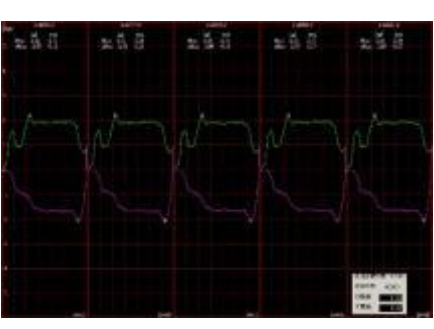
HDMI Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

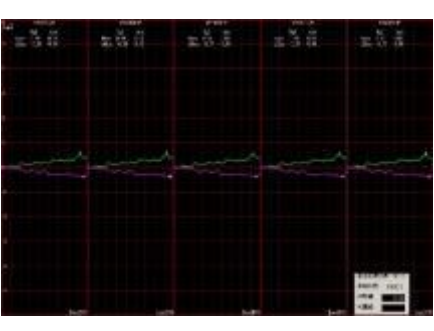
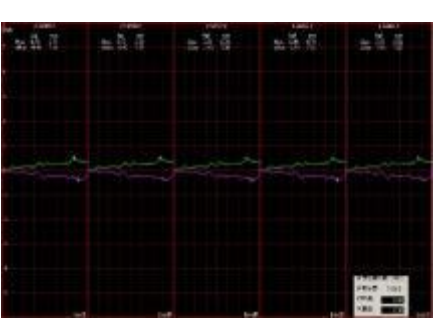
USB2.0 Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

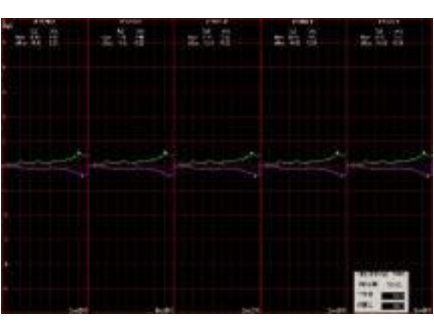
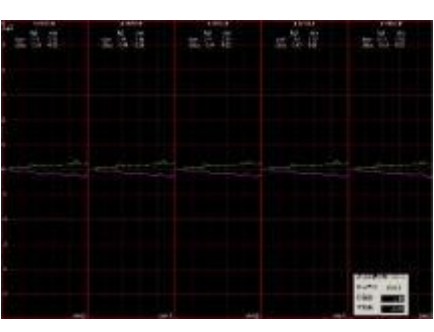
USB3.0 Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

MIC Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

AUX Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

RJ-45 Connector

Item	After Test	Test Profile	Test result
Sample 1			PASS
Sample 2			PASS

13. Button Life Test

Purpose:

Simulate the normal user usage to demonstrate that the button can withstand mechanical cycling straight pressure.

Quantity: 2 units

Test Objective: Test cycles: 5,000 cycles
Test Speed: 10 cycles/min

Test Profile:



Test Procedure:

1. Perform functional check and visual inspection on DUTs before test, and make sure the button can work normally.
2. Press and release the button by Button Life Tester, repeat the action for 5,000 cycles with speed of 10 cycles/min.

Pass Criteria:

Buttons must withstand mechanical cycling.

Test Result: **PASS**



14. Power Switch Life Test

Purpose:

Simulate the normal user usage to demonstrate that the power switch can withstand cycle switching.

Quantity: 2 units

Test Objective: Test cycles: 5,000 cycles
Test Speed: 10 cycles/min

Test Profile:



Test Procedure:

1. Perform functional check and visual inspection on DUTs before test, and make sure the Power Switch can work normally.
2. Manually switch the power switch to carry out the life test, repeat the action for 5,000 cycles with speed of 10 cycles/min.

Pass Criteria:

Power Switch must withstand cycle switching.

Test Result: **PASS**



15. Chassis Static Load

Purpose:

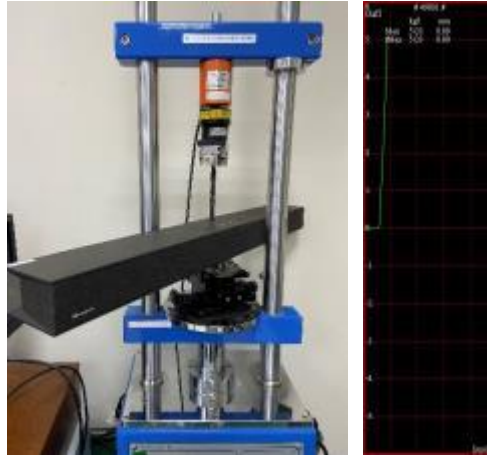
To demonstrate the product can meet worst case condition.

Quantity: 1 unit

Test Objective: 1. Applied position: TOP on the enclosure

2. Weight and time: 5 Kg/ diameter 9 mm area/ apply 30 seconds

Test Profile:



Test Procedure:

1. Perform functional test and visual inspection on DUTs before test.
2. Place and fix the DUT on Precision Loading Tester.
4. Use diameter 9 mm area, start test for this orientation by add the push force to 5 kg, and hold on for 30s.
5. Released the force, and visual inspect the DUT to make sure no any damage of Mechanical material.

Pass Criteria:

There is no damage of Mechanical material (for examples Cover's crack, breakdown).

Test Result: **PASS**



16. Surface Coating Abrasion

Purpose:

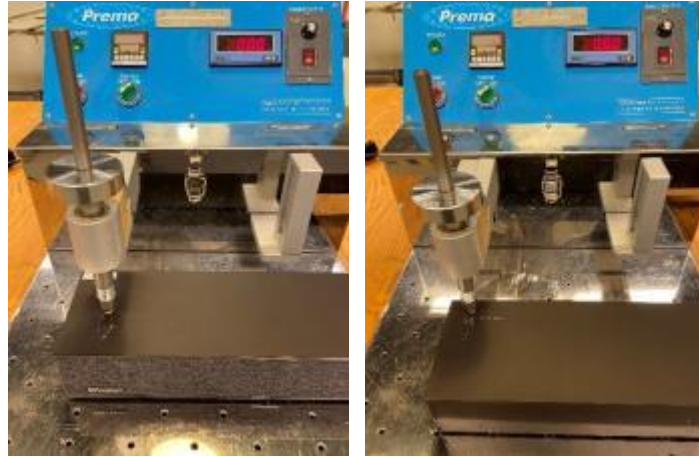
Reveal abrasive weakness on all surface coating.

Quantity: 1 unit

Test Objective: Test loading: 250 g

Test cycles: 50 cycles by No.74 the eraser

Test Profile:



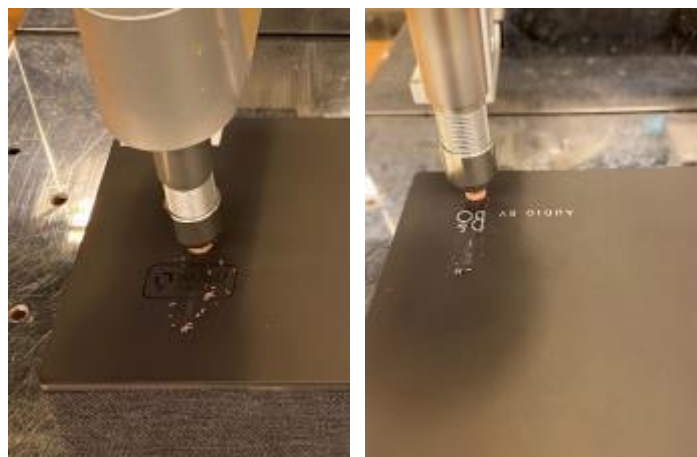
Test Procedure:

1. Visually inspect all enclosure components to be tested.
2. Test 50 cycles by the No.74 eraser.
3. Visually inspect all components after test.

Pass Criteria:

No physical defect and functional failure after this test.

Test Result: **PASS**



17. Abrasion Resistance of Label Test

Purpose:

To demonstrate that products can be deformed or disfigured in any way by the chemical solvents.

Quantity: 1 unit

Test Objective: Loading force: 1,000 g

Test cycles: 800 cycles for the abrasion by the 75% alcohol solvent

Test Profile:



Test Procedure:

1. Fixed the DUT on the abrasion Tester
2. Alcohol concentration: 75%
3. Load: 1,000g for cycle: 800 cycles (one cycle= forward + backward)

Pass Criteria:

There is no abrasion of printing character and number.

Test Result: **PASS**



18. Logo/Printing Abrasion Test

Purpose:

To demonstrate that products can be deformed or disfigured in any way by the chemical solvents.

Quantity: 1 unit

Test Objective: Loading force: 1,000 g

Test cycles: 2,000 cycles for the abrasion by the 75% alcohol solvent

Test Profile:



Test Procedure:

1. Fixed the DUT on the abrasion Tester
2. Alcohol concentration: 75%
3. Load: 1,000g for cycle: 2,000 cycles (one cycle= forward + backward)

Pass Criteria:

There is no abrasion of printing character and number.

Test Result: **PASS**



19. Free Fall Drop Test (Gift Box packaging test)

Purpose:

To assess the effects on a specimen of simple standard test intended to be representative of the fall likely to be experience during rough handling, or to demonstrate a minimum degree of robustness, for the purpose of assessing safety requirements.

Quantity: 2 gift box

Test Objective:

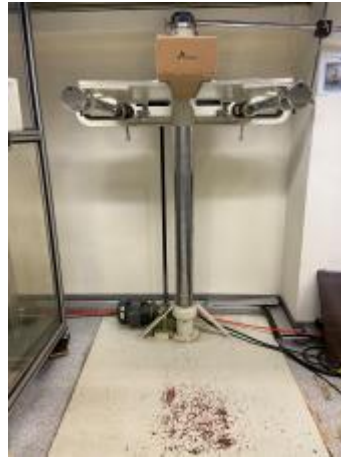
1. Gift box weight: 3.660 kg
2. Height for fall test: 1.5 m
3. Fall plate: steel floor
4. Drop 6 faces



Test Profile:



Top



Bottom



Front



Rear



Left



Right

Test Procedure:

1. Put the carton on drop mechanism.
2. Drop 1.5 m for six faces.
3. Check the mechanical and function after the test.

Pass Criteria:

No function failures both during and after packaged drop test.

Test Result: PASS



Gift Box1



Gift Box 2