Verification

Issue Date: March 12, 2021
Ref. Report No.: ISL-21LE090CE50155-MA

Product Name : THN 20WIR THN 30WIR Series
Model(s) : THN 30-7210WIR;THN 30-7225WIR;THN 30-2410WIR;
THN 30-2411WIR;THN 30-2412WIR;THN 30-2413WIR;
THN 30-2415WIR;THN 30-2422WIR;THN 30-2423WIR;
THN 30-2425WIR;THN 30-4810WIR;THN 30-4811WIR;
THN 30-4812WIR;THN 30-4813WIR;THN 30-4815WIR;
THN 30-4822WIR;THN 30-4823WIR;THN 30-4825WIR;
THN 30-7211WIR;THN 30-7212WIR;THN 30-7213WIR;
THN 30-7215WIR;THN 30-7222WIR;THN 30-7223WIR;
THN 20-2410WIR;THN 20-2411WIR;THN 20-2412WIR;
THN 20-2413WIR;THN 20-2415WIR;THN 20-2422WIR;
THN 20-2423WIR;THN 20-2425WIR;THN 20-4810WIR;
THN 20-4811WIR;THN 20-4812WIR;THN 20-4813WIR;
THN 20-4815WIR;THN 20-4822WIR;THN 20-4823WIR;
THN 20-4825WIR;THN 20-7210WIR;THN 20-7211WIR;
THN 20-7212WIR;THN 20-7213WIR;THN 20-7215WIR;
THN 20-7222WIR;THN 20-7223WIR;THN 20-7225WIR
Applicant : TRACO ELECTRONIC AG
Brand : TRACO POWER
Address : Sihlbruggstrasse 111 CH-6340 Baar Switzerland

We, **International Standards Laboratory Corp.**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report. And Our laboratories is the accredited laboratories and are approved according to ISO/IEC 17025. The device was passed the test performed according to:

Standards:
EN 50155:2017 for EMC, Environmental and Characteristic
EN 50121-3-2:2016+A1:2019 for EMC
EN 60068-2-1:2007 for Environmental
EN 60068-2-2:2007 for Environmental
EN 60068-2-30:2005 for Environmental
EN 61373:2010 for Environmental

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.
The determination of the test results is determined by customer agreement, regulations or standard document specifications.
The Laboratory evaluates measurement inaccuracies based on regulatory or standard document specifications and is listed in the report for reference. The quantitative project part judges the conformity of the test results based on the evaluation results of the standard cited uncertainty, and the qualitative project does not temporarily evaluate the measurement uncertainty.

Angus Chu

Angus Chu / Director

International Standards Laboratory Corp. LT Lab.
TEL: +886-3-263-8888 FAX: +886-3-263-8899
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

TEST REPORT

of

EN 50155
(EMC, Characteristic, Environmental Test)

Product : **THN 20WIR THN 30WIR Series**
Model(s): **THN 30-7210WIR;THN 30-7225WIR**
(more serial models listed on 1.3 of this test report)

Brand: **TRACO POWER**
Applicant: **TRACO ELECTRONIC AG**
Address: **Sihlbruggstrasse 111 CH-6340 Baar Switzerland**

Test Performed by:
International Standards Laboratory Corp. LT Lab.
TEL: +886-3-263-8888 FAX: +886-3-263-8899
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

Report No.: **ISL-21LE090 CE50155-MA**
Issue Date : **March 12, 2021**

Contents of Report

1. General

1.1 Certification of Accuracy of Test Data

Standards:	Please refer to 1.2
Equipment Tested:	THN 20WIR THN 30WIR Series
Model:	THN 30-7210WIR;THN 30-7225WIR (more serial models listed on 1.3 of this test report)
Brand:	TRACO POWER
Applicant:	TRACO ELECTRONIC AG
Sample received Date:	November 26, 2020
Final test Date:	EMI: refer to the date of test data EMS: December 17, 2020
Test Site:	Chamber 12; Chamber 14; Conduction 03; Immunity 02
Test Distance:	10m (EMI test)
Temperature:	refer to each site test data
Humidity:	refer to each site test data
Input power:	Conduction input power: DC 110 V; DC 72 V Radiation input power: DC 110 V; DC 72 V Immunity input power: DC 110 V
Test Result:	**PASS**
Report Engineer:	Cheryl Tung
Test Engineer:	Sawyer chiang Sawyer Chiang
Approved By:	Benson Chen Benson Chen / Associate Director

1.2 Test Standards

The tests which this report describes were conducted by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp. in accordance with the following

☒EN 50155:2017 for EMC, Environmental and Characteristic
☒EN 50121-3-2:2016+A1:2019 for EMC
☒EN 60068-2-1:2007 for Environmental
☒EN 60068-2-2:2007 for Environmental
☒EN 60068-2-30:2005 for Environmental
☒EN 61373:2010 for Environmental

Characteristic Test					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
2.1	Visual Inspection and Performance test	13.4.1 13.4.2	-	PASS	ISL LAB
2.2	Power Supply Test (Supply variations and Temporary supply dips)	13.4.3.2 13.4.3.3 5.1.1.2 5.1.1.3	-	PASS	ISL LAB
2.3	Power Supply Test (Interruptions of voltage supply)	13.4.3.4 5.1.1.4	-	PASS	ISL LAB
2.4	Power Supply Test (Supply charge-over)	13.4.3.5 5.1.3	-	PASS	ISL LAB
2.5	Insulation Test	13.4.9	-	PASS	ISL LAB
2.6	DC ripple factor	5.1.1.6	EN50155 EN61000-4-17	PASS	ISL LAB

Electromagnetic Compatibility (EMC)					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
3.1	Power Line Conducted Emission Measurement	13.4.8	EN 50121-3-2 EN 61000-6-4	PASS	ISL LAB
3.2	Radiated Emission Measurement	13.4.8	EN 50121-3-2 EN 61000-6-4	PASS	ISL LAB
3.3	Electrostatic Discharge Susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-2	PASS	ISL LAB
3.4	Radio- Frequency interference (RFI) susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-3	PASS	ISL LAB
3.5	Transient Burst Susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-4	PASS	ISL LAB
3.6	Surges Test	13.4.8	EN 50121-3-2 EN 61000-4-5	PASS	ISL LAB
3.7	Radio- Frequency, Conducted Disturbances Immunity Test	13.4.8	EN 50121-3-2 EN 61000-4-6	PASS	ISL LAB
3.8	Power Frequency Magnetic Field	13.4.8	EN 61000-4-8	PASS	ISL LAB

Environmental Tests					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
4.1	Low temperature star-up test	13.4.4	EN 60068-2-1	PASS	ISL LAB
4.2	Dry Heat Test	13.4.5	EN 60068-2-2	PASS	ISL LAB
4.3	Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	PASS	ISL LAB
4.4	Random Vibration Test	13.4.11	EN 61373	PASS	GTTI LAB
4.5	Increased Random Vibration Test	13.4.11	EN 61373	PASS	GTTI LAB
4.6	Shock Test	13.4.11	EN 61373	PASS	GTTI LAB

GTTI LAB= GOLDEN-TECH TECHNOLOGIES INC.

1.2.1 Performance Criteria for Compliance

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.

1.2.2 Performance Criteria for Compliance: EN 50121-1 (only for EMC)

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.

1.3 Model Number Definition

There is more than one model number for this product, please refer the details listed below:

THN 30-7210WIR;THN 30-7225WIR;THN 30-2410WIR;
THN 30-2411WIR;THN 30-2412WIR;THN 30-2413WIR;
THN 30-2415WIR;THN 30-2422WIR;THN 30-2423WIR;
THN 30-2425WIR;THN 30-4810WIR;THN 30-4811WIR;
THN 30-4812WIR;THN 30-4813WIR;THN 30-4815WIR;
THN 30-4822WIR;THN 30-4823WIR;THN 30-4825WIR;
THN 30-7211WIR;THN 30-7212WIR;THN 30-7213WIR;
THN 30-7215WIR;THN 30-7222WIR;THN 30-7223WIR;
THN 20-2410WIR;THN 20-2411WIR;THN 20-2412WIR;
THN 20-2413WIR;THN 20-2415WIR;THN 20-2422WIR;
THN 20-2423WIR;THN 20-2425WIR;THN 20-4810WIR;
THN 20-4811WIR;THN 20-4812WIR;THN 20-4813WIR;
THN 20-4815WIR;THN 20-4822WIR;THN 20-4823WIR;
THN 20-4825WIR;THN 20-7210WIR;THN 20-7211WIR;
THN 20-7212WIR;THN 20-7213WIR;THN 20-7215WIR;
THN 20-7222WIR;THN 20-7223WIR;THN 20-7225WIR

1.4 Description of EUT

EUT

This report test data using the report number 21LE090CE50155

Description	THN 20WIR THN 30WIR Series
Condition	Pre-Production
Model	THN 30-7210WIR;THN 30-7225WIR (more serial models listed on 1.3 of this test report)
Test Model	THN 30-7210WIR
Brand	TRACO POWER
Serial Number	N/A
Highest working frequency	Less than 108MHz

pre-test configuration:

Configuration	Model Name	Input VDC	Output Voltage VDC
1	THN 30-7210WIR	110	3.3
2	THN 30-7225WIR	110	±24

According to the Pre-test, it was found that Configuration 1 is the worst. It was taken as the representative condition for testing by the applicant and its data are recorded in the present document.

Test configuration:

Configuration	Model Name	Input VDC	Output Voltage VDC
1	THN 30-7210WIR	110	3.3
2		72	3.3

For EMS (Not Include Electrical Fast transients/burst immunity & Surge Immunity) test mode

Configuration	Model Name	Input VDC	Output Voltage VDC	With an aluminum electrolytic capacitor test board
1	THN 30-7210WIR	110	3.3	No

For Electrical Fast transients/burst immunity & Surge Immunity test mode

Configuration	Model Name	Input VDC	Output Voltage VDC	With an aluminum electrolytic capacitor test board
1	THN 30-7210WIR	110	3.3	Yes

Different Model list:

Model Name	Input Range (VDC)	Output Voltage (VDC)
THN 30-2410WIR	9 ~ 36	3.3
THN 30-2411WIR	9 ~ 36	5.1
THN 30-2412WIR	9 ~ 36	12
THN 30-2413WIR	9 ~ 36	15
THN 30-2415WIR	9 ~ 36	24
THN 30-2422WIR	9 ~ 36	±12
THN 30-2423WIR	9 ~ 36	±15
THN 30-2425WIR	9 ~ 36	±24
THN 30-4810WIR	18 ~ 75	3.3
THN 30-4811WIR	18 ~ 75	5.1
THN 30-4812WIR	18 ~ 75	12
THN 30-4813WIR	18 ~ 75	15
THN 30-4815WIR	18 ~ 75	24
THN 30-4822WIR	18 ~ 75	±12
THN 30-4823WIR	18 ~ 75	±15
THN 30-4825WIR	18 ~ 75	±24
THN 30-7210WIR	36 ~ 160	3.3
THN 30-7211WIR	36 ~ 160	5.1
THN 30-7212WIR	36 ~ 160	12
THN 30-7213WIR	36 ~ 160	15
THN 30-7215WIR	36 ~ 160	24
THN 30-7222WIR	36 ~ 160	±12
THN 30-7223WIR	36 ~ 160	±15
THN 30-7225WIR	36 ~ 160	±24
THN 20-2410WIR	9 ~ 36	3.3
THN 20-2411WIR	9 ~ 36	5.1
THN 20-2412WIR	9 ~ 36	12
THN 20-2413WIR	9 ~ 36	15
THN 20-2415WIR	9 ~ 36	24
THN 20-2422WIR	9 ~ 36	±12
THN 20-2423WIR	9 ~ 36	±15
THN 20-2425WIR	9 ~ 36	±24
THN 20-4810WIR	18 ~ 75	3.3
THN 20-4811WIR	18 ~ 75	5.1
THN 20-4812WIR	18 ~ 75	12
THN 20-4813WIR	18 ~ 75	15
THN 20-4815WIR	18 ~ 75	24
THN 20-4822WIR	18 ~ 75	±12
THN 20-4823WIR	18 ~ 75	±15
THN 20-4825WIR	18 ~ 75	±24
THN 20-7210WIR	36 ~ 160	3.3
THN 20-7211WIR	36 ~ 160	5.1

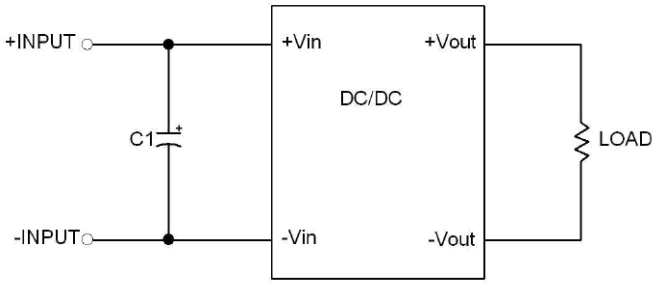
Model Name	Input Range (VDC)	Output Voltage (VDC)
THN 20-7212WIR	36 ~ 160	12
THN 20-7213WIR	36 ~ 160	15
THN 20-7215WIR	36 ~ 160	24
THN 20-7222WIR	36 ~ 160	±12
THN 20-7223WIR	36 ~ 160	±15
THN 20-7225WIR	36 ~ 160	±24

EMI Noise Source:
Please refer to the technical documents.

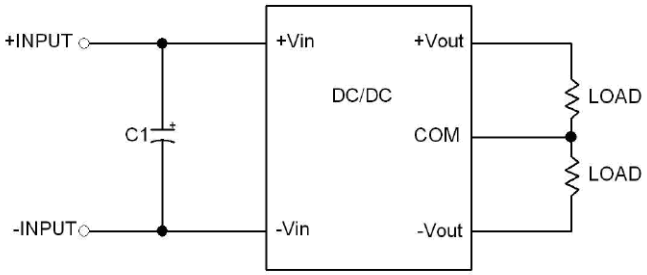
Solution:

For EMI test requirements/Class A

THN 20WIR SERIES



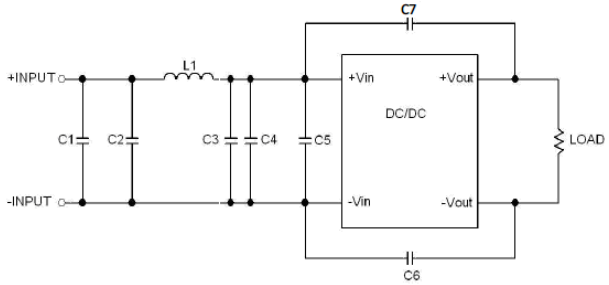
Single Output



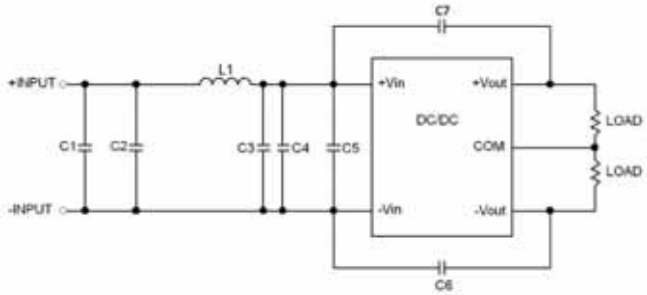
Dual Output

Model	C1
THN 20-24□□WIR THN 20-48□□WIR	N/A
THN 20-72□□WIR	4.7uF/200V Nippon Chemi-con KXJ series

THN 30WIR SERIES



Single Output



Dual Output

Model	C1	L1	C2、C3、C4、C5
THN 30-24□□WIR	10uF / 50V	2.2uH	N/A
THN 30-48□□WIR	4.7uF /100V	10uH	N/A
THN 30-72□□WIR	1.0uF /250V	100uH	1.0uF/250V

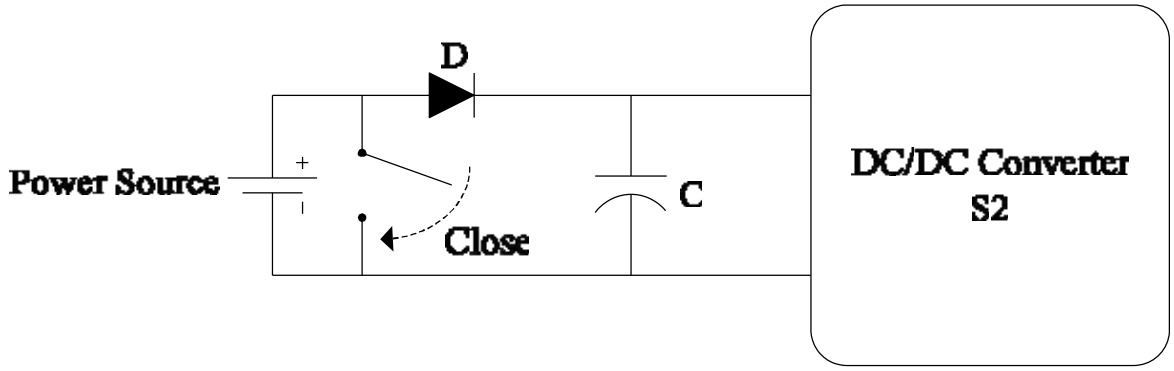
For Electrical Fast transient & Surge Immunity test requirements

Model Reference	Increase countermeasure components
THN 20-24□□WIR	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) in parallel.
THN 20-48□□WIR	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)
THN 20-72□□WIR	With an external input filter capacitor (Nippon chemi-con KXJ series, 150μF/200V) and a TVS (SMBJ300A, 300V, 600Watt peak pulse power) in parallel.

Model Reference	Increase countermeasure components
THN 30-24□□WIR	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)
THN 30-48□□WIR	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)
THN 30-72□□WIR	With 2pcs aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 150μF/200V in parallel) and a TVS (SMBJ220A, 220V, 600Watt peak pulse power) in parallel.

For Interruption voltage supply classes & supply change-over classes test requirements

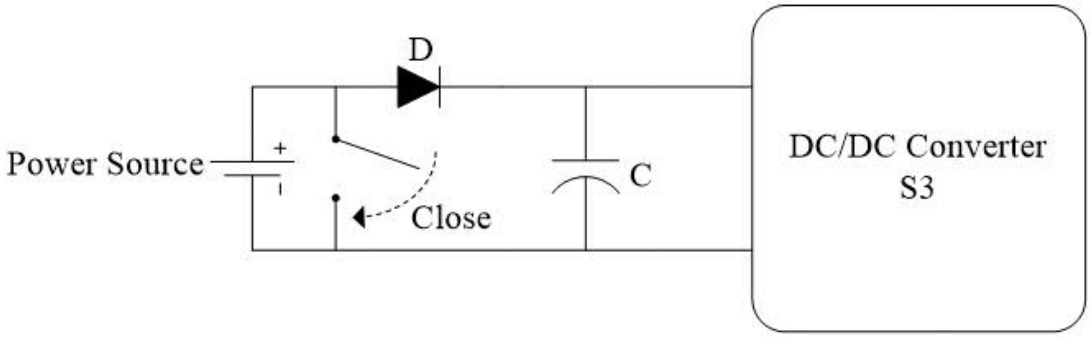
Recommended external components for Interruptions of voltage supply Class S2



Model Reference	D1	Cin
THN 20-24□□WIR	VB30200C(200V/30A)	1440uF/50V
THN 20-48□□WIR		330uF/100V
THN 20-72□□WIR		68uF/200V

Model Reference	D1	Cin
THN 30-24□□WIR	VB30200C(200V/30A)	2000uF/50V
THN 30-48□□WIR		500uF/100V
THN 30-72□□WIR		94uF/200V

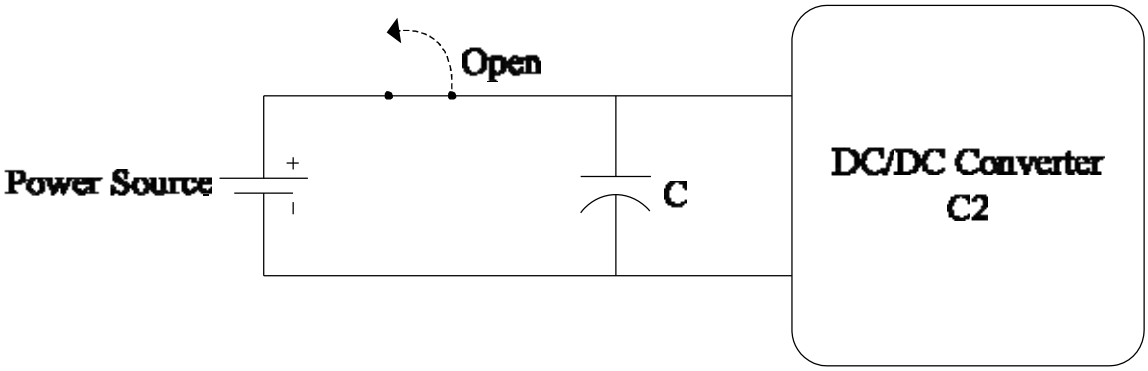
Recommended external components for Interruptions of voltage supply Class S3



Model Reference	D1	Cin
THN 20-24□□WIR	VB30200C(200V/30A)	2700uF/50V
THN 20-48□□WIR		680uF/100V
THN 20-72□□WIR		125uF/200V

Model Reference	D1	Cin
THN 30-24□□WIR	VB30200C(200V/30A)	4000uF/50V
THN 30-48□□WIR		1000uF/100V
THN 30-72□□WIR		188uF/200V

Recommended external components for supply change-over Class C2



Model Reference	Cin
THN 20-24□□WIR	4000uF/50V
THN 20-48□□WIR	1000uF/100V
THN 20-72□□WIR	200uF/200V

Model Reference	Cin
THN 30-24□□WIR	6000uF/50V
THN 30-48□□WIR	1500uF/100V
THN 30-72□□WIR	280uF/200V

1.5 Description of Support Equipment

For EMI test Configuration Support unit: 1~2
For EMS test Configuration Support unit: 1~3

No	Unit	Model Serial No.	Brand	Power Cord	FCC ID
1	DC Power Source	GPD-4050D S/N: N/A	GW INSTEK	Non-shielded	FCC DOC
2	Dummy Load	N/A S/N: N/A	N/A	N/A	N/A
3	DC Voltage meter	BN-670 S/N: N/A	Bonny	N/A	N/A

2. Characteristic Test

2.1 Visual Inspection and Performance test

2.1.1 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.

2.1.2 Test Procedure

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

2.1.3 Test Result

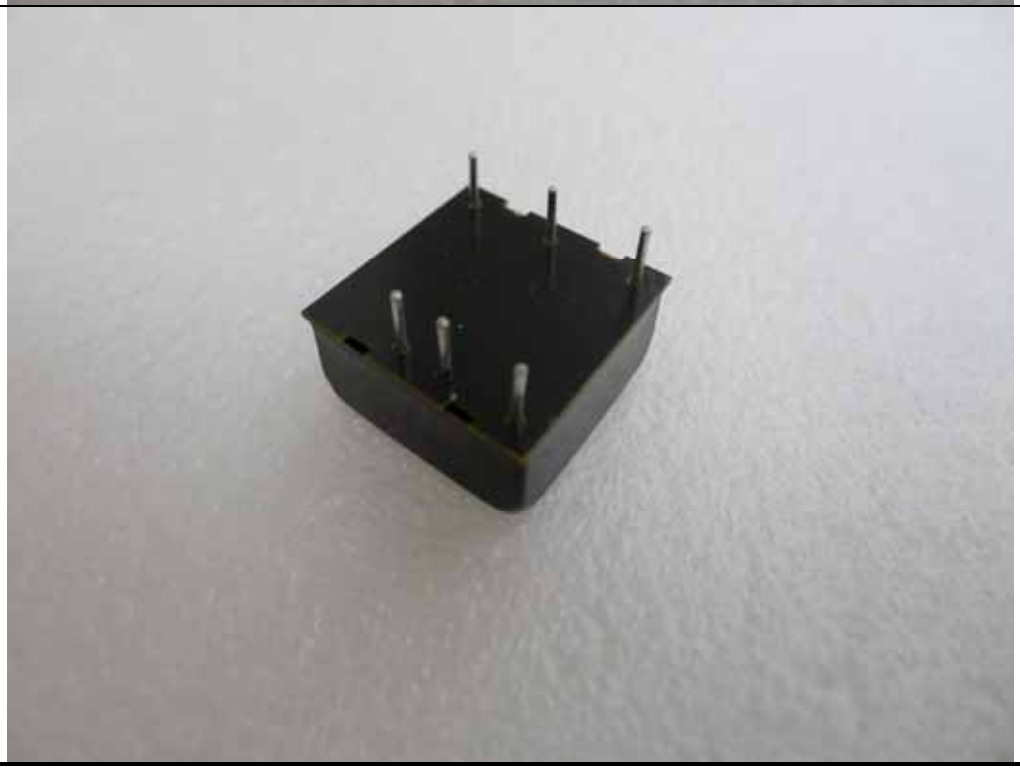
Date : 202011/26	Temperature : 25 ℃	Engineer : SAWYER
EUT Model Name : THN 30-7210WIR	Humidity : 56 %	Barometer Pressure: 99.1 kPa
		Standard: EN 50155
Voltage/Freq: 110Vdc		

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.

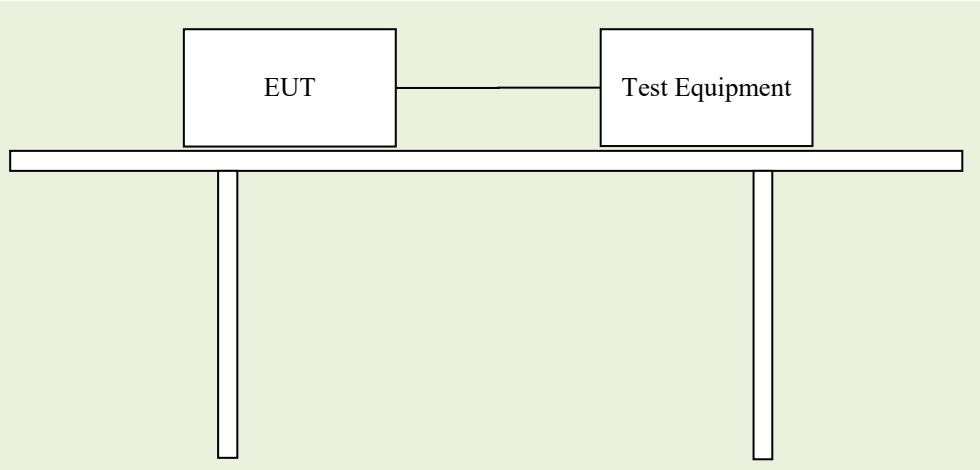
Inspection item	Result
EUT outside	OK
EUT function	OK

Before test：Ok



2.2 Power supply test (Supply variation and temporary supply dips)

2.2.1 Test Setup

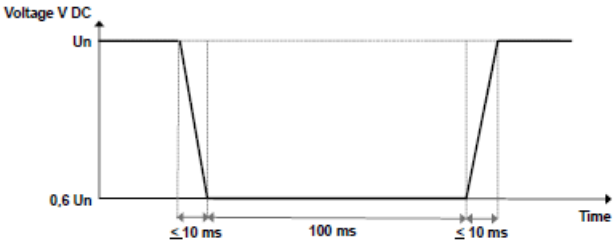


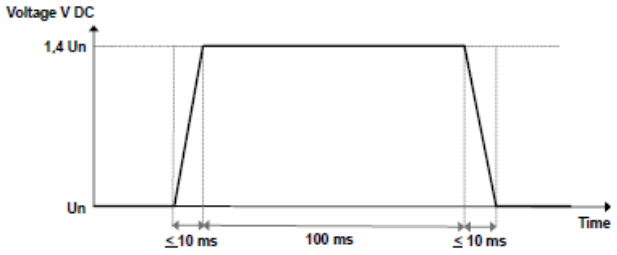
2.2.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.3.2, 13.4.3.3, 5.1.1.2 & 5.1.1.3

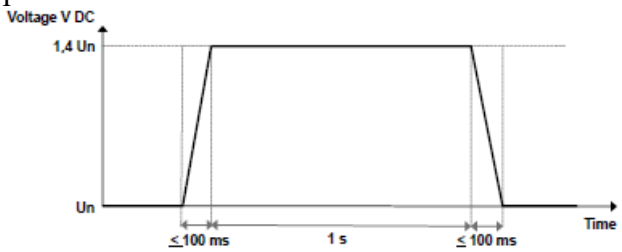
2.2.3 Test Requirement

☒D.C. supplied equipment:
Test performed to prove correct functioning at nominal supply voltage and at the upper and lower limits of specified voltage as defined below:
Minimum Continuous voltage: 0.7 *Un* Maximum Continuous voltage: 1.25 *Un*
Voltage fluctuations (e.g. during start-up of auxiliary equipment or voltage oscillations of battery chargers) lying between 0.6 *Un* and 1.4 *Un* and not exceeding 0.1 s shall not cause deviation of function (performance criterion A).





For temporary supply overvoltages up to 1,4 *Un* lasting no more than 1 s the equipment shall fulfil performance criterion B.



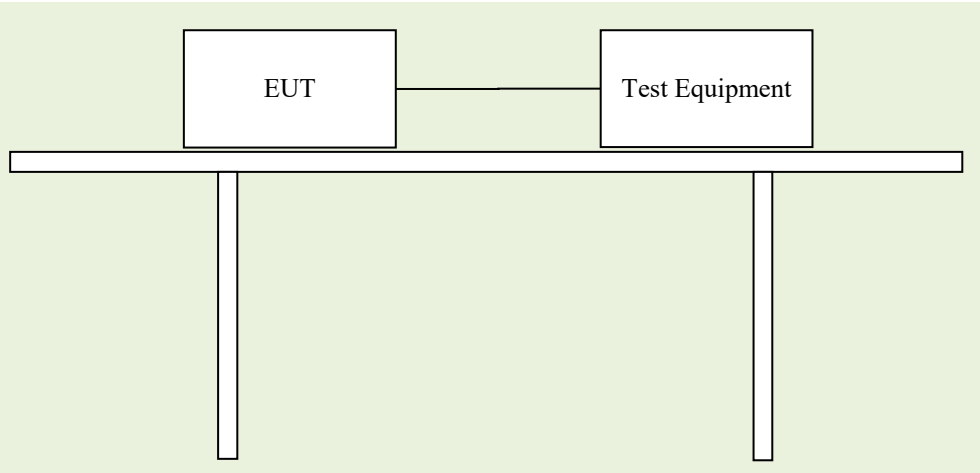
☐A.C. supplied equipment:
Test performed to prove correct functioning at:
Nominal voltage and frequency;
The upper and lower limits of voltage and frequency are in all combinations.

2.2.4 Test Result

Date : 2020/12/4		Temperature : 20 ℃		Engineer : SAWYER	
EUT Model Name : THN 30-7210WIR		Humidity : 53 %		Barometer Pressure: 103.2 kPa	
				Standard: EN 50155	
Voltage/Freq: 110Vdc					
Variations of Voltage supply	Level	Voltage	Test Time	EUT Status	Comments
Minimum voltage	0.7 Un	77Vdc	10 min	Pass	
Nominal voltage	Un	110Vdc	10 min	Pass	
Maximum voltage	1.25 Un	137.5Vdc	10 min	Pass	
Voltage fluctuations	Level	Voltage	Test Time	EUT Status	Comments
High voltage	1.4 Un	154Vdc	0.1 s	Pass	
Low voltage	0.6 Un	66Vdc	0.1 s	Pass	
High voltage	1.4 Un	154Vdc	1 s	Pass	
High voltage	1.25 Un	137.5Vdc	1 s	Pass	

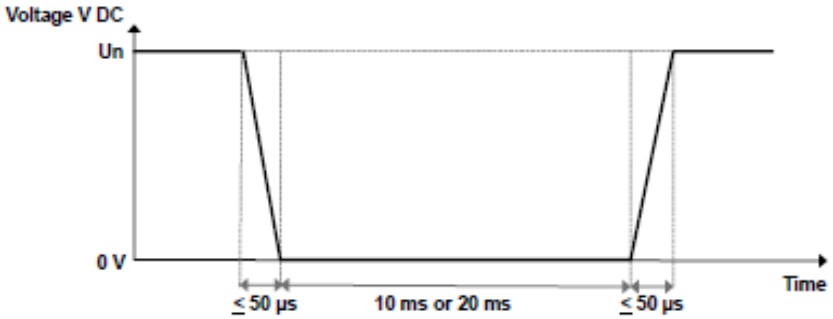
2.3 Power supply test (Supply Interruption)

2.3.1 Test Setup



2.3.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.3.4 & 5.1.1.2



2.3.3 Test Requirement

Interruptions of input voltage as defined below:

Class	Requirements	Duration of the interruption time Tint
S1	No performance criterion is requested but the equipment shall continue to operate as specified after the voltage interruption.	This test is not required.
S2	The equipment shall behave according performance criterion A.	10 ms
S3	The equipment shall behave according performance criterion A.	20 ms

2.3.4 Test Result

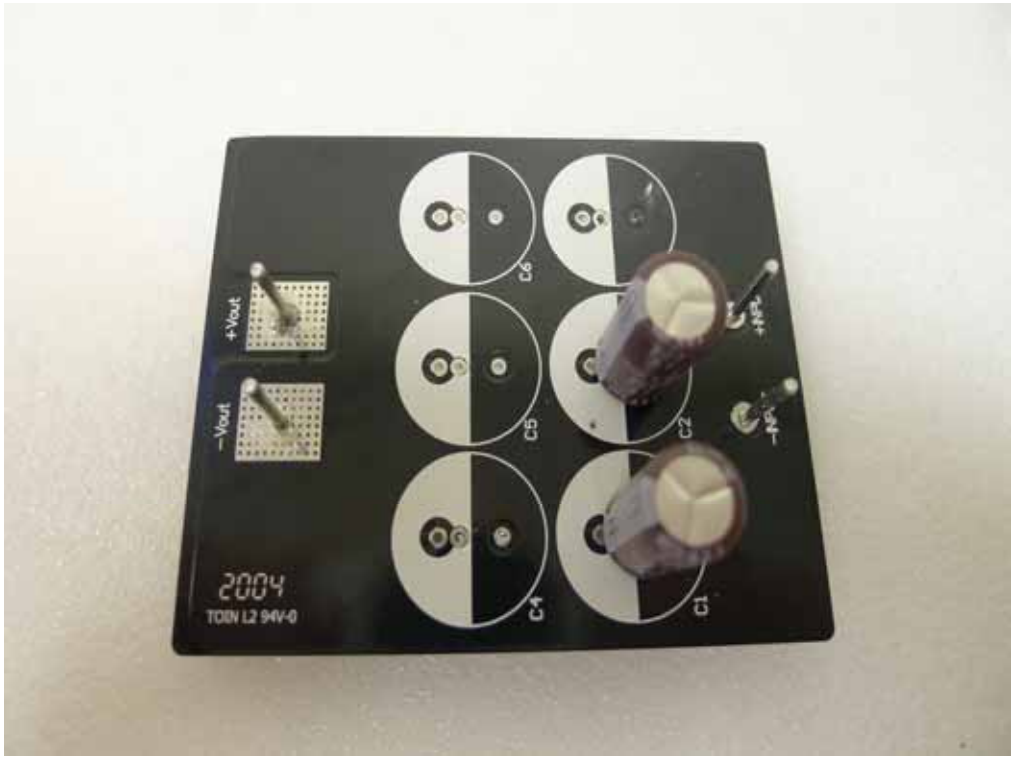
Date : 2020/12/4	Temperature : 20 ℃	Engineer : SAWYER
EUT Model Name : THN 30-7210WIR	Humidity : 53 %	Barometer Pressure: 103.2 kPa
		Standard: EN 50155
Voltage/Freq: 110Vdc		

Interruptions of voltage supply	Level	Voltage	INT time	EUT Status	Comments
Class S1:Voltage interruptions	Un	110Vdc	0 s	Pass	
Class S2:Voltage interruptions	0 Un	0Vdc	10ms	Pass	Note1
Class S3:Voltage interruptions	0 Un	0Vdc	20ms	Pass	Note2

Note1: Add aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 94uF /200V) and a diode VB30200C(200V/30A) for testing

Note2: Add aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 188uF /200V) and a diode VB30200C(200V/30A) for testing

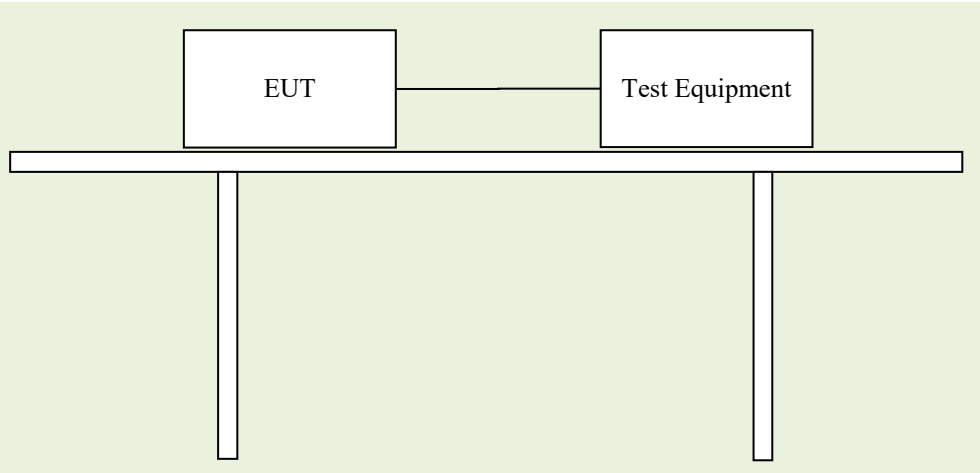
The following photos




+Vout
-Vout
2004

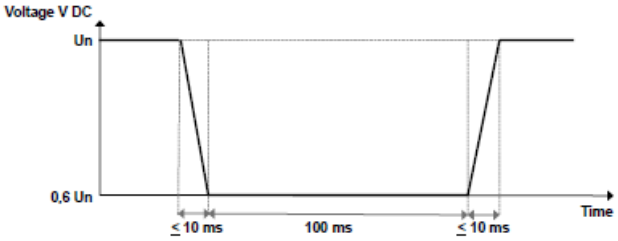
2.4 Power supply test (Supply Change Over)

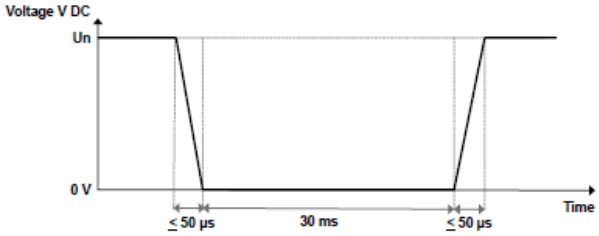
2.4.1 Test Setup



2.4.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.3.5 & 5.1.3





2.4.3 Test Requirement

- Class C1 at 0.6 *Un* during 100ms (without interruptions) **Performance criterion A;**
- Class C2: during a supply break of 30 ms starting at *Un* **Performance criterion B.**

2.4.4 Test Result

Date : 2020/12/4		Temperature : 20 ℃		Engineer : SAWYER	
EUT Model Name : THN 30-7210WIR		Humidity : 53 %		Barometer Pressure: 103.2 kPa	
				Standard: EN 50155	
Voltage/Freq: 110Vdc					
Supply change over	Level	Voltage	INT time	EUT Status	Comments
Class C1:60% residual voltage	0.6 Un	66Vdc	100ms	Pass	
Class C2:0% residual voltage	0 Un	0Vdc	30ms	Pass	Note1
Note1: Add aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 280uF /200V) for testing					
The following photos					

2.5 Insulation Test

2.5.1 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.9

2.5.2 Test Requirement

☒**Insulation measurement Test: 500VDC**
The insulation resistance test carried out at 500 VDC and the values recorded.
The test repeated after the voltage withstand test.
Test acceptance requirements:
There shall be no fundamental deterioration from the initial measurement.

☒**Voltage withstand test:**

Nominal battery voltages and/or I/O voltage	Test Voltage
＜ 72Vdc or 50Vac $_{rms}$	500Vac or 750Vdc
72Vdc ≦ Vdc ＜ 125Vdc or from 50 to 90 Vac $_{rms}$	1000Vac or 1500Vdc
125Vdc ≦ Vdc ＜ 315Vdc or from 90 to 225 Vac $_{rms}$	1500Vac or 2200Vdc

Test acceptance requirements:
Neither disruptive discharge nor flashover shall occur.

2.5.3 Test Result

Date : 2021/01/18	Temperature : 23.3 ℃	Engineer : Dora Yu
EUT Model Name: THN 30-7210WIR; other Model see 1)	Humidity : 41.7 %	Equipment: SE 7452, TH110-POSE
	Barometer Pressure: 99.2 kPa	Standard: EN 50155 insulation test

Insulation Test Requirement:

1.Insulation measurement 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.

Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	50GΩ	50GΩ	Pass

2.Voltage Withstand test

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

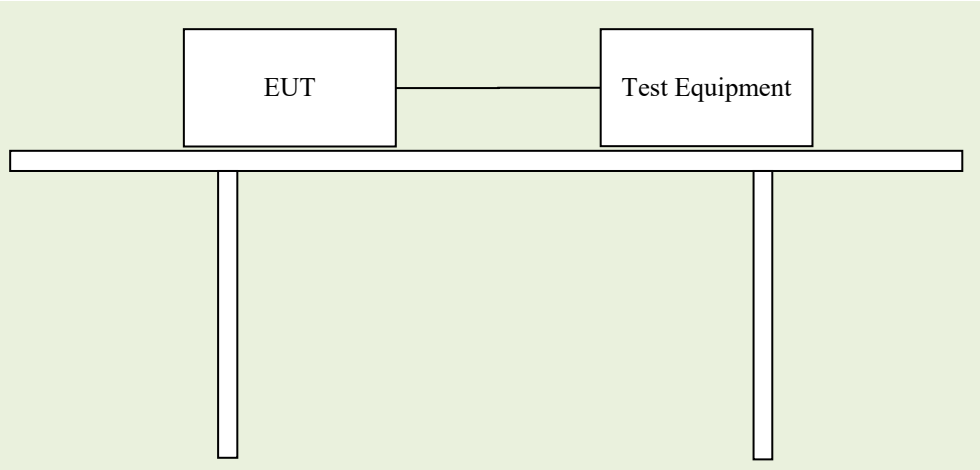
Test item	Test Voltage	Test Time	Result	Comments
Primary side to secondary side	1500Vdc	1 min	0.01mA	Pass
Primary side to secondary side	3000Vdc	1 min	0.01mA	Pass

Supplementary information: Test is only for the sample monomer.

1) THN 30-7225WIR;THN 30-2410WIR; THN 30-2411WIR;THN 30-2412WIR;
THN 30-2413WIR; THN 30-2415WIR;THN 30-2422WIR;THN 30-2423WIR; THN 30-2425WIR;
THN 30-4810WIR;THN 30-4811WIR; THN 30-4812WIR;THN 30-4813WIR;THN 30-4815WIR;
THN 30-4822WIR;THN 30-4823WIR;THN 30-4825WIR; THN 30-7211WIR;THN 30-7212WIR;
THN 30-7213WIR; THN 30-7215WIR;THN 30-7222WIR;THN 30-7223WIR; THN 20-2410WIR;
THN 20-2411WIR;THN 20-2412WIR; THN 20-2413WIR;THN 20-2415WIR;THN 20-2422WIR;
THN 20-2423WIR;THN 20-2425WIR;THN 20-4810WIR; THN 20-4811WIR;THN 20-4812WIR;
THN 20-4813WIR; THN 20-4815WIR;THN 20-4822WIR;THN 20-4823WIR; THN 20-4825WIR;
THN 20-7210WIR;THN 20-7211WIR; THN 20-7212WIR;THN 20-7213WIR;THN 20-7215WIR;
THN 20-7222WIR;THN 20-7223WIR;THN 20-7225WIR

2.6 DC ripple factor

2.6.1 Test Setup



2.6.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 5.1.1.6

2.6.3 Test Requirement

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

$$\text{DC Ripple Factor (\%)} = \frac{U_{max} - U_{min}}{2U_n} \times 100 \text{ approximately } \frac{U_{max} - U_{min}}{2U_{max} + U_{min}U_n} \times 100$$

Maximum Peak to Peak Voltages with a DC Ripple Factor of 5 % as defined below:

Nominal Voltage (U_n)	Maximum Peak to Peak ripple allowed (V)	Umax (V)	Umin (V)	DC Ripple factor (%)
24	2,4	25,2	22,8	5 %
36	3,6	37,8	34,2	5 %
48	4,8	50,4	45,6	5 %
72	7,2	75,6	68,4	5 %
96	9,6	100,8	91,2	5 %
110	11	115,5	104,5	5 %

2.6.4 Test Result

Date : 2020/12/4		Temperature : 20 ℃		Engineer : SAWYER	
EUT Model Name : THN 30-7210WIR		Humidity : 53 %		Barometer Pressure: 103.2 kPa	
				Standard: EN 50155	
Voltage/Freq: 110Vdc					
Nominal Voltage(Un)	Umax(V)	Umin(V)	DC Ripple factor (%)	EUT Status	Comments
110	115.5	104.5	5%	Pass	

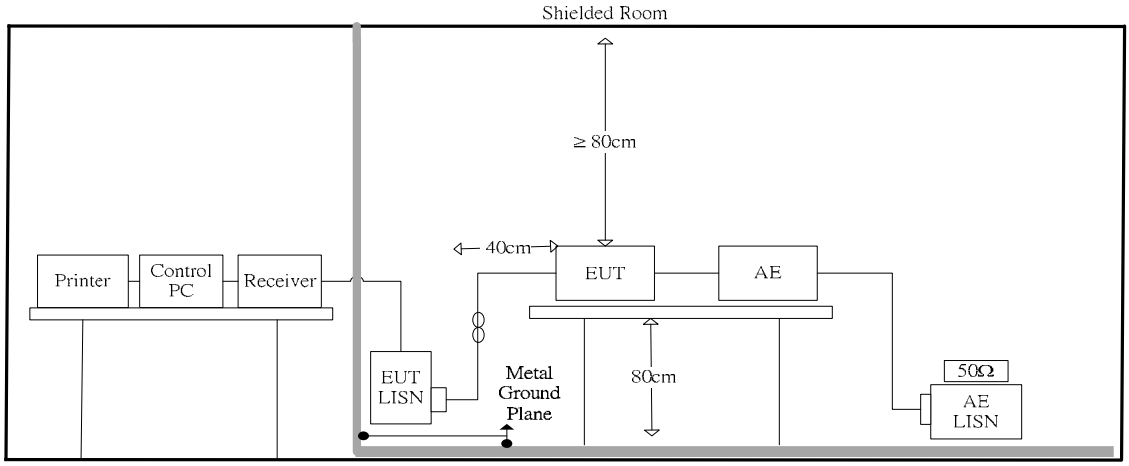
3. Electromagnetic Compatibility (EMC)

Test Procedures were referred to EN 50155 sub-clause 13.4.8.
All EMC tests of the electronic equipment shall be carried out according EN 50121-3-2.

3.1 Power Main Port Conducted Emissions

3.1.1 Test Setup and Procedure

3.1.2 Test Setup



3.1.3 Test Procedure

The measurements are performed in a shielded room site; The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the standard. Powers to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, hot and neutral, were measured. All of the interface cables were manipulated according to EN 55016-2-1 / CISPR 16-2-1 requirements.

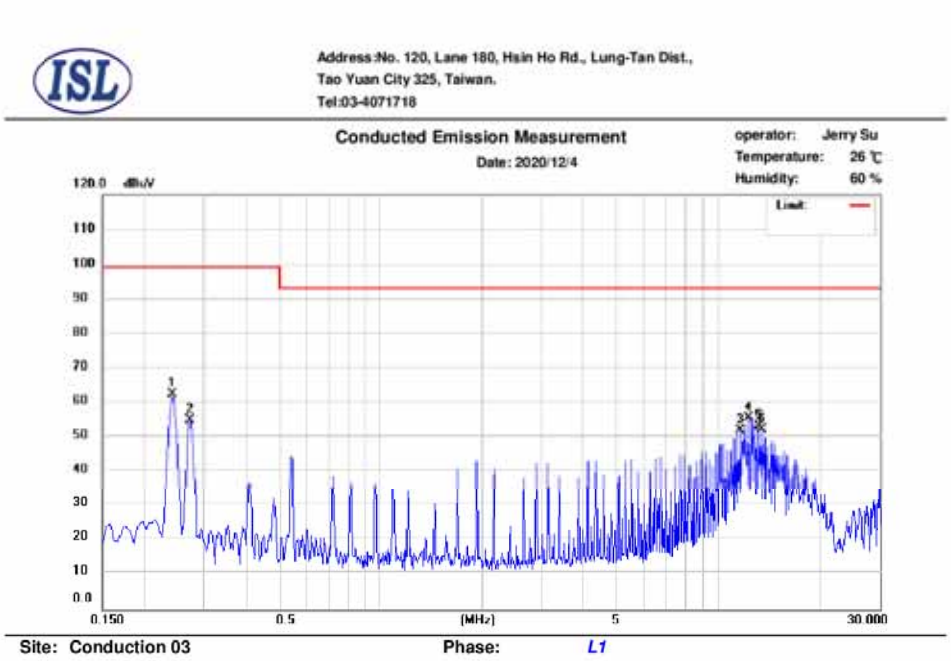
The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

3.1.4 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150KHz--30MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	9KHz

3.2 Conduction Test Data: Configuration 1

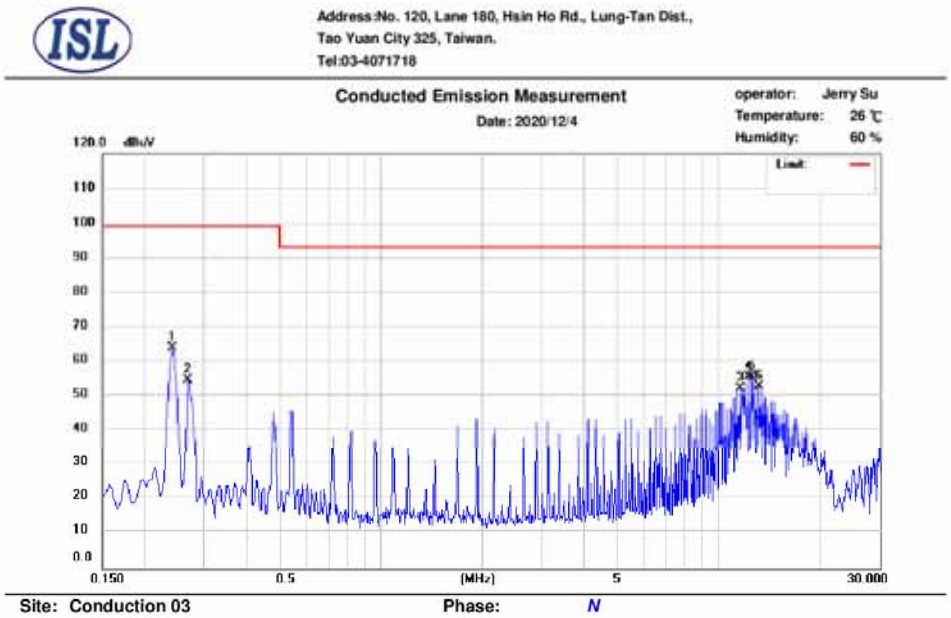
-Live



No.	Frequency (MHz)	QP_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.242	52.29	10.16	62.45	99.00	-36.55
2	0.274	43.96	10.16	54.12	99.00	-44.88
3	11.570	41.24	10.53	51.77	93.00	-41.23
4	12.294	44.68	10.55	55.23	93.00	-37.77
5	13.258	42.04	10.57	52.61	93.00	-40.39
6	13.498	41.11	10.57	51.68	93.00	-41.32

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit
The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.
If peak data can pass, it will be shown in “QP/AVG Correct” column, if not, QP/AVG data will instead.

- Neutral

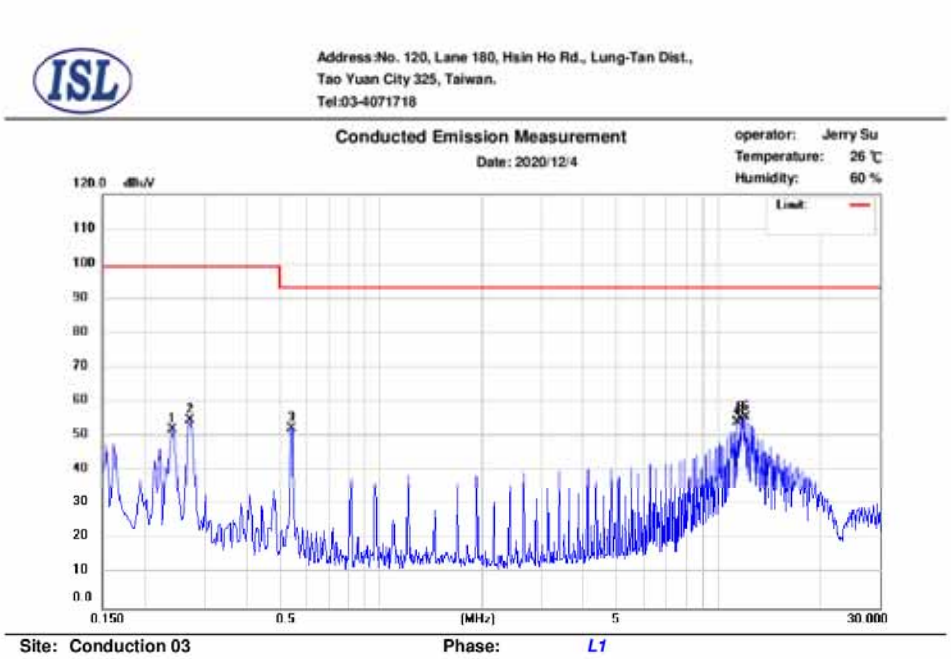


No.	Frequency (MHz)	QP_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.242	53.52	10.15	63.67	99.00	-35.33
2	0.270	44.31	10.15	54.46	99.00	-44.54
3	11.570	41.40	10.52	51.92	93.00	-41.08
4	12.294	44.74	10.54	55.28	93.00	-37.72
5	12.534	44.56	10.54	55.10	93.00	-37.90
6	13.258	41.80	10.56	52.36	93.00	-40.64

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit
The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.
If peak data can pass, it will be shown in “QP/AVG Correct” column, if not, QP/AVG data will instead.

3.3 Conduction Test Data: Configuration 2

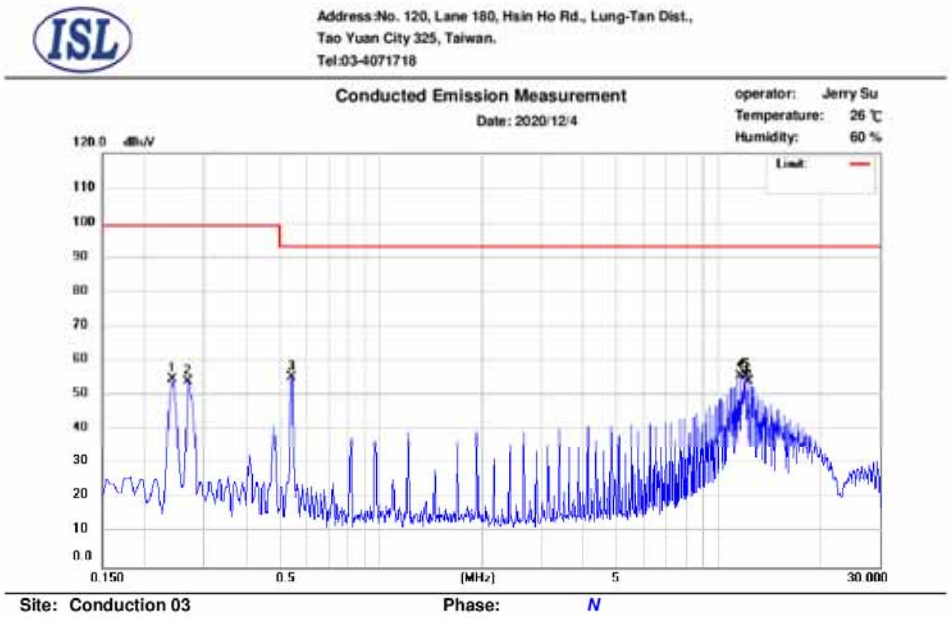
-Live



No.	Frequency (MHz)	QP_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.242	41.43	10.16	51.59	99.00	-47.41
2	0.274	43.33	10.16	53.49	99.00	-45.51
3	0.546	43.66	10.17	53.83	93.00	-39.17
4	11.326	42.55	10.53	53.08	93.00	-39.92
5	11.566	42.73	10.53	53.26	93.00	-39.74
6	12.050	44.16	10.55	54.71	93.00	-38.29

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit
The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.
If peak data can pass, it will be shown in “QP/AVG Correct” column, if not, QP/AVG data will instead.

- Neutral



No.	Frequency (MHz)	QP_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.242	44.29	10.15	54.44	99.00	-44.56
2	0.270	43.74	10.15	53.89	99.00	-45.11
3	0.546	42.14	10.16	52.30	93.00	-40.70
4	11.574	44.16	10.52	54.68	93.00	-38.32
5	12.054	44.62	10.54	55.16	93.00	-37.84
6	12.294	42.96	10.54	53.50	93.00	-39.50

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit
The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.
If peak data can pass, it will be shown in “QP/AVG Correct” column, if not, QP/AVG data will instead.

3.3.1 Test Setup Photo

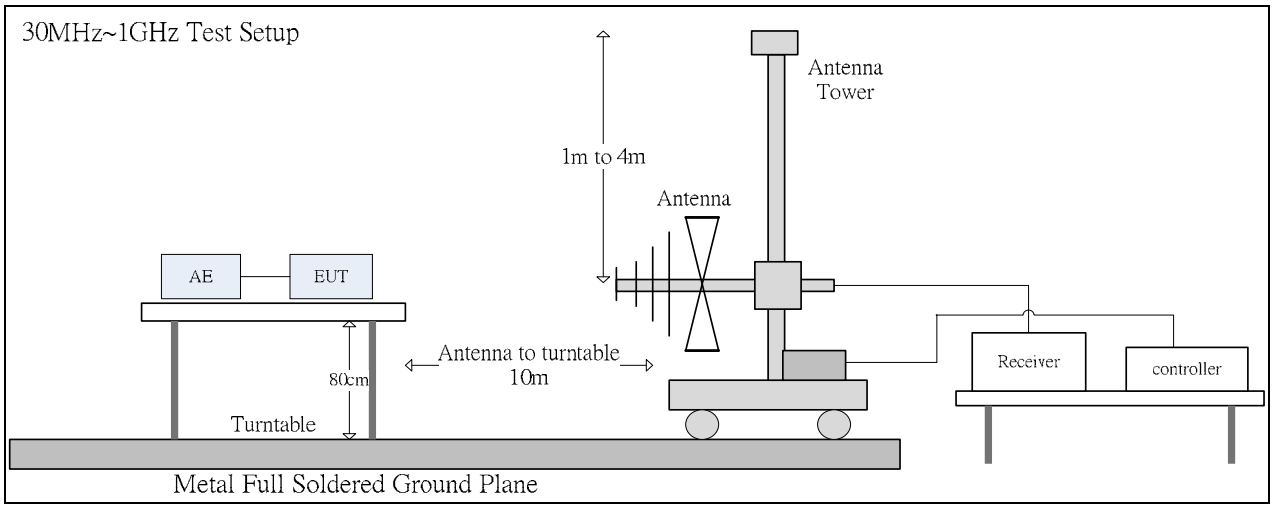
Front View

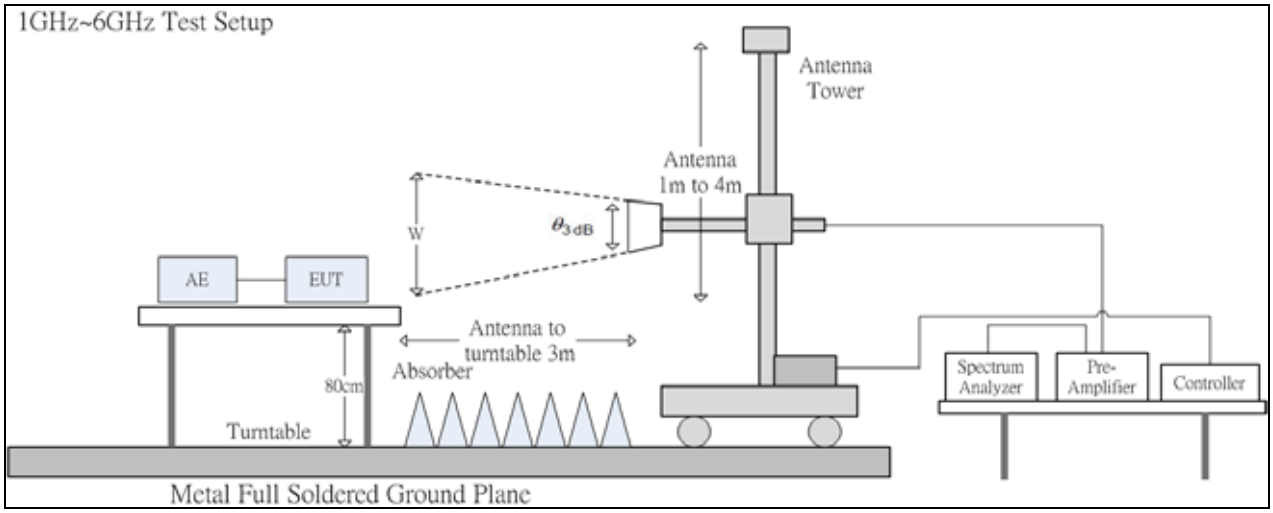
Back View

3.4 Radiated Disturbance Emissions

3.4.1 Test Setup and Procedure

3.4.2 Test Setup





The 3dB beam width of the horn antenna used for the test is as shown in the table below.

Frequency (GHz)	E-plane	H-plane	θ_{3dB}(min)	d= 3 m
				w (m)
1	88°	147°	88°	5.79
2	68°	119°	68°	4.04
3	73°	92°	73°	4.44
4	70°	89°	70°	4.20
5	55°	60°	55°	3.12
6	63°	62°	62°	3.60

3.4.3 Test Procedure

The radiated emissions test will then be repeated on the open site or chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of 10 meter open field sites or 10 meter chamber. Desktop EUT are set up on a wooden stand 0.8 meter above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane. The test volume for a height of up to 30 cm may be obstructed by absorber placed on the ground plane.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The highest emissions between 1 GHz to 6 GHz were analyzed in details by operating the spectrum analyzer in peak and average mode to determine the precise amplitude of the emissions.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings. All of the interface cables were manipulated according to EN 61000-6-4 requirements.

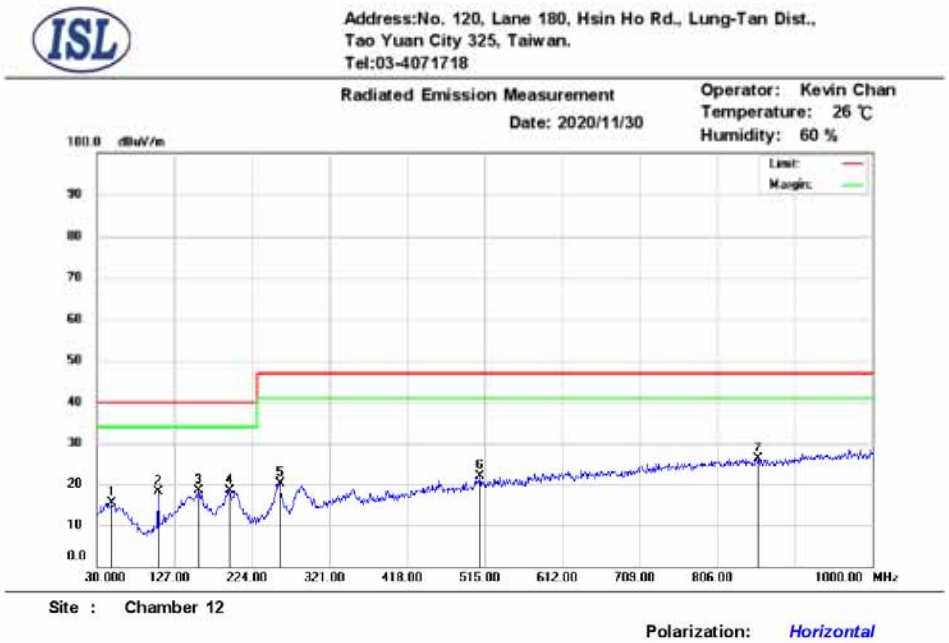
The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

3.4.4 Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	30MHz--1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	120KHz

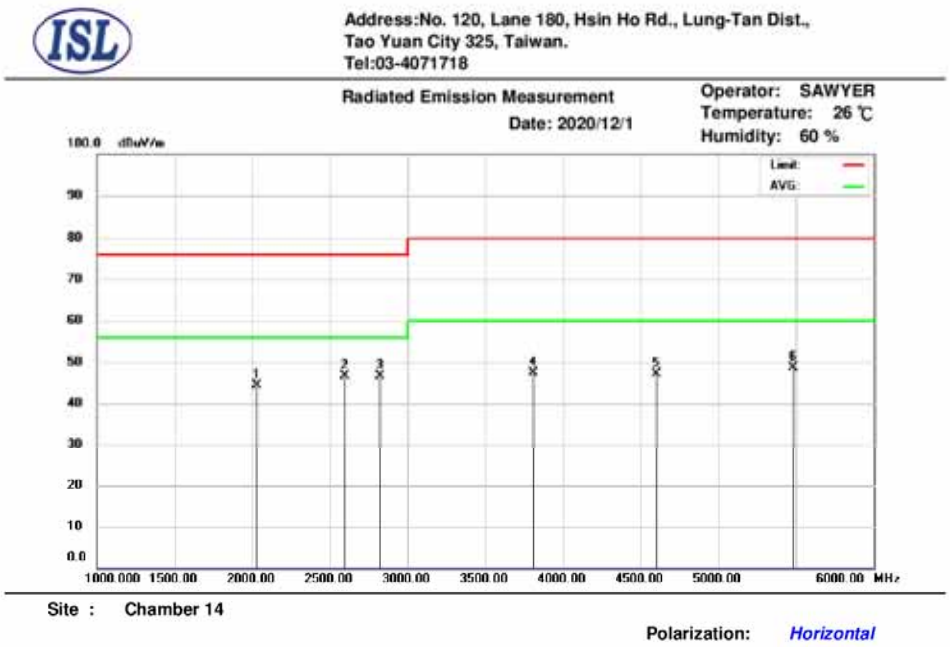
Frequency Range:	Above 1 GHz to 6 GHz
Detector Function:	Peak / Average Mode
Resolution Bandwidth:	1MHz

3.5 Radiation Test Data: Configuration 1
- Radiated Emissions (Horizontal)



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	48.43	32.14	-16.68	15.46	40.00	-24.54	300	183	peak
2	106.63	38.17	-20.06	18.11	40.00	-21.89	300	180	peak
3	157.07	33.89	-15.59	18.30	40.00	-21.70	400	347	peak
4	195.87	36.41	-18.04	18.37	40.00	-21.63	400	160	peak
5	258.92	36.24	-16.02	20.22	47.00	-26.78	400	0	peak
6	509.18	31.26	-9.43	21.83	47.00	-25.17	200	40	peak
7	857.41	29.99	-3.92	26.07	47.00	-20.93	100	44	peak

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



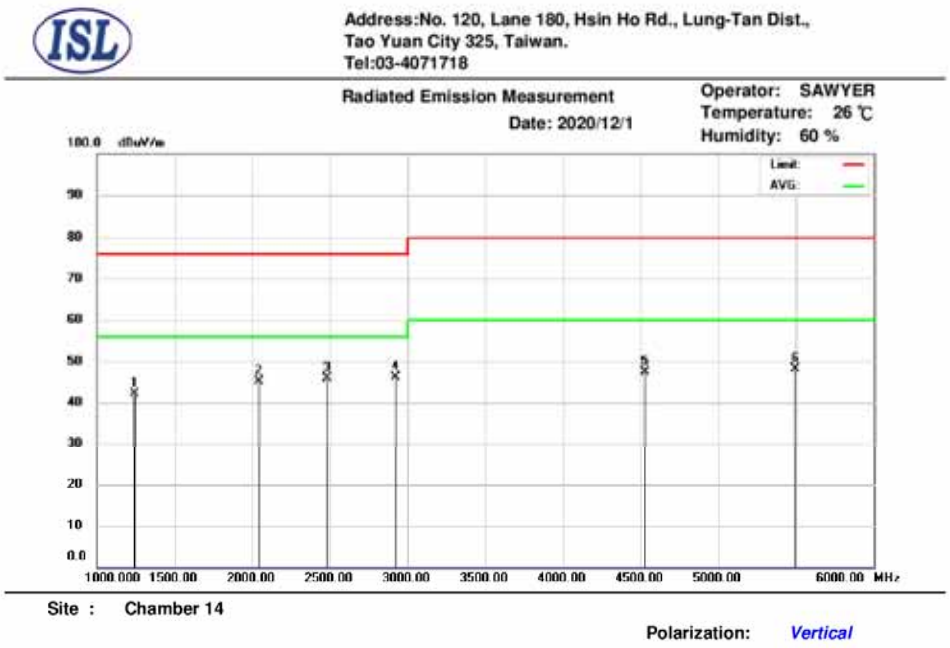
Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	2030.00	46.45	-2.15	44.30	76.00	-31.70	400	65	peak
2	2595.00	47.68	-1.03	46.65	76.00	-29.35	400	352	peak
3	2820.00	47.51	-0.86	46.65	76.00	-29.35	400	200	peak
4	3810.00	46.46	0.95	47.41	80.00	-32.59	100	25	peak
5	4605.00	45.56	1.62	47.18	80.00	-32.82	299	105	peak
6	5480.00	45.86	2.82	48.68	80.00	-31.32	100	340	peak

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

-Radiated Emissions (Vertical)

Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	42.61	40.83	-17.13	23.70	40.00	-16.30	100	0	peak
2	106.63	38.85	-20.06	18.79	40.00	-21.21	400	61	peak
3	158.04	38.12	-15.58	22.54	40.00	-17.46	100	51	peak
4	196.84	39.06	-18.12	20.94	40.00	-19.06	100	18	peak
5	445.16	30.21	-10.30	19.91	47.00	-27.09	200	111	peak
6	692.51	29.40	-6.16	23.24	47.00	-23.76	100	358	peak
7	850.62	30.72	-3.86	26.86	47.00	-20.14	300	60	peak

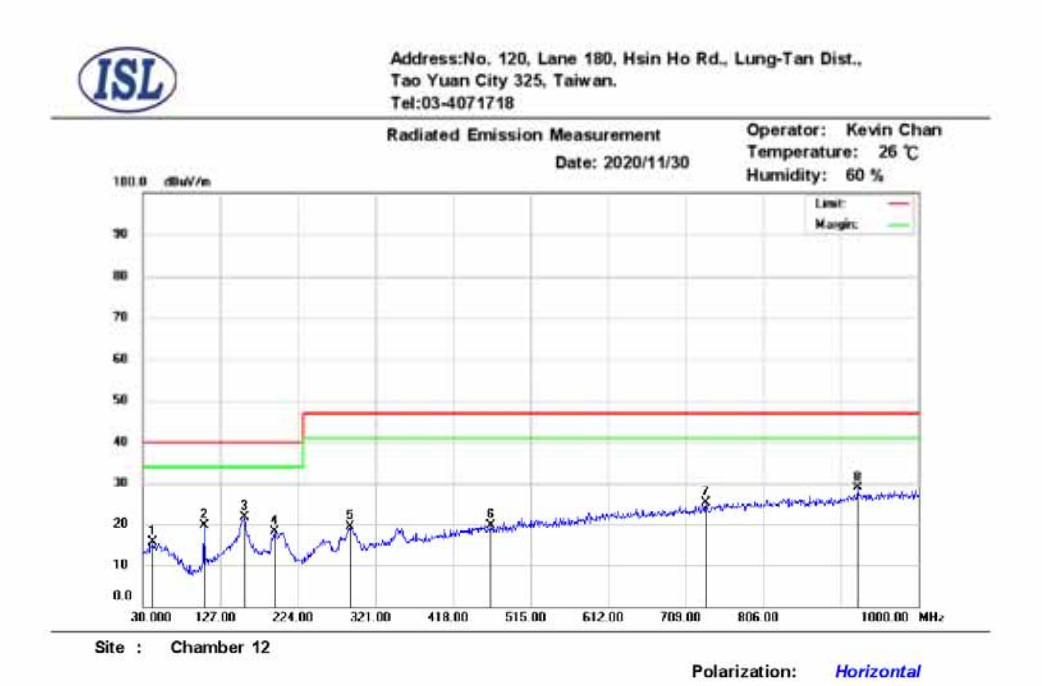
* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	1240.00	48.31	-6.17	42.14	76.00	-33.86	287	0	peak
2	2045.00	47.37	-2.14	45.23	76.00	-30.77	400	147	peak
3	2480.00	46.79	-1.02	45.77	76.00	-30.23	358	360	peak
4	2925.00	46.93	-0.68	46.25	76.00	-29.75	200	333	peak
5	4530.00	46.00	1.50	47.50	80.00	-32.50	100	144	peak
6	5495.00	45.16	2.89	48.05	80.00	-31.95	200	243	peak

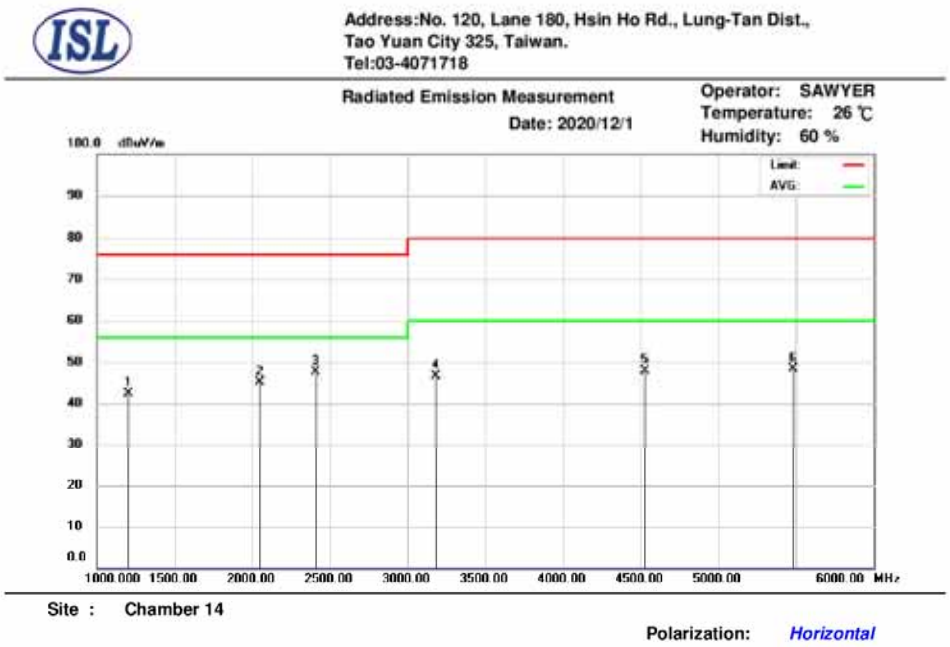
* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

3.6 Radiation Test Data: Configuration 2
- Radiated Emissions (Horizontal)



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	42.61	32.64	-17.13	15.51	40.00	-24.49	400	115	peak
2	106.63	39.80	-20.06	19.74	40.00	-20.26	372	360	peak
3	157.07	37.18	-15.59	21.59	40.00	-18.41	396	360	peak
4	194.90	36.18	-18.05	18.13	40.00	-21.87	400	146	peak
5	288.99	34.07	-14.61	19.46	47.00	-27.54	300	148	peak
6	465.53	29.91	-10.17	19.74	47.00	-27.26	200	132	peak
7	734.22	30.37	-5.15	25.22	47.00	-21.78	300	102	peak
8	924.34	31.27	-2.51	28.76	47.00	-18.24	200	259	peak

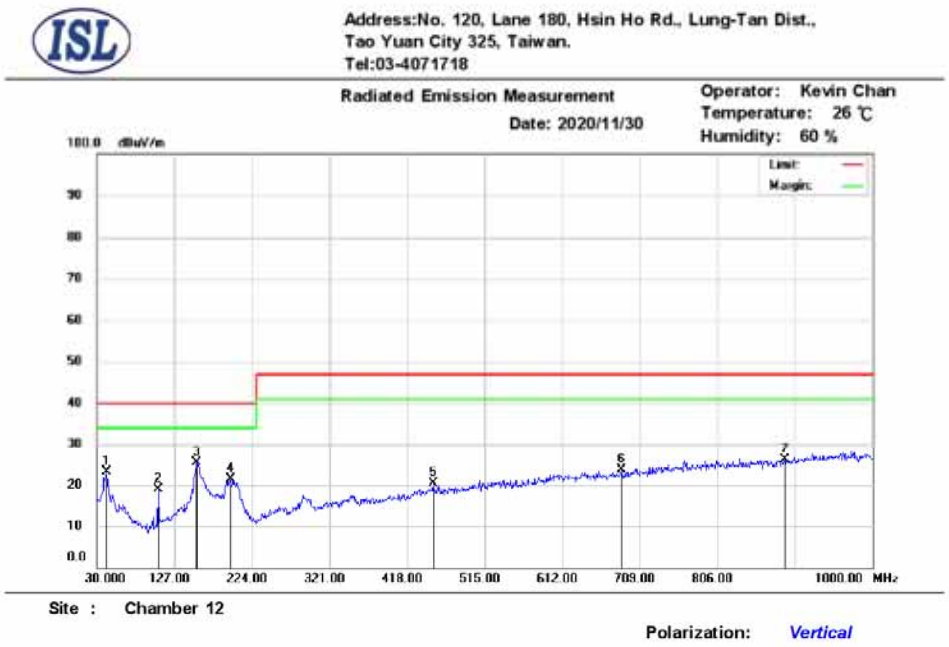
* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	1205.00	48.69	-6.32	42.37	76.00	-33.63	298	0	peak
2	2050.00	47.34	-2.14	45.20	76.00	-30.80	100	296	peak
3	2410.00	48.91	-1.36	47.55	76.00	-28.45	400	305	peak
4	3185.00	46.48	0.15	46.63	80.00	-33.37	100	261	peak
5	4530.00	46.26	1.50	47.76	80.00	-32.24	157	360	peak
6	5485.00	45.49	2.85	48.34	80.00	-31.66	100	60	peak

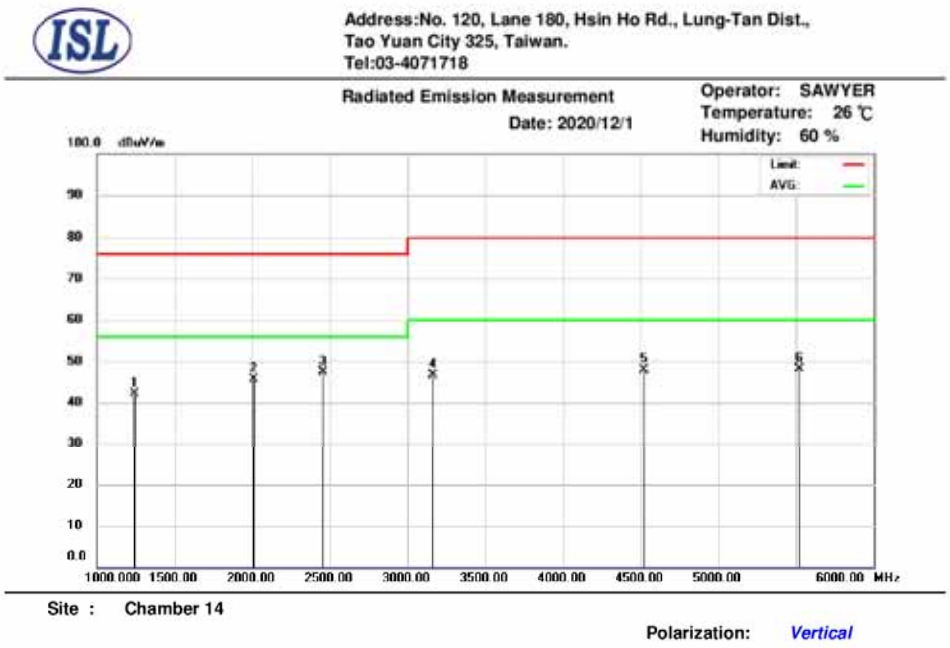
* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

-Radiated Emissions (Vertical)



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	41.64	40.24	-17.20	23.04	40.00	-16.96	236	0	peak
2	106.63	39.04	-20.06	18.98	40.00	-21.02	100	267	peak
3	155.13	41.06	-15.61	25.45	40.00	-14.55	100	43	peak
4	196.84	39.45	-18.12	21.33	40.00	-18.67	100	16	peak
5	450.98	30.81	-10.40	20.41	47.00	-26.59	300	61	peak
6	686.69	30.07	-6.36	23.71	47.00	-23.29	100	133	peak
7	890.39	29.59	-3.49	26.10	47.00	-20.90	200	360	peak

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	1240.00	48.35	-6.17	42.18	76.00	-33.82	200	19	peak
2	2010.00	47.69	-2.16	45.53	76.00	-30.47	200	209	peak
3	2455.00	48.52	-1.08	47.44	76.00	-28.56	100	178	peak
4	3160.00	46.56	0.13	46.69	80.00	-33.31	100	360	peak
5	4520.00	46.45	1.45	47.90	80.00	-32.10	301	356	peak
6	5520.00	45.20	2.84	48.04	80.00	-31.96	100	219	peak

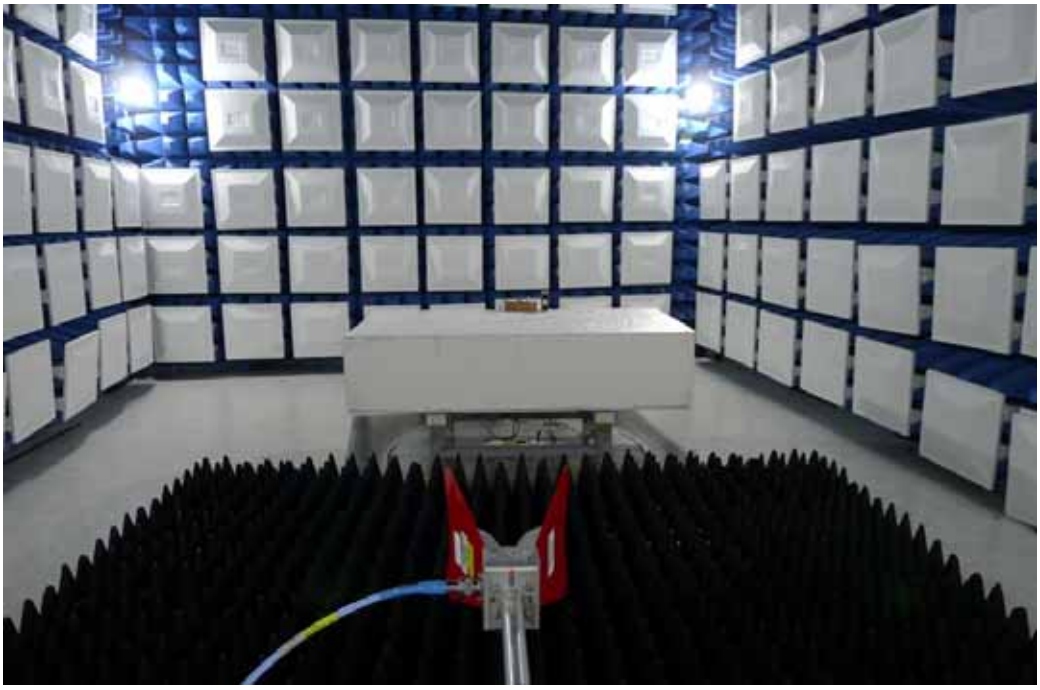
* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

3.6.1 Test Setup Photo

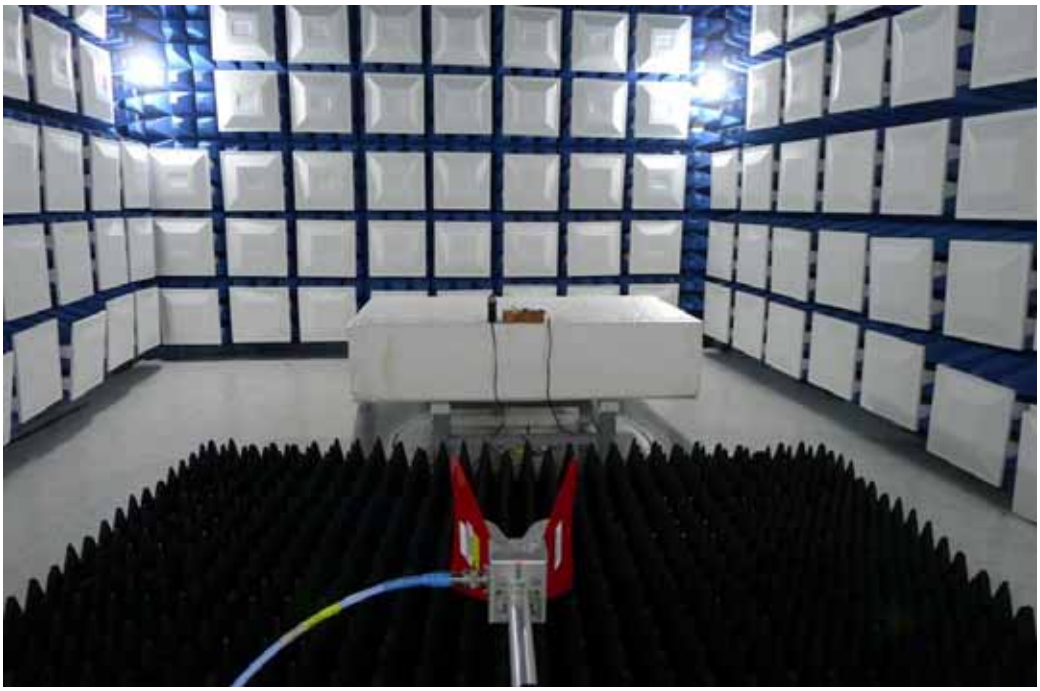
Front View (30MHz~1GHz)

Back View (30MHz~1GHz)

Front View (above 1GHz)



Back View (above 1GHz)



3.7 Electrostatic discharge (ESD) immunity

3.7.1 Test Specification

Port:	Enclosure
Basic Standard:	EN 61000-4-2/ IEC EN61000-4-2 (details referred to Sec 1.2)
Test Level:	Air +/- 2 kV, +/- 4 kV, +/- 6 kV, +/- 8 kV Contact +/- 4 kV, +/- 6 kV
Criteria:	B
Test Procedure	refer to ISL QA -T4-E-S7

Selected Test Point

Air: discharges were applied to slots, aperture or insulating surfaces. 10 single air discharges were applied to each selected points.

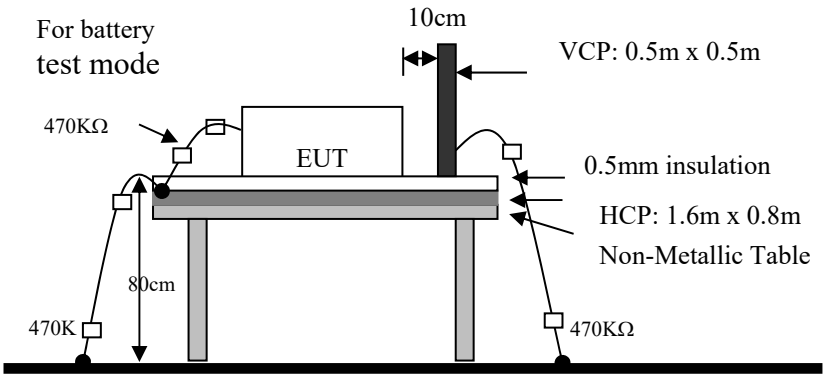
Contact: 10 discharges to the selected contact points.

Indirect Contact Points: 10 discharges were applied to center of one edge of VCP and each EUT side of HCP with 10 cm away from EUT.

Energy-Storage Capacitor:150 pF; Discharge Resistor:330 Ω

3.7.2 Test Setup

EUT is 1m from the wall and other metallic structure. When Battery test mode is needed, a cable with one 470KΩ resister at two rare ends is connected from metallic part of EUT and screwed to HCP.



Ground reference Plane

3.7.3 Test Result

Performance of EUT complies with the given specification.

3.7.4 Test Data:Configuration1

Basic Standard	EN 61000-4-2		Date
EUT Model Name	THN 30-7210WIR		2020-12-17
			Engineer
Barometer Pressure	100.8kPa		SAWYER
Temperature	25℃		Equipment & Test Site
Humidity	40%		EM TEST(Model: Dito)
Voltage/Freq.	110Vdc		

A=criteria A, B=criteria B, C=criteria C

→Blue arrow represent Air discharge point

→Red arrow represent Contact discharge point

ND=No Discharge, No Arcing; Meets criteria but unable to obtain an electrostatic discharge (ESD) at this test point.

X=EUT DOES NOT meet the acceptance criteria

A=criteria A, B=criteria B, C=criteria C

Contact Discharge	Voltage kV 25 Discharge @ 1 PPS										
Test Location	+4	-4	+6	-6							Comments
1	ND	ND	ND	ND							
2	ND	ND	ND	ND							
3	ND	ND	ND	ND							
4	ND	ND	ND	ND							
5	ND	ND	ND	ND							
Air Discharge	Voltage kV 10 Discharge @ 1 PPS										
Test Location	+2	-2	+4	-4	+8	-8					Comments
1	ND	ND	ND	ND	A	A					
2	ND	ND	ND	ND	A	A					
3	ND	ND	ND	ND	A	A					
4	ND	ND	ND	ND	A	A					
5	ND	ND	ND	ND	A	A					
Indirect Discharge	Voltage kV 25 Discharge @ 1 PPS										
Test Location	+4	-4	+6	-6							Comments
VCP Front	A	A	A	A							
VCP Right	A	A	A	A							
VCP Left	A	A	A	A							
VCP Back	A	A	A	A							
Test Location	+4	-4	+6	-6							Comments
HCP Front	A	A	A	A							
HCP Right	A	A	A	A							
HCP Left	A	A	A	A							
HCP Back	A	A	A	A							

Additional Notes: A=criteria A, B=criteria B, C=criteria C

3.7.5 Test Point

Red arrow lines indicate the contact points, and blue arrow lines indicate the air points.

Figure 1 : Test Point Assignments Discharge:

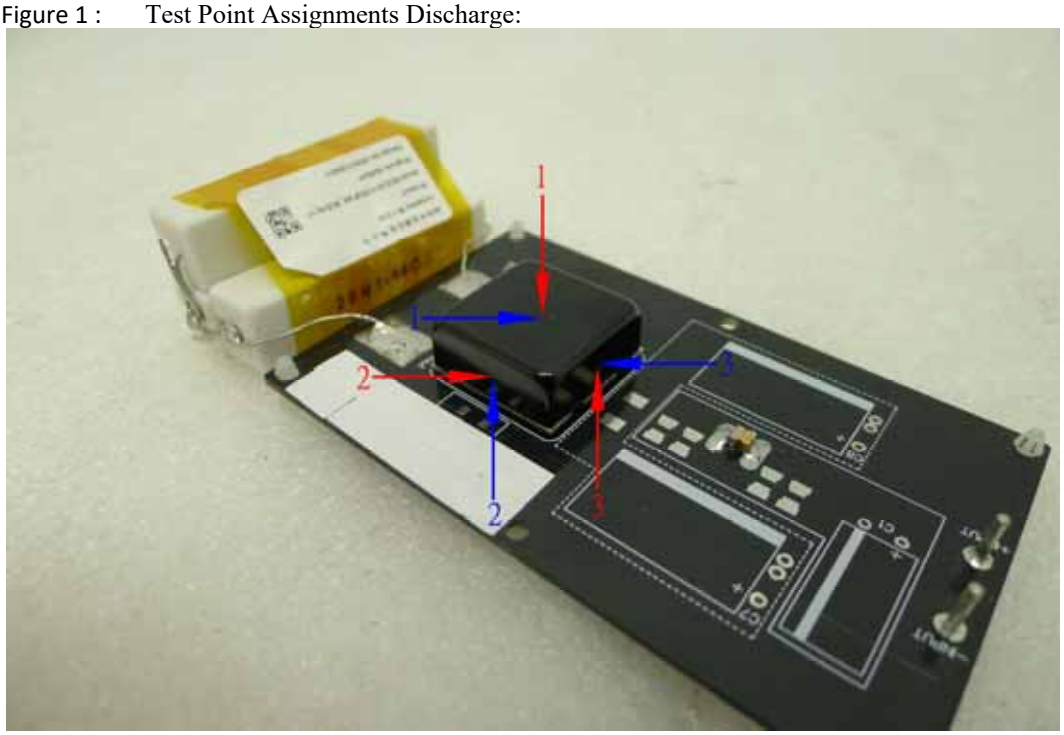
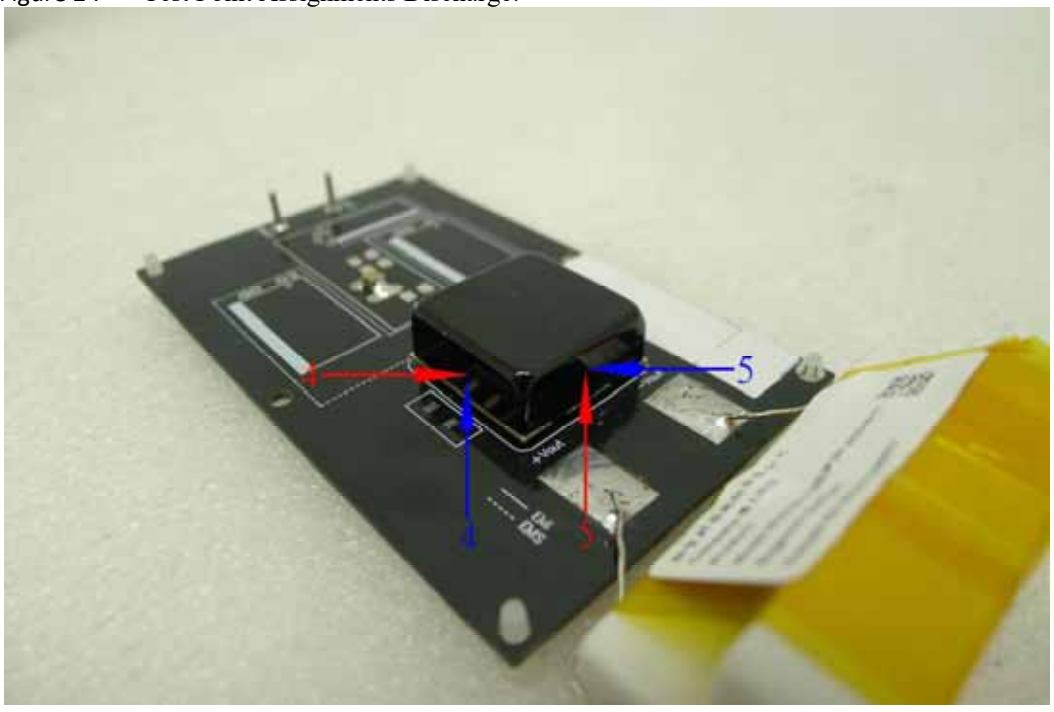


Figure 2 : Test Point Assignments Discharge:



3.7.6 Test Setup Photo

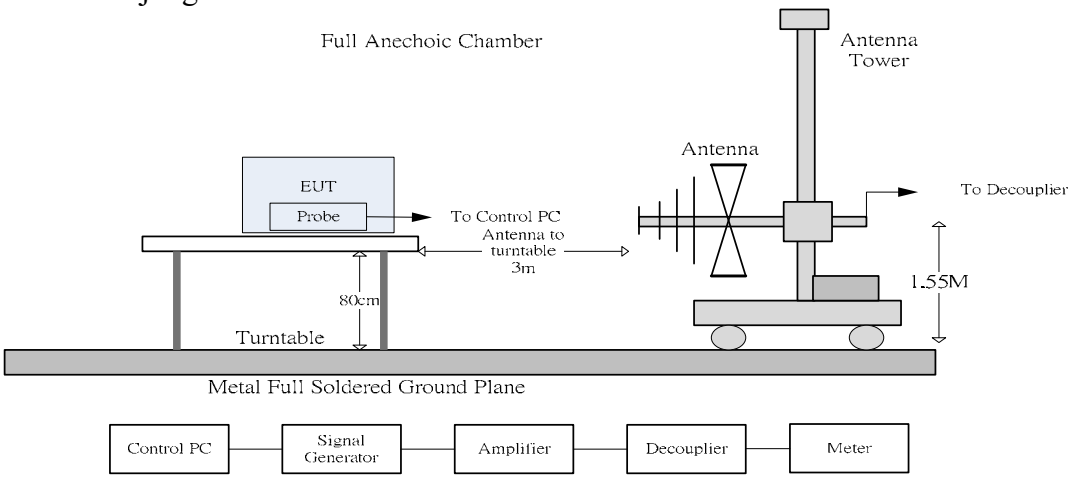
3.8 Radio-Frequency, Electromagnetic Field immunity

3.8.1 Test Specification

Port:	Enclosure
Basic Standard:	EN 61000-4-3/ IEC EN61000-4-3 (details referred to Sec 1.2)
Frequency range/Test Level:	80 MHz to 1000 MHz: 20 V/m 1400 MHz to 2000 MHz: 10 V/m 2000 MHz to 2700 MHz: 5 V/m 5100 MHz to 6000 MHz: 3 V/m
Modulation:	AM 1KHz 80%
Frequency Step:	1% of last step frequency
Dwell time:	2s
Polarization:	Vertical and Horizontal
EUT Azimuth Angle	☒0° ☒90° ☒180° ☒270°
Criteria:	A
Test Procedure	refer to ISL QA -T4-E-S8

3.8.2 Test Setup

The field sensor is placed at one calibration grid point to check the intensity of the established fields on both polarizations. EUT is adjusted to have each side of EUT face coincident with the calibration plane. A CCD camera and speakers are used to monitor the condition of EUT for the performance judgment.



3.8.3 Test Result

Performance of EUT complies with the given specification.

3.8.4 Test Data:Configuration1

Basic Standard	EN 61000-4-3	Date
EUT Model Name	THN 30-7210WIR	2020-12-17
		Engineer
Barometer Pressure	102.2kPa	SAWYER
Temperature	23℃	Equipment & Test Site
Humidity	55%	Chamber 15
Voltage/Freq.	110 Vdc	

A=criteria A, B=criteria B, C=criteria C

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0°(front)	80-1000	1	2s	80% @ 1kHz	20	Vertical	A	
90°(left)	80-1000	1	2s	80% @ 1kHz	20	Vertical	A	
180°(back)	80-1000	1	2s	80% @ 1kHz	20	Vertical	A	
270°(right)	80-1000	1	2s	80% @ 1kHz	20	Vertical	A	
0°(front)	80-1000	1	2s	80% @ 1kHz	20	Horizontal	A	
90°(left)	80-1000	1	2s	80% @ 1kHz	20	Horizontal	A	
180°(back)	80-1000	1	2s	80% @ 1kHz	20	Horizontal	A	
270°(right)	80-1000	1	2s	80% @ 1kHz	20	Horizontal	A	

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0°(front)	1400-2000	1	2s	80% @ 1KHz	10	Vertical	A	
90°(left)	1400-2000	1	2s	80% @ 1KHz	10	Vertical	A	
180° (back)	1400-2000	1	2s	80% @ 1KHz	10	Vertical	A	
270° (right)	1400-2000	1	2s	80% @ 1KHz	10	Vertical	A	
0°(front)	1400-2000	1	2s	80% @ 1KHz	10	Horizontal	A	
90°(left)	1400-2000	1	2s	80% @ 1KHz	10	Horizontal	A	
180° (back)	1400-2000	1	2s	80% @ 1KHz	10	Horizontal	A	
270° (right)	1400-2000	1	2s	80% @ 1KHz	10	Horizontal	A	

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0°(front)	2000-2700	1	2s	80% @ 1KHz	5	Vertical	A	
90°(left)	2000-2700	1	2s	80% @ 1KHz	5	Vertical	A	
180°(back)	2000-2700	1	2s	80% @ 1KHz	5	Vertical	A	
270°(right)	2000-2700	1	2s	80% @ 1KHz	5	Vertical	A	
0°(front)	2000-2700	1	2s	80% @ 1KHz	5	Horizontal	A	
90°(left)	2000-2700	1	2s	80% @ 1KHz	5	Horizontal	A	
180°(back)	2000-2700	1	2s	80% @ 1KHz	5	Horizontal	A	
270°(right)	2000-2700	1	2s	80% @ 1KHz	5	Horizontal	A	
EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0°(front)	5100-6000	1	2s	80% @ 1KHz	3	Vertical	A	
90°(left)	5100-6000	1	2s	80% @ 1KHz	3	Vertical	A	
180° (back)	5100-6000	1	2s	80% @ 1KHz	3	Vertical	A	
270° (right)	5100-6000	1	2s	80% @ 1KHz	3	Vertical	A	
0°(front)	5100-6000	1	2s	80% @ 1KHz	3	Horizontal	A	
90°(left)	5100-6000	1	2s	80% @ 1KHz	3	Horizontal	A	
180° (back)	5100-6000	1	2s	80% @ 1KHz	3	Horizontal	A	
270° (right)	5100-6000	1	2s	80% @ 1KHz	3	Horizontal	A	
Additional Notes: A=criteria A, B=criteria B, C=criteria C								

3.8.5 Test Setup Photo

3.9 Electrical Fast transients/burst immunity

3.9.1 Test Specification

Basic Standard:	EN 61000-4-4/ IEC EN61000-4-4 (details referred to Sec 1.2)
Signal & communication, process measurement & control ports Test Level:	+/- 2 kV
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)	+/- 2 kV
Rise Time:	5ns
Hold Time:	50ns
Repetition Frequency:	5KHz
Criteria:	A
Test Procedure	refer to ISL QA -T4-E-S9

Test Procedure

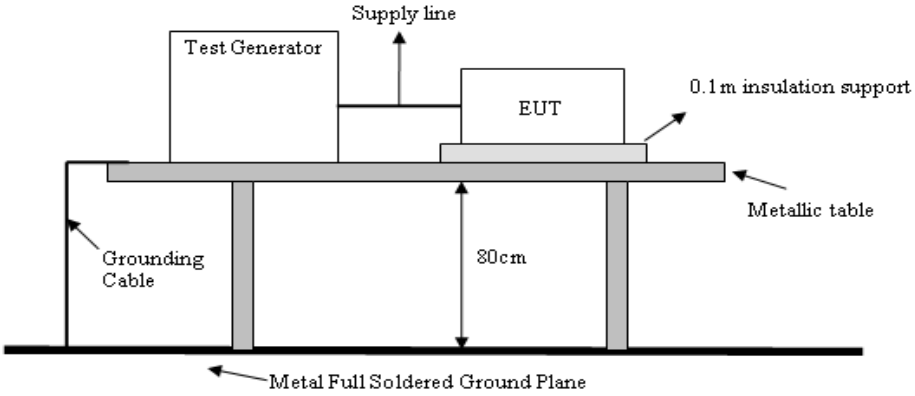
The EUT was setup on a nonconductive table 0.1 m above a reference ground plane.

Test Points	Polarity	Result	Comment
Line	+	N	60 sec
	-	N	60 sec
Neutral	+	N	60 sec
	-	N	60 sec
Line to Neutral	+	N	60 sec
	-	N	60 sec

Note: 'N' means normal, the EUT function is correct during the test.

3.9.2 Test Setup

EUT is at least 50cm from the conductive structure.



3.9.3 Test Result

Performance of EUT complies with the given specification.

3.9.4 Test Data:Configuration1

Basic Standard	EN 61000-4-4	Date	
EUT Model Name	THN 30-7210WIR	2020-11-27	
		Engineer	
Barometer Pressure	102.3kPa	SAWYER	
Temperature	24℃	Equipment & Test Site	
Humidity	52%	EMC-PARTNER (Model: IMU3000)	
Voltage/Freq.	110 Vdc		

A=criteria A, B=criteria B, C=criteria C

AC Power Port: ☐	DC Power Port: ☑	LAN Port: ☐	Telephone Port: ☐

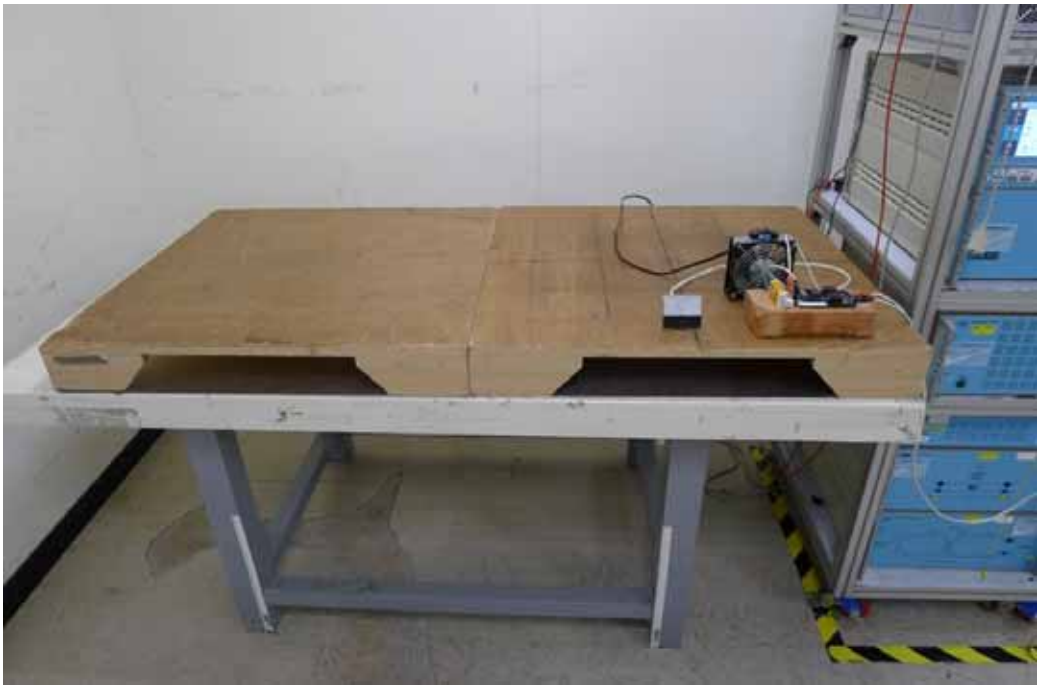
DC Power Port

Line Under Test	Voltage Level	Severity Level	Pulse Polarity	Burst Repetition Rate	Test Duration	EUT Status	Comments
Line	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Line	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	
Neutral	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Neutral	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	
Line- Neutral	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Line- Neutral	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

NOTE:
With 2pcs aluminum electrolytic capacitor(Nippon chemi-con KXJ series,150μF/200V in parallel) and a TVS (SMBJ220A, 220V, 600Watt peak pulse power) in parallel.

3.9.5 Test Setup Photo

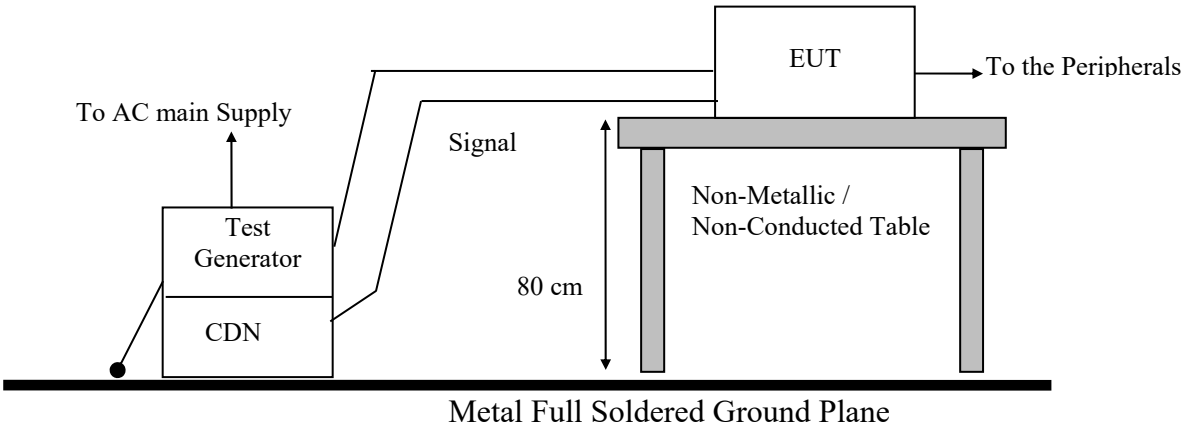


3.10 Surge Immunity

3.10.1 Test Specification

Basic Standard:	EN 61000-4-5/ IEC EN61000-4-5 (details referred to Sec 1.2)
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)	Line to Line: 42 Ω, 0.5 μF +/- 0.5 kV, +/- 1 kV, +/- 2 kV
Rise Time:	1.2us
Hold Time:	50us
Repetition Rate:	60 seconds, 5 time/each condition
Angle:	☐0° ☐90° ☐180° ☐270°
Criteria:	B
Test Procedure:	refer to ISL QA -T4-E-S10

3.10.2 Test Setup



3.10.3 Test Result

Performance of EUT complies with the given specification.

3.10.4 Test Data:Configuration1

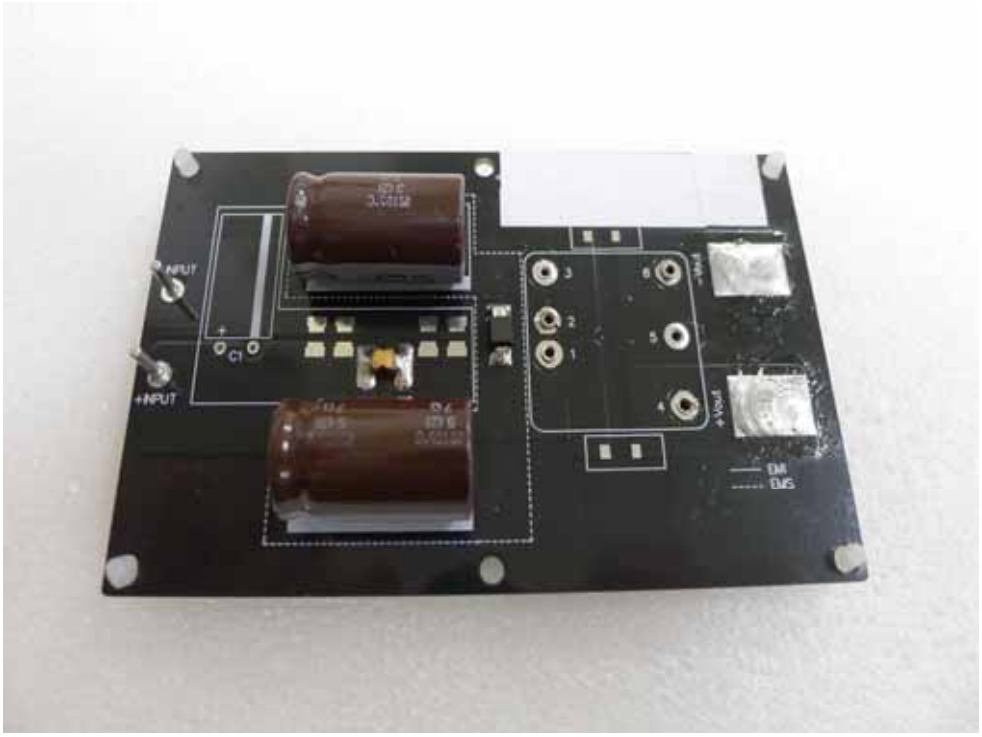
Basic Standard	EN 61000-4-5		Date
EUT Model Name	THN 30-7210WIR		2020-11-30
			Engineer
Barometer Pressure	102.3kPa		SAWYER
Temperature	24℃		Equipment & Test Site
Humidity	52%		EMC-PARTNER (Model: IMU3000)
Voltage/Freq.	110 Vdc		
A=criteria A, B=criteria B, C=criteria C			
AC Power Port: ☐	DC Power Port: ☑	LAN Port: ☐	Telephone Port: ☐

DC Power Port

Line Under Test	Voltage	Level	Polarity	Repetition Rate	Cycle	Pulse Position	EUT Status	Comments
Line-Neutral	0.5kV	1	+	60 sec	5		A	
Line-Neutral	0.5kV	1	−	60 sec	5		A	
Line- Neutral	1.0kV	2	+	60 sec	5		A	
Line- Neutral	1.0kV	2	−	60 sec	5		A	
Line- Neutral	2.0kV	2	+	60 sec	5		A	
Line- Neutral	2.0kV	2	−	60 sec	5		A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

NOTE:
With 2pcs aluminum electrolytic capacitor(Nippon chemi-con KXJ series,150μF/200V in parallel) and a TVS (SMBJ220A, 220V, 600Watt peak pulse power) in parallel.



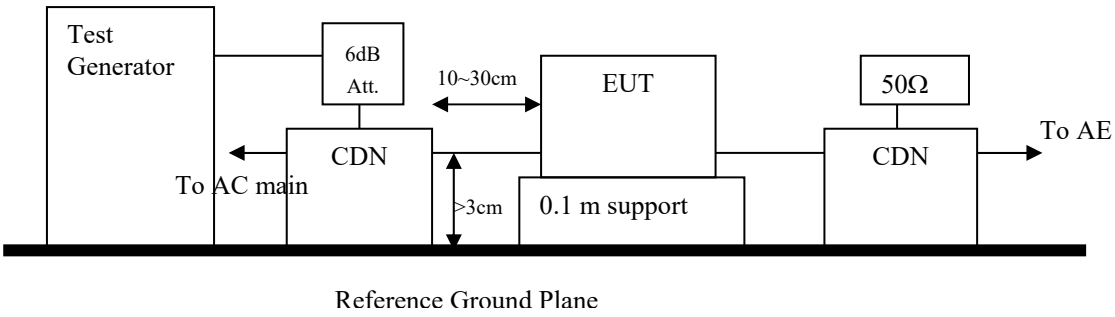
3.10.5 Test Setup Photo

3.11 Immunity to Conductive Disturbance

3.11.1 Test Specification

Basic Standard:	EN 61000-4-6/ IEC EN61000-4-6 (details referred to Sec 1.2)
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)Test Level:	10 V
Signal & communication, process measurement & control ports Test Level:	10 V
Modulation:	AM 1KHz 80%
Frequency range:	0.15 MHz - 80MHz
Frequency Step:	1% of last Frequency
Dwell time:	2s
Criteria:	A
CDN Type:	CDN M2+M3
Test Procedure	refer to ISL QA -T4-E-S11

3.11.2 Test Setup



3.11.3 Test Result

Performance of EUT complies with the given specification.

3.11.4 Test Data:Configuration1

Basic Standard	EN 61000-4-6				Date		
EUT Model Name	THN 30-7210WIR				2020-11-28		
					Engineer		
Barometer Pressure	102.2kPa				SAWYER		
Temperature	24℃				Equipment & Test Site		
Humidity	57%				FRANKONIA (Model: CIT-10/75)		
Voltage/Freq.	110 Vdc						
A=criteria A, B=criteria B, C=criteria C							
DC Power Port							
Line Under Test	Frequency		Level	Modulation	Dwell time	EUT Status	Comments
	Range (MHz)	Steps %					
DC Power Port	0.15 to 80	1	10V	80% @ 1kHz	2s	A	
Additional Notes: A=criteria A, B=criteria B, C=criteria C							

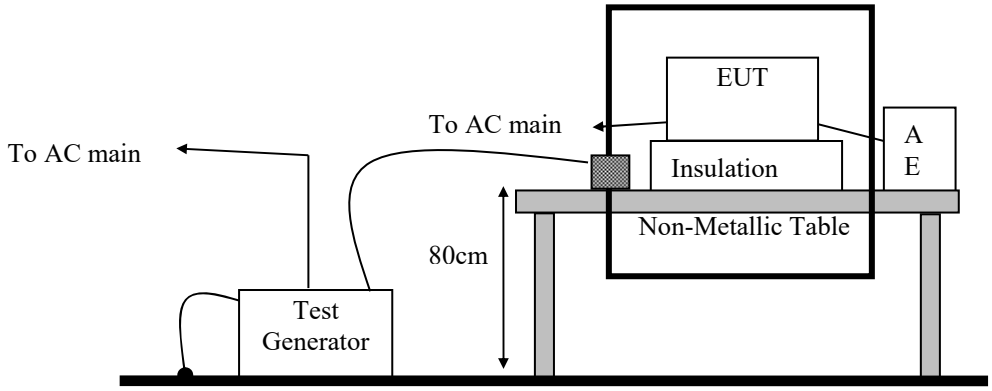
3.11.5 Test Setup Photo

3.12 Power Frequency Magnetic Field immunity

3.12.1 Test Specification

Port:	Enclosure
Basic Standard:	EN 61000-4-8/ IEC 61000-4-8 (details referred to Sec 1.2)
D.C. systems Test Level:	100A/m(continuous),1000A/m(1s)
Polarization:	X, Y, Z
Criteria:	A
Test Procedure	refer to ISL QA -T4-E-S12

3.12.2 Test Setup



3.12.3 Test Result

Performance of EUT complies with the given specification.

3.12.4 Test Data:Configuration1

Basic Standard	EN 61000-4-8	Date
EUT Model Name	THN 30-7210WIR	2020-11-30
		Engineer
Barometer Pressure	102.3kPa	SAWYER
Temperature	24℃	Equipment & Test Site
Humidity	55%	Magnetic Field Immunity Loop Brand: Pic Model:PMF1000 & Magnetic Field Test AC Power Source Brand: Pic Model: AC Power Source
Voltage/Freq.	110Vdc	

A=criteria A, B=criteria B, C=criteria C

Antenna Polarization	Frequency (Hz)	Test Level	Test Duration	EUT Status	Comment
X	0	100 A/m	1 Minutes	A	
Y	0	100 A/m	1 Minutes	A	
Z	0	100 A/m	1 Minutes	A	
X	0	1000 A/m	1 Second	A	
Y	0	1000 A/m	1 Second	A	
Z	0	1000 A/m	1 Second	A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

3.12.5 Test Setup Photo

4. Environmental Tests

4.1 Low temperature start-up test

4.1.1 Test Ambience

Temperature:21℃ ± 2℃
Humidity: 53% ± 6%

4.1.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.4

4.1.3 Test Condition

Table 1 – Operating temperature classes

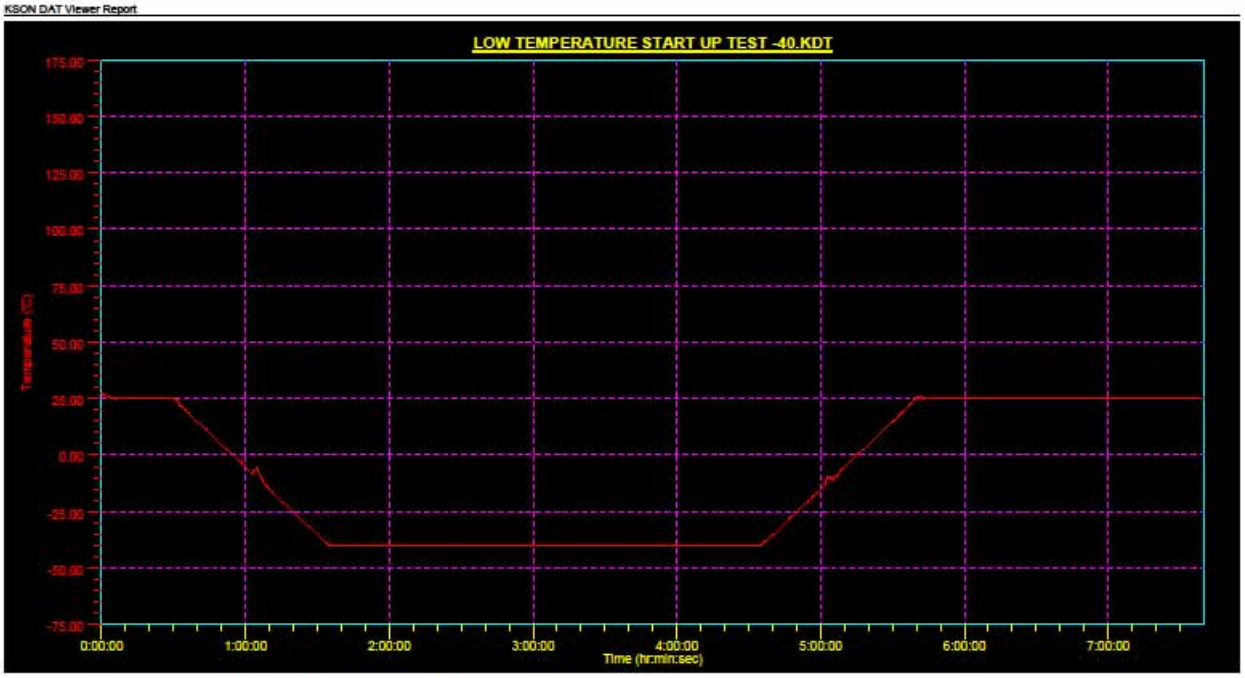
Class	Equipment operating temperature range (°C)	Test Condition
OT1	-25 to +55	
OT2	-40 to +55	
OT3	-25 to +70	
OT4	-40 to +70	V
OT5	-25 to +85	
OT6	-40 to +85	

4.1.4 Test Result

A. Photo of test Setup was shown in 4.1.5
B. Testing data were shown as below
C. Test specimen was visually inspected after test. No physical damage occurred.
D. The function of specimen was normal during and after the cooling test.
E. According to test result, the specimen passed the EN 50155 sub-clause 13.4.4 Low temperature start-up test.

Low temperature start-up test Record

KSON DAT Viewer Report



Filename: G:\Low temperature start up Test -40.KDT

Date range: 08:27:56 01/19/2021 - 16:07:50 01/19/2021
Time range: 0:00:00 - 7:39:54

Y axes:
  Temperature('C) -75.000 ~ 175.000

Tracks:
  1. Temperature('C)

16:44:44 Tuesday, January 19, 2021 Page 1/1

4.1.5 Test Setup Photo

4.2 Dry Heat Test

4.2.1 Test Ambience

Temperature:21℃ ± 2℃
Humidity: 53% ± 6%

4.2.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.5

4.2.3 Test Condition

Table 1 – Operating temperature classes

Class	Equipment operating temperature range (°C)	Test Condition
OT1	-25 to +55	
OT2	-40 to +55	
OT3	-25 to +70	
OT4	-40 to +70	V
OT5	-25 to +85	
OT6	-40 to +85	

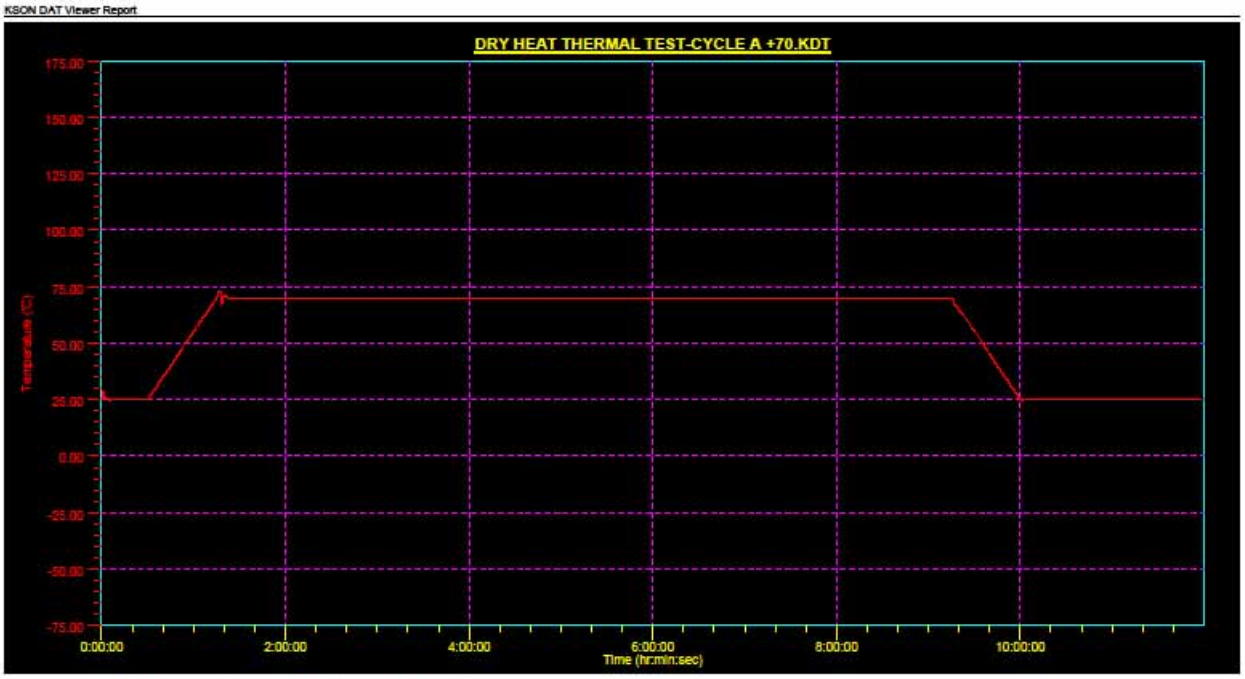
Table 2 –Switch-on extended Operating temperature classes

Class	Switch-on extended Operating temperature (duration: 10 min)	Thermal test cycle See 13.4.5	Test Condition
ST0	No switch-on extended operating temperature	Test cycle A	
ST1	OTx + 15 °C	Test cycle B	V
ST2	OTx + 15 °C	Test cycle C	

4.2.4 Test Result

A. Photo of test Setup was shown in 4.1.5.
B. The testing data were shown in Figure 1.
C. The testing data were shown in Figure 2.
D. Test specimen was visually inspected after test. No physical damage occurred.
E. The function of specimen was normal during and after the Dry heat test.
F. According to test result, the specimen passed the EN 50155 sub-clause 13.4.5 Dry heat test.

Figure 1 :Dry Heat test Record (Test cycle A)



Filename: G:\Dry heat thermal test-Cycle A +70.KDT

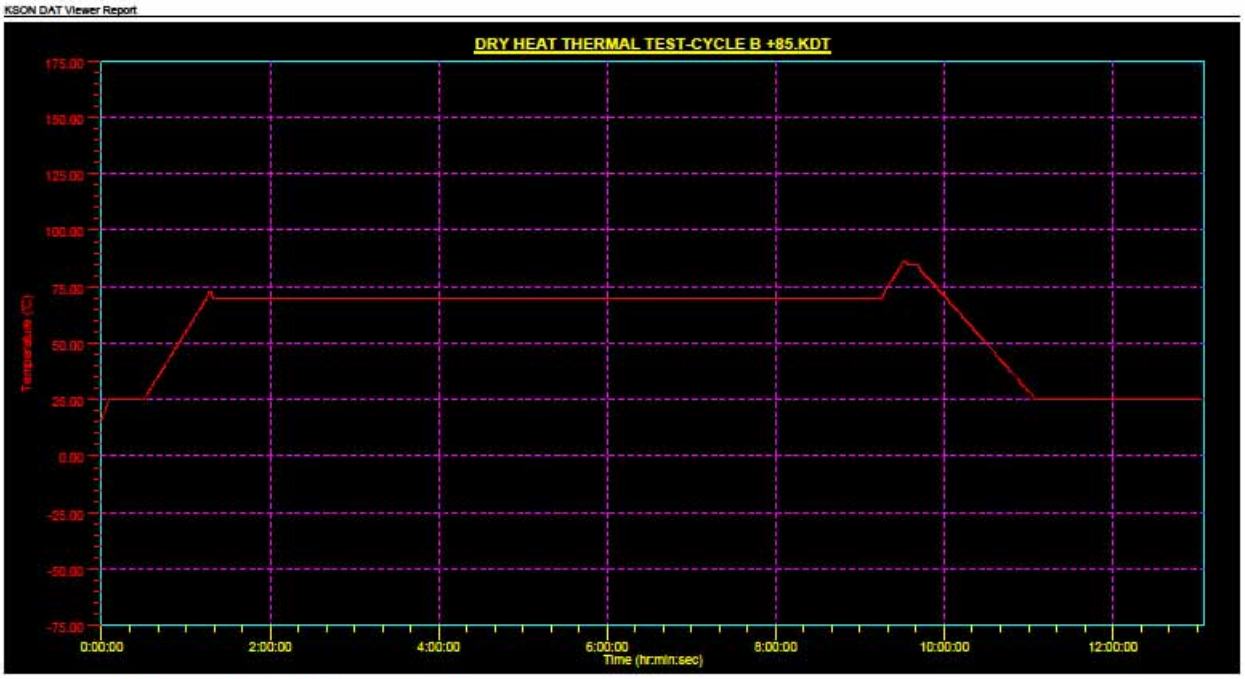
Date range: 18:00:01 01/19/2021 - 05:59:55 01/20/2021
Time range: 0:00:00 - 11:59:54

Y axes:
  Temperature('C) -75.000 ~ 175.000

Tracks:
  1. Temperature('C)

08:56:29 Wednesday, January 20, 2021 Page 1/1

Figure 2 :Dry Heat test Record (Test cycle B)



Filename: G:\Dry heat thermal test-Cycle B +85.KDT

Date range: 18:00:01 01/18/2021 - 07:04:55 01/19/2021
Time range: 0:00:00 - 13:04:54

Y axes:
  Temperature('C) -75.000 ~ 175.000

Tracks:
  1. Temperature('C)

08:55:41 Tuesday, January 19, 2021 Page 1/1

4.3 Damp Heat Test

4.3.1 Test Ambience

Temperature: 21℃ ± 2℃
Humidity: 53% ± 6%

4.3.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.7

4.3.3 Test Condition

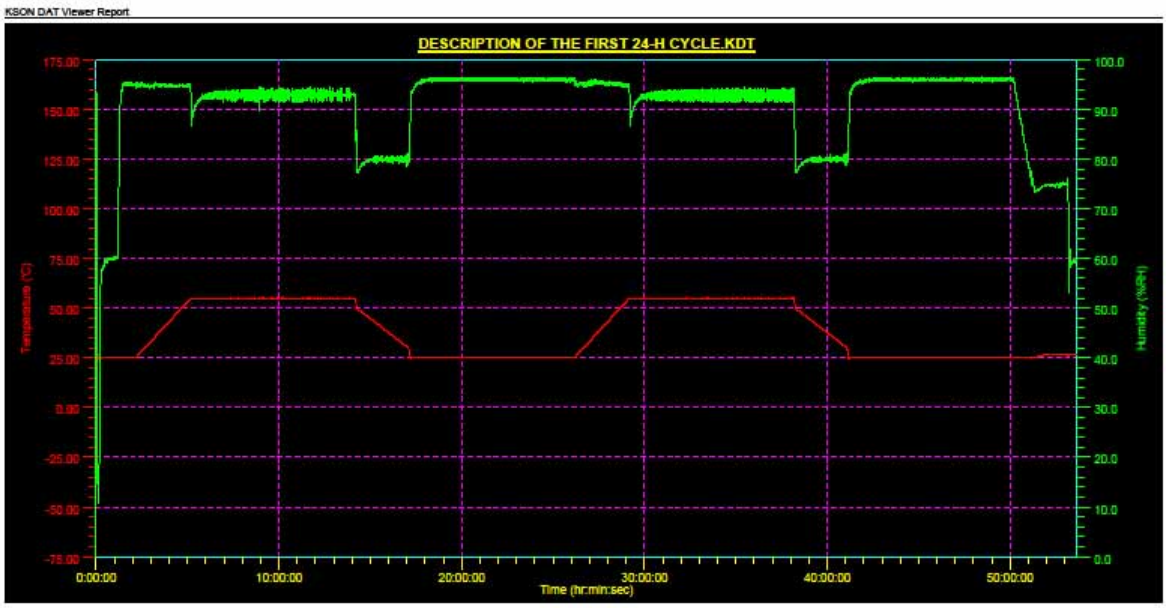
Temperature / Humidity:55℃ and 25℃, 95%±5%RH without condensation, 48 hours.
Performance Check: The performance check was carried out before and after the Damp Heat Test.

4.3.4 Test Result

A. Photo of test Setup was shown in 4.1.5.
B. The testing data were shown as below.
C. Test specimen was visually inspected after test. No physical damage occurred.
D. The function of specimen was normal during and after the Damp heat test.
E. According to test result, the specimen passed the EN 50155 ch.13.4.7 Cyclic Damp Heat Test.

Damp Heat Test Record

KSON DAT Viewer Report



Filename: G:\Description of the first 24-h cycle.KDT

時間範圍: 15:20:31 02/22/2021 - 21:00:31 02/24/2021
時間範圍: 0:00:00 - 53:40:00

Y軸:
Temperature('C) -75.000 ~ 175.000
Humidity(%RH) 0.00 ~ 100.00

曲線:
1. Temperature('C)
2. Humidity(%RH)

21:25:32 Thursday, January 12, 2012 Page 1/1

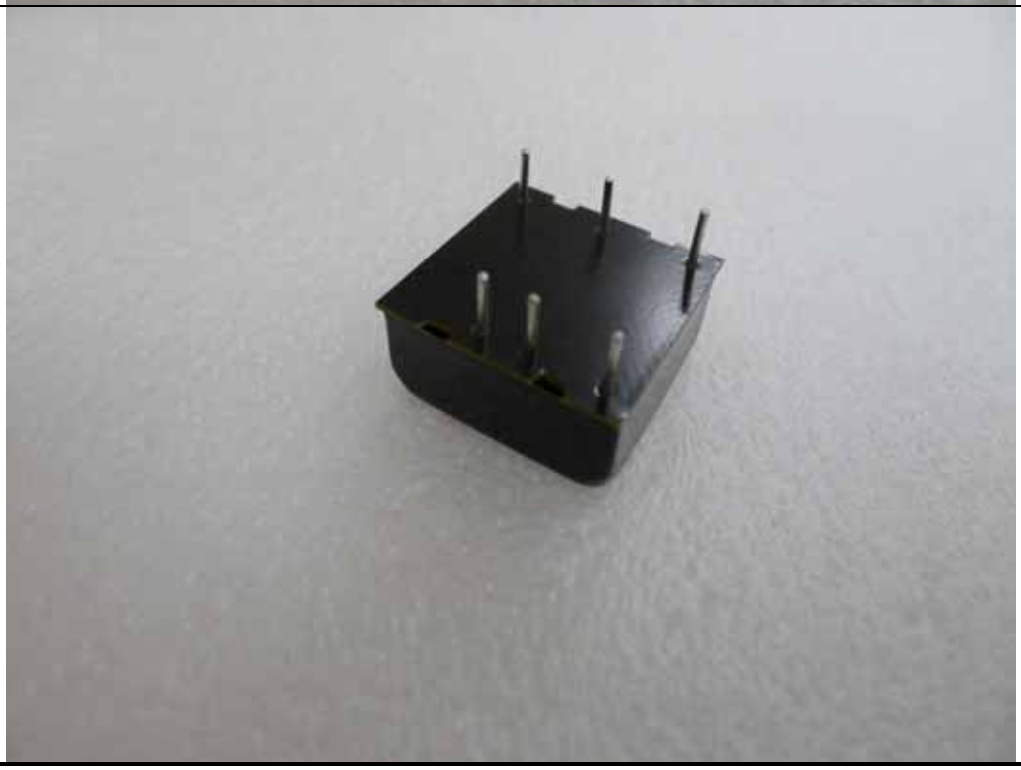
Date : 2021/01/28	Temperature :24 ℃	Engineer : SAWYER
EUT Model Name : THN 30-7210WIR	Humidity : 58.6 %	Barometer Pressure: 99.2 kPa
		Standard: EN 50155
Voltage/Freq: 110Vdc		

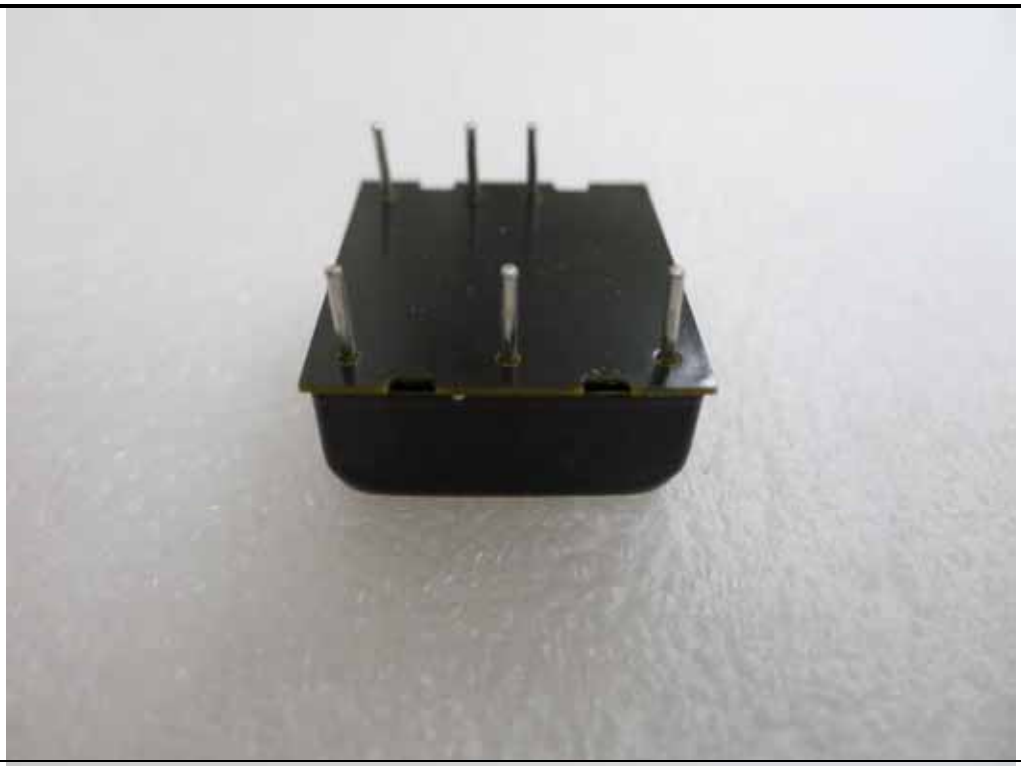
Visual inspection requirement:

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 outside	OK
EUT function	OK

After test：





Date : 2021/01/18	Temperature : 23.3 ℃	Engineer : Dora Yu
EUT Model Name: THN 30-7210WIR; other Model see 1)	Humidity : 41.7 %	Equipment: SE 7452, THS-B4T-150, TH110-POSE, GP-5A, PSW 30-36
	Barometer Pressure: 99.2 kPa	Standard: EN 50155 insulation test

Insulation Test Requirement after first run:

1.Insulation measurement 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.

Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	50GΩ	50GΩ	Pass

2.Voltage Withstand test

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

Test item	Test Voltage	Test Time	Result	Comments
Primary side to secondary side	1500Vdc	1 min	0.01mA	Pass

Insulation Test Requirement after second run:

1.Insulation measurement 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.

Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	50GΩ	50GΩ	Pass

2.Voltage Withstand test

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

Test item	Test Voltage	Test Time	Result	Comments
Primary side to secondary side	1200Vdc	1 min	0.01mA	Pass

Supplementary information: Test is only for the sample monomer.

(1) THN 30-7225WIR;THN 30-2410WIR; THN 30-2411WIR;THN 30-2412WIR;
THN 30-2413WIR; THN 30-2415WIR;THN 30-2422WIR;THN 30-2423WIR; THN 30-2425WIR;
THN 30-4810WIR;THN 30-4811WIR; THN 30-4812WIR;THN 30-4813WIR;THN 30-4815WIR;
THN 30-4822WIR;THN 30-4823WIR;THN 30-4825WIR; THN 30-7211WIR;THN 30-7212WIR;
THN 30-7213WIR; THN 30-7215WIR;THN 30-7222WIR;THN 30-7223WIR; THN 20-2410WIR;
THN 20-2411WIR;THN 20-2412WIR; THN 20-2413WIR;THN 20-2415WIR;THN 20-2422WIR;
THN 20-2423WIR;THN 20-2425WIR;THN 20-4810WIR; THN 20-4811WIR;THN 20-4812WIR;
THN 20-4813WIR; THN 20-4815WIR;THN 20-4822WIR;THN 20-4823WIR; THN 20-4825WIR;
THN 20-7210WIR;THN 20-7211WIR; THN 20-7212WIR;THN 20-7213WIR;THN 20-7215WIR;
THN 20-7222WIR;THN 20-7223WIR;THN 20-7225WIR

4.4 Functional random Vibration Test

4.4.1 Test Specification and / or standard:

EN 61373:2010

4.4.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force：1000 kgf-peak / 250 kgw Loading
Max. displacement：50 mm p-p
Max. acceleration：55 g
Frequency range：5 Hz to 2000 Hz
Calibrate trace code：VP-200410-1

4.4.3 Test Condition and procedure:

Test Condition:

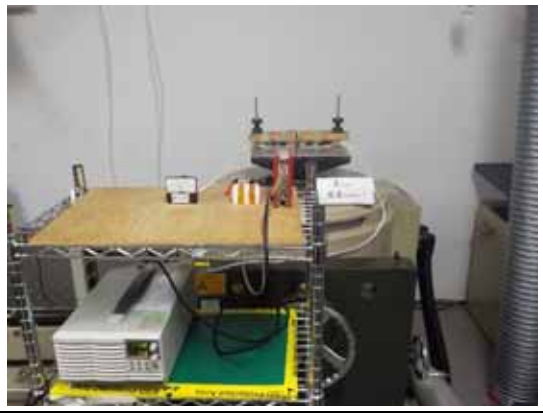
	Category	Orientation	RMS m/s^2
☐	1 Class A Body mounted	Vertical Transverse Longitudinal	0.75 0.37 0.5
☒	1 Class B Body mounted	Vertical Transverse Longitudinal	1.01 0.45 0.7
☐	2 Bogie mounted	Vertical Transverse Longitudinal	5.4 4.7 2.5
☐	3 Axle mounted	Vertical Transverse Longitudinal	38.0 34.0 17.0

Test Procedure:
A. Check out samples.
B. Place the test samples on the vibration table in its normal operating orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

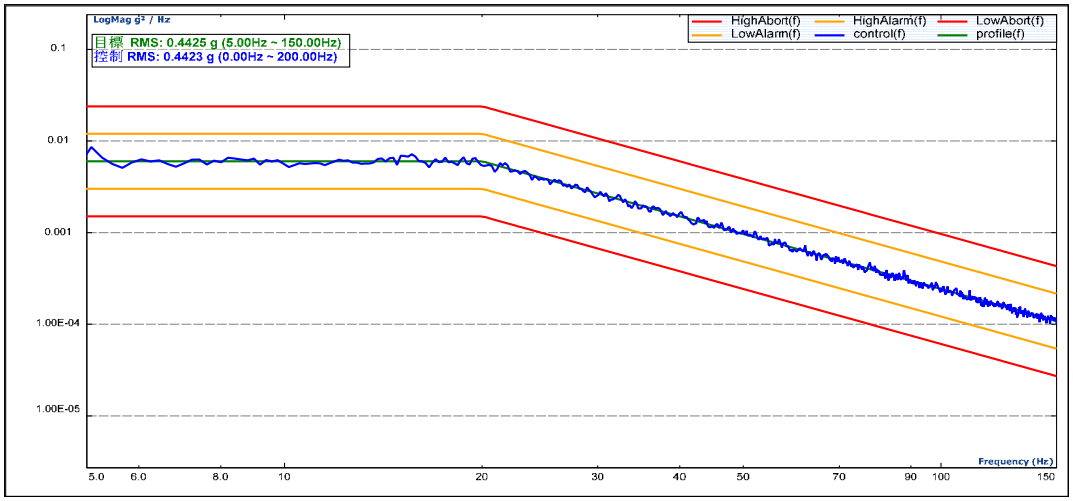
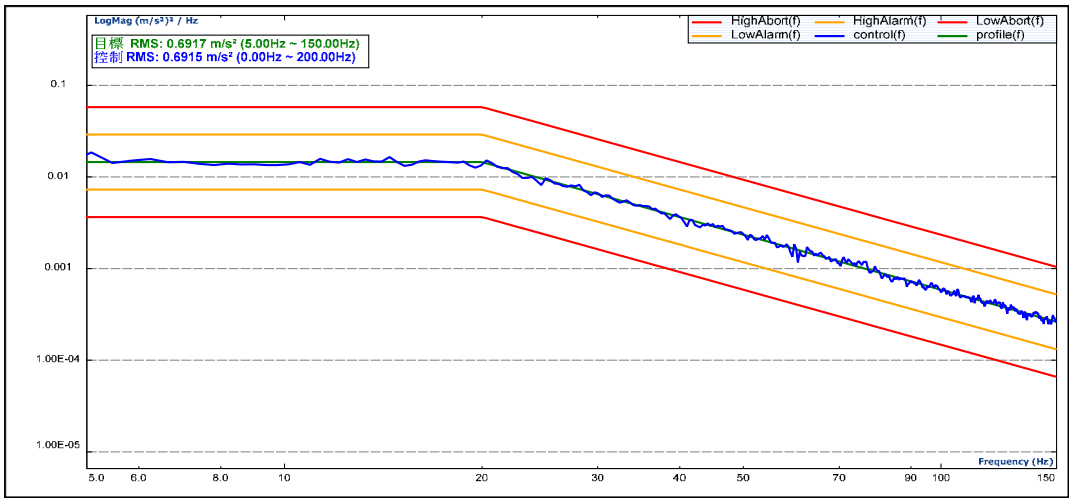
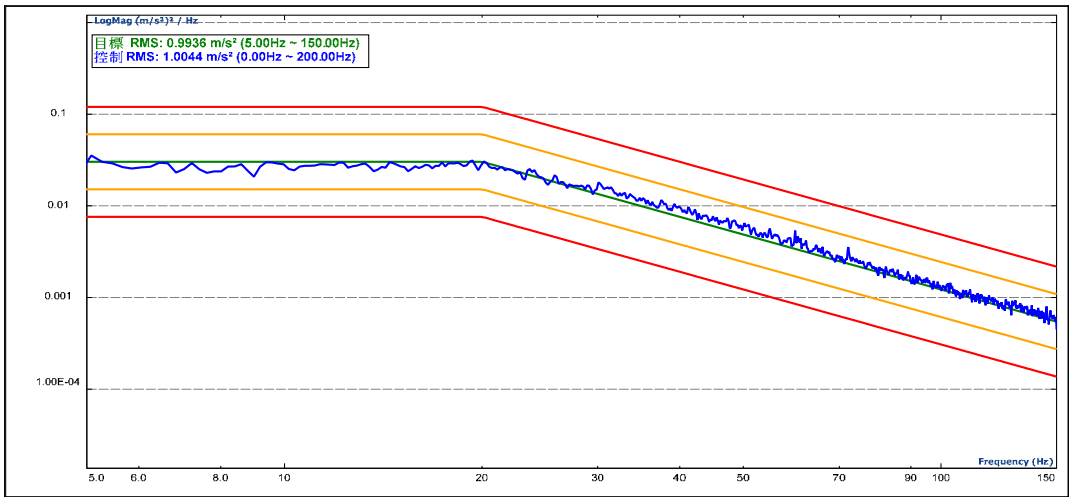
4.4.4 Test Result

Inspection item	Result
EUT	Pass

4.4.5 Test Setup Photo

Transverse	
Longitudinal	
Vertical	

4.4.6 Test Profile:

Transverse	
Longitudinal	
Vertical	

4.5 Simulated long-life testing at increased Random Vibration Test

4.5.1 Test Specification and/or standard:

EN 61373:2010

4.5.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force：1000 kgf-peak / 250 kgw Loading
Max. displacement：50 mm p-p
Max. acceleration：55 g
Frequency range：5 Hz to 2000 Hz
Calibrate trace code：VP-200410-1

4.5.3 Test Condition and procedure:

Test Condition:

	Category	Orientation	RMS 5 h test period m/s^2
☐	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

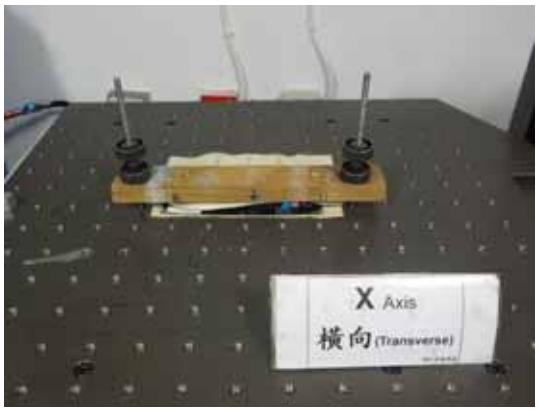
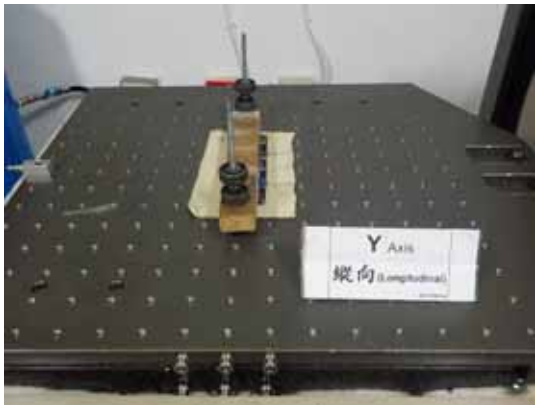
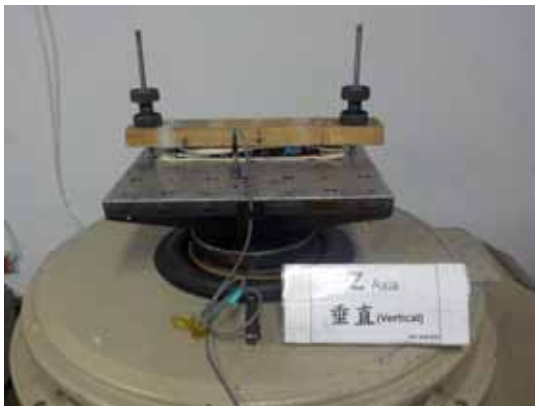
Test Procedure:

A. Check out samples.
B. Place the test samples on the vibration table in its normal operating orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

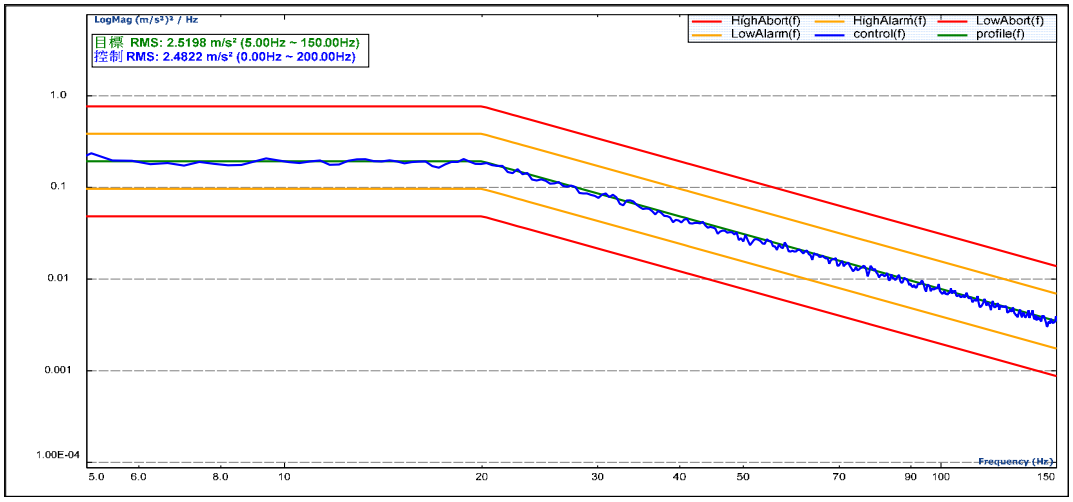
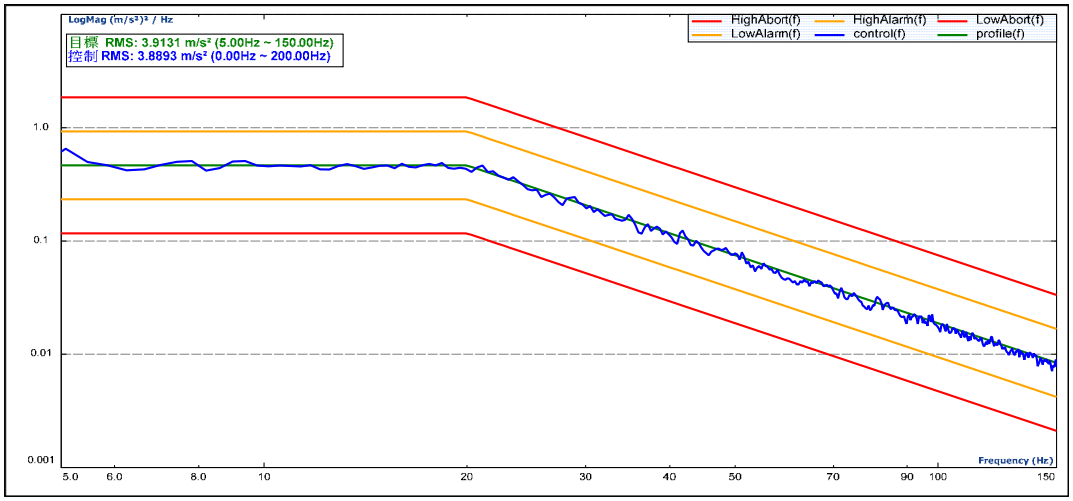
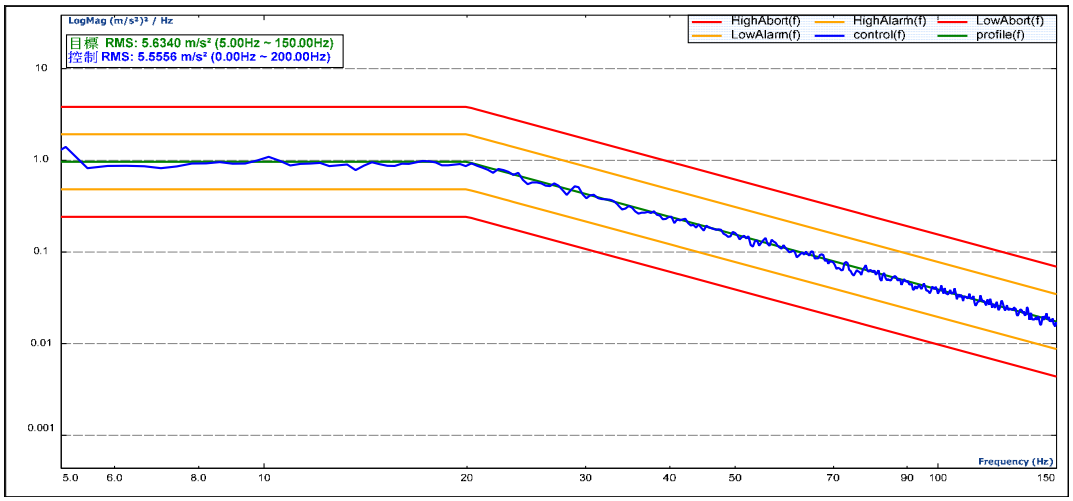
4.5.4 Test Result

Inspection item	Result
EUT	Pass

4.5.5 Test Setup Photo

Transverse	
Longitudinal	
Vertical	

4.5.6 Test Profile:

Transverse	
Longitudinal	
Vertical	

4.6 Shock Test

4.6.1 Test Specification and/or standard:

EN 61373:2010

4.6.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force：1000 kgf-peak / 250 kgw Loading
Max. displacement：50 mm p-p
Max. acceleration：55 g
Frequency range：5 Hz to 2000 Hz
Calibrate trace code：VP-200410-1

4.6.3 Test Condition and procedure:

Test Condition:

	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	Vertical Transverse Longitudinal	300	18
☐	3 Axle mounted	Vertical Transverse Longitudinal	1000	6

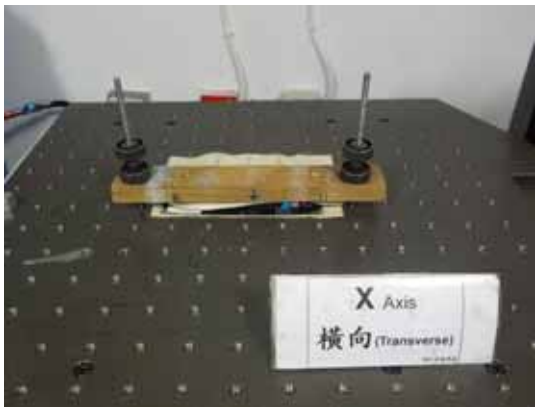
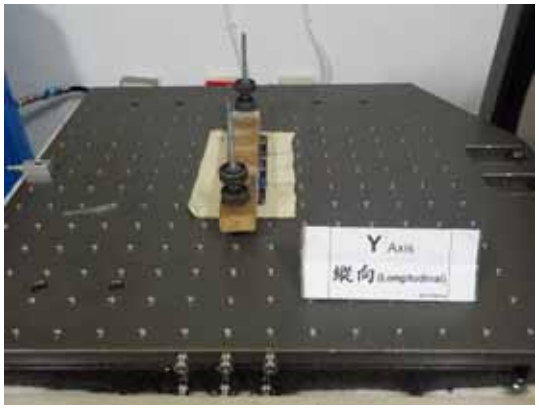
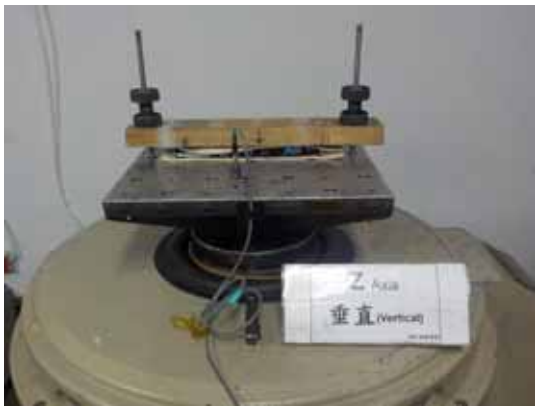
Test Procedure:

A. Check out samples.
B. Place the test samples on the vibration table in its normal operating Orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

4.6.4 Test Result

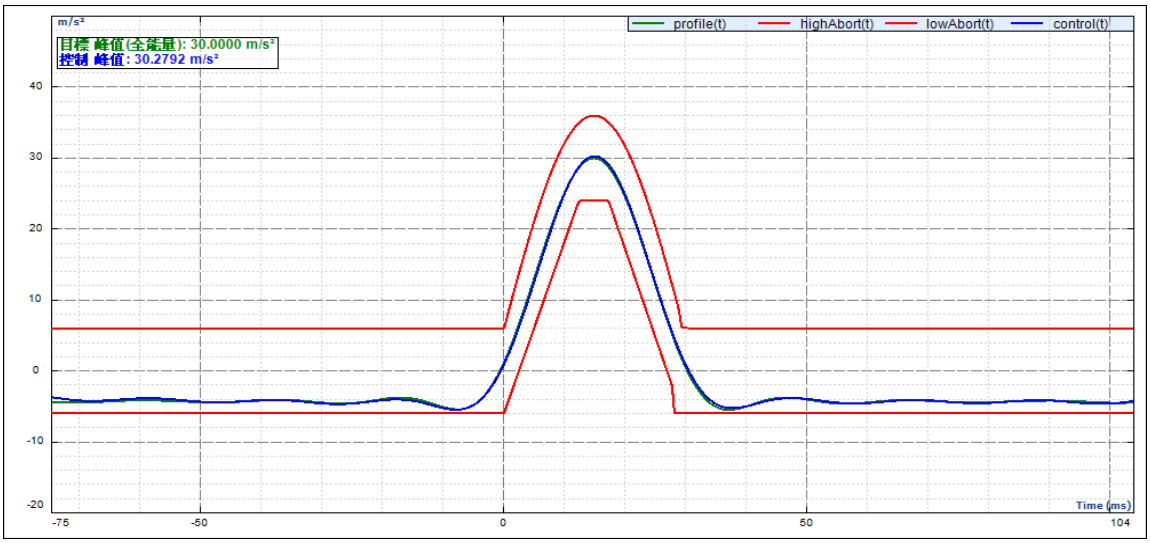
Inspection item	Result
EUT	Pass

4.6.5 Test Setup Photo

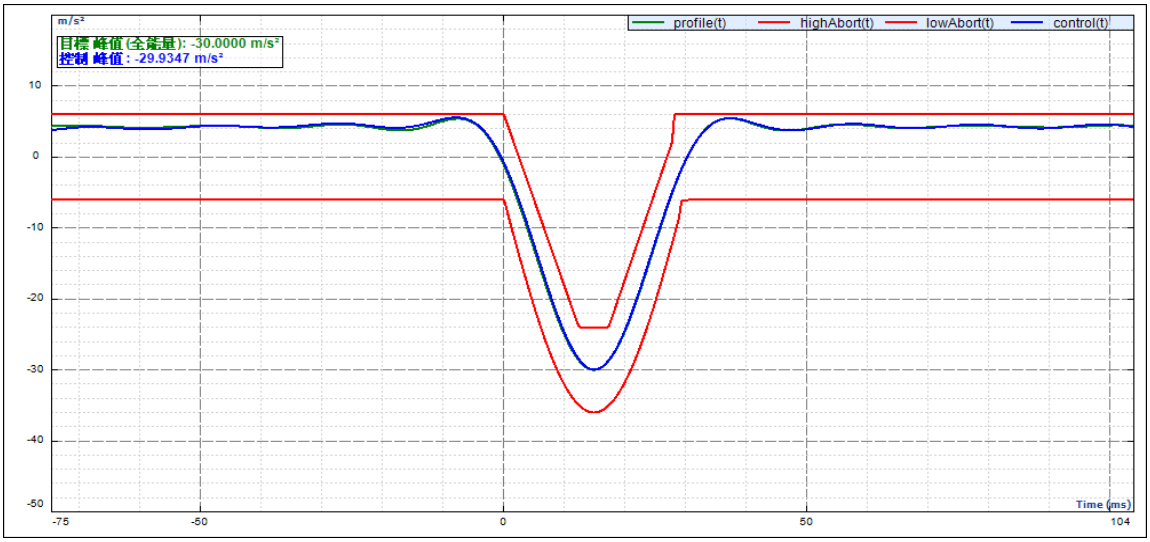
Transverse	
Longitudinal	
Vertical	

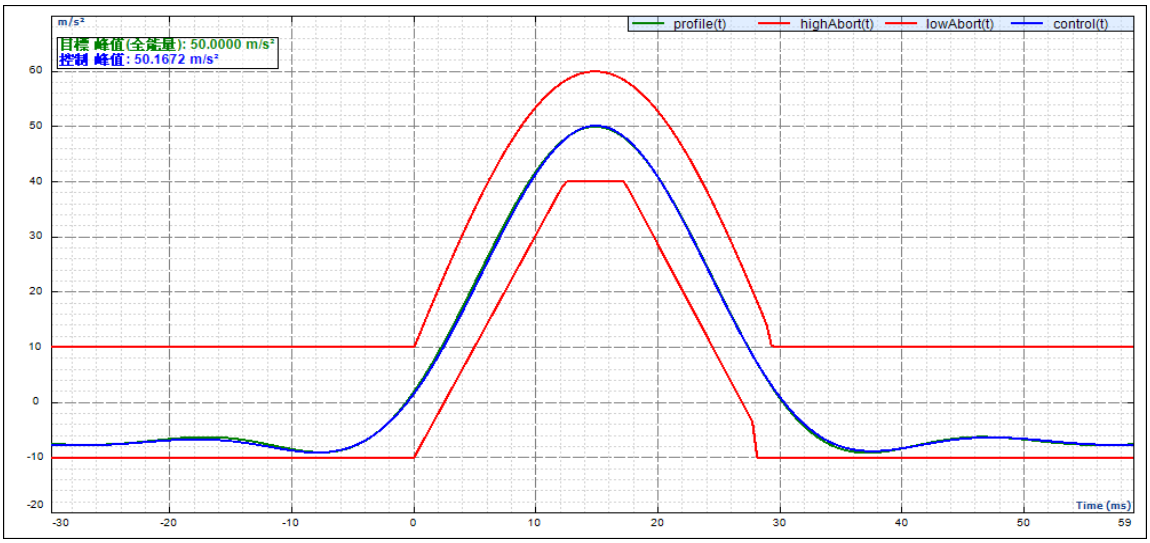
4.6.6 Test Profile:

+ X Axis



- X Axis



+ Y Axis

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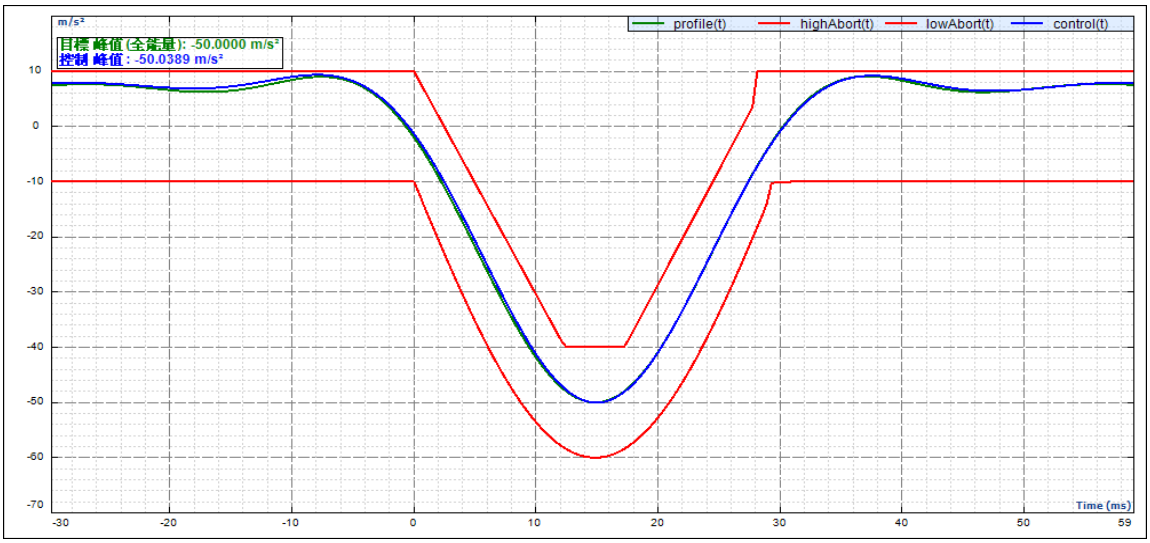
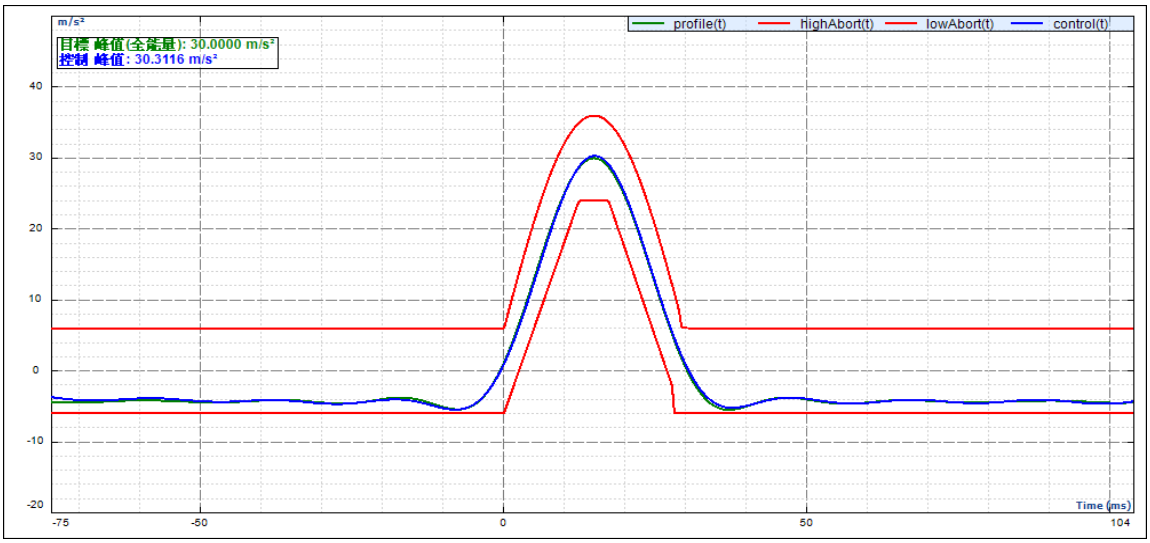
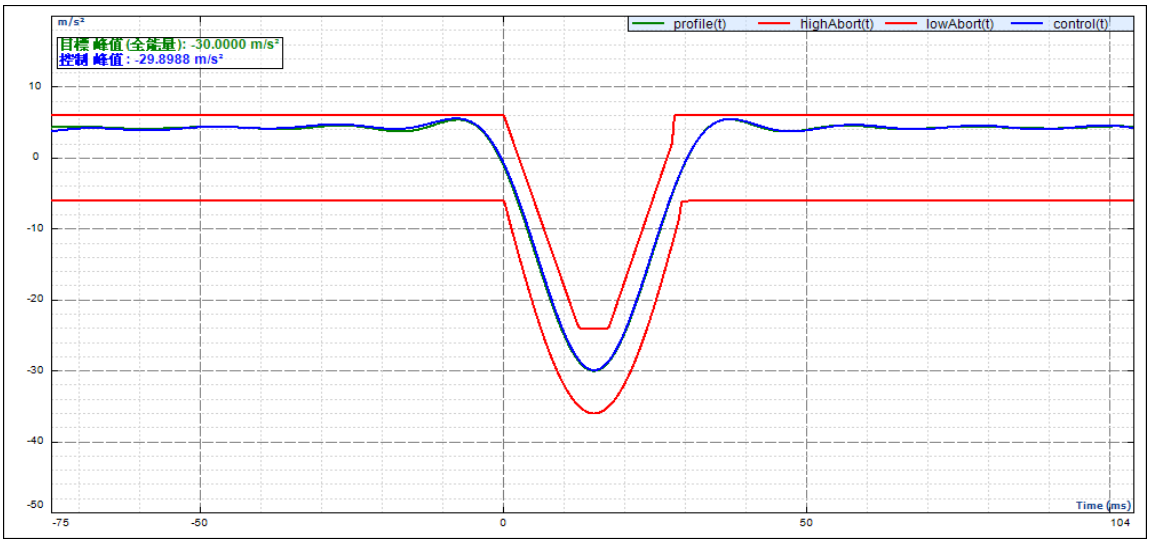


m/s²
目標 峰值(全能量): 50.0000 m/s²
控制 峰值: 50.1672 m/s²
profile(t)
highAbort(t)
lowAbort(t)
control(t)
Time (ms)

m/s²
目標 峰值(全能量): -50.0000 m/s²
控制 峰值: -50.0389 m/s²
profile(t)
highAbort(t)
lowAbort(t)
control(t)
Time (ms)

+ Z Axis

- Z Axis


m/s²
目標 峰值(全能量): 30.0000 m/s²
控制 峰值: 30.3116 m/s²
profile(t)
highAbort(t)
lowAbort(t)
control(t)
Time (ms)
m/s²
目標 峰值(全能量): -30.0000 m/s²
控制 峰值: -29.8988 m/s²
profile(t)
highAbort(t)
lowAbort(t)
control(t)
Time (ms)

5. Appendix

5.1 Appendix A: Test Equipment

5.1.1 Test Equipment List

Equipment	Model	Manufacturer	Serial No.	Equipment Range	Last Cal. Date	Next Cal. Date
Electrical safety analyzer	SE 7452	Extech Electronics.	1713353	AC 5kV/100mA, DC 6kV/10mA Insulation: 10M ohm ~ 10G ohm	06/08/2020	06/08/2021
Chamber	THS-B4T-150	King San Technology Co. Ltd.	5290K	"Temperature -40~150°C Humidity 10~95%"	11/18/2019	11/18/2020
Temperature & Humidity Record	TH110-POSE	KIMO	1F130907473	Temperature10°C~35°C Humidity 20%~95%	04/23/2020	04/23/2021
Digital Timer - Alarm Clock	N-396T	AVDr.AV	ISL-LT006	Timer (Full Range)	03/04/2020	03/04/2021

Safety Equipment Calibration List

Equipment	Model	Manufacturer	Serial No.	Equipment Range	Cal. Date	Due Date
Electrical safety analyzer	SE 7452	Extech Electronics	1713353	AC 5kV/100mA, DC 6kV/10mA	06/08/2020	06/08/2021
Temperature & Humidity Record	TH110-POSE	KIMO	1F130907473	Temperature10°C~35°C Humidity 20%~95%	04/23/2020	04/23/2021

Safety Equipment Calibration List

Equipment	Model	Manufacturer	Serial No.	Equipment Range	Cal. Date	Due Date
Electrical safety analyzer	SE 7452	Extech Electronics	1713353	AC 5kV/100mA, DC 6kV/10mA IR 10Mohm~10Gohm	06/08/2020	06/08/2021
Chamber	THS-B4T-150	King San Technology	5290K	Temperature -40~150°C Humidity 10~95%	11/18/2020	11/28/2021
Temperature & Humidity Record	TH110-POSE	KIMO	1F130907473	Temperature10°C~35°C Humidity 20%~95%	04/23/2020	04/23/2021
Digital Timer - Alarm Clock	GP-5A	AVDr.AV	ISL-LT006	Timer (Full Range)	11/06/2020	11/06/2021
DC Power Source	PSW 30-36	Good Will Instrument	GEP130132	DCV 30V DCA 36A	05/15/2020	05/15/2021

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction 03	EMI Receiver 15	ROHDE & SCHWARZ	ESCI	101166	07/29/2020	07/29/2021
Conduction 03	LISN 19	R&S	ENV216	101425	11/05/2020	11/05/2021
Conduction 03	LISN 24	Schwarzbeck	NNLK 8121	8121-829	06/06/2020	06/06/2021
Conduction 03	Conduction 04-3 Cable	WOKEN	CFD 300-NL	conduction 04-3	09/07/2020	09/07/2021

Location Chmb12	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Radiation (Chamber12)	BILOG Antenna 18	Schwarzbeck	Schwarzbeck VULB 9168+EMCI-N-6-05	646	02/18/2020	02/18/2021
Radiation (Chamber12)	Preamplifier 26	EMCI	EMC9135	980297	02/21/2020	02/21/2021
Radiation (Chamber12)	Coaxial Cable Chmb 12-10M-01	PEWC	CFD400-NL	Chmb 12-10M-01	10/14/2020	10/14/2021
Radiation (Chamber12)	EMI Receiver 19	ROHDE & SCHWARZ	ESR 3	102460	08/04/2020	08/04/2021

Location Chmb14	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Rad. Above 1GHz	Spectrum Analyzer 25	R&S	FSV 40	101499	11/04/2020	11/04/2021
Rad. Above 1GHz	Horn Antenna 06	ETS-Lindgren	3117	00066665	11/04/2020	11/04/2021
Rad. Above 1GHz	Preamplifier 20	EMC INSTRUMENT	EMC051845	980084	11/19/2020	11/19/2021
Rad. Above 1GHz	Microwave Cable-11	HUBER SUHNER	SUCOFLEX 106	78034/6	02/03/2020	02/03/2021
Rad. Above 1GHz	Microwave Cable-26	EMCI	EMC104-NM-SM-800	141112	02/26/2020	02/26/2021

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
EN61K-4-2	ESD Gun 9	EM TEST	Dito	V1018106503	04/28/2020	04/28/2021
EN61K-4-3	Broadband Log-Periodic Antenna	AR	AT1080	310698	N/A	N/A
EN61K-4-3	Horn Antenna RF-01	AR	ATS700M11G	0335864	N/A	N/A
EN61K-4-3	Amplifier 80Mz~1GHz 750W	AR	750W1000A	0344168	N/A	N/A
EN61K-4-3	Amplifier 800MHz~4.2GHz 50W	AR	50S1G4M1	312762	N/A	N/A
EN61K-4-3	Amplifier 4.0~8.0GHz 35W	AR	35S4G8AM1	0335752	N/A	N/A
EN61K-4-3	Broadband Coupler 80M~1GHz	Amplifier Research	DC6180A	0341805	N/A	N/A
EN61K-4-3	Coaxial Cable	INSULATED	NPS-4806-2360-NP3	108599.003.01.03	N/A	N/A
EN61K-4-3	Broadband Coupler 0.8G~4.26GHz	AR	DC7144A	0335226	N/A	N/A
EN61K-4-3	Broadband Coupler 4G~8GHz	AR	DC7350A	0335817	N/A	N/A
EN61K-4-3	Signal Generator 07	ROHDE& SCHWARZ	SMB100A	107780	12/04/2019	12/04/2020
EN61K-4-4 EN61K-4-5	EFT and SURGE Test System	EMC Partner	IMU3000	1547	03/19/2019	09/19/2020
EN61K-4-6	CDN M2+M3 04	TESEQ	CDN M016	43257	09/03/2020	09/03/2021
EN61K-4-6	Coaxial Cable 4-6 02-1			4-6 02-1	N/A	N/A
EN61K-4-6	Conducted Immunity Test System 03	Frankonia	CIT-10-75	126B1151	01/15/2020	01/15/2021
EN61K-4-8	Magnetic Field Test Generator 02	PIC	PMF-1000	ANT150701	05/29/2020	05/29/2021

PS: N/A => The equipment does not need calibration.

****Software for Controlling Spectrum/Receiver and Calculating Test Data**

Test Item	Filename	Version
EN61000-4-2	N/A	2.0
EN61000-4-3	i2	529b
EN61000-4-4	EMC TEST	4.10
EN61000-4-5	EMC Partner	1.69
EN61000-4-6	FRANKONIA CD-LAB	V5.221
EN61000-4-8	N/A	

Site	Filename	Version	Issue Date
Conduction/Radiation	EZ EMC	ISL-03A2	3/6/2013

5.2 Appendix B: Uncertainty of Measurement

The laboratory measurement uncertainty accordance with refers to CISPR 16-4-2. If Ulab is less than or equal to Ucispr in Table 1, then the test report may either state the value of Ulab or state that Ulab is less than Ucispr.
The coverage factor k = 2 yields approximately a 95 % level of confidence.

<Conduction 03>
AMN: ±2.90dB

<Chamber 12 (10M)>
Horizontal
30MHz~200MHz: ±4.14dB
200MHz~1000MHz: ±4.12dB
Vertical
30MHz~200MHz: ±4.30dB
200MHz~1000MHz: ±4.45dB

<Chamber 14 (3M)>
1GHz~6GHz: ±4.93dB

<Immunity 02>

Test item	Uncertainty	Test item	Uncertainty
EN 61000-4-2 (ESD)		EN 61000-4-6 (CS)	
Rise time tr	≦ 9.81%	CDN	± 1.74dB
Peak current Ip	≦ 5.54%	EM Clamp	± 3.36dB
current at 30 ns	≦ 5.55%	EN 61000-4-8 (Magnetic)	± 6.53%
current at 60 ns	≦ 5.55%		
EN 61000-4-3 (RS)	± 1.89dB		
EN 61000-4-4 (EFT)			
voltage rise time (tr)	± 5.1%		
peak voltage value (VP)	± 6.39%		
voltage pulse width (tw)	± 5.0%		
EN 61000-4-5 (Surge)			
open-circuit voltage front time	±13.5%		
open-circuit voltage peak value	±6.6%		
open-circuit voltage duration (Td)	53.33μs		

5.3 Appendix C: Photographs of EUT

Please refer to the File of **ISL-21LE090P-MA**

--- END ---

Appendix

Photographs of EUT

of

Product Name

THN 20WIR THN 30WIR Series

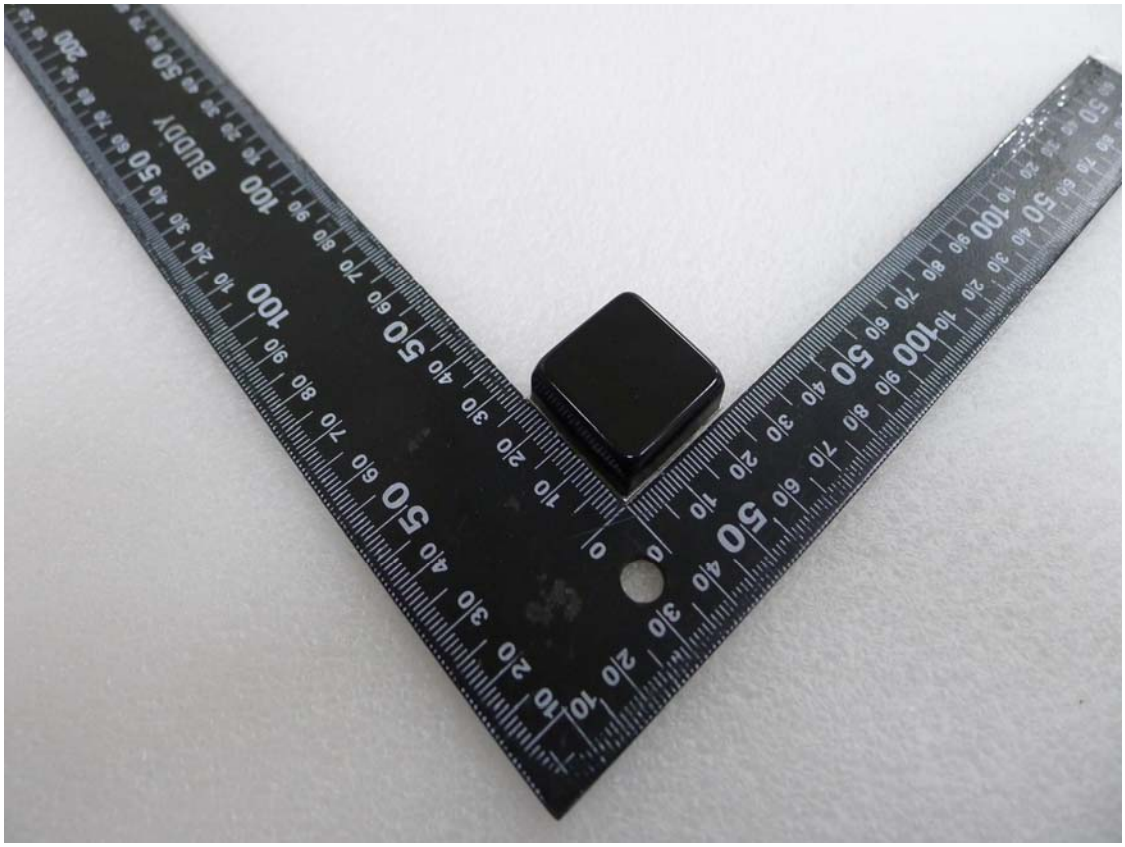
Model

**THN 30-7210WIR;THN 30-7225WIR;THN 30-2410WIR;
THN 30-2411WIR;THN 30-2412WIR;THN 30-2413WIR;
THN 30-2415WIR;THN 30-2422WIR;THN 30-2423WIR;
THN 30-2425WIR;THN 30-4810WIR;THN 30-4811WIR;
THN 30-4812WIR;THN 30-4813WIR;THN 30-4815WIR;
THN 30-4822WIR;THN 30-4823WIR;THN 30-4825WIR;
THN 30-7211WIR;THN 30-7212WIR;THN 30-7213WIR;
THN 30-7215WIR;THN 30-7222WIR;THN 30-7223WIR;
THN 20-2410WIR;THN 20-2411WIR;THN 20-2412WIR;
THN 20-2413WIR;THN 20-2415WIR;THN 20-2422WIR;
THN 20-2423WIR;THN 20-2425WIR;THN 20-4810WIR;
THN 20-4811WIR;THN 20-4812WIR;THN 20-4813WIR;
THN 20-4815WIR;THN 20-4822WIR;THN 20-4823WIR;
THN 20-4825WIR;THN 20-7210WIR;THN 20-7211WIR;
THN 20-7212WIR;THN 20-7213WIR;THN 20-7215WIR;
THN 20-7222WIR;THN 20-7223WIR;THN 20-7225WIR**

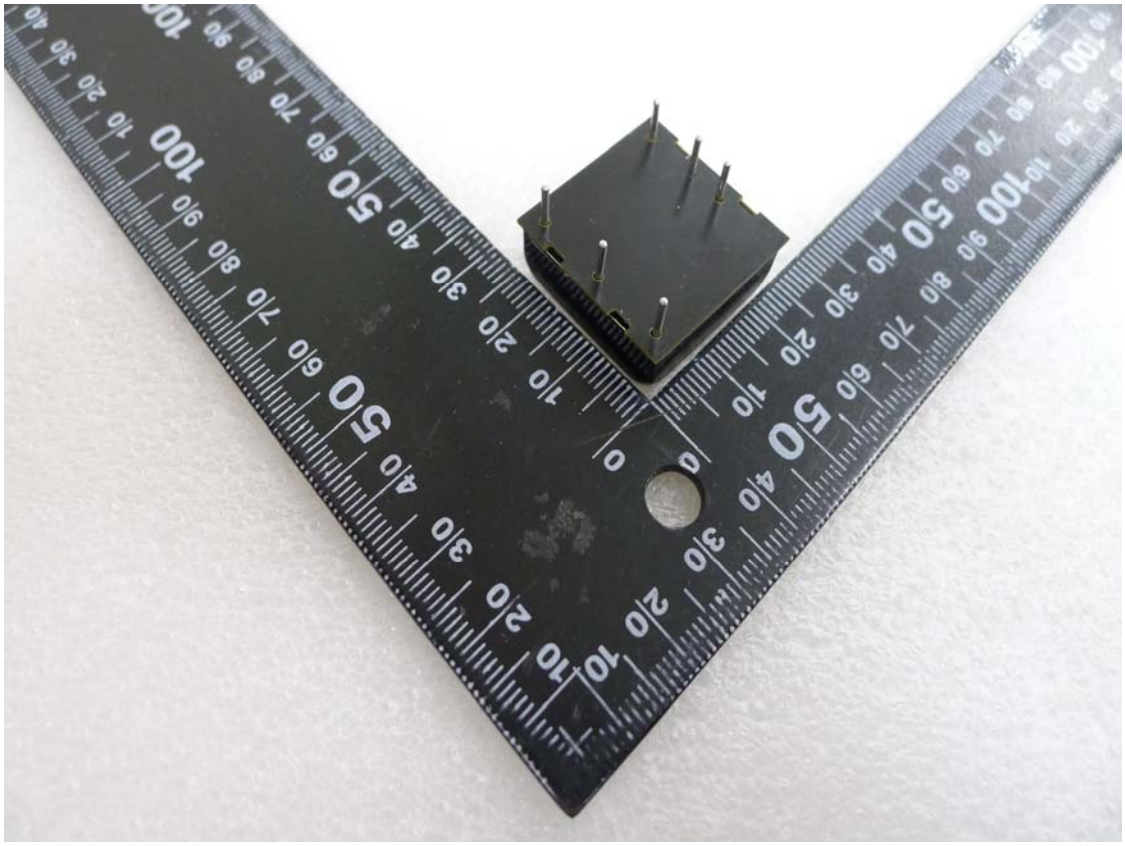
Brand

TRACO POWER

EUT-1.



EUT-2.



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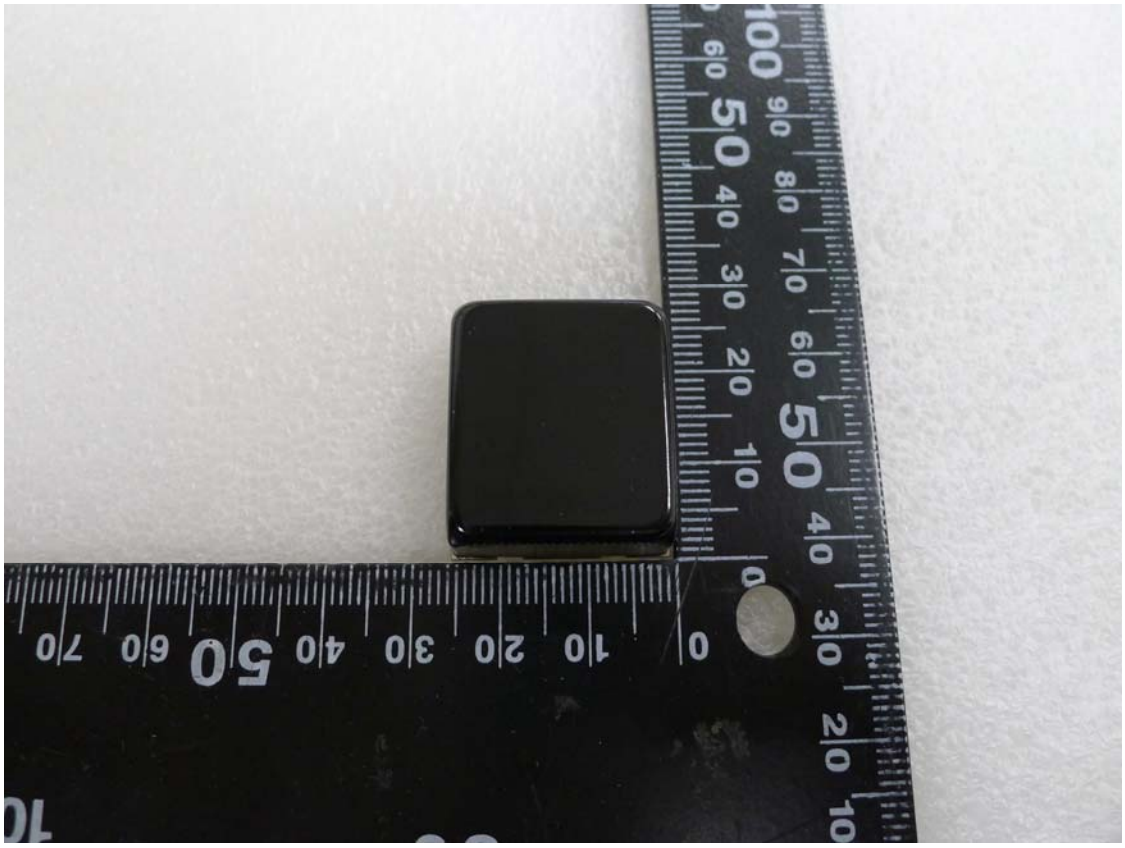

EUT-4.