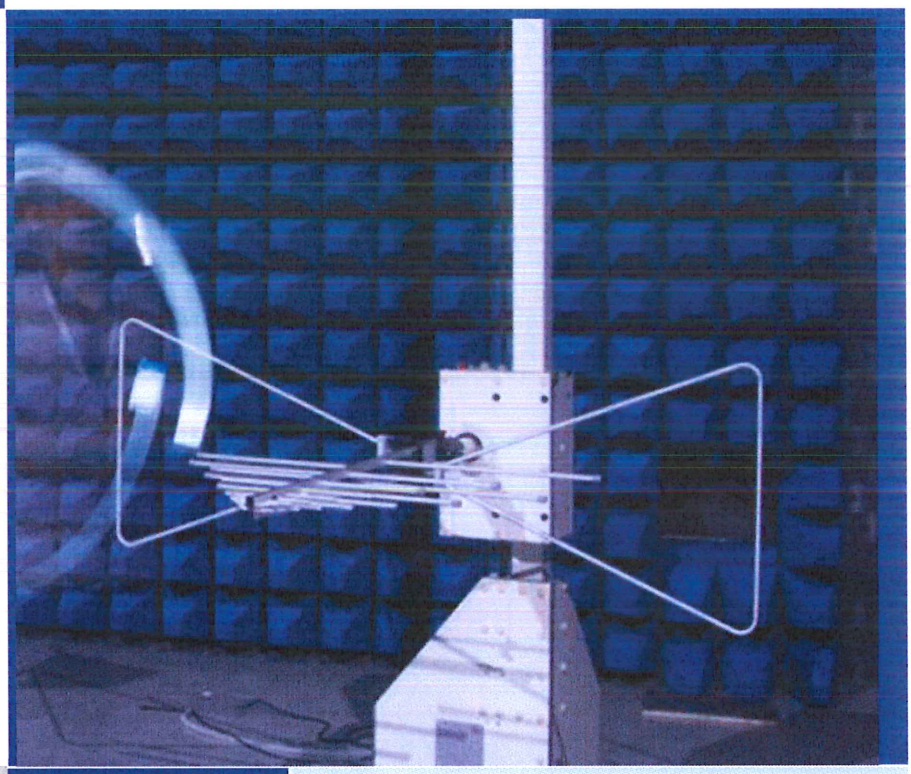
EMC TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR
Solar Grid-tied Inverter

ISSUED TO
EVOLVE ENERGY GROUP CO., LIMITED

RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK



Report No.:	BL-DG2060276-401
EUT Name:	Solar Grid-tied Inverter
Model Name:	EVVO 50000TL3P (refer section 2.4)
Brand Name:	EVVO
Test Standard:	Refer to 3.1
Test conclusion:	Pass
Test Date:	Apr. 20, 2018 ~ May 10, 2018
Date of Issue:	Jun. 23, 2020

Tested by: Xiong Chong
Xiong Chong
Date Jun. 23, 2020

Reviewed by: Xia Long
Xia Long
Date Jun. 23, 2020

Approved by:
Liao Jianming
(Technical Director)
Date Jun. 23, 2020

NOTE: This test report of test results only related to testing samples, which can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. Any objections should be raised within thirty days from the date of issue. To validate the report, please contact us.

Block B, 1st FL,Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
TEL: +86-755-66850100, FAX: +86-755-61824271
Email: info@baluntek.com
www.baluntek.com

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jun. 23, 2020	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organizatin accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C~25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

(1) The test report reference to the report template version v4.5.

(2) The test report is invalid if not marked with the signatures of the persons responsible for testing, reviewing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	EVOLVE ENERGY GROUP CO., LIMITED
Address	RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK

2.2 Manufacturer Information

Manufacturer	EVOLVE ENERGY GROUP CO., LIMITED
Address	RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK

2.3 Factory Information

Factory	Dongguan SOFAR SOLAR Co., Ltd.
Address	1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City.

2.4 General Description for Equipment under Test (EUT)

EUT Name		Solar Grid-tied Inverter
Mode Name Under Test		EVVO 50000TL3P
Series Model Name		EVVO 50000TL3P, EVVO 60000TL3P, EVVO 70000TL3P-HV
Power input		DC input: 250-950Vd.c. ,Max 1000Vd.c.
Test voltage		DC 800V
Software Version		V2.00
Interfaces present on the EUT	AC Ports	From mains to AC power adapter
	DC Ports	DC ports
	Telecom Port	No Telecom Ports.
	Signal Ports	No Signal ports.
Remark		Model No.:EVVO 50000TL3P, EVVO 60000TL3P, EVVO 70000TL3P-HV.The electrical circuit design, layout, components used, internal wiring And function were identical for the above models.

2.5 Ancillary Equipment

Note: not application.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

The objective of the report is to perform testing according to following standards for CE marking:

No.	Identity	Document Title
1	EN IEC 61000-6-1:2019	Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards —Immunity for residential, commercial and light-industrial environments.
2	IEC 61000-6-1:2019	Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments.
3	EN 61000-6-3: 2007/A1:2011/AC:2012	Electromagnetic compatibility (EMC) -- Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments.
4	IEC 61000-6-3: 2006+AMD1:2010	Electromagnetic compatibility (EMC) -- Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments.
5	EN 61000-3-11: 2000	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current≤75 A and subject to conditional connection.
6	IEC 61000-3-11: 2017	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current≤75 A and subject to conditional connection.
7	EN 61000-3-12: 2011	Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and≤75 A per phase.
8	IEC 61000-3-12: 2011	Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and≤75 A per phase.

3.2 Verdict

No.	Base Standard	Description		Test Verdict	Result	Remark
Emission						
1	EN 61000-6-3 IEC 61000-6-3	Radiated Emission	Below 1 GHz	Pass	Annex A.1	--
			Above 1 GHz	N/A		Note 1
2	EN 61000-6-3 IEC 61000-6-3	Conducted Emission	AC Ports	Pass	Annex A.2	--
			DC Ports	N/A		--
			Telecom Ports	N/A		--
3	EN 61000-3-12 IEC 61000-3-12	Harmonic Current Emissions		Pass	Annex A.3	--
4	EN 61000-3-11 IEC 61000-3-11	Voltage Fluctuations & Flicker		Pass	Annex A.4	--
Immunity						
5	IEC 61000-4-2	Electrostatic Discharge Immunity		Pass	Annex A.5	--
6	IEC 61000-4-3	Radiated RF Electromagnetic Field Immunity		Pass	Annex A.6	--
7	IEC 61000-4-4	Electrical Fast Transient/Burst Immunity	AC Ports	Pass	Annex A.7	--
			DC Ports	Pass		--
			Signal Ports	N/A		--
8	IEC 61000-4-5	Surge Immunity	AC Ports	Pass	Annex A.8	--
			DC Ports	Pass		--
9	IEC 61000-4-6	Immunity to Conducted Disturbances Induced by RF Fields	AC Ports	Pass	Annex A.9	--
			DC Ports	Pass		--
			Signal Ports	N/A		--
10	IEC 61000-4-8	Power-frequency magnetic field		N/A	Annex A.10	Note 2
11	IEC 61000-4-11	Voltage Dips and Short Interruptions Immunity	AC Port	Pass	Annex A.11	--

Note 1: The highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall be made up to 1 GHz.

Note 2: The EUT not containing devices susceptible to magnetic fields, so this test item is not applicable.

Note 3: The only difference between the EUT (test samples in this report) and testing sample of report No. BL-DG2030080-401, which was issued by Shenzhen BALUN Technology Co., Ltd. on Apr. 07, 2020 is that add IEC standards, and EUT is the same. All the test result data please refer to report No. BL-DG2030080-401, which was issued by Shenzhen BALUN Technology Co., Ltd. on Apr. 07, 2020.

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	3.23 dB
Radiated emissions (30 MHz-1 GHz)	4.30 dB
Radiated emissions (1 GHz-18 GHz)	4.81 dB
Radiated emissions (18 GHz-40 GHz)	5.71 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	23°C~25°C	DC 800V	50%-55%	100 to 102 kPa

4.2 Test Equipment List

Radiated Emission Test For Frequency Below 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2016.07.19	2018.07.18	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1600	2016.07.12	2018.07.11	☐
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2016.08.09	2018.08.08	☒

Radiated Emission Test For Frequency Above 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2017.11.08	2018.11.07	☐
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2017.07.22	2019.07.21	☐
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2016.07.12	2018.07.11	☐
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2019.02.20	☐

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2017.06.22	2018.06.21	☐
LISN	SCHWARZBECK	NNLK 8129	8129-462	2017.11.08	2018.11.07	☒
AMN	SCHWARZBECK	NNBM8124	8124-509	2017.06.22	2018.06.21	☐
AMN	SCHWARZBECK	NNBM8124	8124-510	2017.06.22	2018.06.21	☐

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
ISN	TESEQ	ISN T800	34449	2017.06.22	2018.06.21	☐
Shielded Enclosure	ChangNing	CN-130701	130703	N/A	N/A	☒

Voltage Fluctuations & Flicker and Harmonic Current Emissions Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
HARMONICS,FLICKER coupling network	HTEC	FI-75A	172101	2018.3.21	2019.3.20	☒
ANALYSER	FULKE	435II	37143115	2018.3.21	2019.3.20	☒
power analyzer	HIOKI	PW6001	150901722	2018.3.21	2019.3.20	☒

Electrostatic Discharge Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
ESD Test System	SCHLODER	SESD 30000	206253	2017.06.22	2018.06.21	☒

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2019.02.20	☒
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2017.06.12	2018.06.11	☒
Power Amplifier	OPHIR RF	5225F	1037	2018.02.17	2019.02.16	☒
Power Amplifier	OPHIR RF	5273F	1016	2018.02.17	2019.02.16	☐
Power Meter	Agilent	E4419B	GB40201833	2017.11.16	2018.11.15	☒
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A	☒
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A	☐
Feld Strength Meter	Narda	EP601	511WX51129	2017.05.22	2018.05.21	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2017.07.22	2019.07.21	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2016.07.12	2018.07.11	☐
Mouth Simulator	B&K	4227	2423931	2017.11.16	2018.11.15	☐
Sound Calibrator	B&K	4231	2430337	2017.11.16	2018.11.15	☐
Sound Level Meter	B&K	NL-20	00844023	2017.11.16	2018.11.15	☐
Ear Simulator	B&K	4185	2409449	2017.11.16	2018.11.15	☐

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Ear Simulator	B&K	4195	2418189	2017.11.16	2018.11.15	☐
Audio analyzer	B&K	UPL 16	100129	2017.11.16	2018.11.15	☐

Electrical Fast Transient/Burst Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EFT Test System	HTEC	HEFT 51	1331011	2017.06.22	2018.06.21	☒
EFT coupling network	HTEC	ECDN 51	150601	2017.06.22	2018.06.21	☒
EFT clamp	TESEQ	CDN 3425	25164	2017.06.22	2018.06.21	☐

Transients and Surges Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
SURGE Generator (AC/DC Ports)	HTEC	HCWG 70	151601	2017.06.22	2018.06.21	☒
SURGE coupling network (AC/DC Ports)	HTEC	SCDN303P7	151602	2017.06.22	2018.06.21	☒
SURGE Generator (Telecom Ports)	HTEC	HCOMB 70	143806	2017.06.22	2018.06.21	☐
SURGE coupling network (Telecom Ports)	HTEC	TCOMB-4	143807	2017.06.22	2018.06.21	☐

Immunity to Conducted Disturbances Induced by RF Fields						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
CONDUCTED DISTURBANCES TEST SYSTEM	Schloder GmbH	CDG 6000	126B1286	2017.06.22	2018.06.21	☒
CDN-M2+3	Schloder GmbH	CDN M2+M3-16	A2210276	2017.06.22	2018.06.21	☐
CDN-M1	Schloder GmbH	CDN-M1	A2010063	2017.06.22	2018.06.21	☐
CDN-M4	Schloder GmbH	CDN-M4	A2610002	2017.06.22	2018.06.21	☐
CDN-M5	Schloder GmbH	CDN-M5	A2560005	2017.06.22	2018.06.21	☒
EM Clamp	Schloder GmbH	CDN-EMCL 20	1456165	2017.06.22	2018.06.21	☒

Voltage Dips and Short Interruptions Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Voltage Fault Simulating Generator	HTEC	HPFS303P	152301	2017.06.22	2018.06.21	☒
Voltage Fault Coupling Network	HTEC	HV3P30	152302	2017.06.22	2018.06.21	☒

4.3 Test Enclosure list

Description	Manufacturer	Model	Serial No.	Length	Description	Use
PC	Dell	015K3N	N/A	N/A	Special Handled	☐
Laptop	Apple	A1465	N/A	N/A	N/A	☐
Printer	HP	DESKJET 1000	N/A	N/A	N/A	☐
Keyboard	Logitech	Y-BP62a	N/A	N/A	N/A	☐
Mouse	Logitech	M100	N/A	N/A	N/A	☐
USB disk	Kingston	N/A	N/A	N/A	N/A	☐
TF Card	Kingston	N/A	N/A	N/A	N/A	☐
VGA Cable	N/A	N/A	N/A	1.5 m	Shielded with core	☐
HDMI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	☐
DVI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	☐
Coaxial video cable	N/A	N/A	N/A	2.0 m	Shielded with core	☐
iPhone	Apple	A1586	N/A	N/A	N/A	☐
Phone	MI	M4	N/A	N/A	N/A	☐
Bluetooth Earphone	SAMSUNG	Gear Circle	N/A	N/A	N/A	☐
Wireless Communications Test Set	R&S	CMW500	142028	N/A	Cal. Due 2018.06.11	☐
WIFI Router	TP-LINK	TL-WDR7500	N/A	N/A	N/A	☐
Earphone	N/A	OPPO	N/A	1.1 m	N/A	☐
Car Battery	Camel	55530	N/A	N/A	12 V/55 Ah	☐
Artificial load	N/A	N/A	N/A	N/A	2.5 Ω/100 W	☐
Artificial load	N/A	N/A	N/A	N/A	4 Ω/2000 W	☐
Electronic Load	ITECH	IT8511	N/A	N/A	N/A	☐

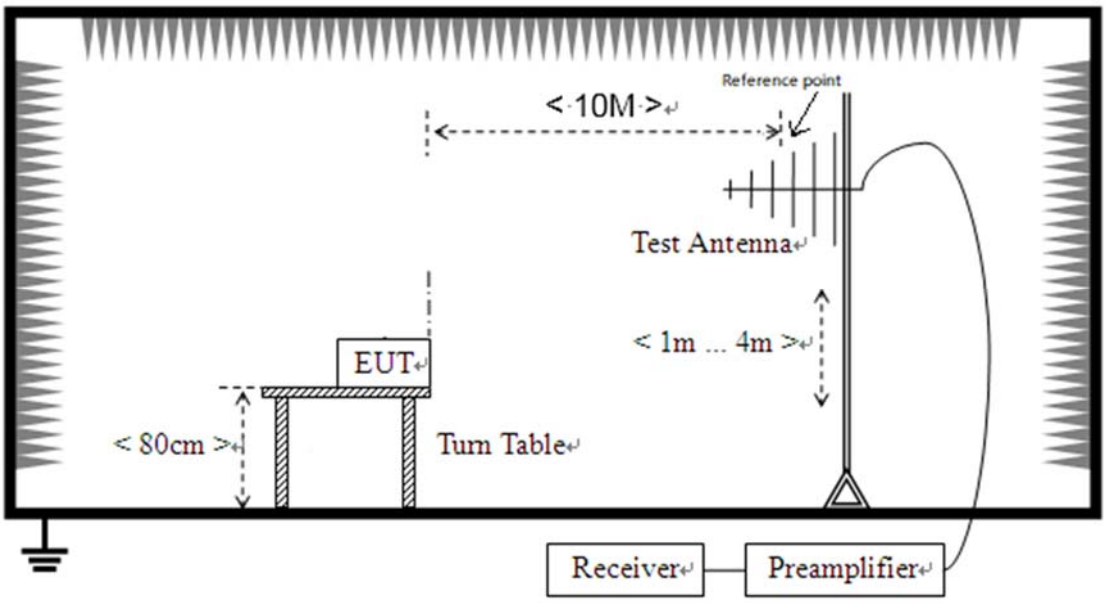
USB Cable	N/A	N/A	N/A	1.5 m	Shielded with core	☐
DC Power Supply	ITECH	IT6863A	600014010687210006	N/A	N/A	☐
LCD Monitor	SAMSUNG	UA32C4000P	N/A	N/A	N/A	☐
LCD Monitor	Dell	U241HB	N/A	N/A	N/A	☐
RJ45 Cable	N/A	N/A	N/A	1.5 m	Shielded with core	☐
Simulation of AC Power Supply	Kewell	KACM-75-33	603001150100159	N/A	N/A	☒
Solar IV Simulator	Kewell	BZ-EP-L002	602006150100159	N/A	N/A	☒

4.4 Test Configurations

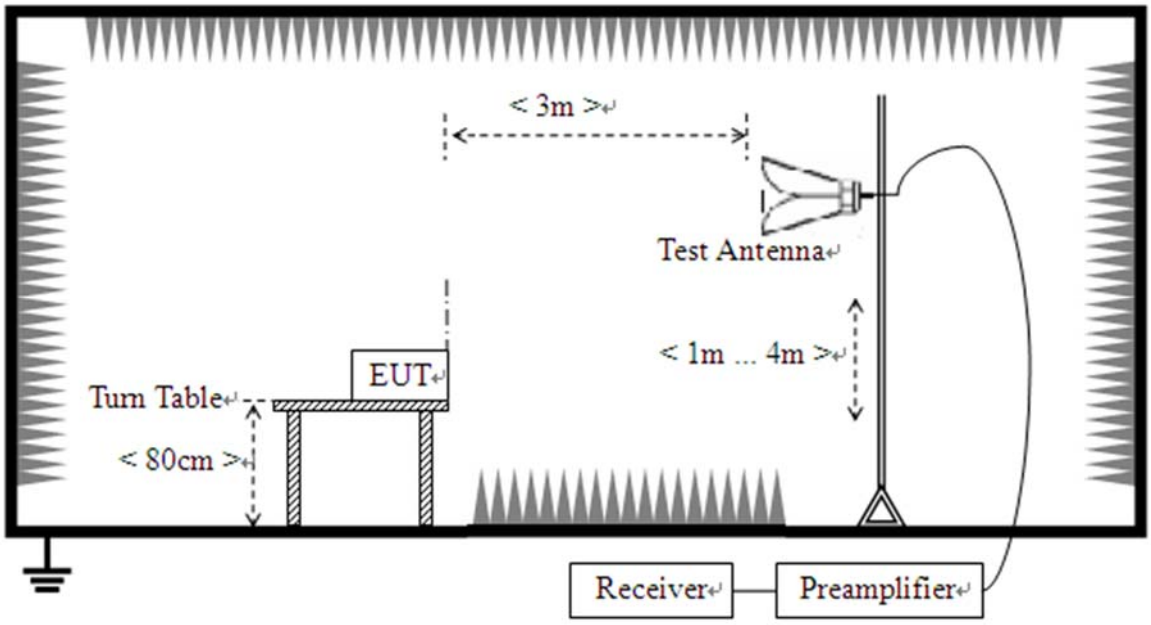
Test Configurations (TC) No.	Description
TC01	The Normal Working Test mode EUT + Simulation of AC Power Supply + Solar IV Simulator.

4.5 Description of Test Setup

Test Setup 1

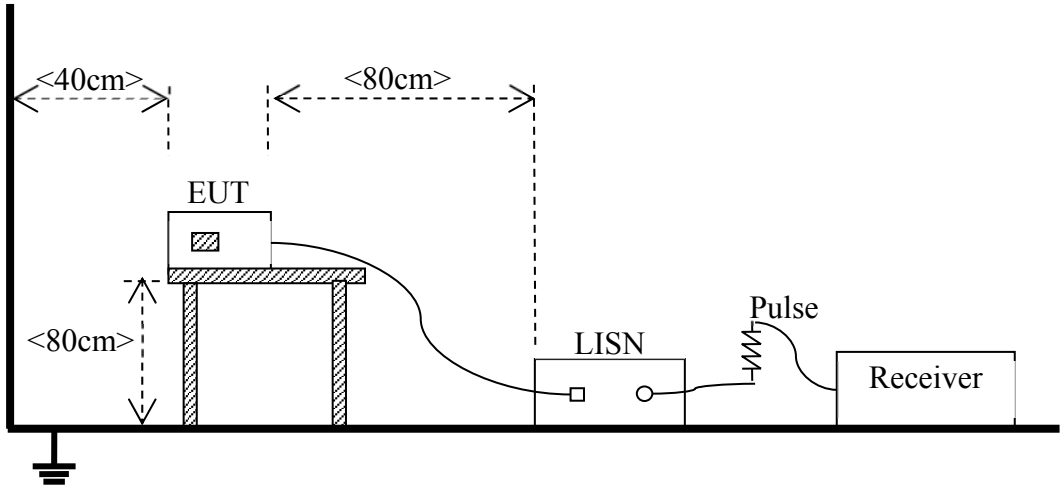


(For Radiated Emission Test (30 MHz-1 GHz))

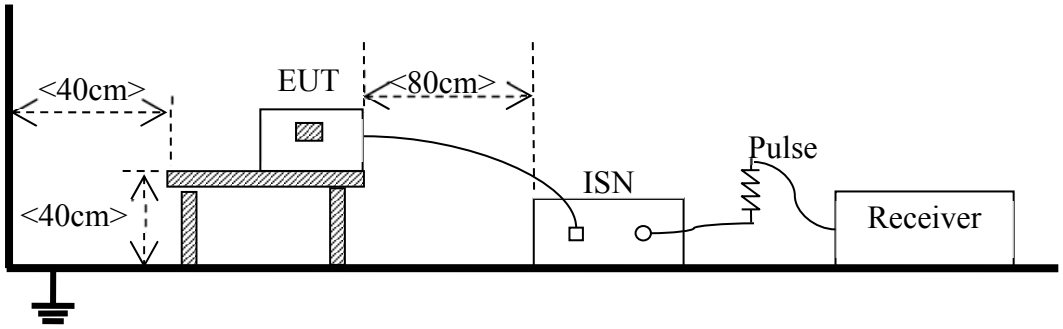


(For Radiated Emission Test (above 1 GHz))

Test Setup 2

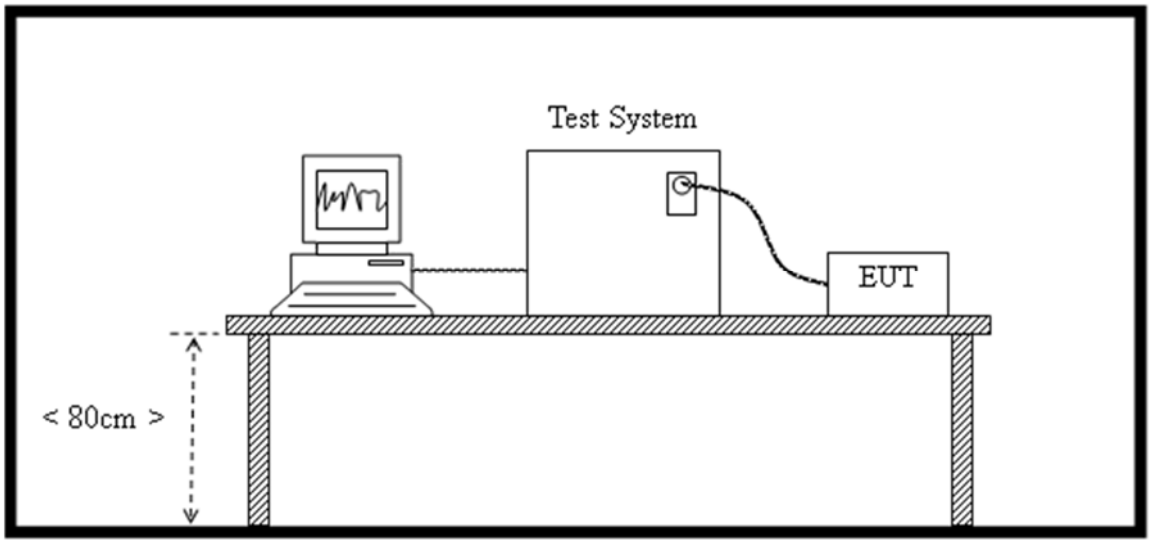


(For Conducted disturbance voltage at mains terminals Test)



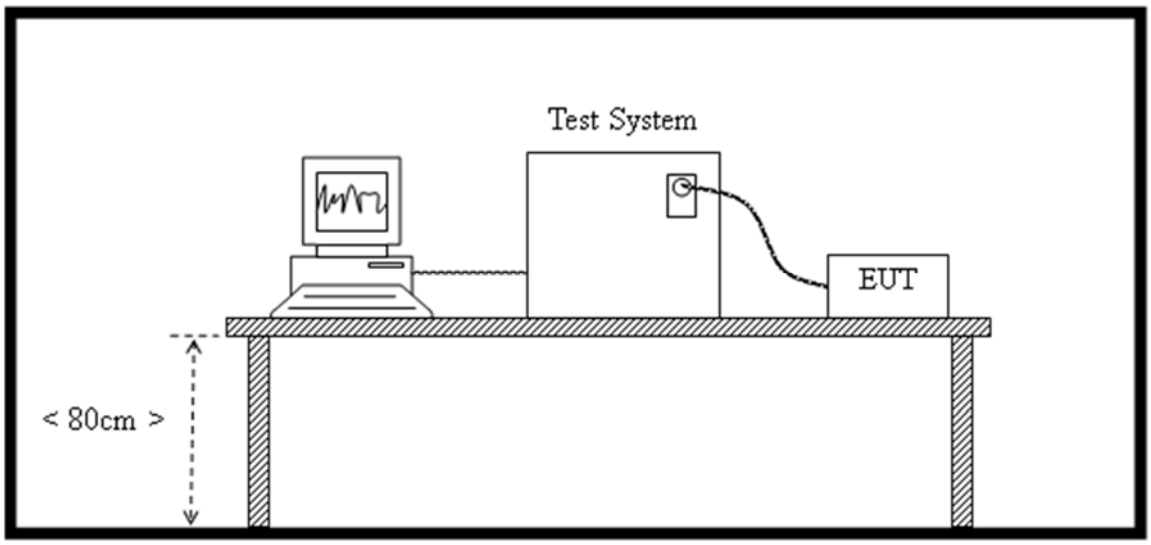
(For Conducted disturbance for asymmetric mode Test)

Test Setup 3



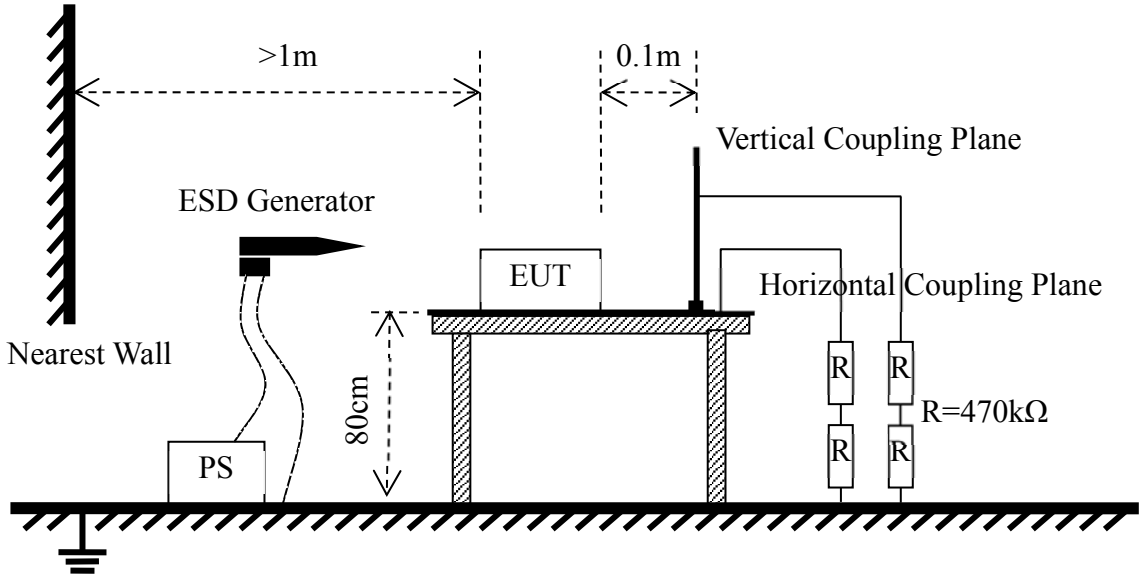
(For Harmonic Current Emissions Measurement Test)

Test Setup 4



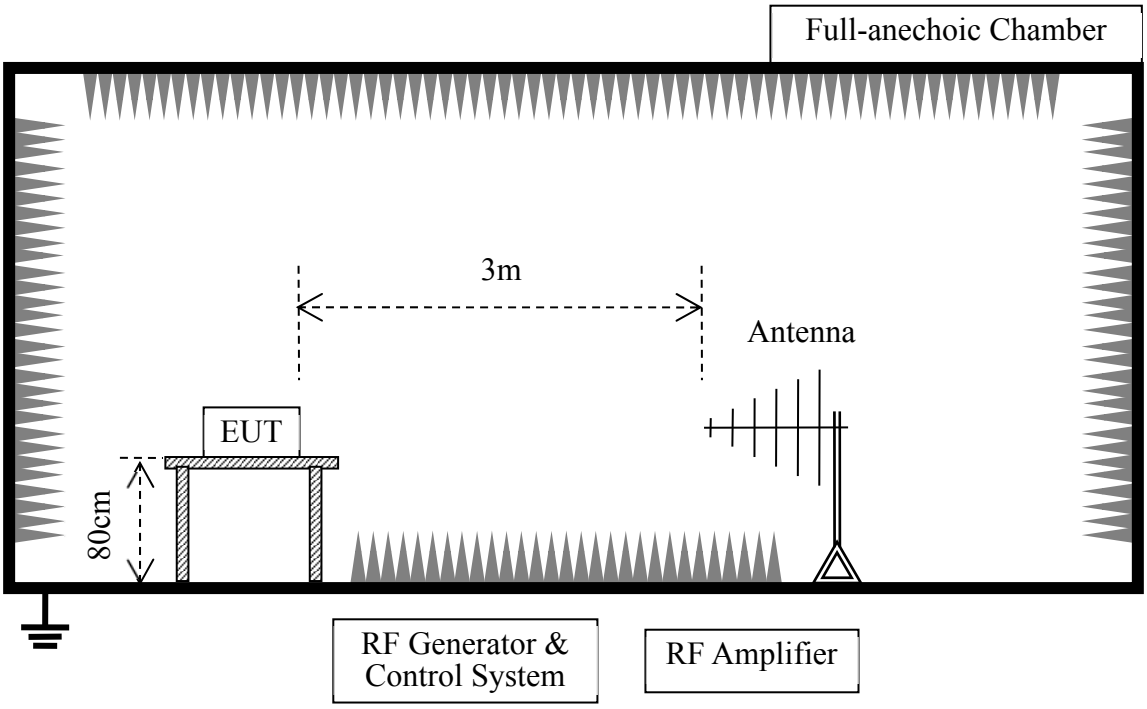
(For Voltage Fluctuations and Flicker Measurement Test)

Test Setup 5



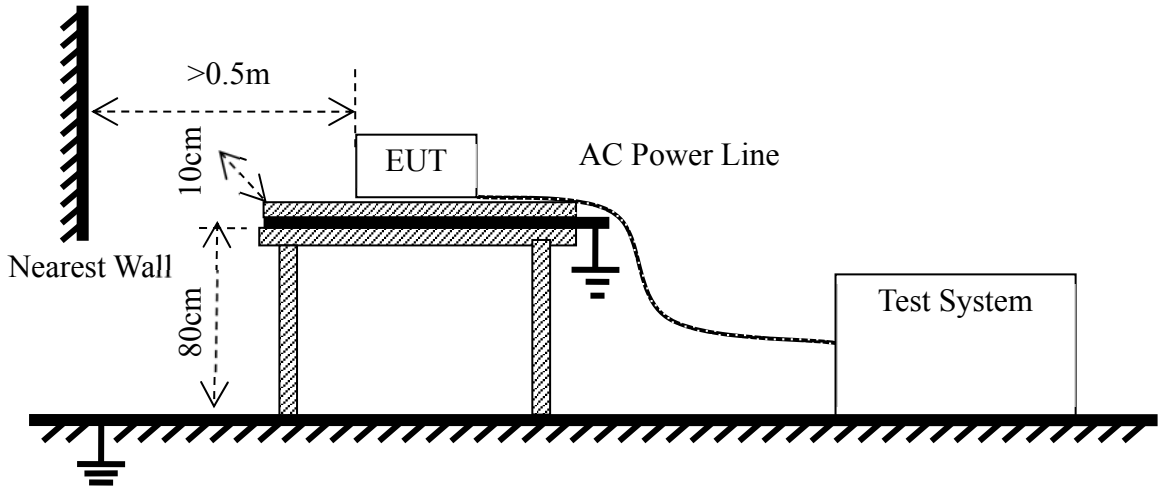
(For Electrostatic Discharge Immunity Test)

Test Setup 6



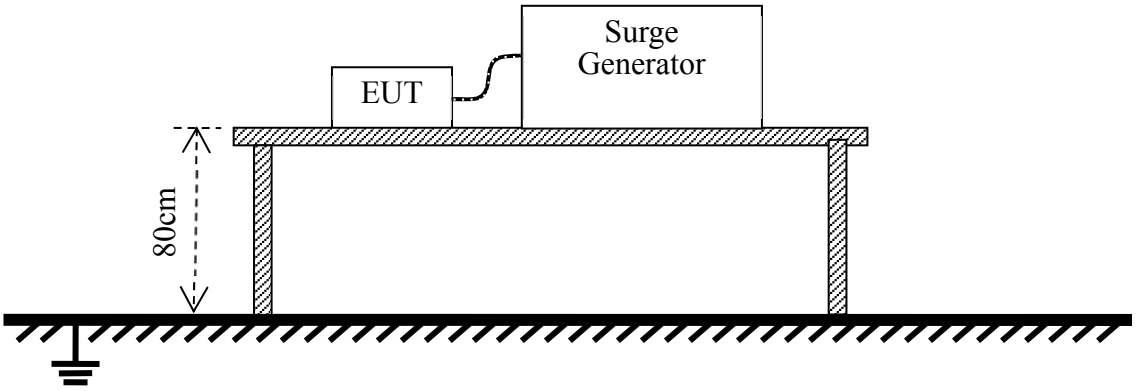
(For Radiated Immunity Test)

Test Setup 7



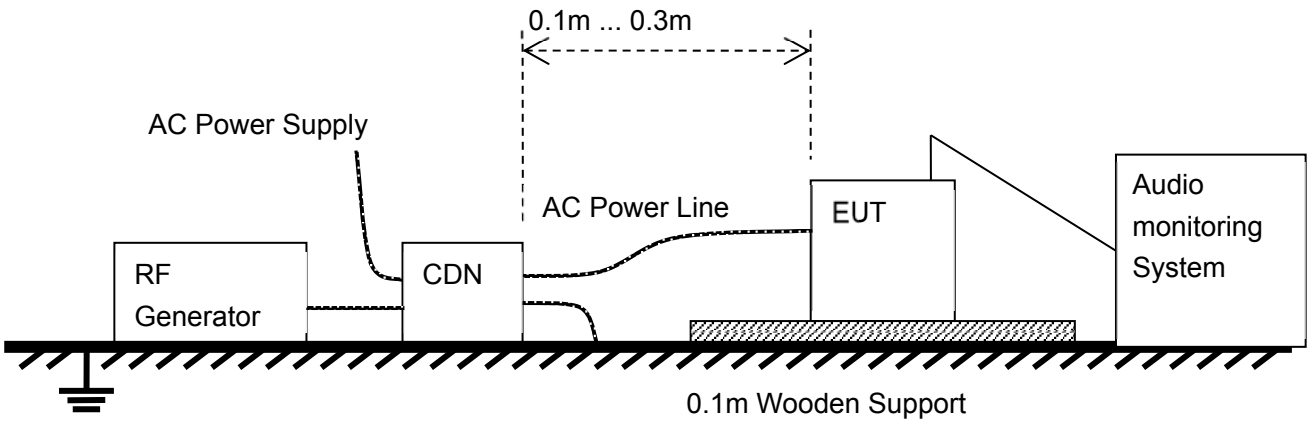
(For Electrical Fast Transient / Burst Immunity Test)

Test Setup 8



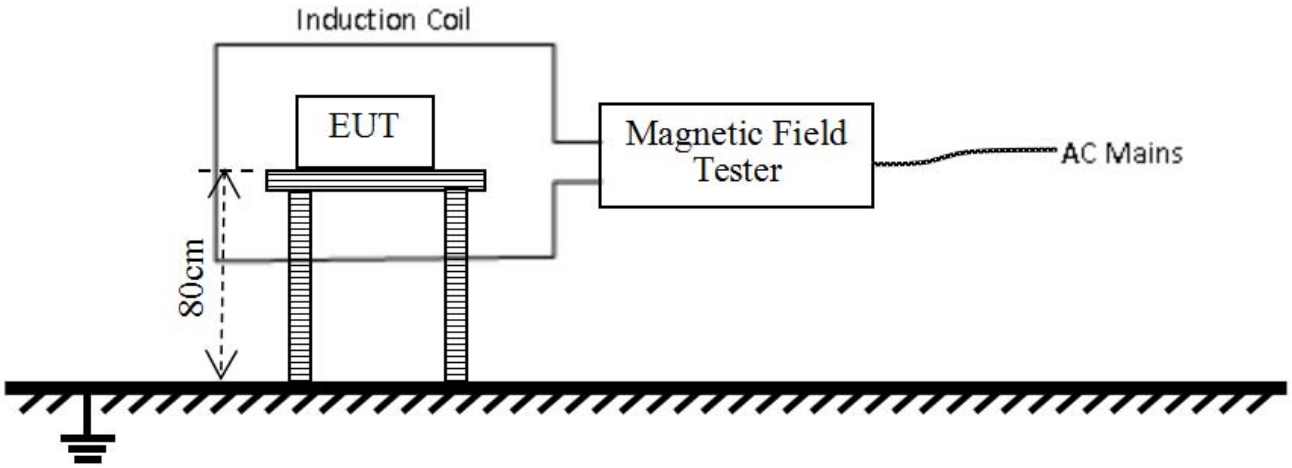
(For Surge Immunity Test)

Test Setup 9



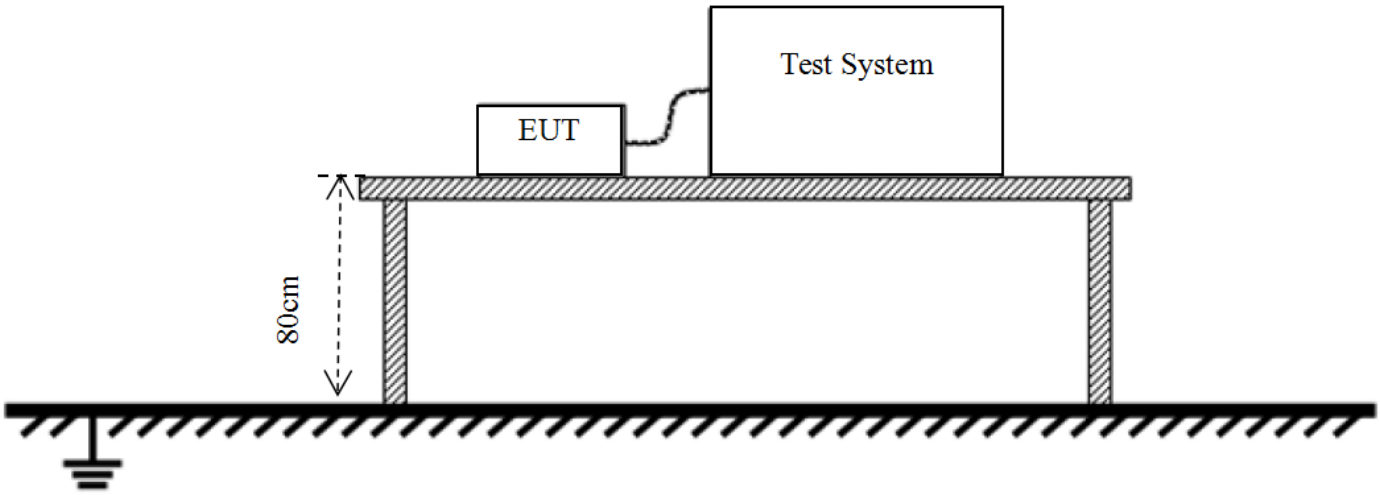
(For Immunity to Conducted Disturbances Induced By RF Fields Test)

Test Setup 10



(Power Frequency Magnetic Fields)

Test Setup 11



(For Voltage Dips and Short Interruptions Immunity Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission, Below 1GHz	Test Env.	NTNV
	Test Setup	Test Setup 1
	Test Configuration	TC01 Note
Conducted Emission, AC Ports	Test Env.	NTNV
	Test Setup	Test Setup 2
	Test Configuration	TC01 Note
Harmonic Current Emissions	Test Env.	NTNV
	Test Setup	Test Setup 3
	Test Configuration	TC01 Note
Voltage Fluctuations & Flicker	Test Env.	NTNV
	Test Setup	Test Setup 4
	Test Configuration	TC01 Note
Electrostatic Discharge Immunity	Test Env.	NTNV
	Test Setup	Test Setup 5
	Test Configuration	TC01 Note
Radiated RF Electromagnetic Field Immunity	Test Env.	NTNV
	Test Setup	Test Setup 6
	Test Configuration	TC01 Note
Electrical Fast Transient/Burst Immunity	Test Env.	NTNV
	Test Setup	Test Setup 7
	Test Configuration	TC01 Note
Surge Immunity	Test Env.	NTNV
	Test Setup	Test Setup 8
	Test Configuration	TC01 Note
Immunity to Conducted Disturbances Induced by RF Fields	Test Env.	NTNV
	Test Setup	Test Setup 9
	Test Configuration	TC01 Note
Voltage Dips and Short Interruptions Immunity	Test Env.	NTNV
	Test Setup	Test Setup 11
	Test Configuration	TC01 Note
Note: Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report. The Normal Working test mode is the worst test mode in this report.		

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (at 10 m)	Class B (at 10 m)
	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Limit (dBμV/m)
30 - 230	40	30
230 - 1000	47	37

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)
1000-3000	76	56	70	50
3000-6000	80	60	74	54

NOTE:

1) The lower limit shall apply at the transition frequency.
2) Additional provisions may be required for cases where interference occurs.
3) Only apply to apparatus containing devices operating at frequencies more than 9 kHz.

5.1.1.2 Test Procedure

All Radiated Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

AC Port

Frequency range (MHz)	Class B	
	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.
3) It is tested under the low voltage which is for the distribution of AC electric power, the upper limit is generally accepted to be 1000 V.

DC Port

Frequency range (MHz)	Class B	
	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.50	79	66
0.50 - 30	73	60

NOTE:

1) The lower limit shall apply at the band edges.
2) Applicable only to ports intended for connection to a local DC power network or a local battery by a connecting cable exceeding a length of 30 m.

Telecom Port

Frequency (MHz)	Class B	
	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.50	84-74	74-64
0.50 - 30	74	64

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.
3) The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to telecommunication port under test.

5.1.2.2 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Telecommunication port was checked to find out the maximum conducted emission

5.1.3 Harmonic Current Emissions

5.1.3.1 Limit

S_{SC}

value of the three-phase short-circuit power calculated from the nominal interphase system voltage t/nomjnal and the line impedance Z of the system at the PCC:

$$S_{SC}=U^2_{normimal}/Z$$

where Z is the system impedance at the power frequency

S_{equ}

value calculated from the rated current I_{equ} of the piece of equipment stated by the manufacturer and the rated voltage Up (single phase) or U_l (interphase) as follows:

a) $S_{equ} = U_p I_{equ}$ for single-phase equipment and the single-phase part of hybrid equipment;

b) $S_{equ} = U_i I_{equ}$ for interphase equipment;

c) $S_{equ} = \sqrt{3}\, U_i I_{equ}$ for balanced three-phase equipment and the three-phase part of hybrid equipment;

d) $S_{equ} = \sqrt{3}\, U_i I_{equ\ max}$ for unbalanced three-phase equipment, where I_{equ} max is the maximum of the r,m_s. currents flowing in any one of the three phases

a) $S_{sce} = S_{SC}/(3\ S_{equ})$ for single-phase equipment and the single-phase part of hybrid equipment;

b) $S_{sce} = S_{SC}/(2\ S_{equ})$ for interphase equipment;

c) $S_{sce} = S_{SC}/(S_{equ}$ for all three-phase equipment and the three-phase part of hybrid equipment

The limits given apply to 230/400 V, 50 Hz systems. The limits for the other systems will be added in a future edition of this standard.

The harmonic current limits specified in the tables apply to each of the line currents and not to current in the neutral conductor.

For equipment with multiple rated currents, an assessment is made for each current.

As an example (for the same equipment):

Rated voltage: 230 V single phase, rated current: x A per phase, assessment and test at 230 V.

Rated voltage: 400 V three phase, rated current: y A per phase, assessment and test at 400 V.

The harmonic current limits are specified in Tables 2 to 5

Equipment complying with the harmonic current emission limits corresponding to 7?sce = 33 is suitable for connection at any point of the supply system.

NOTE 2 Values are based on a minimum value of Rsce = 33. Short-circuit ratios less than 33 are not considered.

NOTE 3 In order to reduce the depth of commutation notches of converters, a short-circuit ratio higher than 33 may be necessary.

For equipment not complying with the harmonic current emission limits corresponding to Rsce = 33, higher emission values are allowed, under the assumption that the short-circuit ratio Rsce is greater than 33. It is expected that this will apply to the majority of equipment with input current above 16 A per phase. See requirement for product documentation in Clause 6.

Table 2 is applied to equipment other than balanced three-phase equipment and Tables 3, 4 and 5 are applied to balanced three-phase equipment.

Table 3 may be used for any balanced three-phase piece of equipment.

Table 4 may be used with balanced three-phase equipment if any one of these conditions is met.
a) The 5th and 7th harmonic currents are each less than 5 % of the reference current during the whole test observation period.
b) The design of the piece of equipment is such that the phase angle of the 5th harmonic current has no preferential value over time and can take any value in the whole interval [0°，360°]
c) The phase angle of the 5th harmonic current related to the fundamental phase-to-neutral voltage (see 3.16) is in the range of 90 ° to 150 ° during the whole test observation period.

Table 5 may be used with balanced three-phase equipment if any one of these conditions is met:
d) The 5th and 7th harmonic currents are each less than 3 % of the reference current during the whole test observation period.
e) The design of the piece of equipment is such that the phase angle of the 5th harmonic current has no preferential value over time and can take any value in the whole interval [0 °, 360 °].
f) The phase angle of the 5th harmonic current related to the fundamental phase-to-neutral voltage (see 3.16) is in the range of 150 ° to 210 ° during the whole test observation period.

Table 3，Table 4 or Table 5 can be applied to hybrid equipment in one of the following circumstances:
a) hybrid equipment having a maximum 3rd harmonic current of less than 5 % of the reference current，or

b) there is provision in the construction of hybrid equipment to separate the balanced three- phase and the single-phase or interphase loads for the measurement of supply currents, and when the current is being measured, the part of the equipment being measured draws the same current as under normal operating conditions. In that case, the relevant limits shall be applied separately to the single-phase or interphase part and to the balanced three-phase part. Table 3, Table 4 or Table 5 applies to the current of the balanced three- phase part, even if the rated current of the balanced three-phase part is less than or equal to 16 A per phase. Table 2 applies to the current of the single-phase or interphase part, but if the rated current of the single-phase or interphase part is less than or equal to 16 A, the manufacturer may apply the relevant limits of IEC 61000-3-2 to the single-phase or interphase part instead of the limits stated in Table 2.

For verification purposes, when circumstance b) above applies, the manufacturer shall state in the product documentation the rated current and give in the test report the measured and specified values of the input current as defined in 4.1, for each separate load. The value of Rsce for this type of hybrid equipment is determined as follows:
•the minimum Rsce value is first determined for each of the two loads, using the reference current of the considered part for the calculation of the harmonic current emissions to be compared to the limit values given in Tables 2 to 5; in case IEC 61000-3-2 is applied to the single-phase or interphase part instead of Table 2 limits, the minimum Rsce value for this part is deemed to be equal to 33;
•then, for each of the two parts, the minimum value of Ssc is calculated from its minimum Rsce value and its rated current (see 3.11 and 3.14);
•finally, the value of Rsce for the hybrid equipment is determined from the highest of both minimum values of Ssc and the rated apparent power of the whole hybrid equipment.

Table 2 – Current emission limits for equipment other than balanced three-phase equipment

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %						Admissible harmonic parameters %	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	THC/I_{ref}	$PWHC/I_{ref}$
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥350	41	24	15	12	10	8	47	47
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between successive R_{sce} values is permitted.								
[a] I_{ref} = reference current; I_h = harmonic current component.								

Table 3 – Current emission limits for balanced three-phase equipment

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %				Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	THC/I_{ref}	$PWHC/I_{ref}$
33	10,7	7,2	3,1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥350	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between successive R_{sce} values is permitted.						
[a] I_{ref} = reference current; I_h = harmonic current component.						

Table 4 – Current emission limits for balanced three-phase equipment under specified conditions (a, b, c)

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %				Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	THC / I_{ref}	$PWHC/ I_{ref}$
33	10,7	7,2	3,1	2	13	22
≥120	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between both R_{sce} values is permitted.						
[a] I_{ref} = reference current; I_h = harmonic current component.						

Table 5 – Current emission limits for balanced three-phase equipment under specified conditions (d, e, f)

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %												Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	I_{17}	I_{19}	I_{23}	I_{25}	I_{29}	I_{31}	I_{35}	I_{37}	THC / I_{ref}	$PWHC/ I_{ref}$
33	10,7	7,2	3,1	2	2	1,5	1,5	1,5	1	1	1	1	13	22
≥250	25	17,3	12,1	10,7	8,4	7,8	6,8	6,5	5,4	5,2	4,9	4,7	35	70
For R_{sce} equal to 33, the relative values of even harmonics up to order 12 shall not exceed 16/h %. The relative values of all harmonics from I_{14} to I_{40} not listed above shall not exceed 1 % of I_{ref} For R_{sce}≥ 250, the relative values of even harmonics up to order 12 shall not exceed 16/h %. The relative values of all harmonics from I_{14} to I_{40} not listed above shall not exceed 3 % of I_{ref}. Linear interpolation between both R_{sce} values is permitted.														
[a] I_{ref} = reference current; I_h = harmonic current component.														

5.1.3.2 Test Procedure

The EUT is placed on the top of a wooden table 0.8m above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the necessary for the EUT to be exercised.

5.1.4 Voltage Fluctuations and Flicker Measurement

5.1.4.1 Limit

Test Item	Limit	Note
Pst	1.0	Short-term flicker indicator
Plt	0.65	Long-term flicker indicator
Tdt	0.5	Maximum time that dt exceeds 3%
dmax (%)	4%	Maximum relative voltage change
dc (%)	3.3%	Relative steady-state voltage change

5.1.4.2 Test Procedure

During the Flicker measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours. The test specifications refer the next table.

5.2 Immunity Tests

5.2.1 Test Performance Criteria for Immunity Test

5.2.1.1 General Performance Criteria

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

5.2.2 Electrostatic Discharge Immunity

5.2.2.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-2
Discharge Impedance	330 Ohm / 150 pF
Discharge Voltage	Air Discharge: 2 kV; 4 kV; 8 kV; Contact Discharge: 2 kV; 4 kV
Polarity	Positive / Negative
Number of Discharge	Minimum 20 times at each test point
Discharge Mode	Single discharge
Discharge Period	1 second minimum

5.2.2.2 Test Procedure

1. Electrostatic discharges are applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

2. The test is performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

3. The time interval between two successive single discharges is at least 1 second.

4. The ESD generator is held perpendicularly to the surface to which the discharge is applied and the return cable is at least 0.2 meters from the EUT.

5. Contact discharges are applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

6. Air discharges are applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator is removed from the EUT and re-triggered for a new single discharge. The test is repeated until all discharges were completed.

7. At least ten single discharges (in the most sensitive polarity) are applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator is positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

8. At least ten single discharges (in the most sensitive polarity) are applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5 m*0.5 m) is placed vertically to and 0.1 meters from the EUT.

5.2.3 Radio Frequency Electromagnetic Field Immunity

5.2.3.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-3
Frequency Range	80 MHz to 1000 MHz, 1400 MHz to 2700 MHz
Field Strength	3 V/m or 1 V/m (unmodulated, r.m.s)
Modulation	1 kHz sine wave, 80%, AM modulation
Frequency Step	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.5 m
Dwell Time	3 seconds

5.2.3.2 Test Procedure

1. The testing is performed in a fully anechoic chamber. The transmit antenna is located at a distance of 3 meters from the EUT.

2. The test signal is 80% amplitude modulated with a 1 kHz sine wave.

3. The frequency range is swept from 80 MHz to 1000 MHz and 1400 MHz to 2700 MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep does not exceed 1.5*10-3 decade/s. Where the frequency range is swept incrementally, the step size is 1% of fundamental.

4. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

5. The field strength level is 3 V/m for 80 MHz to 1000MHz, 1400 MHz to 2000 MHz and 1 V/m for 2000 MHz to 2700 MHz

6. The test is performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides,but only the worst side data is reported in this report.

5.2.4 Electrical Fast Transient / Burst Immunity

5.2.4.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-4
Test Voltage	AC Power Port: 0.5 kV, 1 kV.
	DC Power Ports, Telecom Ports: 0.25 kV, 0.5 kV.
Polarity	Positive / Negative
Impulse Frequency	5 kHz
Impulse Wave Shape	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	> 1 min

NOTE:

1. The signal ports tests apply only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.
2. The DC ports test not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging.
3. The EUT with a DC power input port intended for use with an AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer or where none is so specified, using a typical AC-DC power adaptor.
4. The test applicable to DC power input ports and signal ports intended to be connected permanently to cables longer than 3 m.

5.2.4.2 Test Procedure

1. The EUT is tested with 1000 V discharges to the AC power input leads, 500 V for signal port and DC port.

2. Both positive and negative polarity discharges are applied.

3. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 m.

4. The duration time of each test sequential is 1min.

5. The transient / burst waveform is in accordance with IEC 61000-4-4, 5/50 ns.

5.2.5 Surge Immunity

5.2.5.1 Test Specification

Specification	Value	
Ports class	AC Power Port	DC Power Port
Basic Standard	IEC 61000-4-5	
Waveform	Voltage: 1.2/50 μs; Current: 8/20 μs	Voltage: 1.2/50 μs; Current: 8/20 μs
Test Voltage	line to ground 0.5 kV, 1 kV, 2 kV; line to line 0.5 kV, 1 kV	0.5k V
Polarity	Positive / Negative	
Phase Angle	0°, 90°, 180°, 270°	N/A
Repetition Rate	60 seconds	
Times	5 times per condition	

NOTE:

1. For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors fitted. Otherwise the 1 kV test level is applied without primary protection in place.
2. The DC ports test not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging.
3. The EUT with a DC power input port intended for use with an AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer or where none is so specified, using a typical AC-DC power adaptor.
4. DC ports which are not intended to be connected to a DC distribution network are treated as signal ports.

5.2.5.2 Test Procedure

The EUT and the auxiliary equipment are placed on a table of 0.8 m heights above a metal ground reference plane. The size of ground plane is greater than 1 m*1 m and project beyond the EUT by at least 0.1 m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT is less than 2 meters (provided by the manufacturer).

The EUT is connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise is applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).

The surges are applied line to line and line(s) to earth. When testing line to earth the test voltage is applied successively between each of the lines and earth. Set up to the test level specified increased the test voltage. All lower levels including the selected test level are tested. The polarity of each surge level included positive and negative test pulses.

5.2.6 Immunity to Conducted Disturbances Induced by RF Fields

5.2.6.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-6
Frequency Range	0.15 MHz – 80 MHz
Field Strength	3 Vrms (unmodulated, r.m.s)
Modulation	1 kHz sine wave, 80% AM
Frequency Step	1% of fundamental
Coupled Cable	AC Power Line; DC Power Line; Telecom Line
Coupling Device	CDN-M2+3

Note:

1) The DC port and signal port only apply to ports interfacing with cables whose total length according to the manufacturers functional specification may exceed 3 m.
2) The AC port only apply to input ports.
3) The test level can also be defined as the equivalent current into a 150 Ω load at signal ports.

5.2.6.2 Test Procedure

The EUT shall be tested within its intended operating and climatic conditions.

The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 150 Ohm load resistor.

The test signal is 80% amplitude modulated with a 1 kHz sine wave.

The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The sweep rate shall not exceed 1.5*10-3 decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.

The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.

Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

5.2.7 Power Frequency Magnetic Fields Immunity

5.2.7.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-8
Field Frequency	50/60 Hz
Test Level	3 A/m
Polarity	Horizontal and Vertical
Test Duration	5 min

NOTE:

1. The test shall be carried out at the frequencies appropriate to the power supply frequency. Equipment intended for use in areas supplied only at one of these frequencies need only be tested at that frequency.
2. Applicable only to apparatus containing devices susceptible to magnetic fields.

5.2.7.2 Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1 m*1 m) and shown in Section 15.1. The induction coil shall then be rotated by 90°in order to expose the EUT to the test field with different orientations.

5.2.8 Voltage Dips and Short Interruptions Immunity

5.2.8.1 Test Specification

AC Ports

Specification	Value
Basic Standard	IEC 61000-4-11
Frequency	50/60Hz
Voltage Dips	100% reduction: 10 ms;100% reduction: 20 ms; 30% reduction: 500/600 ms
Voltage Interruptions	100% reduction: 5000/6000 ms
Voltage Phase Angle	0°

NOTE: Applicable only to AC input ports.

5.2.8.2 Test Procedure

The power cord is used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.

The EUT is tested for a) 100% voltage dip of supplied voltage with duration of 10 ms; b) 100% voltage dip of supplied voltage with duration of 20 ms; c) 30% voltage dip of supplied voltage and duration 500 or 600 ms. Both of the dip tests are carried out for a sequence of three voltage dips with intervals of 10 seconds.

100% voltage interruption of supplied voltage with duration of 5000 or 6000 ms is followed, which is a sequence of three voltage interruptions with intervals of 10 seconds.

Voltage reductions occur at 0 degrees crossover point of the voltage waveform. The performance of the EUT is checked after the voltage dip or interruption.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note: Radiated Emission test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.1 Radiated Emission.

A.2 Conducted Emission

Note: Conducted Emission test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.2 Conducted Emission.

A.3 Harmonic Current Emissions

Note: Harmonic Current Emissions test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.3 Harmonic Current Emissions.

A.4 Voltage Fluctuations & Flicker

Note: Voltage Fluctuations & Flicker test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.4 Voltage Fluctuations & Flicker.

A.5 Electrostatic Discharge Immunity

Note: Electrostatic Discharge Immunity test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.5 Electrostatic Discharge Immunity.

A.6 Radio Frequency Electromagnetic Field Immunity

Note: Radio Frequency Electromagnetic Field Immunity test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.6 Radio Frequency Electromagnetic Field Immunity.

A.7 Electrical Fast Transient/Burst Immunity

Note: Electrical Fast Transient/Burst Immunity test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.7 Electrical Fast Transient/Burst Immunity.

A.8 Surge Immunity

Note: Surge Immunity test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.8 Surge Immunity.

A.9 Immunity to Conducted Disturbances Induced by RF Fields

Note: Immunity to Conducted Disturbances Induced by RF Fields test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.9 Immunity to Conducted Disturbances Induced by RF Fields.

A.10 Power Frequency Magnetic Fields Immunity

Note: Not applicable.

A.11 Voltage Dips and Short Interruptions Immunity

Note: Voltage Dips and Short Interruptions Immunity test result please refer to original test report No. BL-DG2030080-401, which was issued by BALUN on Apr. 07, 2020, section A.11 Voltage Dips and Short Interruptions Immunity.

ANNEX B TEST SETUP PHOTOS

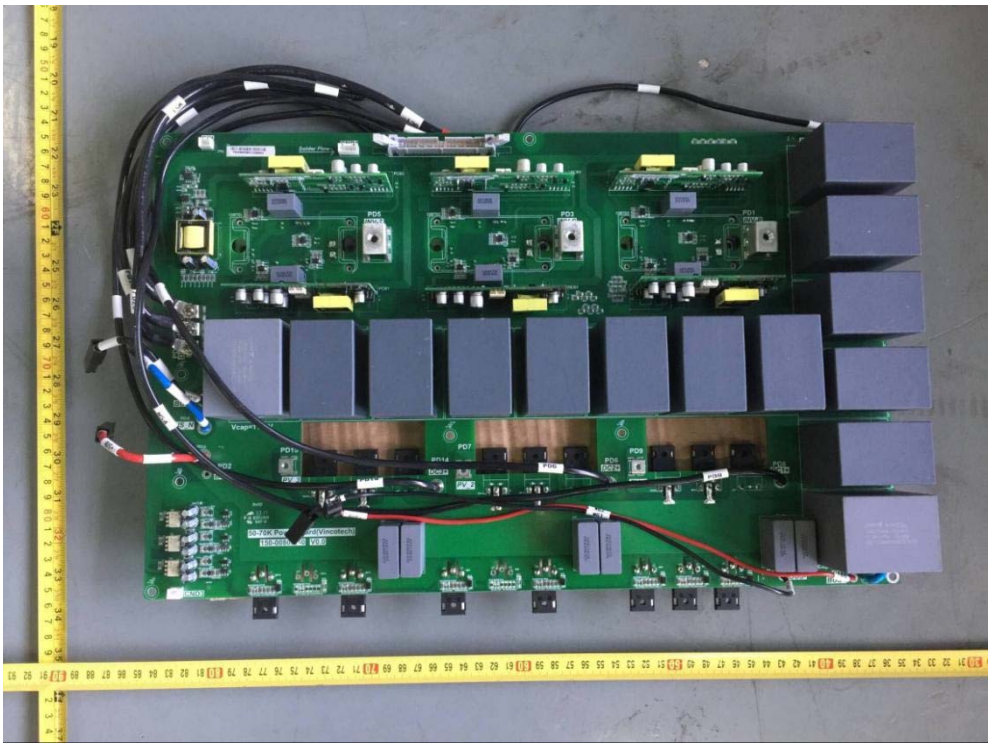
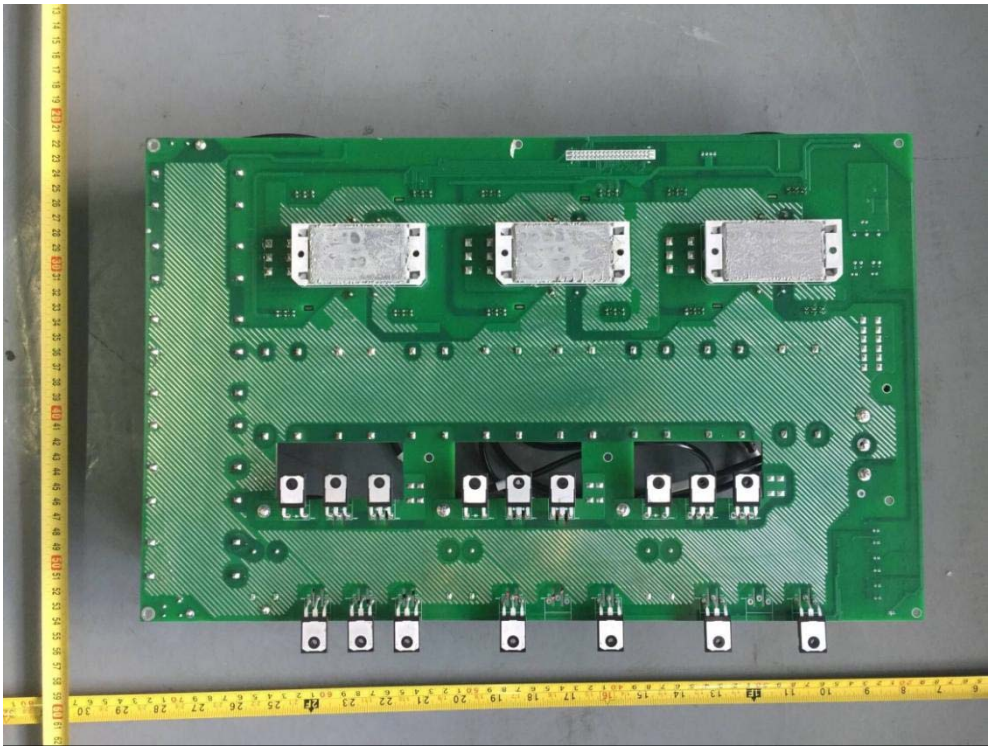
Note: Test photo please refer to original test report No. BL-DG2030080-401,which was issued by BALUN on Apr. 07, 2020, section ANNEX B TEST SETUP PHOTOS.

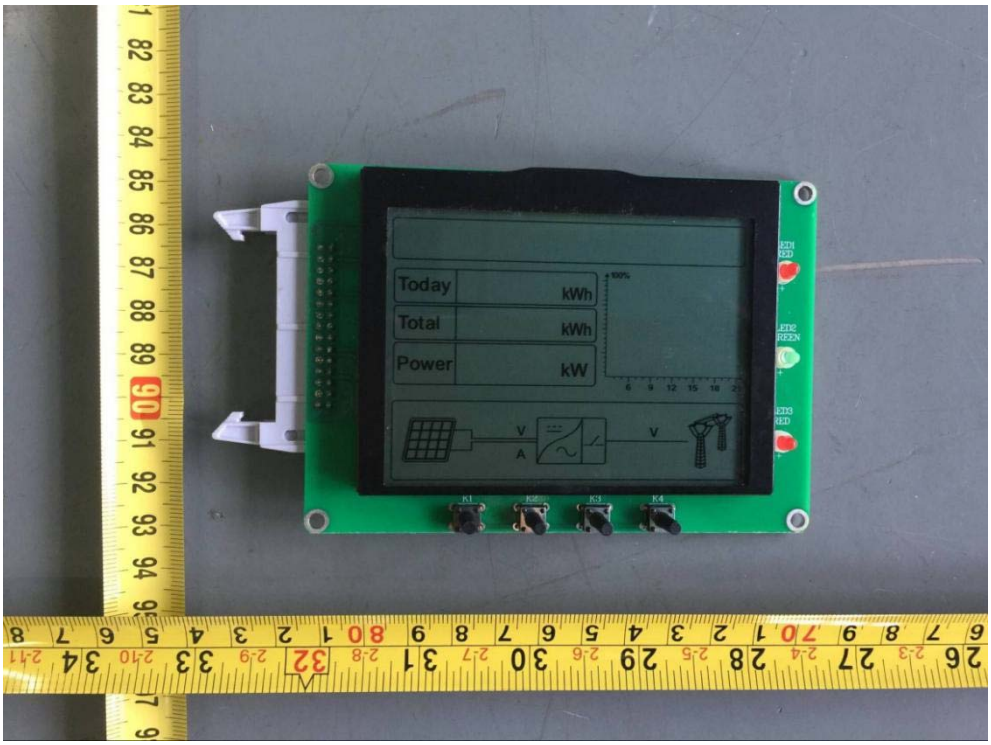
ANNEX C EUT EXTERNAL PHOTOS

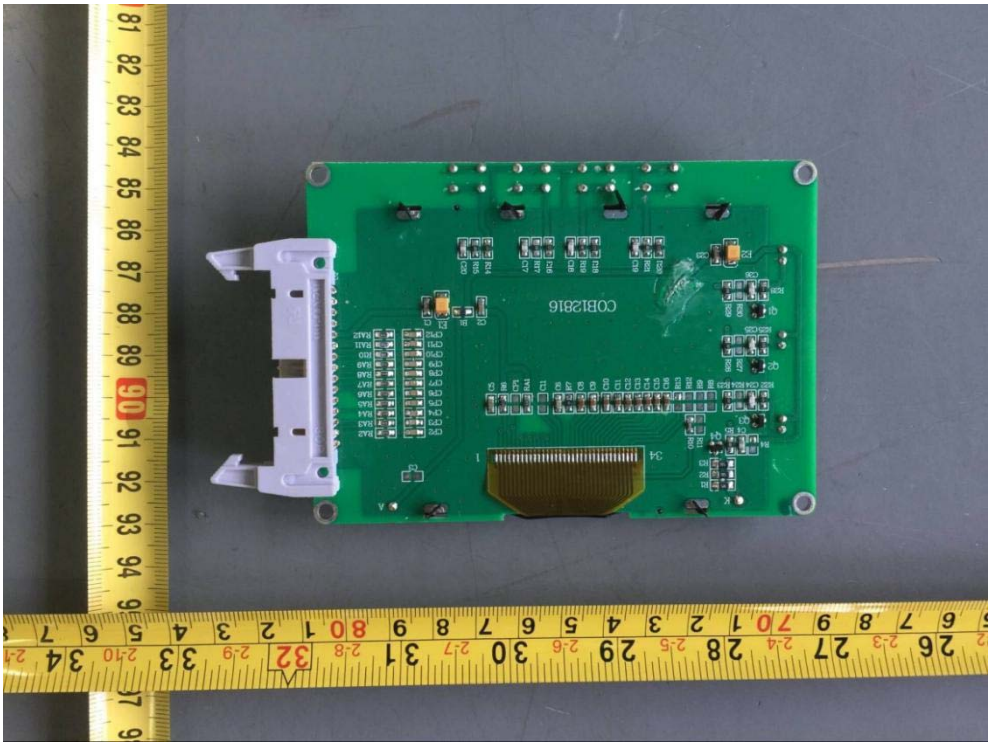
General view

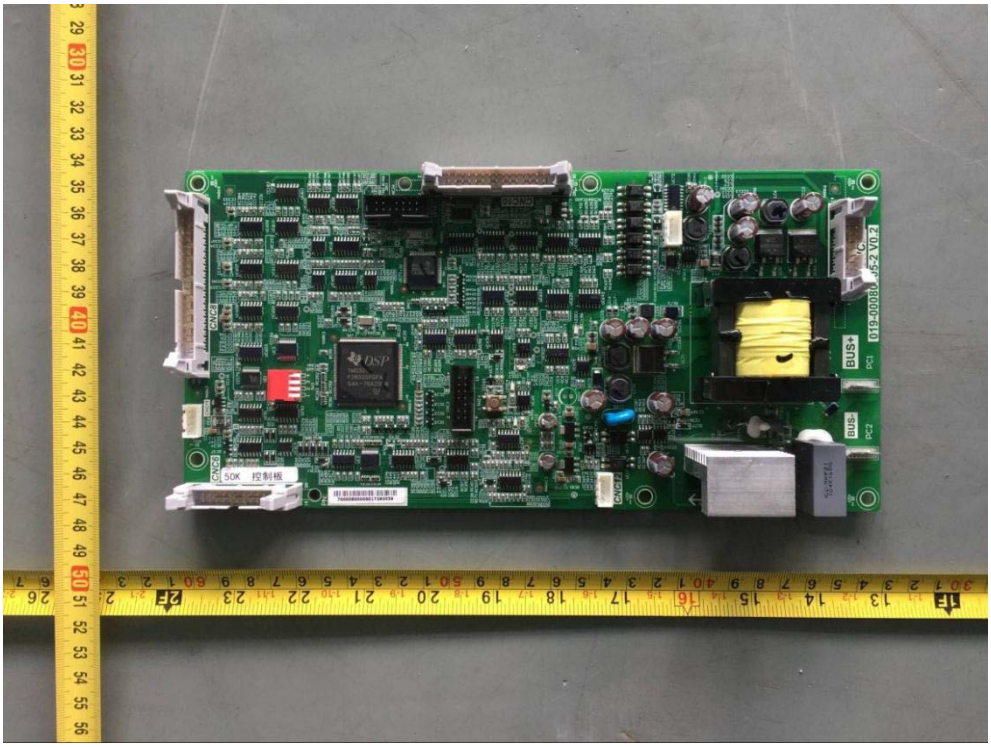
Back view

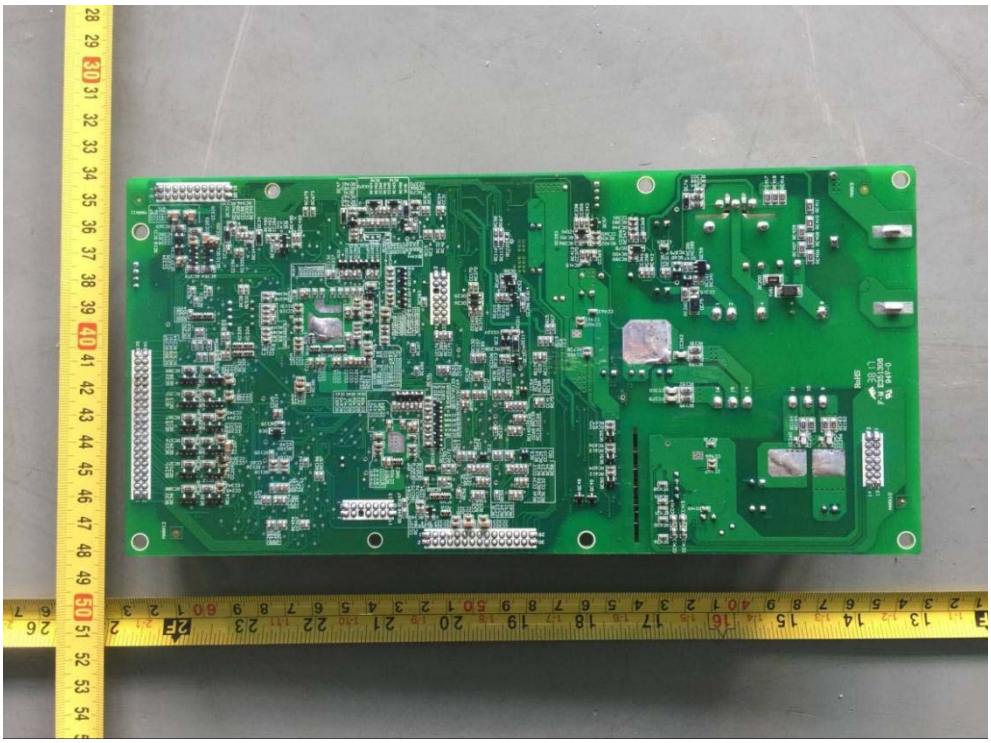

ANNEX D EUT INTERNAL PHOTOS

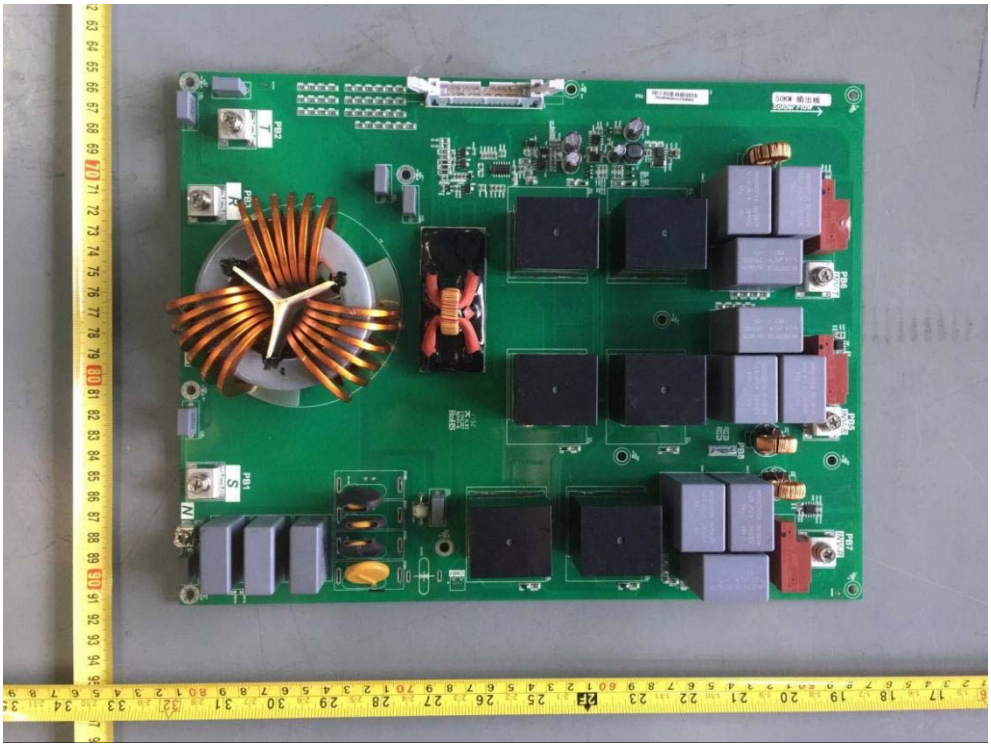
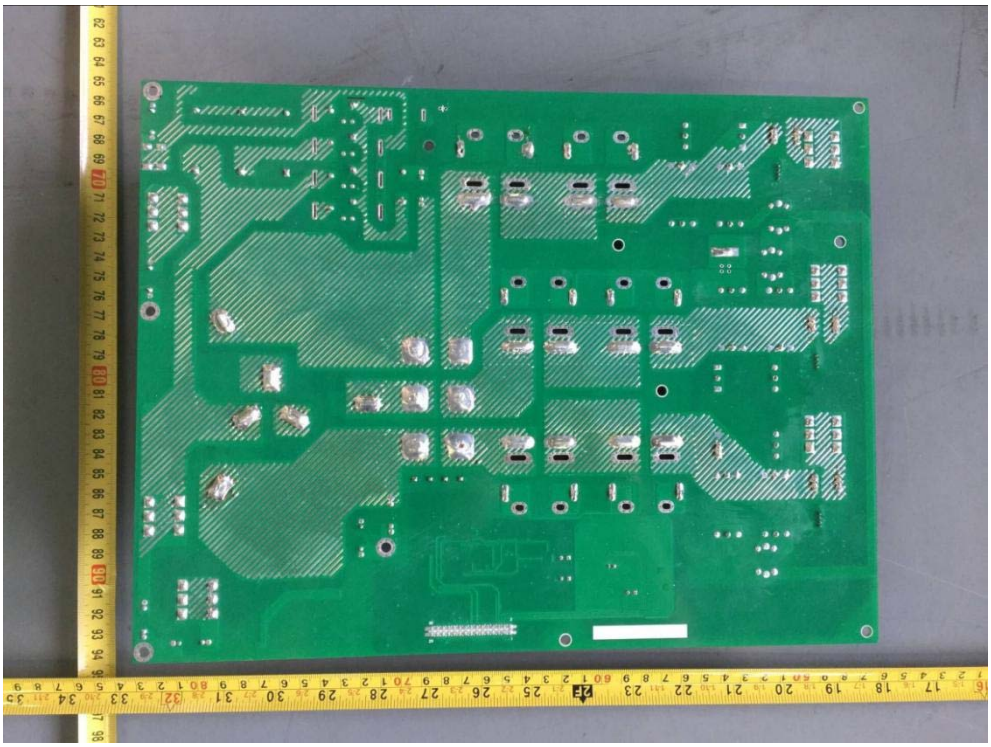
Front view of Main board

Back view of Main board


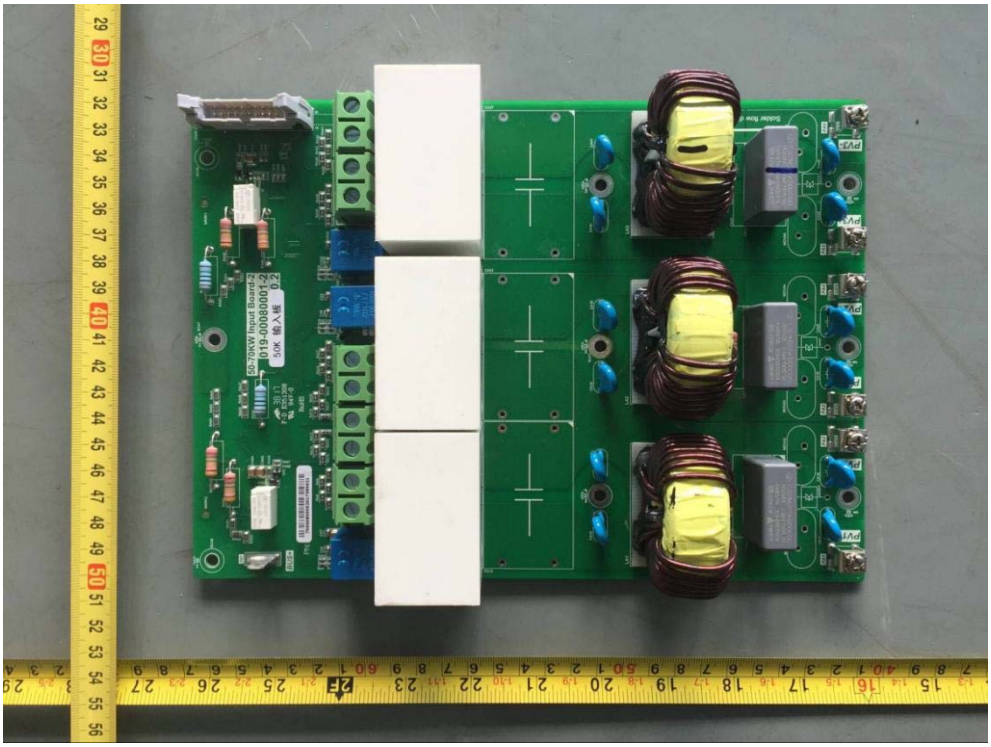
Front View of LCD board


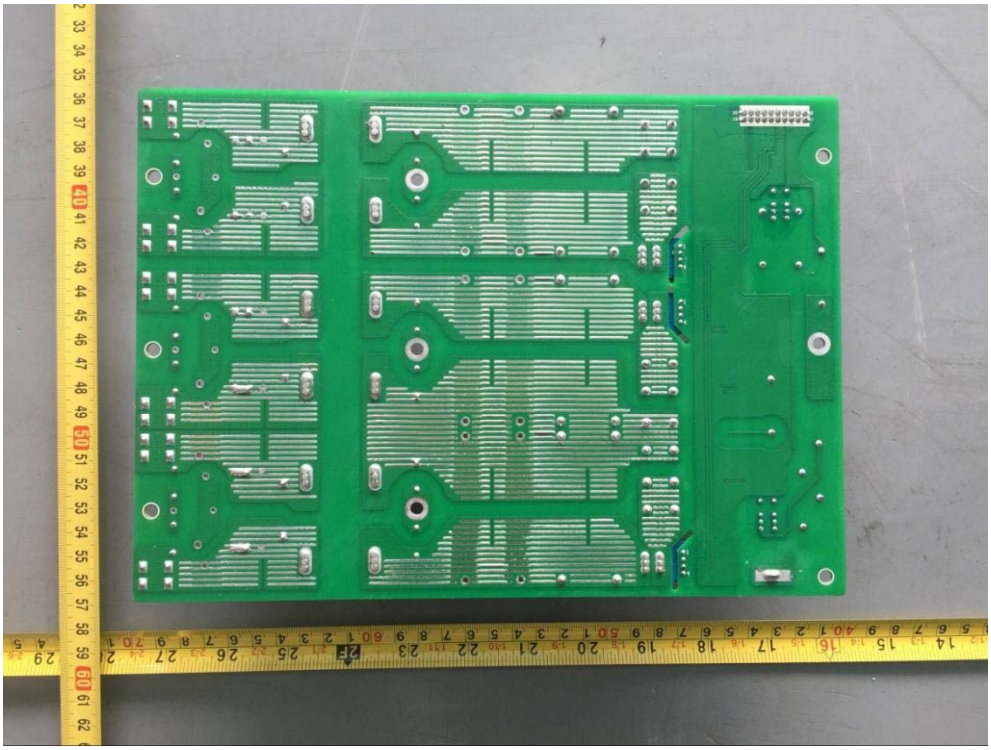
Back View of LCD board


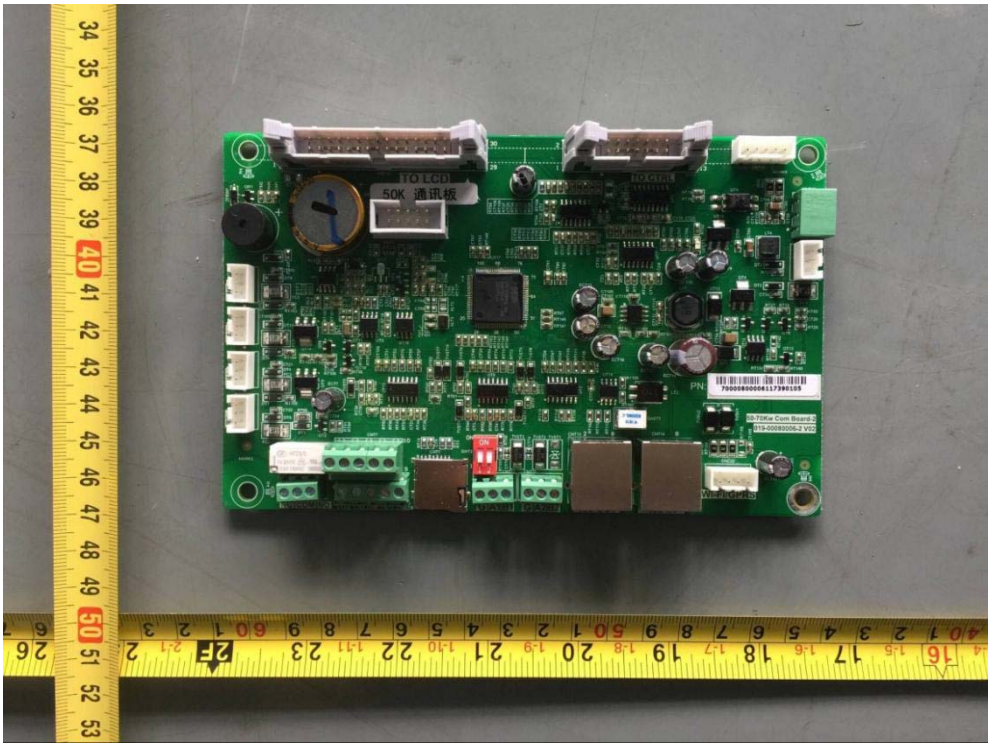
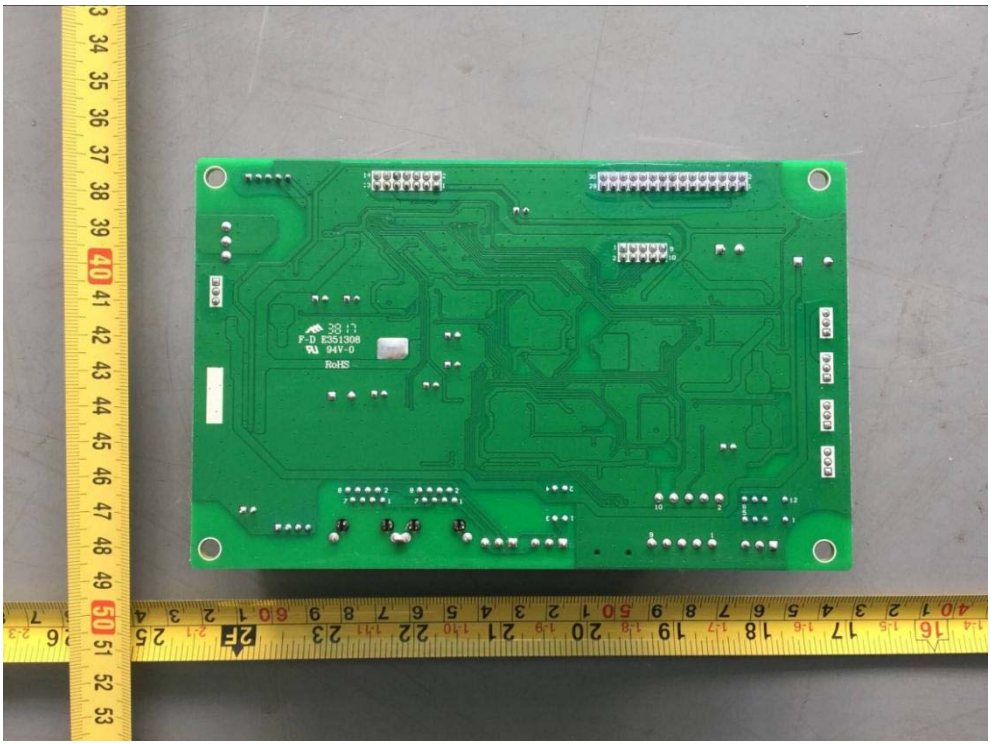
Front View of Control board


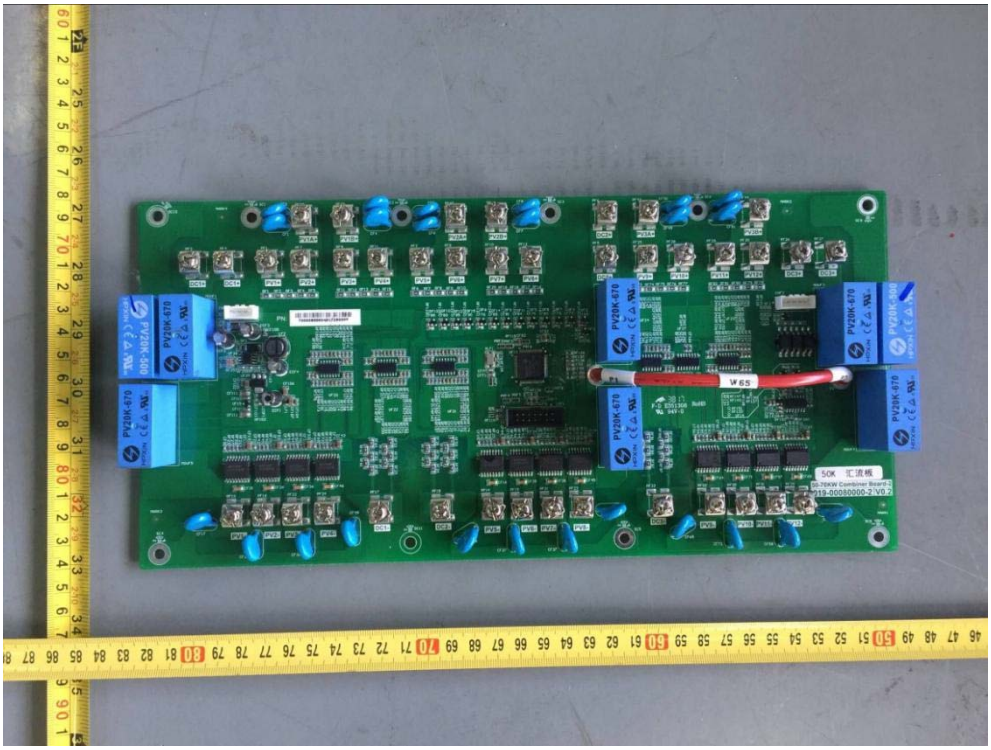
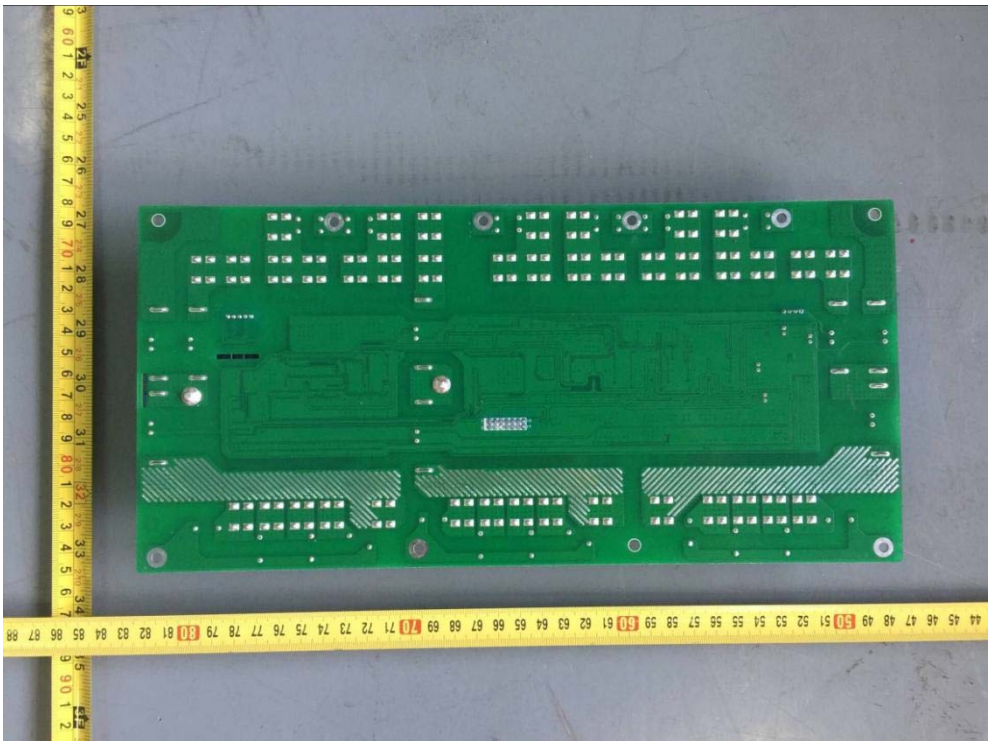
Back View of Control board


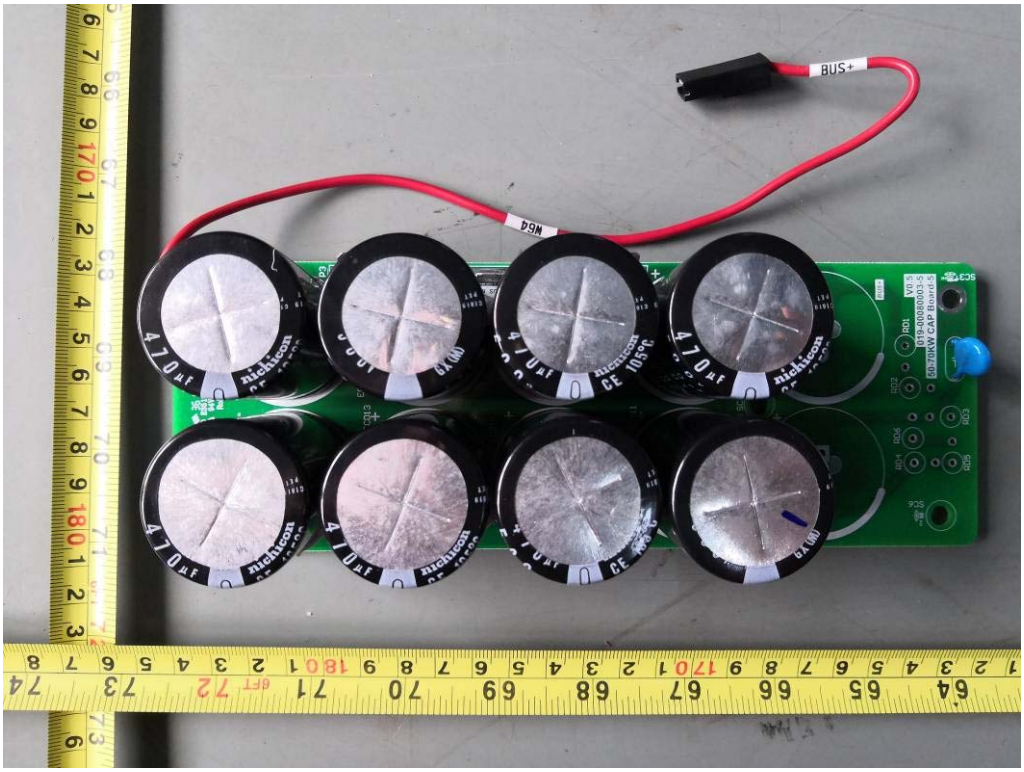
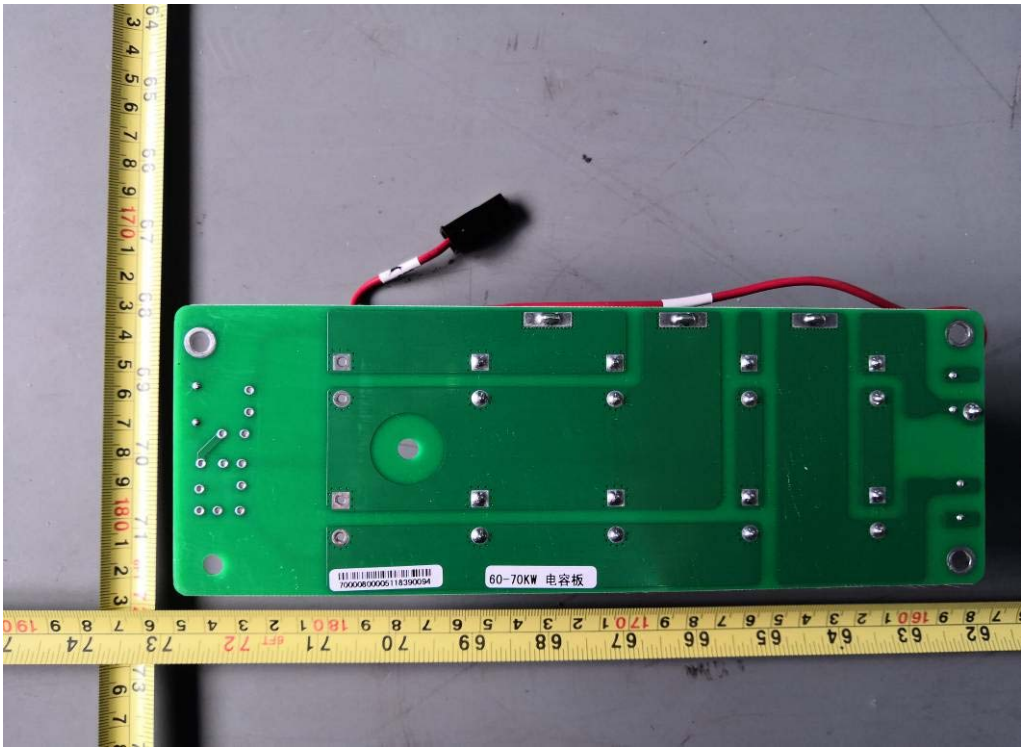
Front View of AC output board

Back View of AC output board


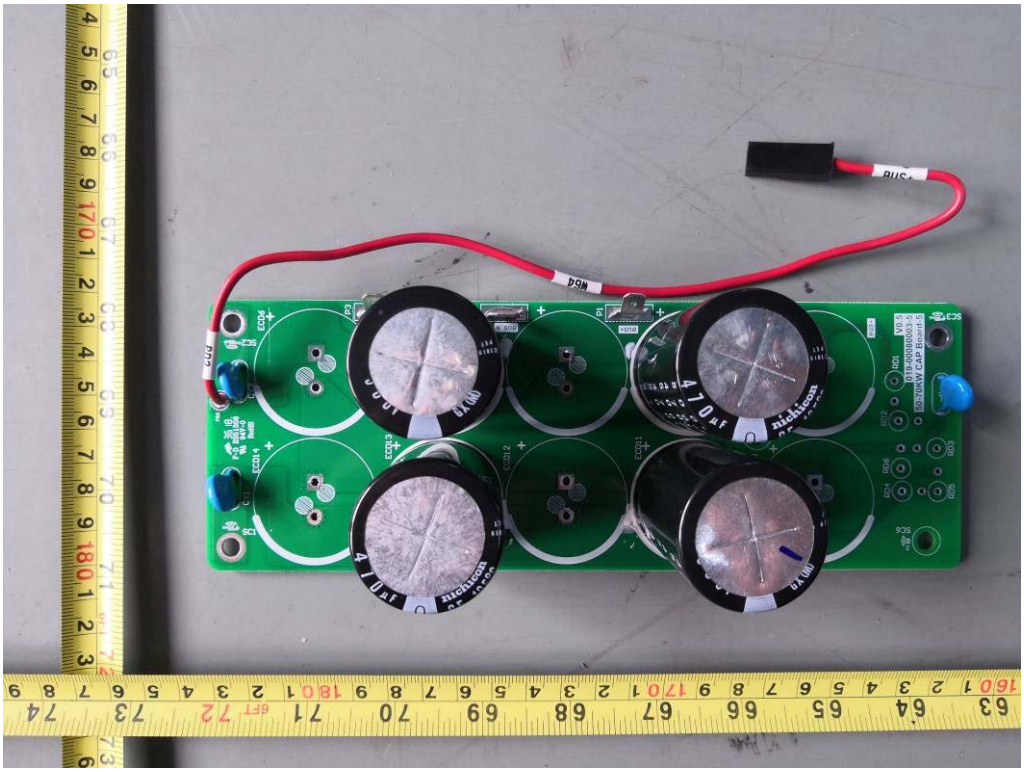
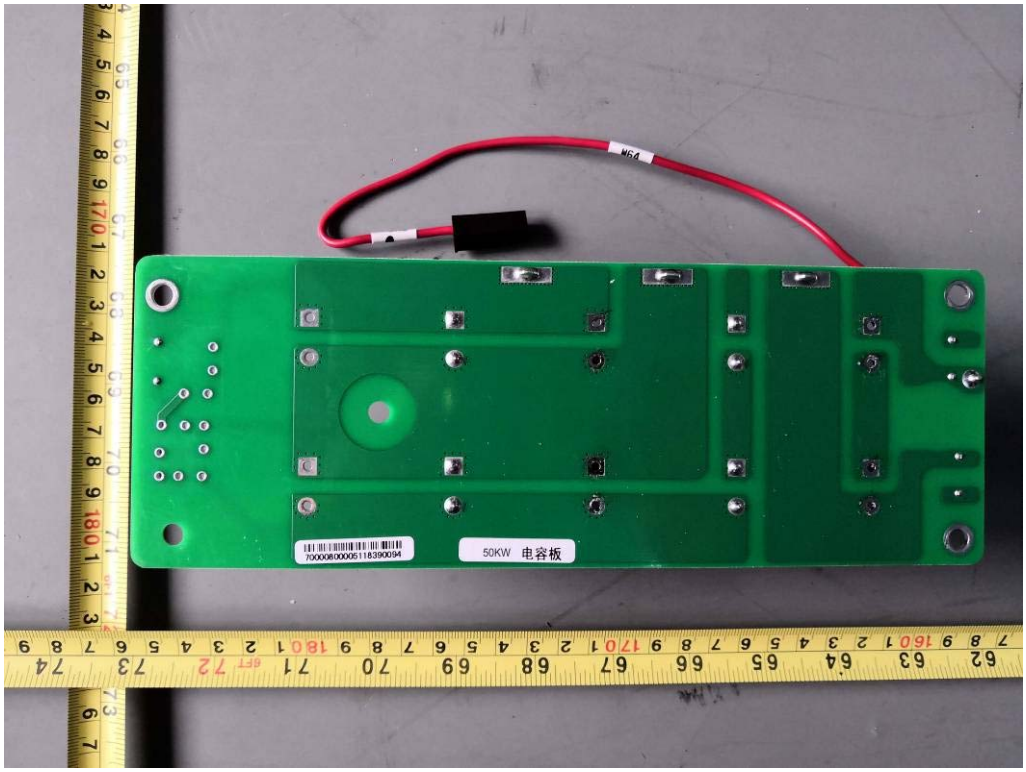
Front View of DC input board


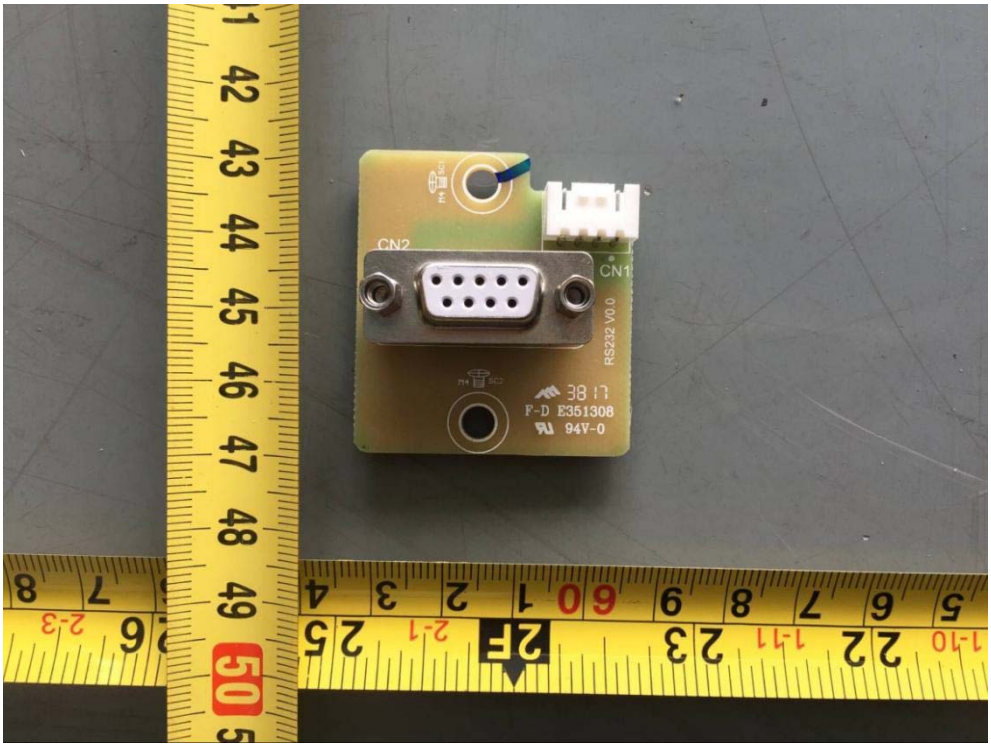
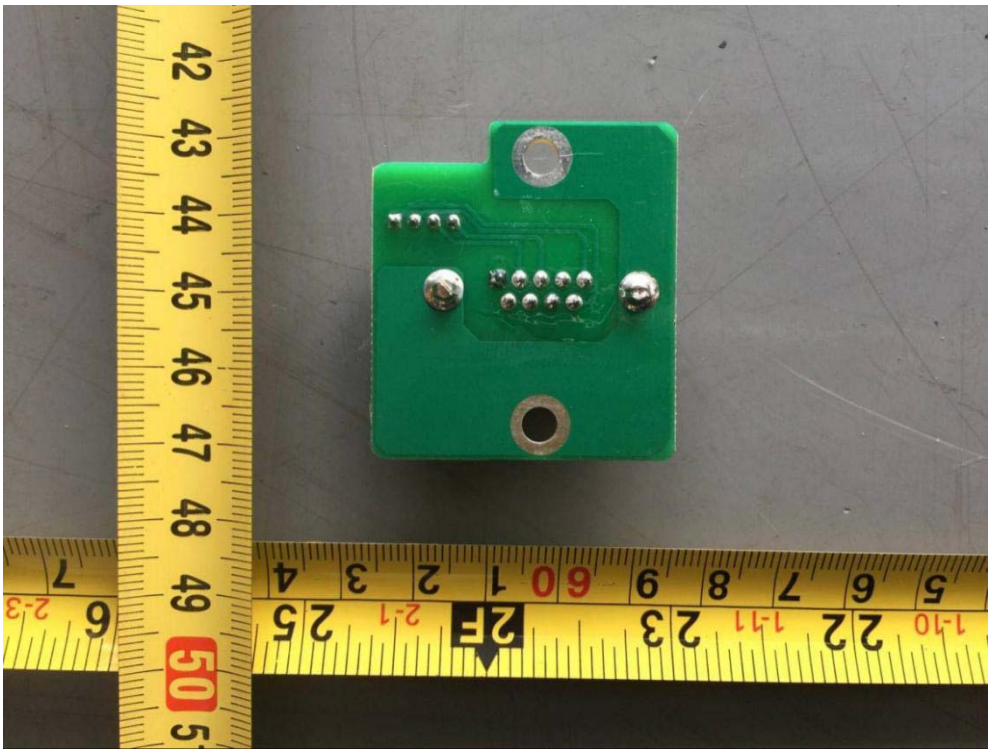
Back View of DC input board


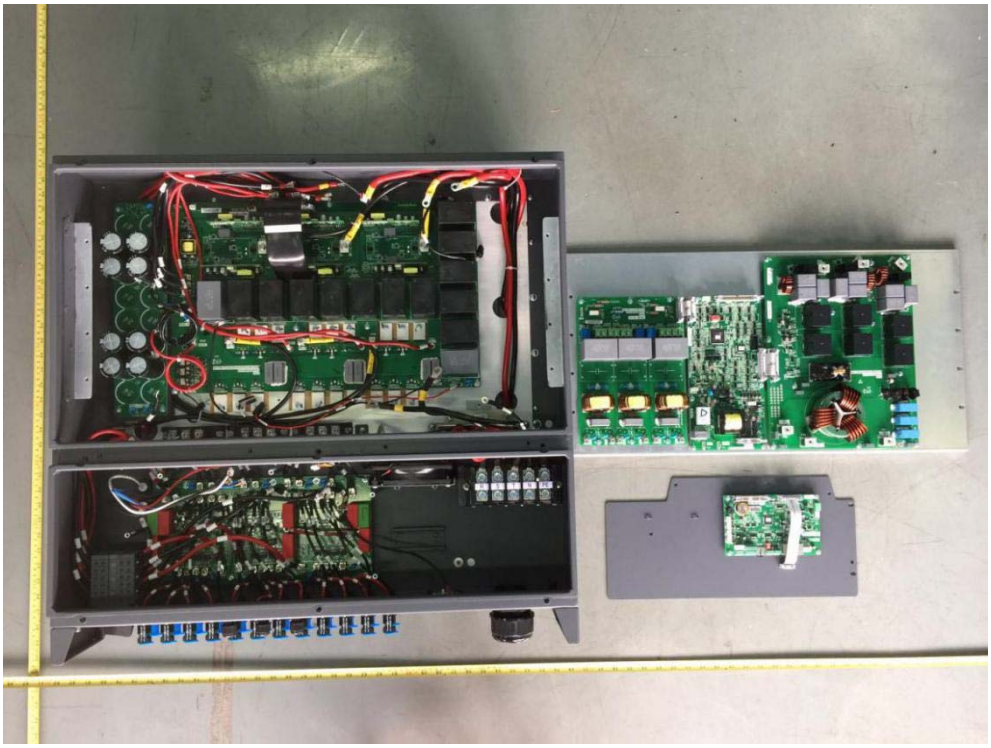
Front View of Communication board

Back View of Communication board


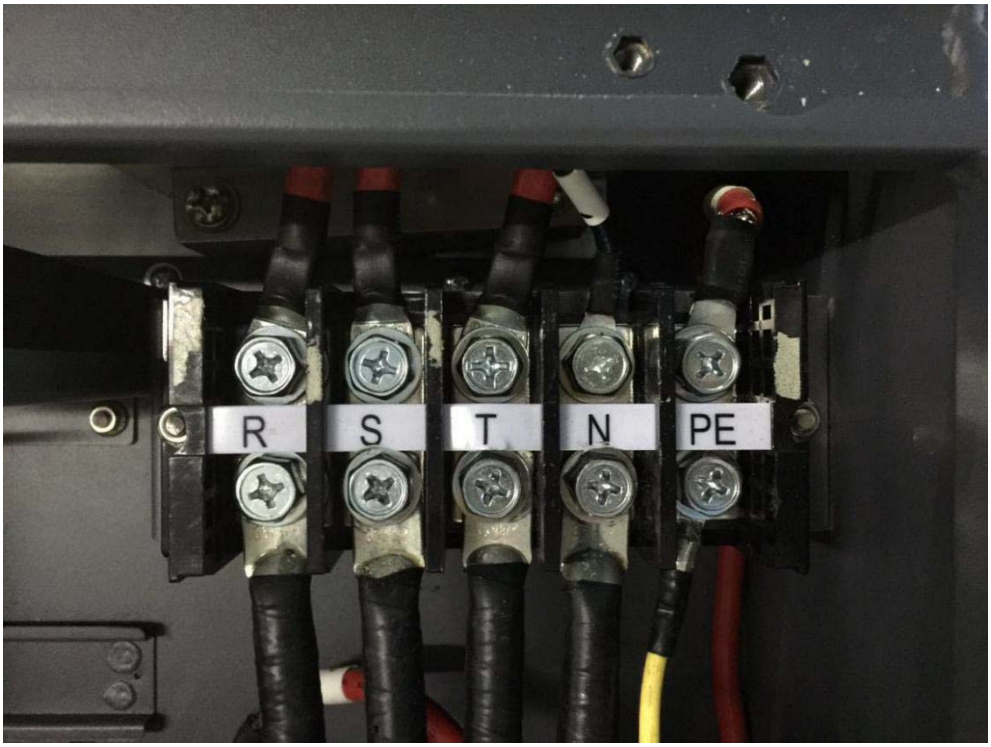
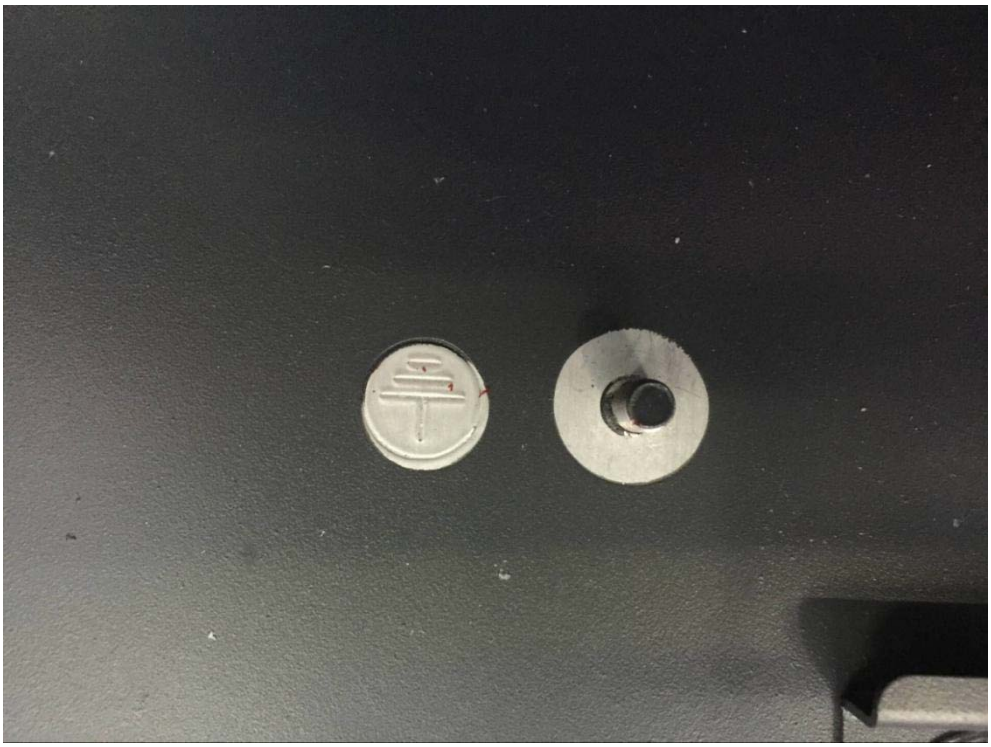
Front View of DC combine board

Back View of DC combine board


Front View of EVVO 60000TL3P, EVVO 70000TL3P-HV Cap. board

Back View of EVVO 60000TL3P, EVVO 70000TL3P-HV Cap. board


Front View of EVVO 50000TL3P Cap. board

Back View of EVVO 50000TL3P Cap. board


Front View of RS232 board

Back View of RS232 board


Intelnal View

Connection interface


AC output connection

External Eathing connection terminal


Side view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