TEST REPORT

This Report Is To Supersede Test Report EBO2107130-E322B

Applicant: HNC ELECTRIC LIMITED

Address of Applicant: Suite A1, 12/F., Ritz Plaza, 122 Austin Road TST., Kowloon. Hong Kong.

Equipment Under Test (EUT)

Product Name : FREQUENCY INVERTER

Brand Name: HNC

Model No.: Please refer to page 5-6

Applicable standards: EN IEC 61800-3:2018

Date of sample receipt: July 20, 2021

Date of Test: July 21, 2021 To July 27, 2021

Date of report issued: August 3, 2021

Test Result : PASS *

*In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives.

Authorized Signature

Kevin Wang
Laboratory Manager

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2 Version

Version No.	Date	Description
00	*July 28, 2021*	*Original*
01	*July 30, 2021*	*New Report(Add Model Name)*
02	*August 3, 2021*	*New Report(Change the order of models)*
03	*August 3, 2021*	*New Report(Change Model Name)*

Prepared By: Gary Wang ***Date:*** *August 3, 2021*

Project Engineer

Reviewed By: Kevin Wang ***Date:*** *August 3, 2021*

Reviewer

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4 Test Summary

Test Item	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission	EN IEC 61800-3	CISPR 11	Table 20	PASS
Conducted Emission	EN IEC 61800-3	CISPR 11	Table 19	PASS
Commutation notches immunity	EN IEC 61800-3	IEC 60146-1-1	Value of the compatibility level	PASS
Harmonics and interharmonics voltages	EN IEC 61800-3	IEC 61000-4-13	Class 3	PASS
Voltage changes, fluctuations,	EN IEC 61800-3	IEC 61000-2-4	Class 2	PASS
Voltage unbalance and Frequency variations	EN IEC 61800-3	IEC 61000-2-4	Class 3	PASS
Voltage dips and short interruptions interruption	EN IEC 61800-3	IEC 61000-2-1	0%,40%,70%,80% remaining, 1,10,25,250 cycles	PASS
Commutation notches immunity	EN IEC 61800-3	IEC 60146-1-1	Depth=40%,total area=250in per cent degrees	PASS
Electrostatic discharges	EN IEC 61800-3	EN 61000-4-2	Contact ±4 kV Air ±8 kV	PASS
Radiated Immunity	EN IEC 61800-3	EN 61000-4-3	10V/m,3V/m,1V/m, 80%, 1kHz Amp. Mod.	PASS
Electrical Fast Transients	EN IEC 61800-3	EN 61000-4- 4	±2.0kV	PASS
Surges	EN IEC 61800-3	EN 61000-4-5	1kV Line to Line 2kV Line to Ground	PASS
Conducted Immunity	EN IEC 61800-3	EN 61000-4-6	10Vrms (emf), 80%, 1kHz Amp. Mod.	PASS

Remark:
Pass: Comply with the essential requirements in the standard.

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Model No.:

HV10-R75G3	HV10-R40G1-1	HV10-R75G1-1	HV10-1R5G1-1
HV10-2R2G1-1	HV10-004G1-1	HV10-R40G1-2	HV10-R75G1-2
HV10-1R5G1-2	HV10-2R2G1-2	HV10-004G1-2	HV10-1R5G3
HV10-2R2G3	HV10-004G3	HV10-5R5G3	HV10-7R5G3
HV10-011G3	HV10-015G3	HV10-018G3	HV10-022G3
HV10-R75G4	HV10-1R5G4	HV10-2R2G4	HV10-004G4
HV10-5R5G4	HV10-7R5G4	HV10-011G4	HV10-015G4
HV10-018G4	HV10-022G4	HV20-R40G1-1	HV20-R75G1-1
HV20-1R5G1-1	HV20-2R2G1-1	HV20-004G1-1	HV20-R40G1-2
HV20-R75G1-2	HV20-1R5G1-2	HV20-2R2G1-2	HV20-004G1-2
HV20-R75G3	HV20-1R5G3	HV20-2R2G3	HV20-004G3
HV20-5R5G3	HV20-7R5G3	HV20-011G3	HV20-015G3
HV20-018G3	HV20-022G3	HV20-R75G4	HV20-1R5G4
HV20-2R2G4	HV20-004G4	HV20-5R5G4	HV20-7R5G4
HV20-011G4	HV20-015G4	HV20-018G4	HV20-022G4
HV100-R40G1x	HV100-R75G1x	HV100-1R5G1x	HV100-2R2G1x
HV100-004G1x	HV100-5R5G1x	HV100-R40G2x	HV100-R75G2x
HV100-R75G2x	HV100-1R5G2x	HV100-2R2G2x	HV100-004G2x
HV100-5R5G2x	HV100-7R5G2x	HV100-011G2x	HV100-015G2x
HV100-018G2x	HV100-022G2x	HV100-030G2x	HV100-037G2x
HV100-045G2x	HV100-055G2x	HV100-075G2x	HV100-093G2x
HV100-110G2x	HV100-R40G3x	HV100-R75G3x	HV100-1R5G3x
HV100-2R2G3x	HV100-004G3x	HV100-5R5G3x	HV100-7R5G3x
HV100-011G3x	HV100-015G3x	HV100-018G3x	HV100-022G3x
HV100-030G3x	HV100-037G3x	HV100-045G3x	HV100-055G3x

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HV100-075G3x	HV100-093G3x	HV100-110G3x	HV100-132G3x
HV100-160G3x	HV100-185G3x	HV100-200G3x	HV100-220G3x
HV100-250G3x	HV100-280G3x	HV100-315G3x	HV100-355G3x
HV100-400G3x	HV100-450G3x	HV100-500G3x	HV100-560G3x
HV100-630G3x	HV100−R40G4x	HV100−R75G4x	HV100-1R5G4x
HV100-2R2G4x	HV100-004G4x	HV100-5R5G4x	HV100-7R5G4x
HV100-011G4x	HV100-015G4x	HV100-018G4x	HV100-022G4x
HV100-030G4x	HV100-037G4x	HV100-045G4x	HV100-055G4x
HV100-075G4x	HV100-093G4x	HV100-110G4x	HV100-132G4x
HV100-160G4x	HV100-185G4x	HV100-200G4x	HV100-220G4x
HV100-250G4x	HV100-280G4x	HV100-315G4x	HV100-355G4x
HV100-400G4x	HV100-450G4x	HV100-500G4x	HV100-560G4x
HV100-630G4x			

Note:
All models are suffix x= A~Z(including 26 letters), or x is blank

Remark: All models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.

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5 General Information

5.1 Client Information

Applicant:	HNC ELECTRIC LIMITED
Address of Applicant:	Suite A1, 12/F., Ritz Plaza, 122 Austin Road TST., Kowloon. Hong Kong.
Manufacturer:	HNC ELECTRIC LIMITED
Address of Manufacturer:	Suite A1, 12/F., Ritz Plaza, 122 Austin Road TST., Kowloon. Hong Kong.

5.2 General Description of E.U.T

Product Name:	FREQUENCY INVERTER
Brand Name:	HNC
Model No.:	Please Refer To Page 5-6
Test Model No.:	HV10−R75G3
Power Supply:	Input: AC 380V, 3PH, 3.4A, 50/60Hz or AC 220-230V, 1PH, 50Hz/60Hz Output: AC 0-220V, 2.1A, 0-400Hz, 2.2KW, 3PH

5.3 Test mode and Test Voltage

On mode:	Keep the EUT in the operation status.
Test Voltage:	AC 230V, 50Hz

5.4 Description of Support Units

None.

5.5 Deviation from Standards

None.

5.6 Abnormalities from Standard Conditions

None.

5.7 Monitoring of EUT for All Immunity Test

Visual:	Monitor the EUT operating status.
Audio:	N/A

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6 Test Instruments List

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	GTS250	N/A	N/A
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	ESU EMI Test Receiver	R&S	ESU26	GTS203	Mar. 19 2021	Mar. 18 2022
4	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	Mar. 19 2021	Mar. 18 2022
5	Double-ridged horn antenna	SCHWARZBECK	9120D	GTS208	June. 24 2021	June. 23 2022
6	RF Amplifier	HP	8347A	GTS204	June. 24 2021	June. 23 2022
7	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	June. 24 2021	June. 23 2022
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial cable	GTS	N/A	GTS210	N/A	N/A
10	Coaxial Cable	GTS	N/A	GTS211	N/A	N/A
11	Thermo meter	KTJ	TA328	GTS256	June. 24 2021	June. 23 2022
12	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2016	May.15 2021
13	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
14	Pulse Limiter	R&S	ESH3-Z2	GTS224	June. 24 2021	June. 23 2022
15	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 24 2021	June. 23 2022
16	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 24 2021	June. 23 2022
17	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
18	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
19	Thermo meter	KTJ	TA328	GTS233	June. 24 2021	June. 23 2022
20	ISN	EMTEST	FCC-TLISN-T8-02	GTS563	June. 24 2021	June. 23 2022
21	EMTEST system	EMTEST	UCS500N	GTS239	June. 24 2021	June. 23 2022
22	Thermo meter	KTJ	TA328	GTS233	June. 24 2021	June. 23 2022
23	capacitive Clamp	EMTEST	HFK	GTS557	June. 24 2021	June. 23 2022
24	ESD Simulator	KIKUSUI	KES4021A	GTS242	June. 24 2021	June. 23 2022
25	Thermo meter	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
26	Signal Generator	SCHLODER	CDG-6000-25	GTS553	June. 24 2021	June. 23 2022
27	CDN	SCHLODER	CDN-M2+3	GTS554	June. 24 2021	June. 23 2022
28	EM-Clapm	SCHLODER	EMCL-20	GTS555	June. 24 2021	June. 23 2022
29	ATT	SCHLODER	ATT-6DB-100	GTS556	June. 24 2021	June. 23 2022
30	Signal Generator	Rohde & Schwarz	SMT03	100059	June. 24 2021	June. 23 2022
31	Power Amplifier	AR	150W1000	300999	June. 24 2021	June. 23 2022
32	Power Amplifier	AR	25S1G4AM1	305993	June. 24 2021	June. 23 2022
33	Power Amplifier	AR	150A220M6	305965	June. 24 2021	June. 23 2022

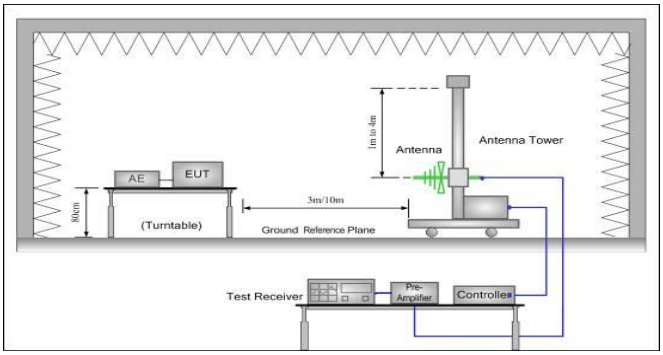
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34	Broadband antenna	CHASE	CBL6111C	2576	June. 24 2021	June. 23 2022
35	Horn Antenna	AR	AT4002A	2783	June. 24 2021	June. 23 2022
36	Signal Generator	ROHDE&SCHWARZ	SML02	A0304261	June. 24 2021	June. 23 2022
37	Field Monitor	Amplifier Research	AR FM5004	305128	June. 24 2021	June. 23 2022
38	AC Power Source	Pacific Power	320AMX	A0412388	June. 24 2021	June. 23 2022

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7 Emission Test Results

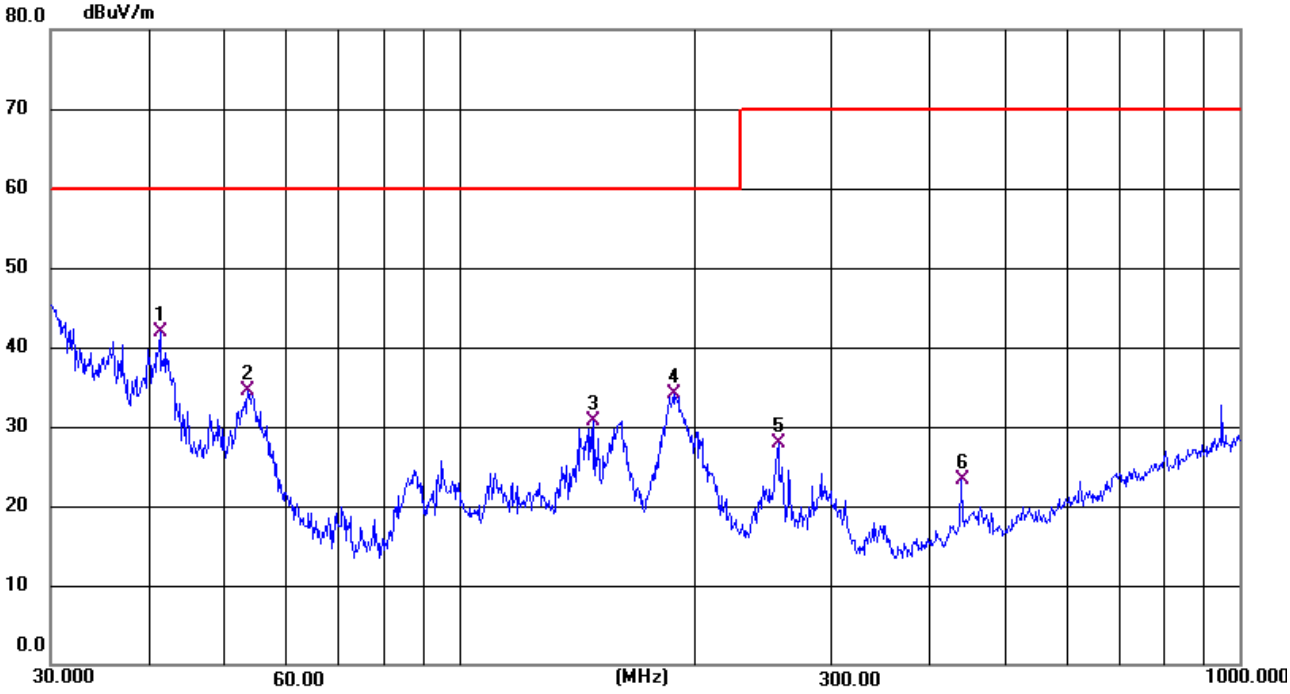
7.1 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td colspan="3">EN IEC 61800-3</td></tr>
<tr><td>Test Method:</td><td colspan="3">CISPR 11</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="3">30MHz to 1GHz</td></tr>
<tr><td>Measurement Distance:</td><td colspan="3">3 m</td></tr>
<tr><td>Limit:</td><td colspan="3"><table><tr><td>Frequency</td><td>Limit (dBµV/m)</td><td>Value</td></tr><tr><td>30MHz-230MHz</td><td>60.00</td><td>Quasi-peak</td></tr><tr><td>230MHz-1GHz</td><td>70.00</td><td>Quasi-peak</td></tr></table></td></tr>
<tr><td>Test setup:</td><td colspan="3">
</td></tr>
<tr><td>Test Procedure:</td><td colspan="3">1. The radiated emissions test was conducted in a semi-anechoic chamber.
2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT.
4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.</td></tr>
<tr><td>Test environment:</td><td>Temp.: 25 °C</td><td>Humid.: 52%</td><td>Press.: 1 012mbar</td></tr>
<tr><td>Measurement Record:</td><td colspan="3">Uncertainty: ± 4.50dB</td></tr>
<tr><td>Test Instruments:</td><td colspan="3">Refer to section 6 for details</td></tr>
<tr><td>Test mode:</td><td colspan="3">Refer to section 5.3 for details</td></tr>
<tr><td>Test results:</td><td colspan="3">Pass</td></tr>
</table>

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Measurement Data

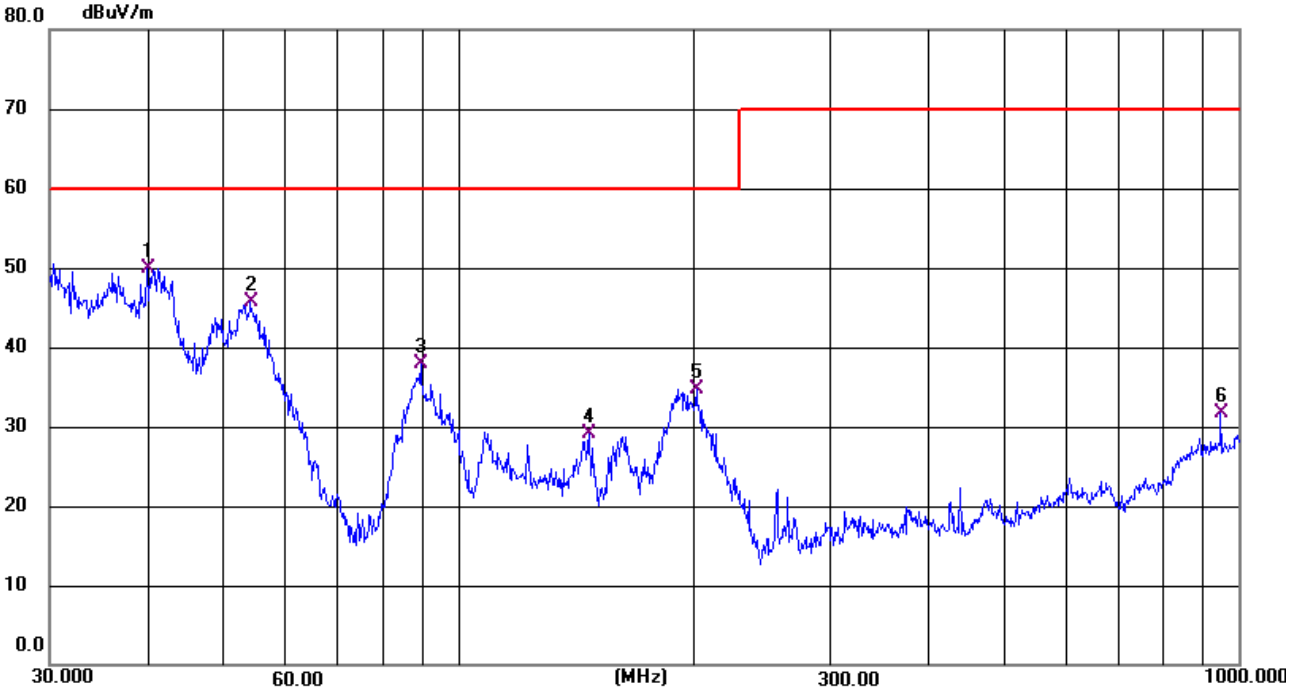
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	41.4215	53.20	-11.37	41.83	60.00	-18.17	QP
2	53.6931	49.26	-14.74	34.52	60.00	-25.48	QP
3	148.9624	48.60	-17.90	30.70	60.00	-29.30	QP
4	188.4125	50.58	-16.45	34.13	60.00	-25.87	QP
5	256.5210	43.50	-15.65	27.85	70.00	-42.15	QP
6	440.1962	32.94	-9.60	23.34	70.00	-46.66	QP

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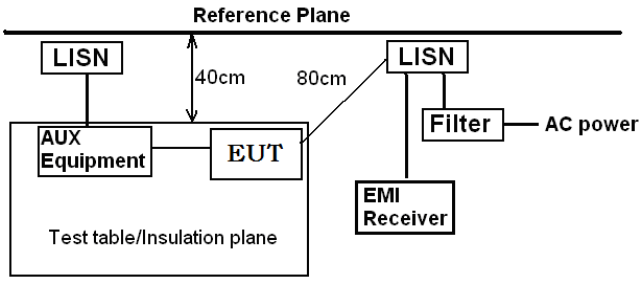
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	39.9942	65.78	-15.86	49.92	60.00	-10.08	QP
2	54.2609	62.82	-17.16	45.66	60.00	-14.34	QP
3	89.5899	58.98	-21.02	37.96	60.00	-22.04	QP
4	147.4036	47.99	-18.83	29.16	60.00	-30.84	QP
5	202.1004	50.67	-15.94	34.73	60.00	-25.27	QP
6	948.7609	31.80	-0.17	31.63	70.00	-38.37	QP

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7.2 Conducted Emission

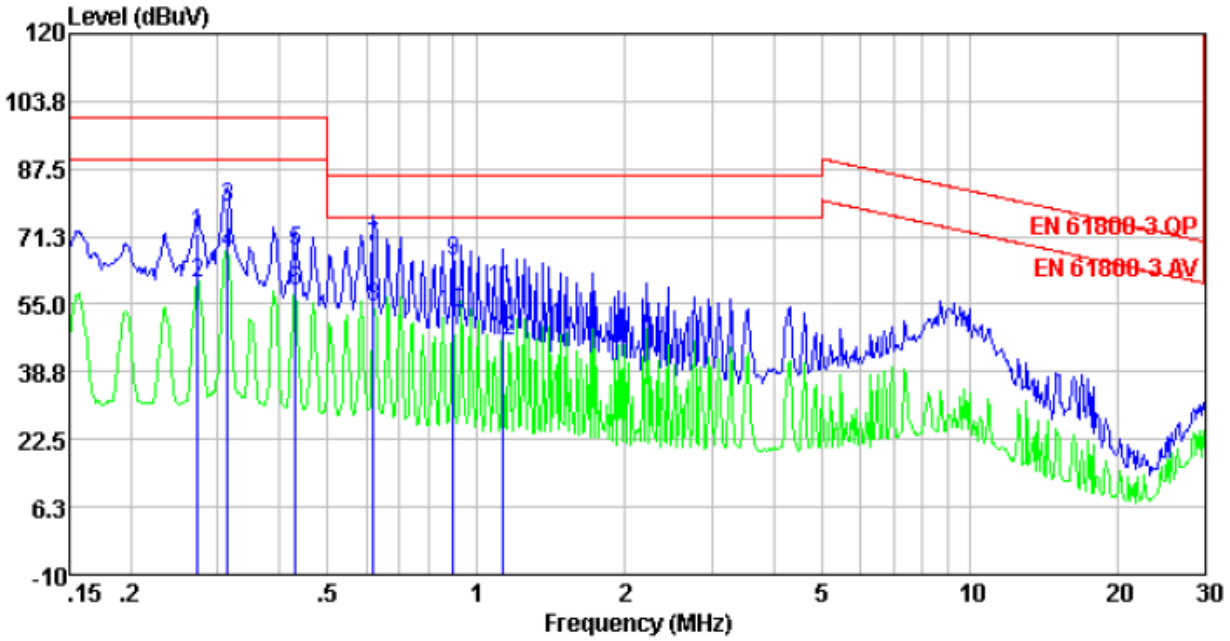
<table>
<tr><td>Test Requirement:</td><td colspan="3">EN IEC 61800-3</td></tr>
<tr><td>Test Method:</td><td colspan="3">CISPR 11</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="3">150kHz to 30MHz</td></tr>
<tr><td>Limit:</td><td colspan="3">
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBµV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15 - 0.50</td><td>100</td><td>90</td></tr>
<tr><td>0.50 - 5</td><td>86</td><td>76</td></tr>
<tr><td>5 - 30</td><td>90
Decreases with log of frequency down to 70</td><td>80
Decreases with log of frequency down to 60</td></tr>
</table>
NOTE:
1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 5MHz to 30MHz.
</td></tr>
<tr><td>Test setup:</td><td colspan="3">


Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m
</td></tr>
<tr><td>Test procedure:</td><td colspan="3">3. The EUT was placed 0.4 meters from the conducting wall of shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provide 50Ω/50µH of coupling impedance for the measuring instrument.
4. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
5. The frequency range from 150 kHz to 30MHz was searched. Emission levels over 10dB under the prescribed limits are not reported.</td></tr>
<tr><td>Test environment:</td><td>Temp.: 24 °C</td><td>Humid.: 51%</td><td>Press.: 1012mbar</td></tr>
<tr><td>Measurement Record:</td><td colspan="3">Uncertainty: ±3.45dB</td></tr>
<tr><td>Test Instruments:</td><td colspan="3">Refer to section 6 for details</td></tr>
<tr><td>Test mode:</td><td colspan="3">Refer to section 5.3 for details</td></tr>
<tr><td>Test results:</td><td colspan="3">Pass</td></tr>
</table>

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Measurement Data

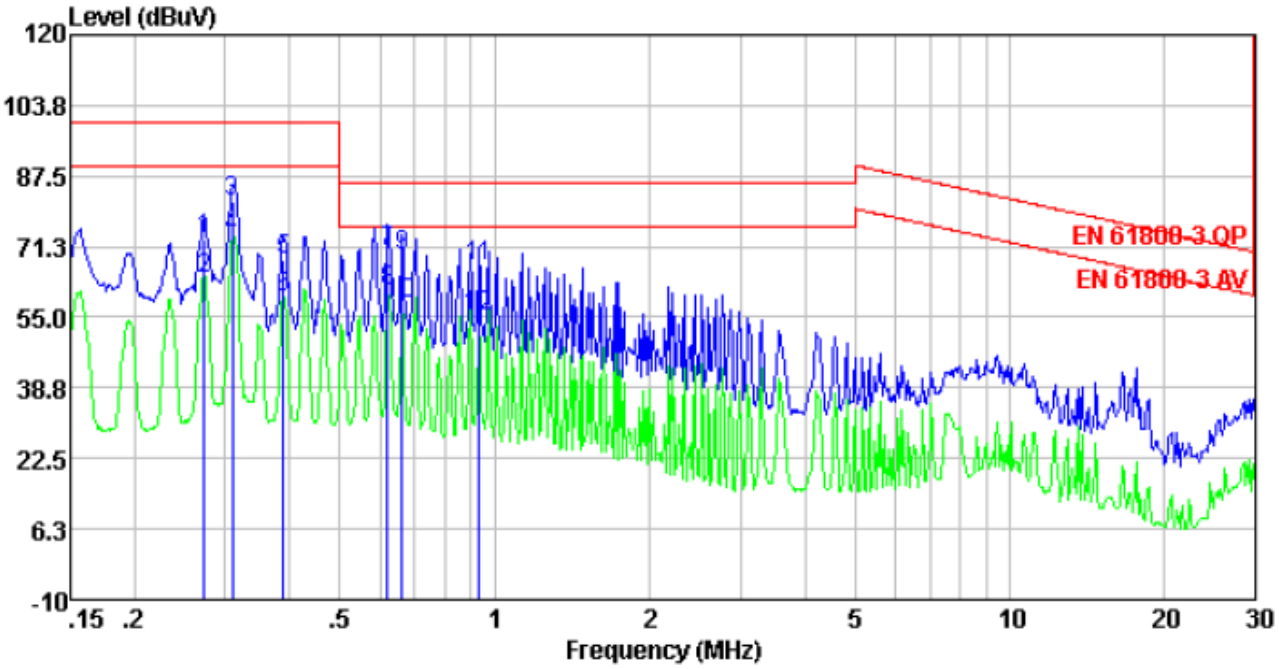
L:



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dBuV	dBuV	dB	
0.27	61.70	10.40	0.01	72.11	100.00	-27.89	QP
0.27	49.55	10.40	0.01	59.96	90.00	-30.04	Average
0.31	67.80	10.39	0.01	78.20	100.00	-21.80	QP
0.31	56.81	10.39	0.01	67.21	90.00	-22.79	Average
0.43	57.18	10.34	0.01	67.53	100.00	-32.47	QP
0.43	47.71	10.34	0.01	58.06	90.00	-31.94	Average
0.62	58.14	10.28	0.02	68.44	86.00	-17.56	QP
0.62	44.14	10.28	0.02	54.44	76.00	-21.56	Average
0.90	55.12	10.22	0.03	65.37	86.00	-20.63	QP
0.90	42.67	10.22	0.03	52.92	76.00	-23.08	Average
1.13	48.33	10.20	0.03	58.56	86.00	-27.44	QP
1.13	36.10	10.20	0.03	46.33	76.00	-29.67	Average

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N:



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dBuV	dBuV	dB	
0.27	62.51	10.40	0.01	72.92	100.00	-27.08	QP
0.27	53.37	10.40	0.01	63.78	90.00	-26.22	Average
0.31	71.43	10.39	0.01	81.83	100.00	-18.17	QP
0.31	63.18	10.39	0.01	73.58	90.00	-16.42	Average
0.39	58.01	10.36	0.01	68.38	100.00	-31.62	QP
0.39	49.29	10.36	0.01	59.66	90.00	-30.34	Average
0.62	59.81	10.28	0.02	70.11	86.00	-15.89	QP
0.62	50.86	10.28	0.02	61.16	76.00	-14.84	Average
0.66	58.77	10.27	0.02	69.06	86.00	-16.94	QP
0.66	47.65	10.27	0.02	57.94	76.00	-18.06	Average
0.93	56.65	10.21	0.03	66.89	86.00	-19.11	QP
0.93	44.79	10.21	0.03	55.03	76.00	-20.97	Average

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8 Immunity Test Results

8.1 Performance Criteria Description in EN IEC 61800-3

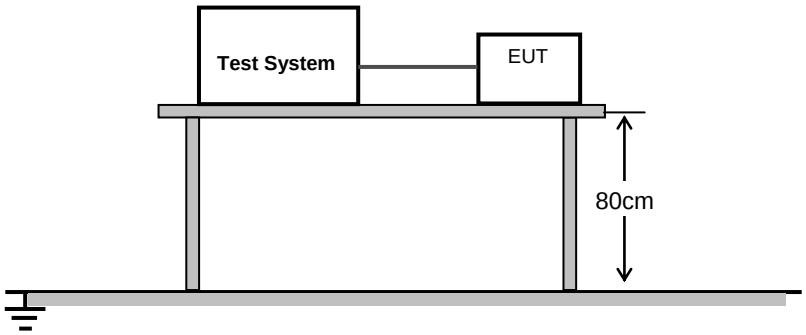
Item	Acceptance (performance) criterion [a]		
	A	B	C
General system performance	No noticeable changes of the operating characteristic Operating as intended, within specified tolerance	Noticeable changes (visible or audible) of the operating characteristic Self-recoverable	Shutdown, changes in operating characteristics Triggering of protective devices [b] Not self-recoverable
Special system performance Torque generating behaviour	Torque deviation within specified tolerances	Temporary torque deviation outside specified tolerances Self-recoverable	Loss of torque Not self-recoverable
Sub-component performance Operation of power electronics and driving circuits	No malfunction of a power semiconductor	Temporary malfunction which cannot cause unintended shut-down of the PDS	Shut-down, triggering of protective devices [b] No loss of stored program No loss of user program No loss of settings Not self-recoverable
Sub-component performance Information processing and sensing functions	Undisturbed communication and data exchange to external devices	Temporarily disturbed communication, but no error reports of the internal or external devices which could cause shut-down	Errors in communication, loss of data and information No loss of stored program, no loss of user program No loss of settings. Not self-recoverable
Sub-component performance Operation of displays and control panels	No changes of visible display information, only slight light intensity fluctuation of LEDs, or slight movement of characters	Visible temporary changes of information, undesired LED illumination	Shut down, permanent loss of information, or unpermitted operating mode, obviously wrong display information No loss of stored program, no loss of user program No loss of settings

[a] Acceptance criteria A, B, C – False starts are not acceptable. A false start is an unintended change from the logical state "STOPPED" which can make the motor run.

[b] Acceptance criterion C – The function can be restored by operator intervention (manual reset). Opening of fuses is allowed for line-commutated converters operating in inverting mode.

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8.2 Voltage Dips and Short Interruptions Immunity Test

Test Requirement:	EN IEC 61800-3		
Basic Standard:	IEC 61000-4-11		
Voltage Dips:	0%,40%,70%,80% remaining, 1,10,25,250 cycles		
Short interruptions:	0%, 250 cycles		
Test setup:			
Test Procedure:	The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement Record:

Test Mode	Voltage Remaining	Duration (cycles)	Operating time (minute)	Observation	Comply with Criterion
Voltage dips	0%	1	10	Note (1)	C
	40%	10	10	Note (1)	C
	70%	25	10	Note (1)	C
	80%	250	10	Note (1)	C
Short-time Interruptions	0%	250	10	Note (2)	C

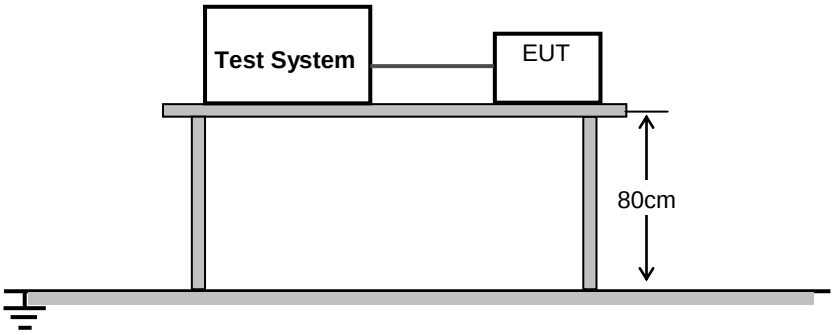
Remark:

(1). The EUT continued to operate as intended after test. Loss of function was observed.

(2). The EUT continued to operate as intended after test. Temporary loss of function was observed during test.

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8.3 Voltage deviations, Fluctuations Test

Test Requirement:	EN IEC 61800-3		
Basic Standard:	IEC 61000-2-4-Class 2		
Level:	±10%		
Test setup:			
Test Procedure:	The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement Record:

Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Voltage variations and fluctuations	±10%	10	Note (1)	A(2)

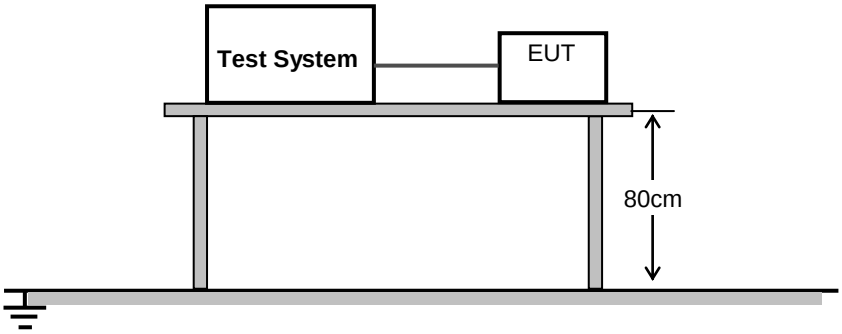
Remark:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

(2). When the voltage is below nominal, the max output power ratings-speed and/or torque may be reduced.

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8.4 Voltage unbalance and frequency variations Test

Test Requirement:	EN IEC 61800-3		
Basic Standard:	IEC 61000-2-4		
Level:	Level-Class 3, 3% negative sequence component, 10 min durations		
Power frequency variation:	±2%		
Test setup:			
Test Procedure:	The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement Record:

Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Voltage unbalance	IEC 61000-2-4 3% negative sequence component	10	Note (1)	A
Power frequency variation Δf/fN	IEC 61000-2-4 ±2%	10	Note (1)	A

Remark:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

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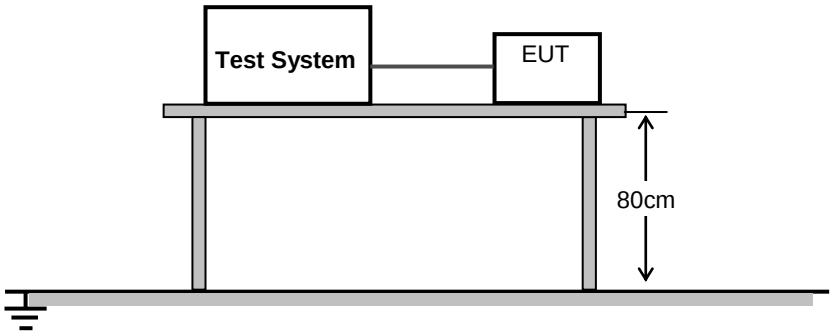
8.5 Harmonics and interharmonics voltages Test

Test Requirement:	EN IEC 61800-3
Basic Standard:	IEC 61000-2-4
Minimum immunity re quirements for total harmonic distortion	Class 3, THD=12%
Minimum immunity requirements for individual harmonic orders	

Phenomenon Harmonic order	First environment		Second environment		Performance (acceptance) criterion
	Reference document	Level	Reference document	Level	
2	IEC 61000-4-13 class 2	3 %	IEC 61000-4-13 class 3	5 %	A
3		8 %		9 %	
4		1,5 %		2 %	
5		9 %		12 %	
Even orders $6 \le h \le 50$		No requirement		1,5 %	
7		7,5 %		10 %	
9		2,5 %		4 %	
11		5 %		7 %	
13		4,5 %		7 %	
15		No requirement		3 %	
17		3 %		6 %	
19		2 %		6 %	
21		No requirement		2 %	
23		2 %		6 %	
25		2 %		6 %	
27		No requirement		2 %	
29		1,5 %		5 %	
31		1,5 %		3 %	
33		No requirement		2 %	
35		1,5 %		3 %	
37		1,5 %		3 %	
39		No requirement		2 %	

NOTE 1 For individual harmonic orders in the first environment, levels are from Class 2 in IEC 61000-4-13 (these are approximately 1,5 times the compatibility levels of IEC 61000-2-4).

NOTE 2 For individual harmonic orders in the second environment, levels are from Class 3 in IEC 61000-4-13 (these are approximately 1,5 times the compatibility levels of IEC 61000-2-4).

Test setup:			
Test Procedure:	The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

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Measurement Record:

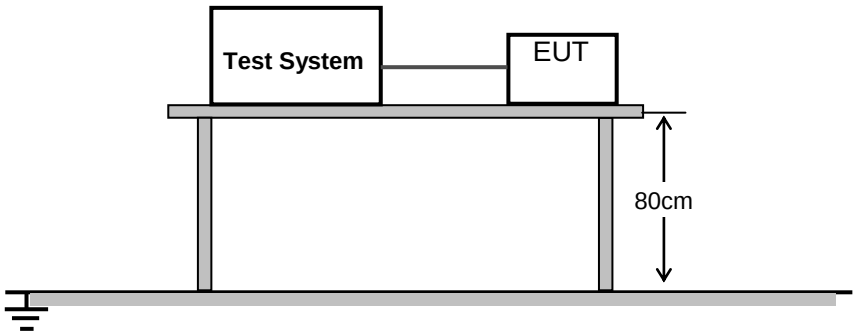
Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Harmonics and Interharmonics	IEC 61000-2-4 THD=12%	2.5	Note (1)	A

Remark:

(1). The EUT continued to operate as intended. No degradation of performance was observed

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8.6 Commutation Notches Test

Test Requirement:	EN IEC 61800-3		
Basic Standard:	IEC 60146-1-1		
Level:	Level-Class B, depth=40%, total area=250%*degrees		
Test setup:			
Test Procedure:	The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement Record:

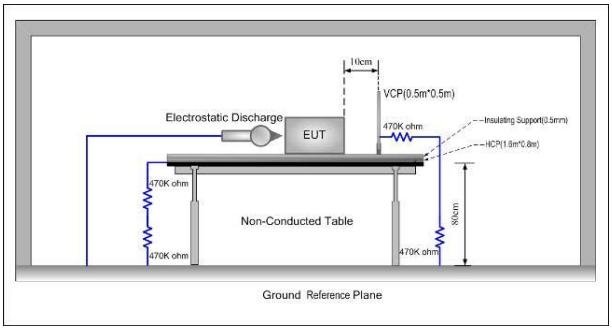
Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Commutation notches	IEC 60146-1-1 Level-Class B, depth=40%, total area=250%*degrees	10	Note (1)	A

Remark:

(1). The EUT continued to operate as intended. No degradation of performance was observed

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8.7 Electrostatic Discharge

Test Requirement:	EN IEC 61800-3
Test Method:	EN 61000-4-2
Discharge Voltage:	Contact Discharge:±4kV Air Discharge: ±8kV HCP/VCP:±4kV
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point.
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum
Performance Criterion:	B
Test setup:	
Test Procedure:	**1. Air discharge:** The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure was repeated until all the air discharge completed **2. Contact Discharge:** The test was applied on conductive surfaces of EUT. the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. the tip of the discharge electrode was touch the EUT before the discharge switch was operated. **3. Indirect discharge for horizontal coupling plane** At least 10 single discharges shall be applied at the front edge of each HCP opposite the centre point of each unit of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge. Consideration should be given to exposing all sides of the EUT. **4. Indirect discharge for vertical coupling plane** At least 10 single discharges were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from

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	the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.		
Test environment:	Temp.: 24 °C	Humid.: 51%	Press.: 1012mbar
Test mode:	Refer to section 6 for details		
Test Instruments:	Refer to section 5.3 for details		
Test results:	Passed		

Measurement Record:

Test points:	I: N/A
	II: Seams, Display panel, LAN port

Direct discharge

Discharge Voltage (KV)	Type of discharge	Test points	Observations (Performance Criterion)	Result
± 4	Contact	I	N/A	N/A
± 8	Air	II	A	Pass

Indirect discharge

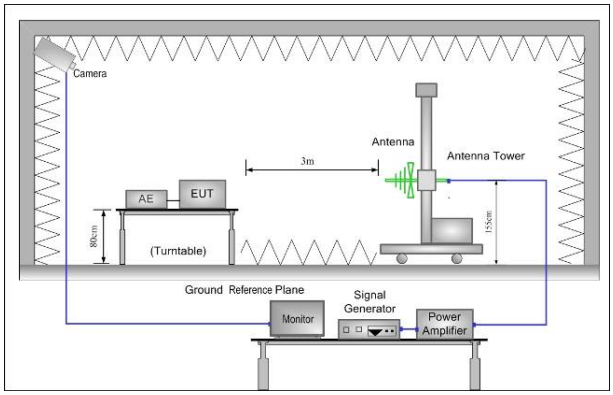
Discharge Voltage (KV)	Type of discharge	Test points	Observation Performance	Result
± 4	HCP-Bottom/Top/ Front/Back/Left/Right	Edge of the HCP	A	Pass
± 4	VCP-Front/Back /Left/Right	Center of the VCP	A	Pass

Remark:

A: No degradation in performance of the EUT was observed.

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8.8 Radiated Immunity

Test Requirement:	EN IEC 61800-3
Test Method:	EN 61000-4-3
Frequency range:	80MHz to 1GHz,1.4GHz-2.0GHz,2.0GHz-2.7GHz
Test Level:	10V/m,3V/m,1V/m
Modulation:	80%, 1kHz Amplitude Modulation
Performance Criterion:	A
Test setup:	
Test Procedure:	1. For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items. 2. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length. 3. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area). 4. The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Were the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value. 5. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s. 6. The test normally was performed with the generating antenna facing each side of the EUT. 7. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. 8. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to

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	monitor the performance of the EUT.		
Test environment:	Temp.: 25°C	Humid.: 52%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

Measurement Record:

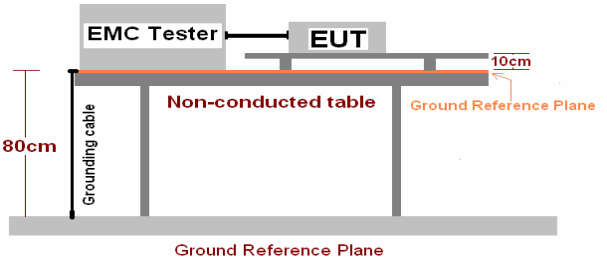
Frequency	Level (V/m)	EUT Face	Dwell time	Observations	Result
80MHz-1GHz	10	Front	2s	A	Pass
		Back		A	Pass
		Left		A	Pass
		Right		A	Pass
		Top		A	Pass
		Underside		A	Pass
1.4GHz-2.0GHz	3	Front	2s	A	Pass
		Back		A	Pass
		Left		A	Pass
		Right		A	Pass
		Top		A	Pass
		Underside		A	Pass
2.0 GHz-2.7GHz	1	Front	2s	A	Pass
		Back		A	Pass
		Left		A	Pass
		Right		A	Pass
		Top		A	Pass
		Underside		A	Pass

Remarks:

A: No degradation in the performance of the E.U.T. was observed.

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8.9 Electrical Fast Transients

Test Requirement:	EN IEC 61800-3		
Test Method:	EN 61000-4-4		
Test Level:	a.c. power port – 2 kV, Control lines – 1 kV		
Polarity:	Positive & Negative		
Repetition Frequency:	5kHz		
Burst Period:	300ms		
Test Duration:	2 minute per level & polarity		
Performance Criterion:	B		
Test setup:			
Test Procedure:	1. The EUT was tested with 1000 volt discharges to the AC power input leads. 2. Both positive and negative polarity discharges were 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 meter. 4. The duration time of each test sequential was 1 minute. 5. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.		
Test environment:	Temp.: 26 °C	Humid.: 54%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

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Measurement Record:

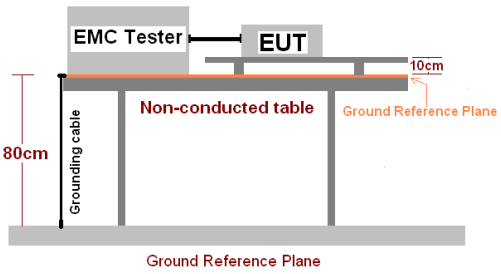
Lead under Test	Level (kV)	Coupling Direct/Clamp	Observations (Performance Criterion)	Result
L	± 2.0	Direct	A	Pass
N	± 2.0	Direct	A	Pass
L-N	± 2.0	Direct	A	Pass
PE	± 2.0	Direct	A	Pass
L-PE	± 2.0	Direct	A	Pass
N-PE	± 2.0	Direct	A	Pass
L-N-PE	± 2.0	Direct	A	Pass

Remark:

A: No degradation in the performance of the E.U.T. was observed.

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8.10 Surges

Test Requirement:	EN IEC 61800-3		
Test Method:	EN 61000-4-5		
Test Level:	1kV line to line 2kV line to earth		
Polarity:	Positive & Negative		
Generator source impedance:	2Ω (line-line coupling) 12Ω (line-earth coupling)		
Test signal specification:	Rise time=1.2us, Duration time=50us; Test Interval: 60s between each surge;		
No. of surges:	5 positive, 5 negative at 0°, 90°, 180°, 270°.		
Performance Criterion:	B		
Test setup:			
Test Procedure:	1. The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer). 2. The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative). 3. The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.		
Test environment:	Temp.: 26 °C	Humid.: 53%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.2 for details		
Test results:	Pass		

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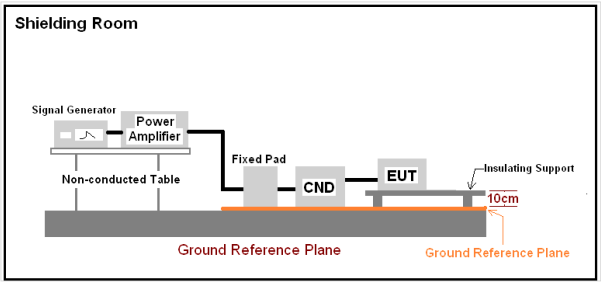
Location	Level(kV)	Pulse No	Surge Interval	Phase(deg)	Observations (Performance Criterion)
L-PE	± 2 kV	5	60s	0, 90, 180, 270	A
N-PE	± 2 kV	5	60s	0, 90, 180, 270	A
L-N	± 1 kV	5	60s	0, 90, 180, 270	A

Remark:

A: No degradation in the performance of the E.U.T. was observed.

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8.11 Conducted Immunity

Test Requirement:	EN IEC 61800-3		
Test Method:	EN 61000-4-6		
Frequency range:	0.15MHz to 80MHz		
Test Level:	10V rms		
Modulation:	80%, 1kHz Amplitude Modulation		
Performance Criterion:	A		
Test setup:			
Test Procedure:	1. The EUT shall be tested within its intended operating and climatic conditions. 2. 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 50-ohm load resistor. 3. 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 signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. 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. 4. 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. 5. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.		
Test environment:	Temp.: 24 °C	Humid.: 51%	Press.: 1012mbar
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

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Measurement Record:

Frequency	Injected Position	Test Level	Modulation	Step Size	Dwell Time	Observations (Performance Criterion)
150kHz to 80MHz	AC Main	10Vrms	80%, 1kHz Amp. Mod.	1%	2s	A
150kHz to 80MHz	Control Lines	10Vrms	80%, 1kHz Amp. Mod.	1%	2s	A

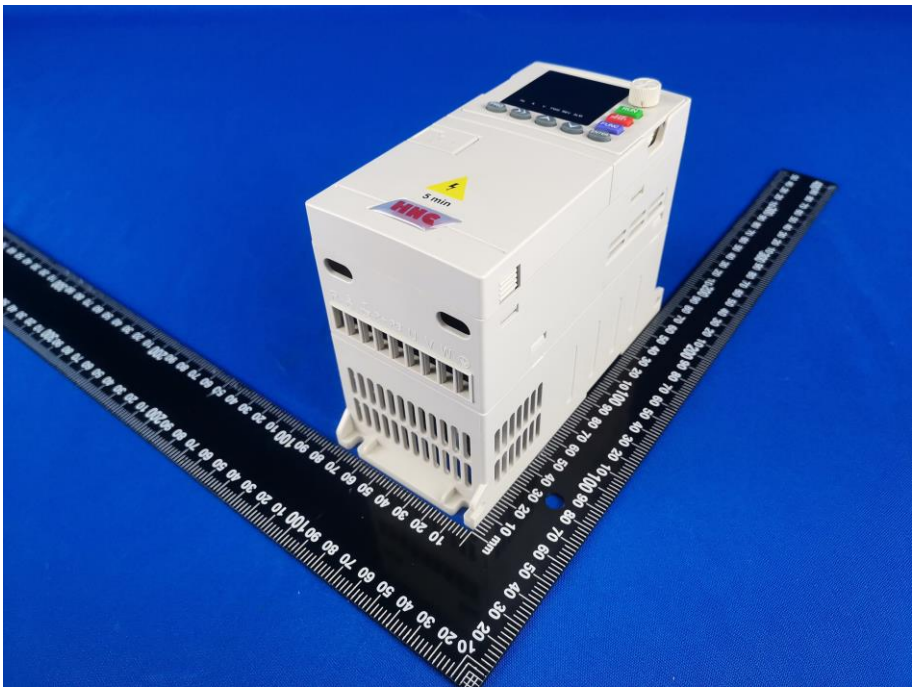
Remark:

A: No loss of function was observed.

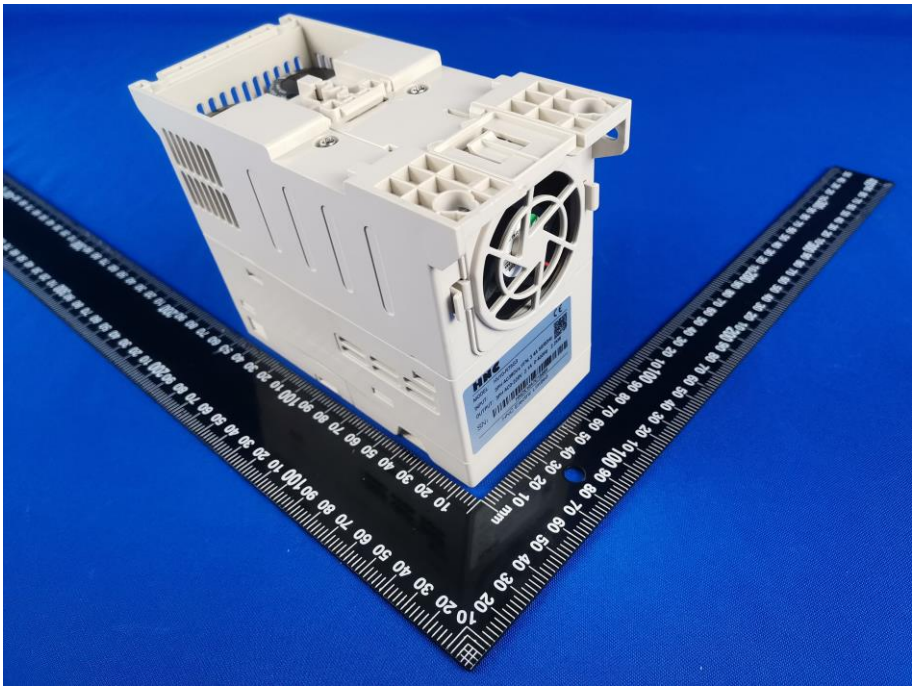
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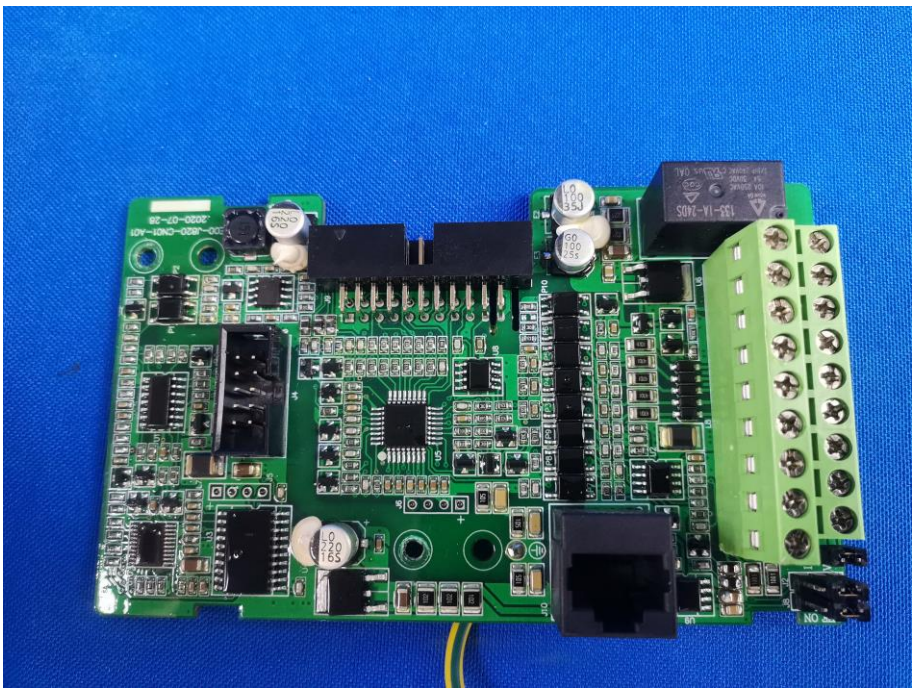
9 Photographs of the EUT



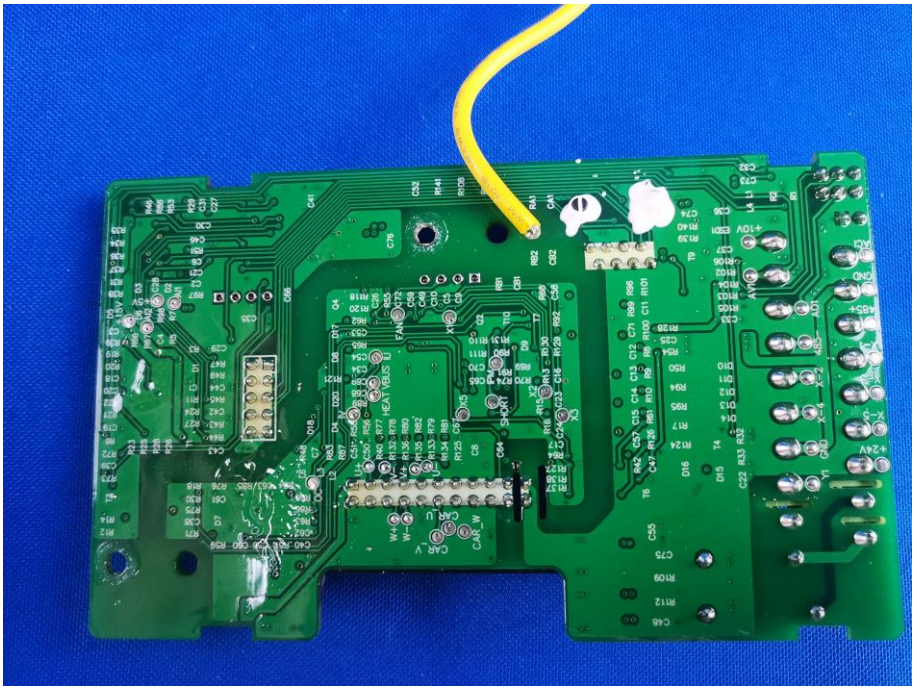


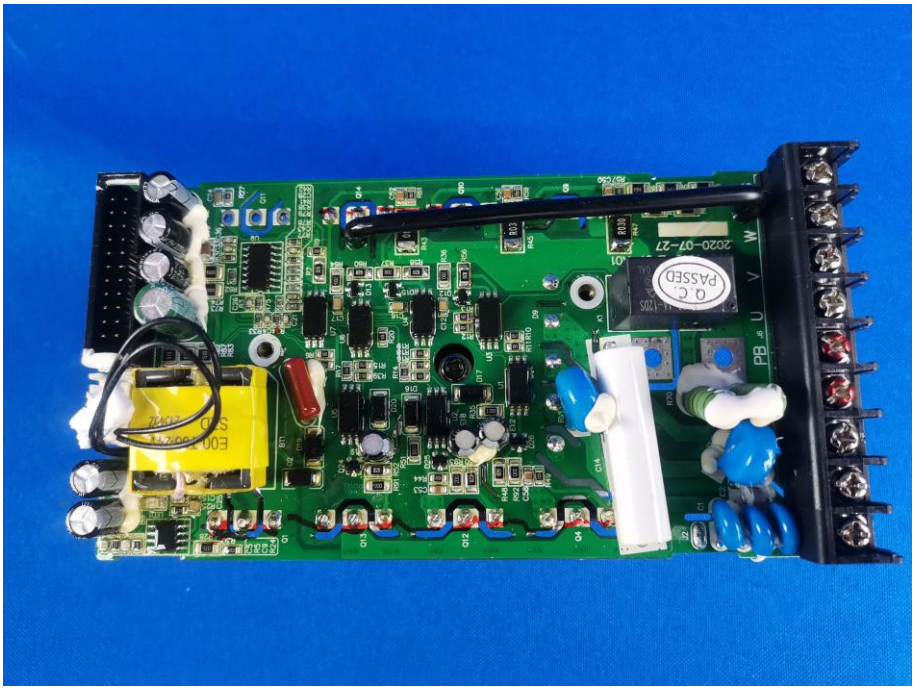
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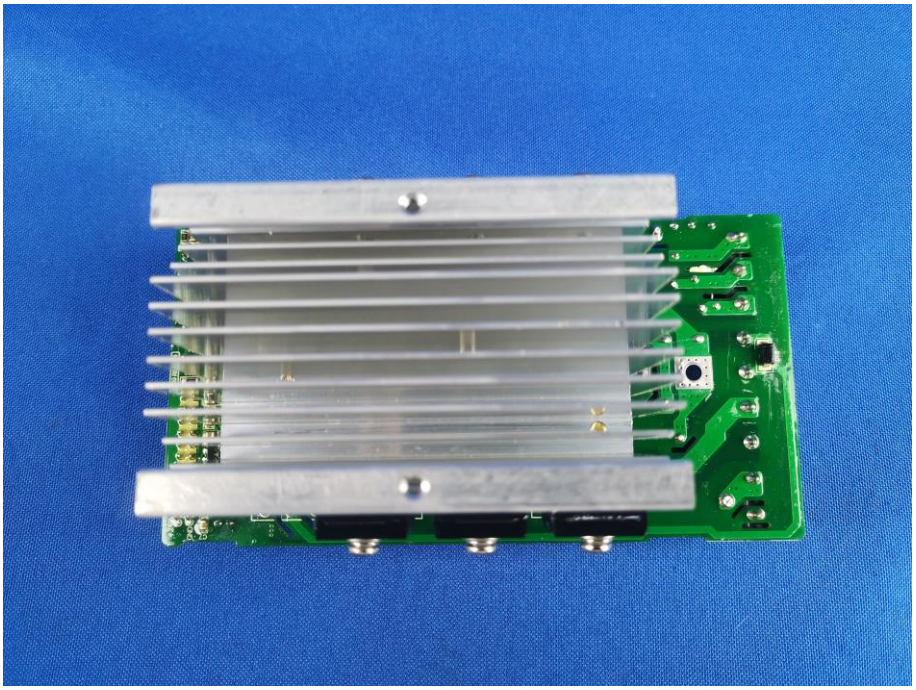


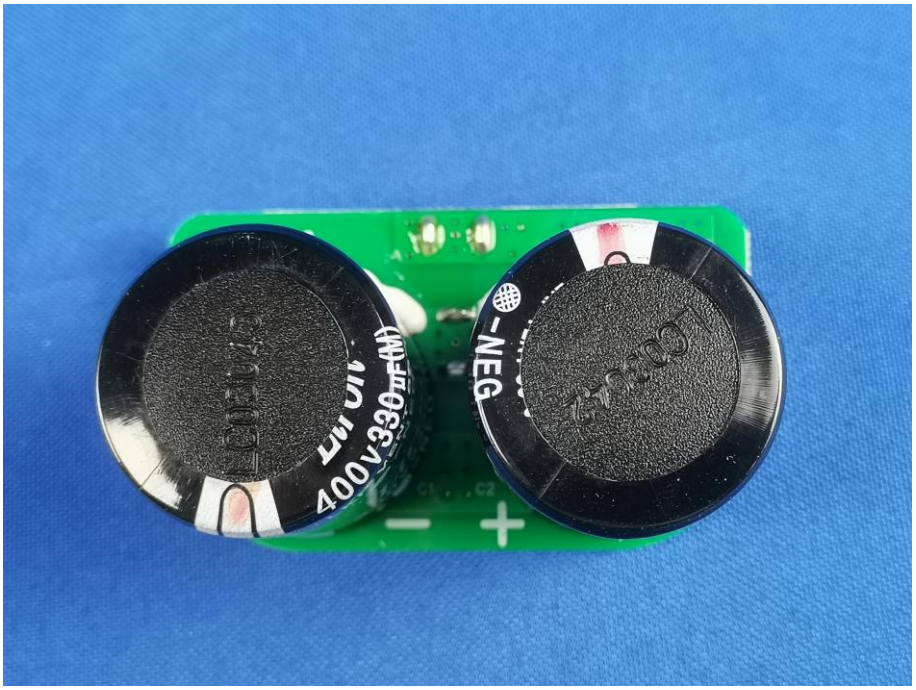
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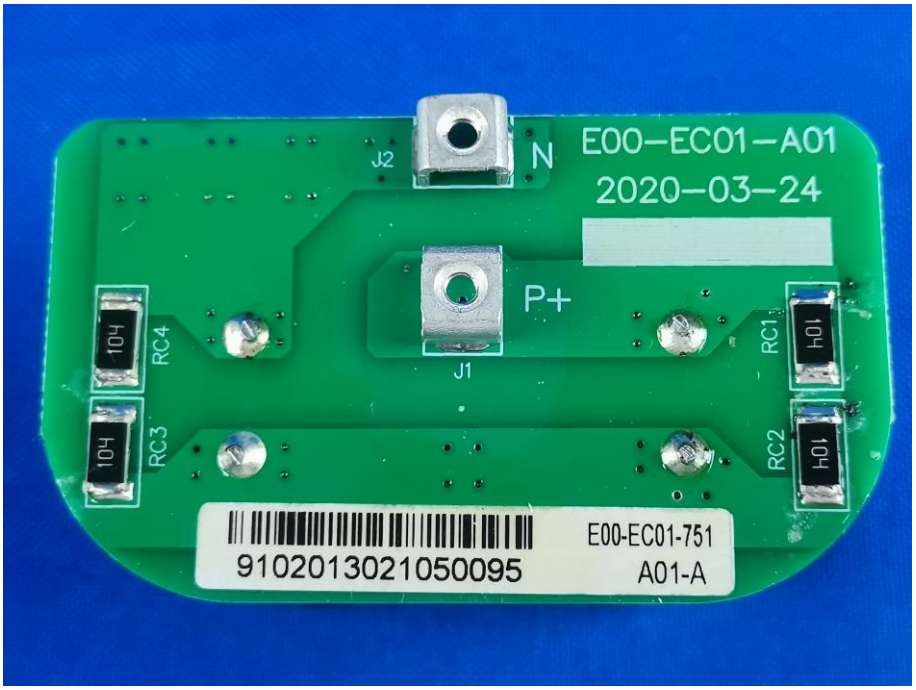


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