TEST REPORT

Applicant:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address of Applicant:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China

Equipment Under Test (EUT)

Product Name:	AC SERVO DRIVE
Brand Name:	
Model No.:	Please refer to page 6
Applicable standards:	EN IEC 61800-3:2018
Date of sample receipt:	December 16, 2020
Date of Test:	December 16, 2020 To December 22, 2020
Date of report issued:	December 22, 2020
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	*December 22, 2020*	*Original*

Prepared By: Gary Wang ***Date:*** *December 22, 2020*

Project Engineer

Reviewed By: Kevin Wang ***Date:*** *December 22, 2020*

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 15	PASS
Conducted Emission	EN IEC 61800-3	CISPR 11	Table 14	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 61000-2-4	Class 3	PASS
Voltage changes, fluctuations,	EN IEC 61800-3	IEC 61000-2-4	Class 3	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	Depth 10% to 100%	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, 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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5 General Information

5.1 Client Information

Applicant:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address of Applicant:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China
Manufacturer:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address of Manufacturer:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China

5.2 General Description of E.U.T

Product Name:	AC SERVO DRIVE
Brand Name:	
Model No.:	Please refer to page 6
Test Model No.:	HSV-180AS-050
Power Supply:	AC 380V, 50/60Hz, 21.9A

5.3 Test mode and Test Voltage

On mode:	Keep the EUT in the operation status.
Test Voltage:	AC 380V, 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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Model No.:

HSV-180AD-050	HSV-180AD-035	HSV-180AD-075
HSV-180AD-100	HSV-180AD-150	HSV-180AD-200
HSV-180AD-300	HSV-180AD-400	HSV-180AD-450
HSV-180AD-100	HSV-180AD-150	HSV-180AD-200
HSV-180AD-300	HSV-180AS-035	HSV-180AS-050
HSV-180AS-075	HSV-180AS-100	HSV-180AS-150
HSV-180AS-200	HSV-180AS-300	HSV-180AS-400
HSV-180AS-450	HSV-180A1S-100	HSV-180A1S-150
HSV-180A1S-200	HSV-180A1S-300	HSV-180UD-035
HSV-180UD-050	HSV-180UD-075	HSV-180UD-100
HSV-180UD-150	HSV-180UD-200	HSV-180UD-300
HSV-180UD-400	HSV-180UD-450	HSV-180UD-035C
HSV-180UD-050C	HSV-180UD-075C	HSV-180UD-100C
HSV-180UD-150C	HSV-180UD-200C	HSV-180UD-300C
HSV-180UD-400C	HSV-180UD-450C	HSV-180U1D-100
HSV-180U1D-150	HSV-180U1D-200	HSV-180U1D-300
HSV-180US-035	HSV-180US-050	HSV-180US-075
HSV-180US-100	HSV-180US-150	HSV-180US-200
HSV-180US-300	HSV-180US-400	HSV-180US-450
HSV-180US-035C	HSV-180US-050C	HSV-180US-075C
HSV-180US-100C	HSV-180US-150C	HSV-180US-200C
HSV-180US-300C	HSV-180US-400C	HSV-180US-450C
HSV-180US-035R	HSV-180US-050R	HSV-180US-075R
HSV-180US-100R	HSV-180US-150R	HSV-180U1S-100
HSV-180U1S-150	HSV-180U1S-200	HSV-180U1S-300
HSV-160U-005	HSV-160U-007	HSV-160U-009
HSV-160U-010	HSV-160U-020	HSV-160U-030
HSV-160U-050	HSV-160U-075	HSV-160U-100
HSV-160UP-005	HSV-160UP-007	HSV-160UP-009
HSV-160UP-010	HSV-160UP-020	HSV-160UP-030
HSV-160UP-050	HSV-160UP-075	HSV-160UP-100
HSV-160B+-020	HSV-160B+-030	HSV-160B+-050
HSV-160B+-075	HSV-160C-010	HSV-160C-020
HSV-160C-030	HSV-160C-050	HSV-160C-075
HSV-162C-030M	HSV-162C-030S	/
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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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	Jul. 3 2016	Jul. 2 2021
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	Jun. 29 2020	Jun. 28 2021
4	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	Jun. 29 2020	Jun. 28 2021
5	Double-ridged horn antenna	SCHWARZBECK	9120D	GTS208	Jun. 29 2020	Jun. 28 2021
6	RF Amplifier	HP	8347A	GTS204	Jun. 29 2020	Jun. 28 2021
7	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	Jun. 29 2020	Jun. 28 2021
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	Jun. 29 2020	Jun. 28 2021
12	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	Jun. 29 2020	Jun. 28 2021
13	EMI Test Receiver	R&S	ESCI 7	GTS552	Jun. 29 2020	Jun. 28 2021
14	Pulse Limiter	R&S	ESH3-Z2	GTS224	Jun. 29 2020	Jun. 28 2021
15	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jun. 29 2020	Jun. 28 2021
16	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	Jun. 29 2020	Jun. 28 2021
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	Jun. 29 2020	Jun. 28 2021
20	ISN	EMTEST	FCC-TLISN-T8-02	GTS563	Jun. 29 2020	Jun. 28 2021
21	EMTEST system	EMTEST	UCS500N	GTS239	Jun. 29 2020	Jun. 28 2021
22	Thermo meter	KTJ	TA328	GTS233	Jun. 29 2020	Jun. 28 2021
23	capacitive Clamp	EMTEST	HFK	GTS557	Jun. 29 2020	Jun. 28 2021
24	ESD Simulator	KIKUSUI	KES4021A	GTS242	Jun. 29 2020	Jun. 28 2021
25	Thermo meter	KTJ	TA328	GTS243	Jun. 29 2020	Jun. 28 2021
26	Signal Generator	SCHLODER	CDG-6000-25	GTS553	Jun. 29 2020	Jun. 28 2021
27	CDN	SCHLODER	CDN-M2+3	GTS554	Jun. 29 2020	Jun. 28 2021
28	EM-Clapm	SCHLODER	EMCL-20	GTS555	Jun. 29 2020	Jun. 28 2021
29	ATT	SCHLODER	ATT-6DB-100	GTS556	Jun. 29 2020	Jun. 28 2021
30	Signal Generator	Rohde & Schwarz	SMT03	100059	Jun. 29 2020	Jun. 28 2021
31	Power Amplifier	AR	150W1000	300999	Jun. 29 2020	Jun. 28 2021
32	Power Amplifier	AR	25S1G4AM1	305993	Jun. 29 2020	Jun. 28 2021
33	Power Amplifier	AR	150A220M6	305965	Jun. 29 2020	Jun. 28 2021

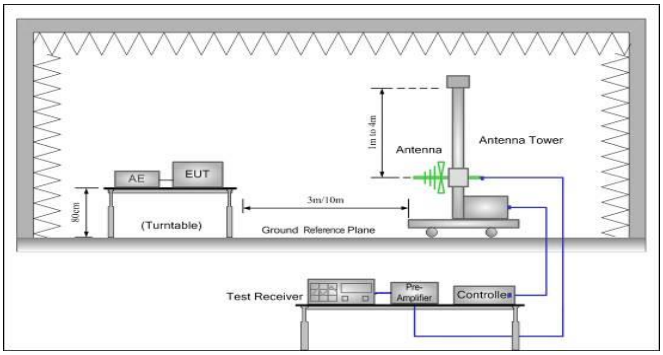
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34	Broadband antenna	CHASE	CBL6111C	2576	Jun. 29 2020	Jun. 28 2021
35	Horn Antenna	AR	AT4002A	2783	Jun. 29 2020	Jun. 28 2021
36	Signal Generator	ROHDE&SCHWARZ	SML02	A0304261	Jun. 29 2020	Jun. 28 2021
37	Field Monitor	Amplifier Research	AR FM5004	305128	Jun. 29 2020	Jun. 28 2021
38	AC Power Source	Pacific Power	320AMX	A0412388	Jun. 29 2020	Jun. 28 2021

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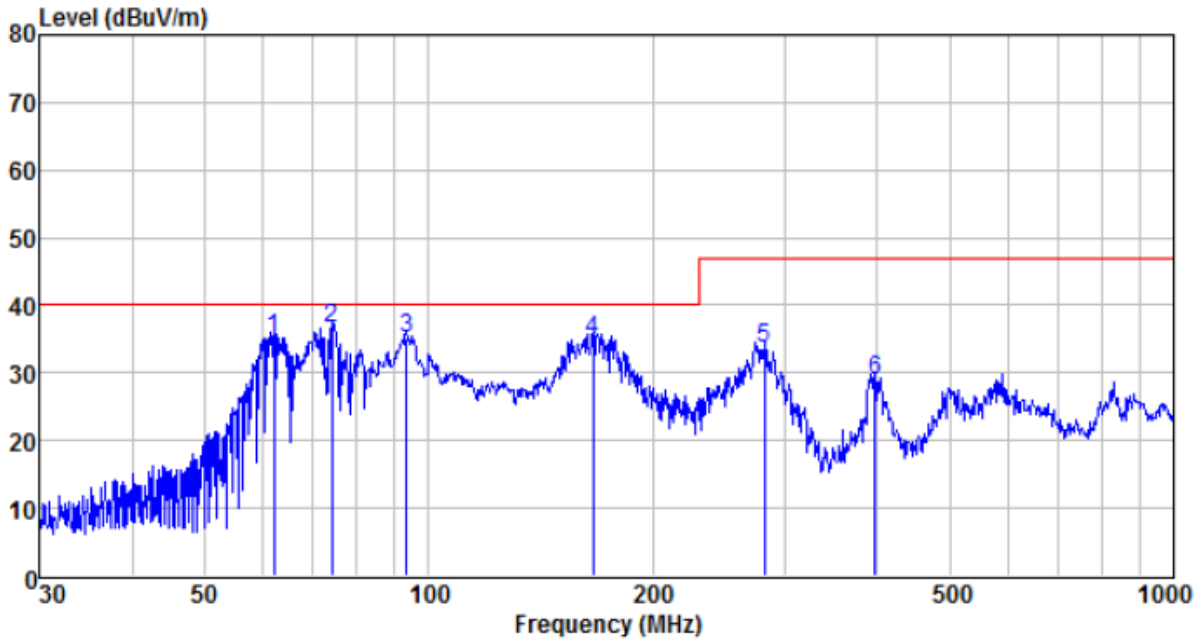
7 Emission Test Results

7.1 Radiated Emission

Test Requirement:	EN IEC 61800-3
Test Method:	CISPR 11
Test Frequency Range:	30MHz to 1GHz
Measurement Distance:	3 m
Limit:	Frequency / Limit (dBμV/m) / Value 30MHz-230MHz / 60.00 / Quasi-peak 230MHz-1GHz / 70.00 / Quasi-peak
Test setup:	
Test Procedure:	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.
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1 012mbar
Measurement Record:	**Uncertainty: ± 4.50dB**
Test Instruments:	Refer to section 6 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

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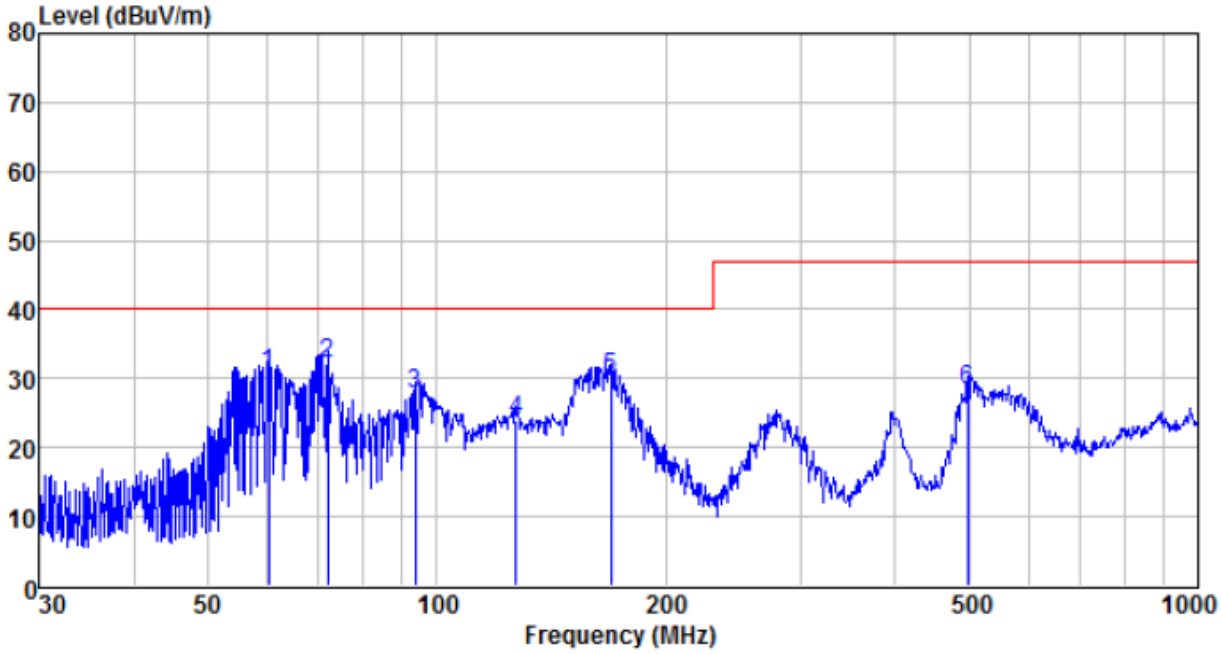
Measurement Data
Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
61.995	54.03	10.07	0.88	29.91	35.07	40.00	-4.93	QP
74.135	58.06	7.35	0.98	29.83	36.56	40.00	-3.44	QP
93.440	52.88	10.98	1.14	29.73	35.27	40.00	-4.73	QP
166.068	54.32	8.33	1.66	29.33	34.98	40.00	-5.02	QP
281.995	48.27	12.92	2.28	29.88	33.59	47.00	-13.41	QP
397.633	40.22	15.44	2.84	29.51	28.99	47.00	-18.01	QP

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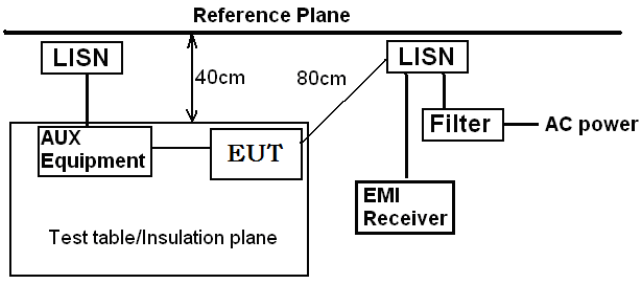
Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
60.069	48.27	11.40	0.86	29.92	30.61	40.00	-9.39	QP
71.832	53.55	7.38	0.96	29.84	32.05	40.00	-7.95	QP
93.768	45.27	10.98	1.14	29.73	27.66	40.00	-12.34	QP
127.218	43.62	8.43	1.41	29.53	23.93	40.00	-16.07	QP
169.005	49.40	8.40	1.68	29.32	30.16	40.00	-9.84	QP
497.677	36.87	17.44	3.29	29.31	28.29	47.00	-18.71	QP

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7.2 Conducted Emission

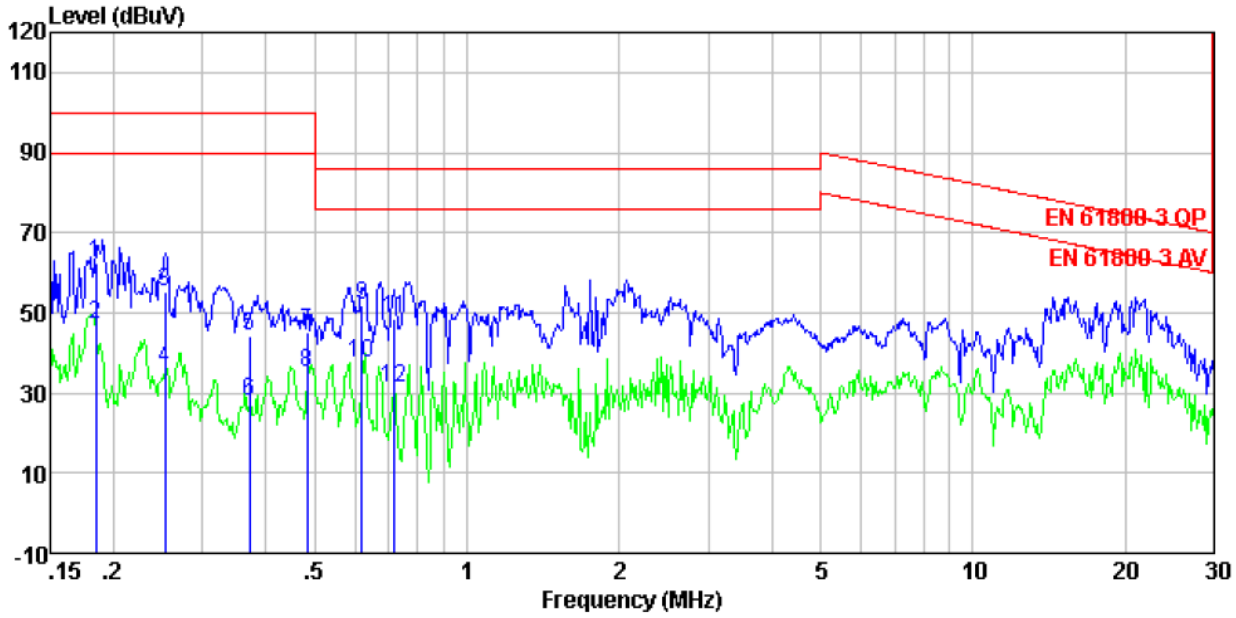
<table>
<tr><td>Test Requirement:</td><td colspan="3">EN IEC 61800-3</td></tr>
<tr><td>Test Method:</td><td colspan="3">CISPR 11</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="3">150kHz to 30MHz</td></tr>
<tr><td>Limit:</td><td colspan="3">
<table>
<tr><td rowspan="2">Frequency range (MHz)</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

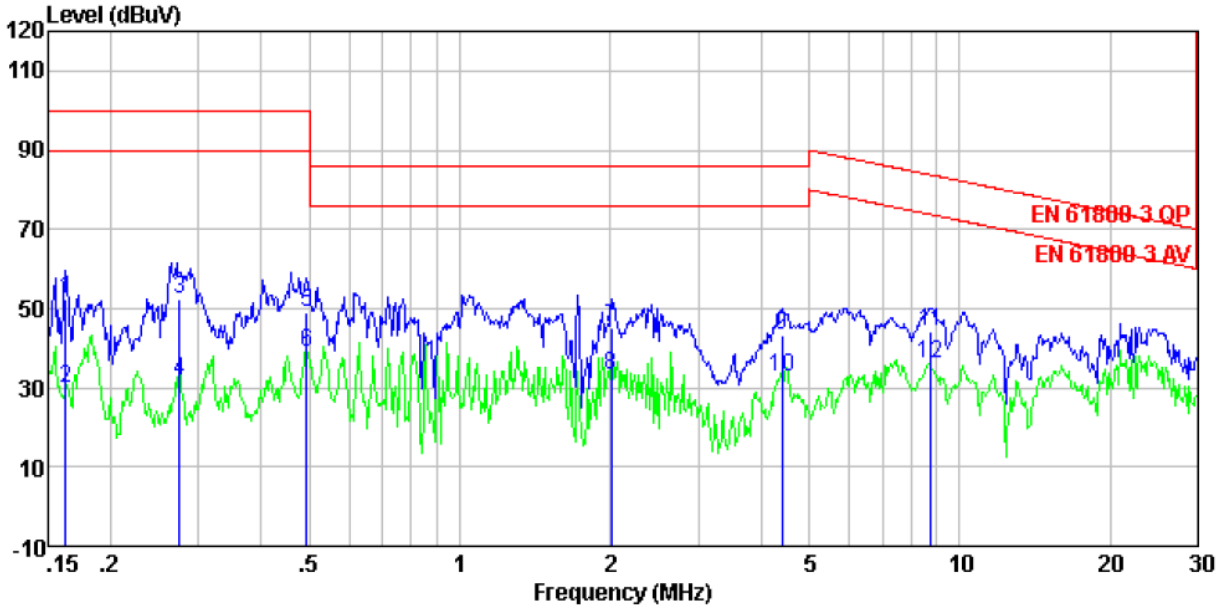
L1:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.18	42.16	20.40	0.10	62.66	100.00	-37.34	QP
0.18	26.60	20.40	0.10	47.10	90.00	-42.90	Average
0.25	34.65	20.40	0.10	55.15	100.00	-44.85	QP
0.25	15.51	20.40	0.10	36.01	90.00	-53.99	Average
0.37	23.95	20.36	0.10	44.41	100.00	-55.59	QP
0.37	7.24	20.36	0.10	27.70	90.00	-62.30	Average
0.48	24.70	20.32	0.11	45.13	100.00	-54.87	QP
0.48	14.60	20.32	0.11	35.03	90.00	-54.97	Average
0.62	31.46	20.28	0.12	51.86	86.00	-34.14	QP
0.62	17.06	20.28	0.12	37.46	76.00	-38.54	Average
0.72	28.26	20.25	0.13	48.64	86.00	-37.36	QP
0.72	11.05	20.25	0.13	31.43	76.00	-44.57	Average

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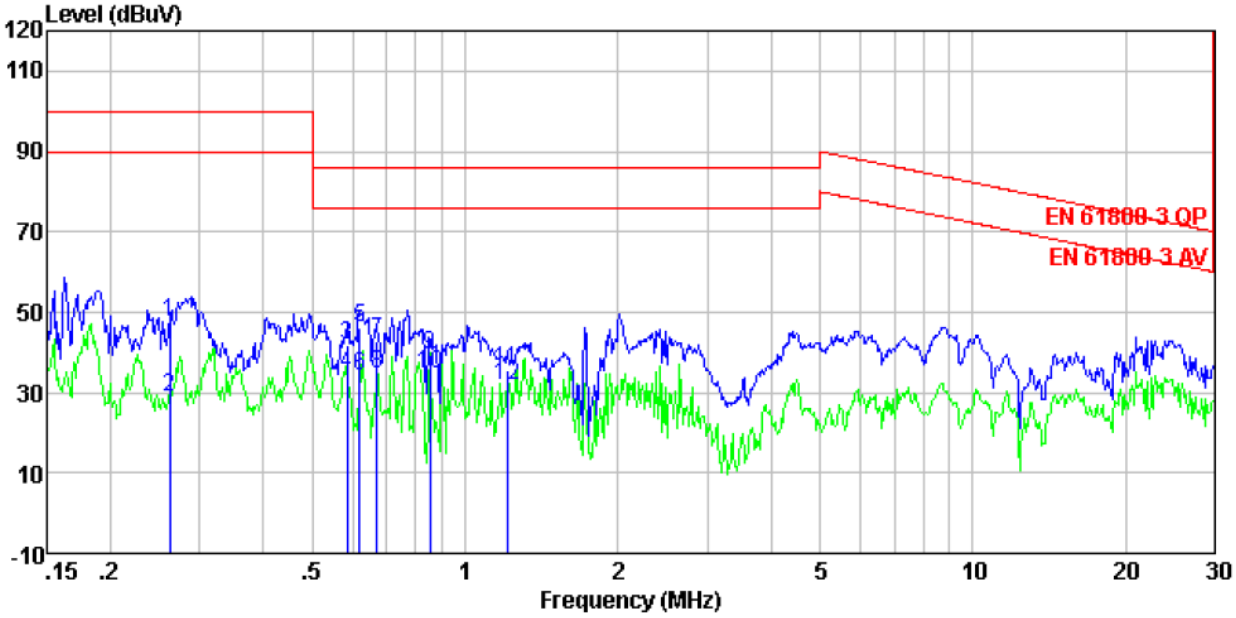
L2:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.16	31.69	20.40	0.08	52.17	100.00	-47.83	QP
0.16	9.51	20.40	0.08	29.99	90.00	-60.01	Average
0.27	31.66	20.40	0.10	52.16	100.00	-47.84	QP
0.27	11.29	20.40	0.10	31.79	90.00	-58.21	Average
0.49	28.50	20.32	0.11	48.93	100.00	-51.07	QP
0.49	18.61	20.32	0.11	39.04	90.00	-50.96	Average
2.01	24.72	20.20	0.18	45.10	86.00	-40.90	QP
2.01	12.75	20.20	0.18	33.13	76.00	-42.87	Average
4.41	22.85	20.20	0.17	43.22	86.00	-42.78	QP
4.41	12.44	20.20	0.17	32.81	76.00	-43.19	Average
8.78	23.93	20.20	0.19	44.32	83.72	-39.40	QP
8.78	15.59	20.20	0.19	35.98	73.72	-37.74	Average

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L3:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.26	27.15	20.40	0.10	47.65	100.00	-52.35	QP
0.26	8.45	20.40	0.10	28.95	90.00	-61.05	Average
0.59	21.28	20.29	0.12	41.69	86.00	-44.31	QP
0.59	14.37	20.29	0.12	34.78	76.00	-41.22	Average
0.62	25.55	20.28	0.12	45.95	86.00	-40.05	QP
0.62	13.88	20.28	0.12	34.28	76.00	-41.72	Average
0.67	22.33	20.27	0.13	42.73	86.00	-43.27	QP
0.67	14.34	20.27	0.13	34.74	76.00	-41.26	Average
0.85	18.83	20.23	0.14	39.20	86.00	-46.80	QP
0.85	14.25	20.23	0.14	34.62	76.00	-41.38	Average
1.21	15.38	20.20	0.16	35.74	86.00	-50.26	QP
1.21	11.58	20.20	0.16	31.94	76.00	-44.06	Average

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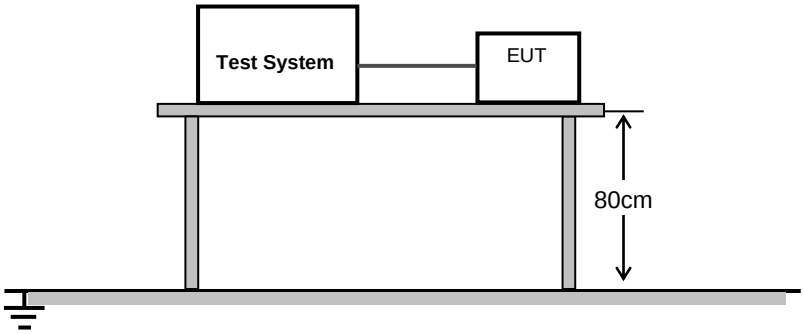
8 Immunity Test Results

8.1 Performance Criteria Description in EN 61800-3

Criterion A:	The apparatus shall continue to operate as intended. 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.

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8.2 Voltage Dips and Short Interruptions Immunity Test

Test Requirement:	EN 618000-3		
Basic Standard:	IEC 61000-2-1		
Voltage Dips:	10-100% reduction, 1-300 half-cycle		
Voltage Interruptions:	100% reduction, <60 seconds		
Test setup:			
Test Procedure:	a. 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. b. The EUT was tested for (I) 10-100% voltage dip of supplied voltage with duration of 1-300 half-cycles. c. 100% voltage short-time interruption of supplied voltage with duration of 60000ms was followed.		
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 Reduction	Duration (ms)	Operating time (minute)	Observation	Comply with Criterion
Voltage dips	100%	100	10	Note (1)	B
	30%	500	10	Note (1)	B
Short-time Interruptions	100%	60000	10	Note (2)	C

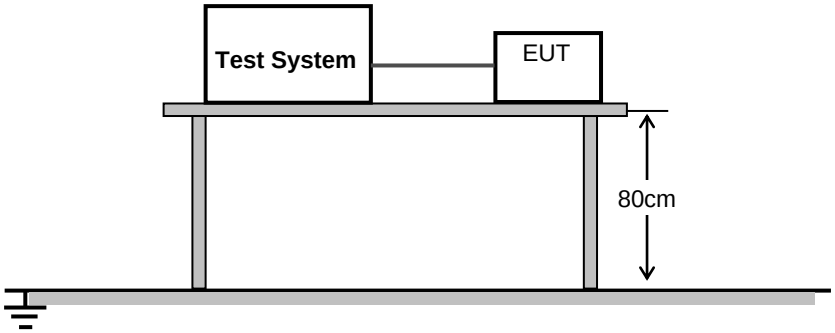
Remark:

(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 Changes, Fluctuations Test

Test Requirement:	EN 618000-3		
Basic Standard:	IEC 61000-2-4-Class 3		
Voltage changes, deviation with respect to nominal Voltage Un:	+10% to -15%, 0.85 to 0.90Un no longer than 60s; 0.90Un to 1.1Un, longer durations.		
Test setup:			
Test Procedure:	a. 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. b. The Generator generates the typical shapes of the voltage fluctuations given in Figures 3 to 6 of IEC 61000-2-1. The values of the voltages in the range of 0.85 Un to 0.90Un keep no longer than 60 s, longer durations for the range 0.90Un to 1.1Un applies.		
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	IEC 61000-2-4 +10% to -15%	10	Note (1)	A(2)

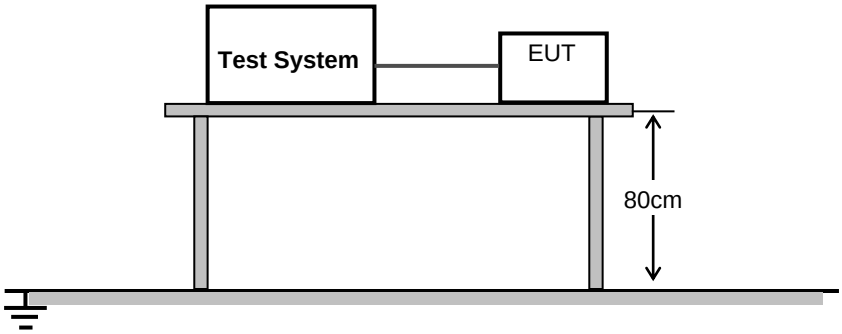
Remark:

(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 618000-3		
Basic Standard:	IEC 61000-2-4		
Voltage unbalance:	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.

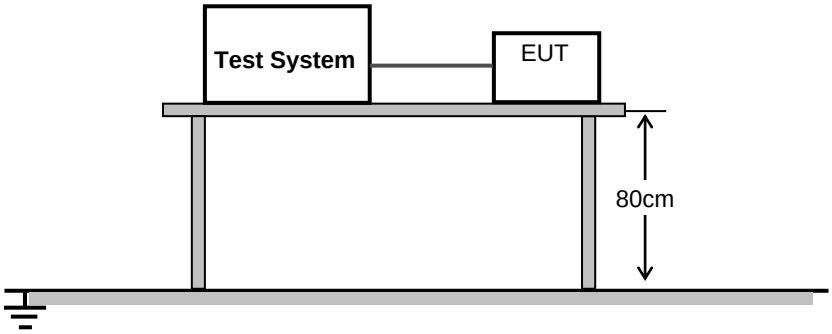
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8.5 Harmonics and interharmonics voltages Test

Test Requirement:	EN 618000-3
Basic Standard:	IEC 61000-2-4
Total Harmonics distrotion:	Level-Class 3, THD=10%

Harmonic voltage components						interharmonics voltage components	
Excluding multiples of 3, odd Order h	**Uh (%)**	**multiples of 3, odd Order h**	**Uh (%)**	**Even Order h**	**Uh (%)**	**Order h**	**Uh (%)**
5	8	3	6	2	3	<11	2.5
7	7	9	2.5	4	1.5	11-13 included	2.25
11	5	15	2	6	1	13-17 included	2
13	4.5	21	1.75	8	1	17-19 included	2
17	4	>21	1	10	1	19-23 included	1.75
19	4			>10	1	23-25 included	1.5
23	3.5					>25	1
25	3.5						
>25	$5\times\sqrt{11/h}$						

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:

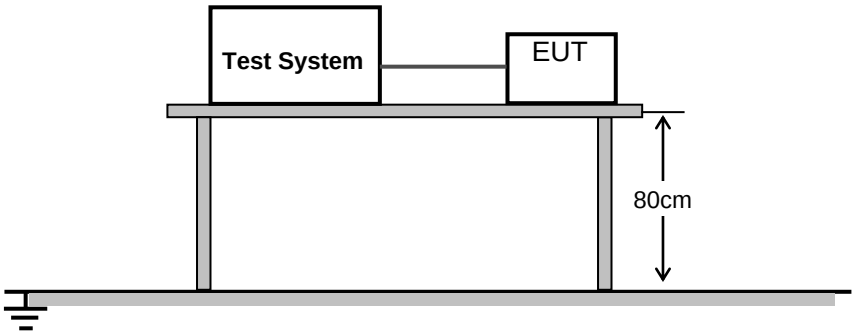
Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Harmonics and Interharmonics	IEC 61000-2-4 THD=10%	2.5	Note (1)	A

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 618000-3		
Basic Standard:	IEC 60146-1-1		
Voltage unbalance:	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:

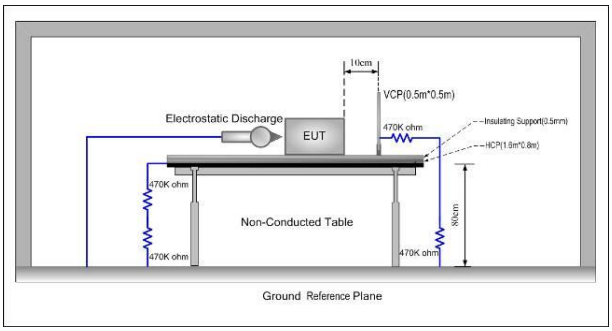
Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Commutation notches	IEC 60146-1-1 Level-Class B, depth=40%, total area=250%*degrees	10	Note (1)	A

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 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: Metal shell
	II: Seams

Direct discharge

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

Indirect discharge

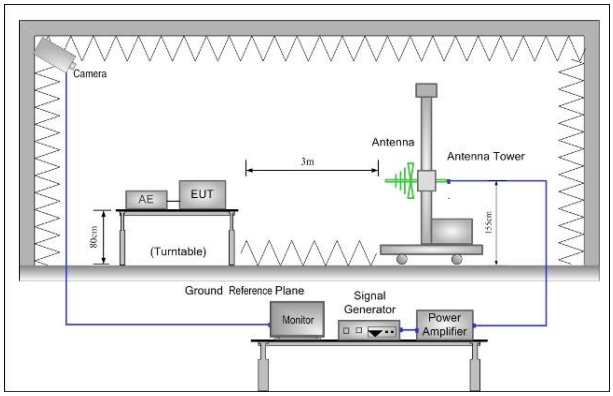
Discharge Voltage (KV)	Type of discharge	Test points	Observation Performance	Result
± 4	HCP-Bottom/Top/ Front/Back/Left/Right	Edge of the HCP	A	Pass
± 4	VCP-Front/Back /Left/Right	Center of the VCP	A	Pass

Remark:

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

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8.8 Radiated Immunity

Test Requirement:	EN 61800-3
Test Method:	EN 61000-4-3
Frequency range:	80MHz to 1GHz
Test Level:	10V/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:

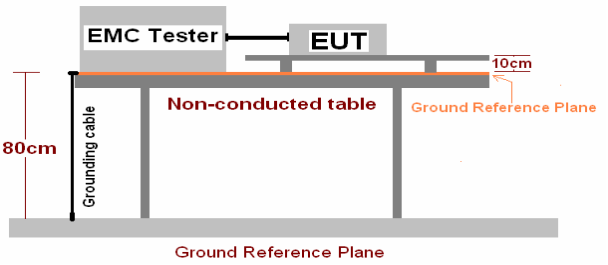
Frequency	Level (V/m)	EUT Face	Dwell time	Observations	Result
80MHz-1GHz	10	Front	2s	A	Pass
		Back		A	Pass
		Left		A	Pass
		Right		A	Pass
		Top		A	Pass
		Underside		A	Pass

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 618000-3		
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:

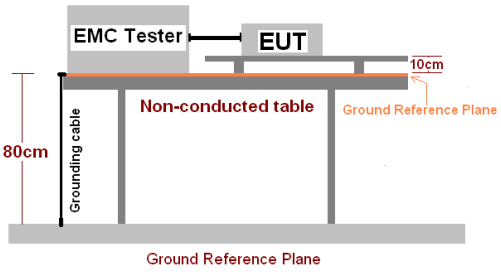
Lead under Test	Level (kV)	Coupling Direct/Clamp	Observations (Performance Criterion)	Result
L1	± 2.0	Direct	A	Pass
L2	± 2.0	Direct	A	Pass
L3	± 2.0	Direct	A	Pass
PE	± 2.0	Direct	A	Pass
L1+PE	± 2.0	Direct	A	Pass
L123	± 2.0	Direct	A	Pass
L123+PE	± 2.0	Direct	A	Pass
Control Lines	± 1.0	Clamp	A	Pass

Remark:

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

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8.10 Surges

Test Requirement:	EN 618000-3		
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 5.3 for details		
Test results:	Pass		

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Measurement Record:

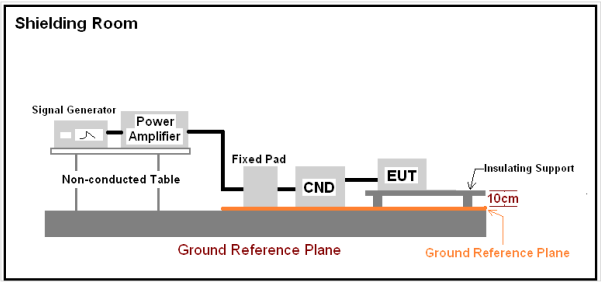
Location	Level(kV)	Pulse No	Surge Interval	Phase(deg)	Observations (Performance Criterion)
L1-PE	± 2 kV	5	60s	0, 90, 180, 270	A
L2- PE	± 2 kV	5	60s	0, 90, 180, 270	A
L3- PE	± 2 kV	5	60s	0, 90, 180, 270	A
L1-L2	± 1 kV	5	60s	0, 90, 180, 270	A
L1-L3	± 1 kV	5	60s	0, 90, 180, 270	A
L2-L3	± 1 kV	5	60s	0, 90, 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 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

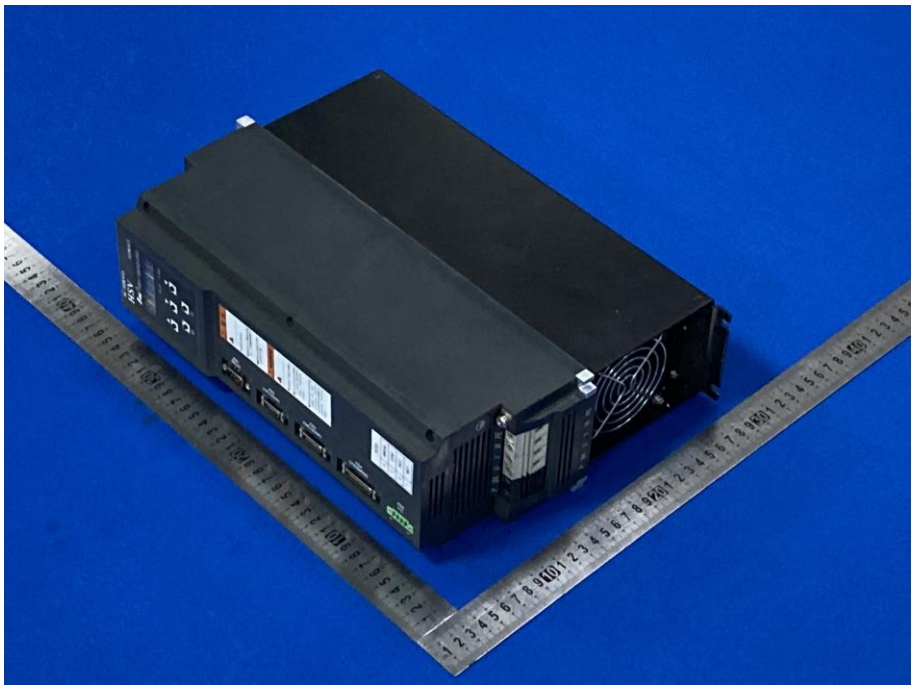
Remark:

A: No loss of function was observed.

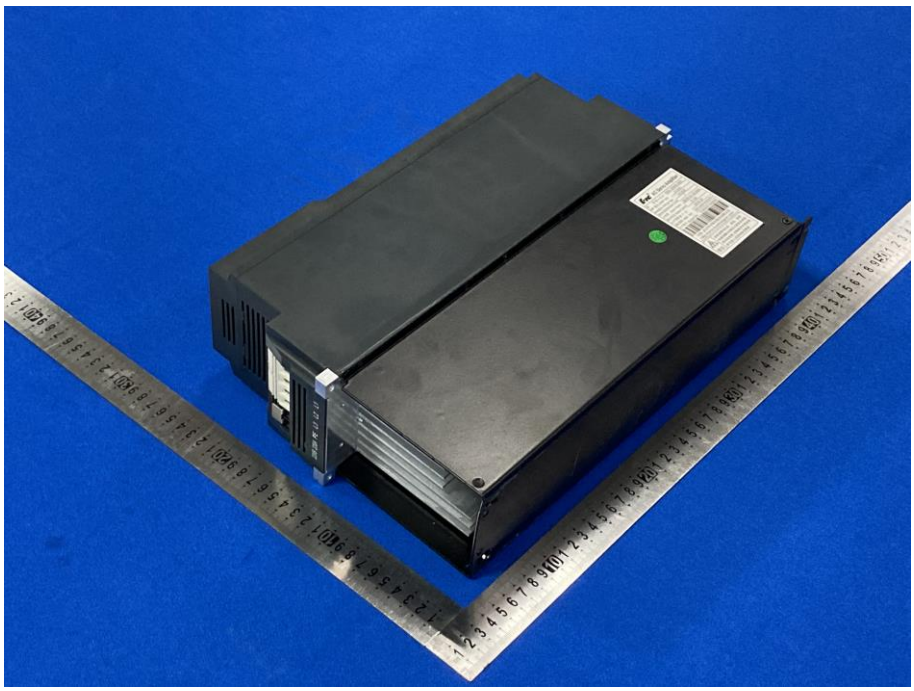
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9 Photographs of the EUT



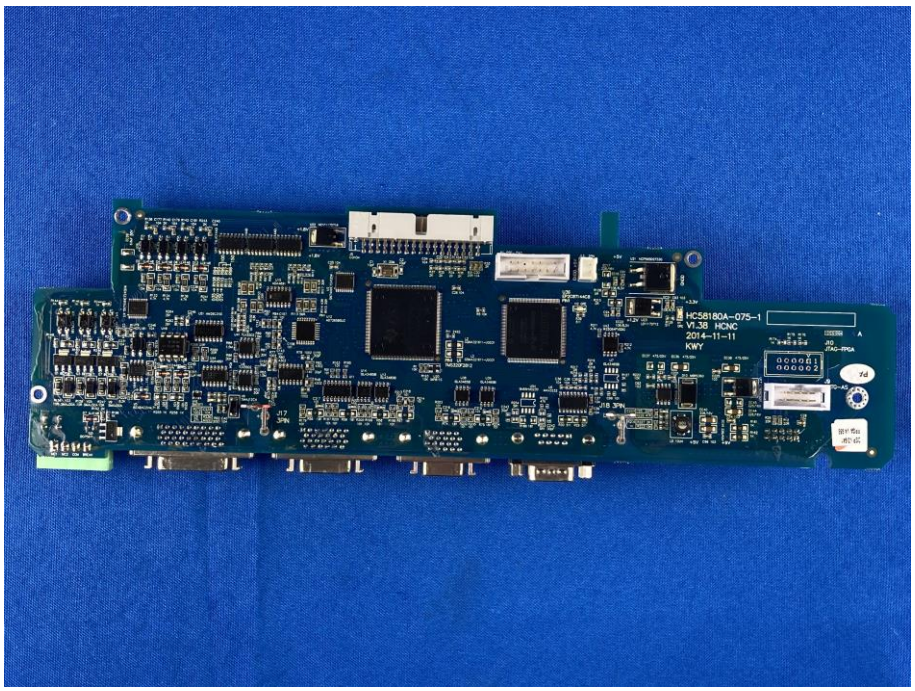


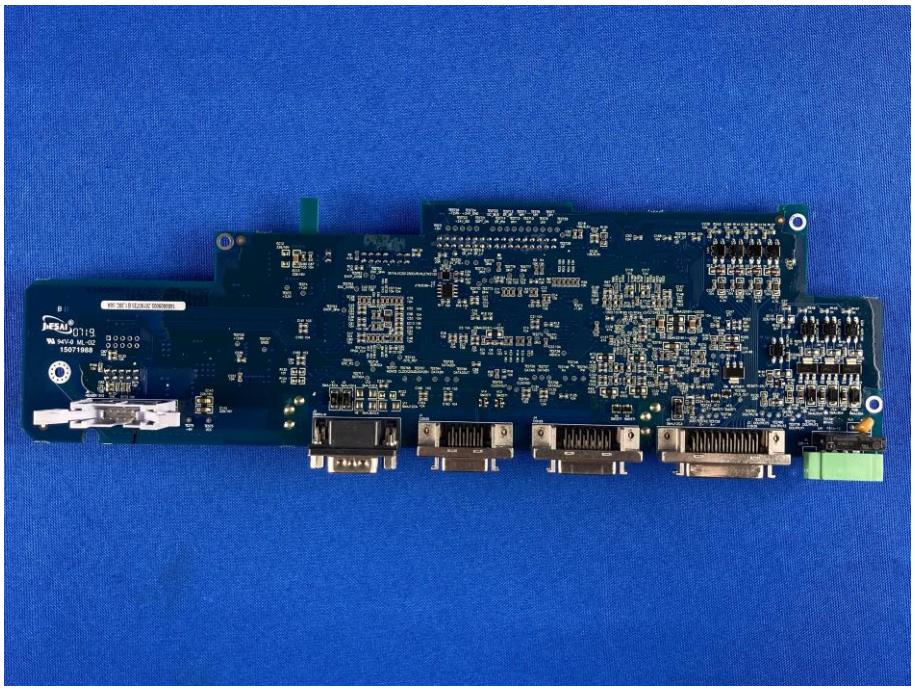
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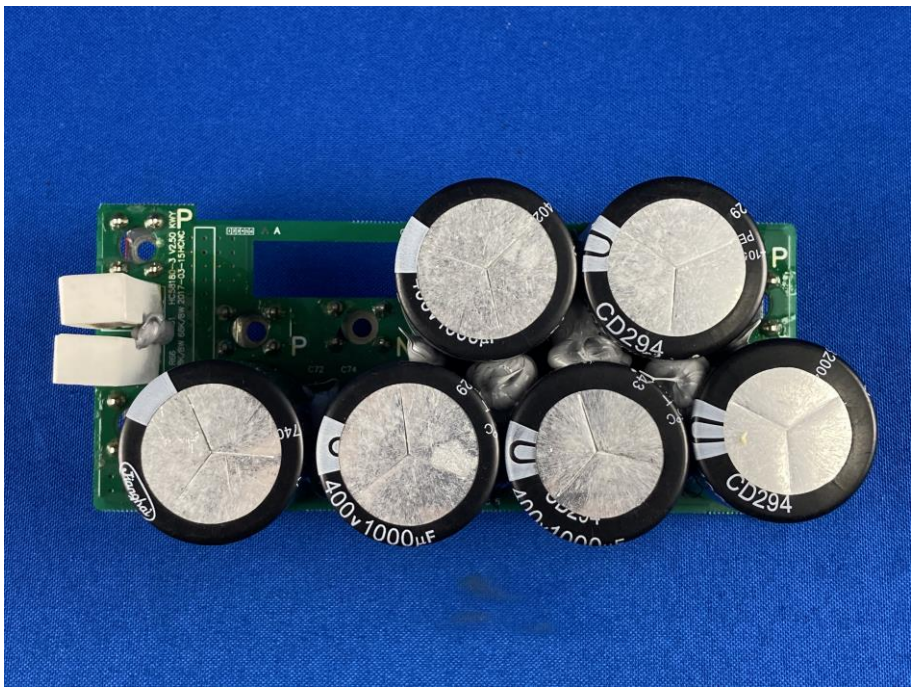


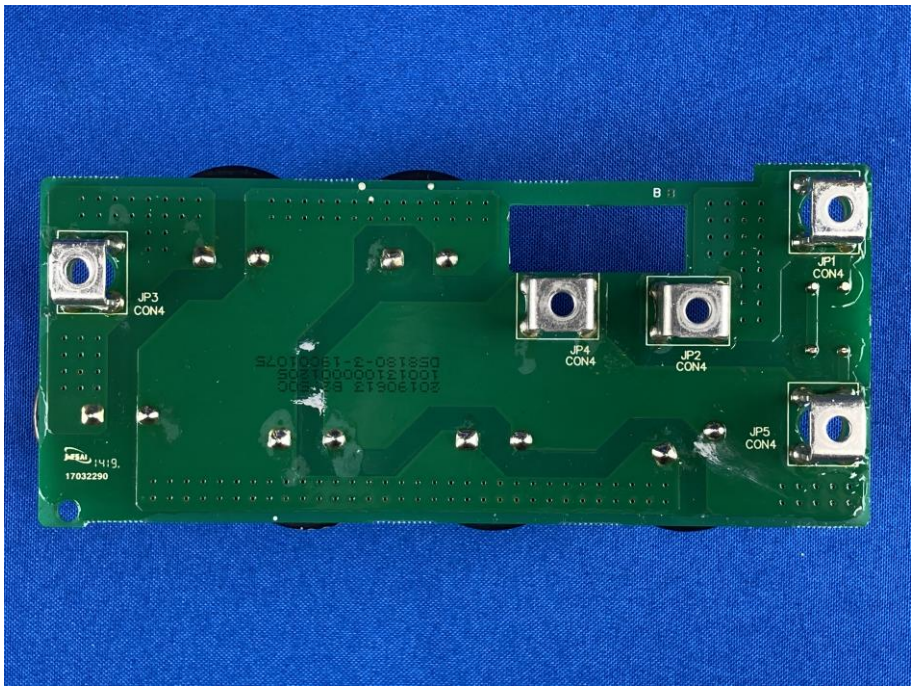
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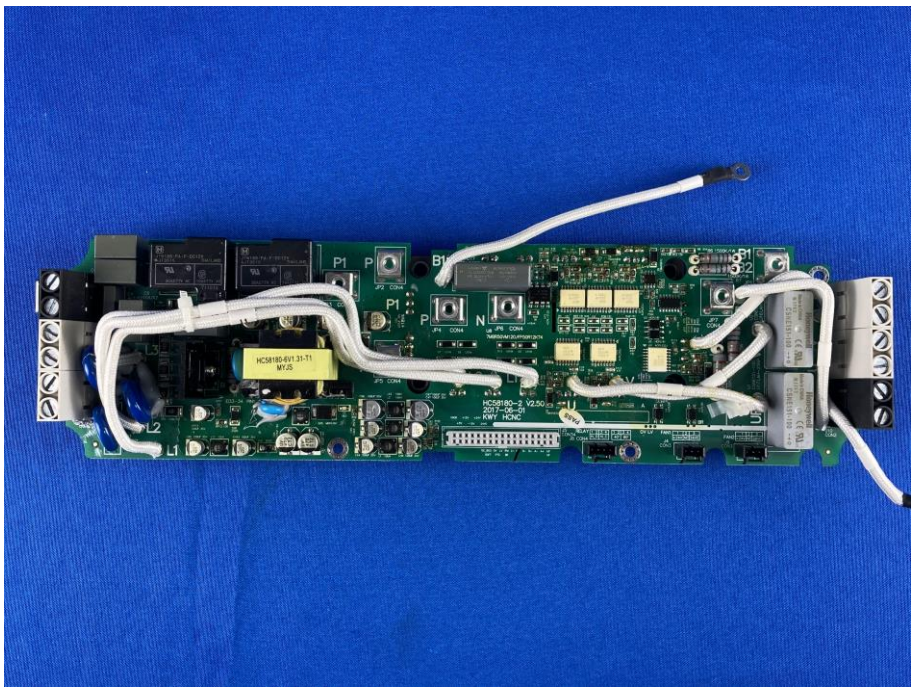


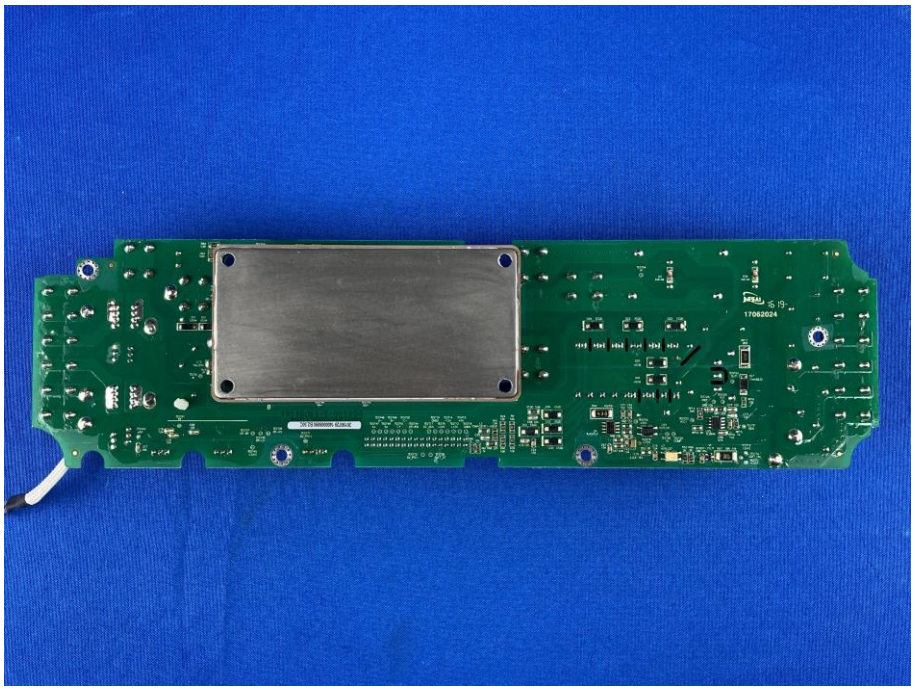
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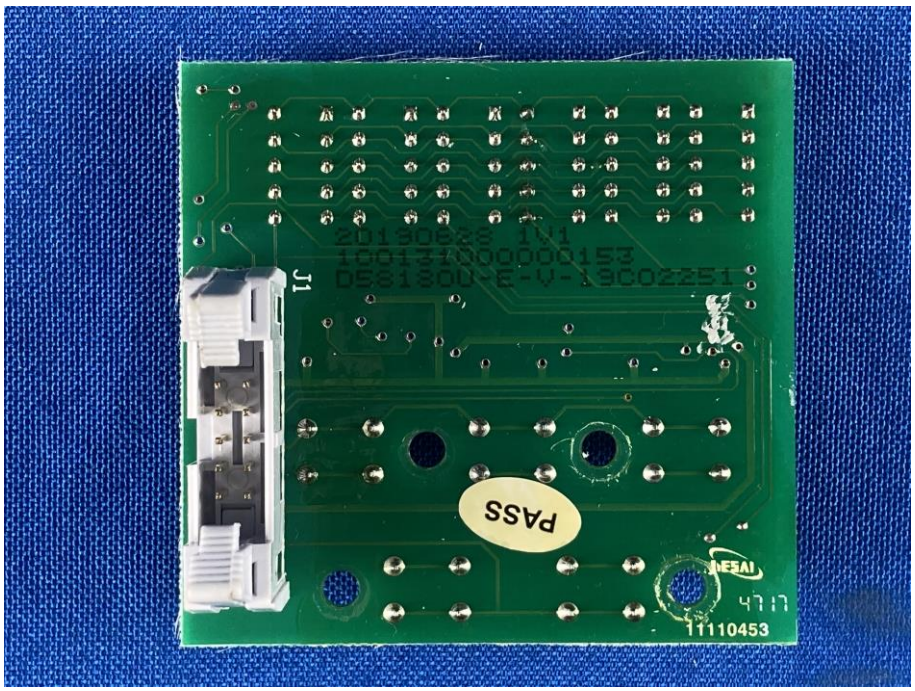


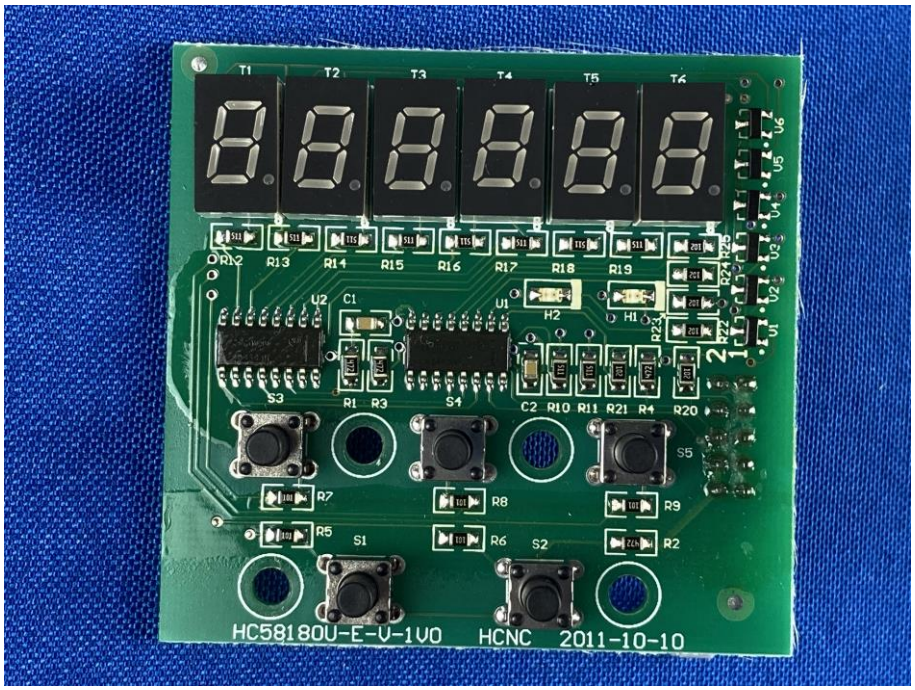
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