

HUNTER FAN COMPANY, INC. TEST REPORT

SCOPE OF WORK

EMC Testing – one Industrial Fan and Driver System, Model(s): 72260

REPORT NUMBER

104246145DAL-002

ISSUE DATE

9-July-2020

PAGES

50

DOCUMENT CONTROL NUMBER

Non-Specific EMC Report Shell Rev. December 2017
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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104246145DAL-002

Project Number: G104246145

Report Issue Date: 9-July-2020

Model(s) Tested: 72260

**Model(s) Not Tested but
declared equivalent by the
client:** 72255, 72256, 72257, 72258, 72259, 72261, 72262, 72263, 72264,
72273, 72274, 72275, 72276, 72277, 72278, 72279, 72280, 72281,
72282, 72283, 72284, 72285, 72286, 72287, 72288.

Standards: IEC 61800-3 Edition 2.1 2012-03

Adjustable speed electrical power drive systems –
Part 3: EMC requirements and specific test methods

Tested by:
Intertek Testing Services NA, Inc.
1809 10th Street Suite 400
Plano, TX 75074
USA

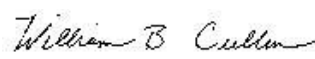
Client:
Hunter Fan Company, Inc.
7130 Goodlett Farms Pkwy Ste 400
Cordova, TN 38016-4991
USA

Report prepared by



Reshar Rouse
Compliance Investigator

Report reviewed by



William Cullen
Engineering Supervisor

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	
4	Description of Equipment Under Test and Variant Models	
5	System Setup and Method	
6	Radiated Emissions (CISPR 16-1-1:2010)	Pass
7	AC Mains Conducted Emissions (CISPR 16-1-1:2010)	Pass
8	Harmonics (IEC 61000-3-2:2014)	N/A
9	Flicker (IEC 61000-3-3:2013)	Pass
10	Electro-Static Discharge Immunity Test (IEC 61000-4-2:2008)	Pass
11	Radiated, Radio-Frequency, Electromagnetic Immunity (IEC 61000-4-3 ed3.0 (with A1:2007+A2:2010))	Pass
12	Electrical Fast Transient/Burst Immunity Test (IEC 61000-4-4 ed3.0 (2012-04))	Pass
13	Immunity to Surges (IEC 61000-4-5 ed3.0 (2014-05))	Pass
14	Conducted, Radio-Frequency, Electromagnetic Immunity Test (IEC 61000-4-6 ed.4 (2013))	Pass
15	Voltage Dips/Interruptions Immunity Test (IEC 61000-4-11:2004)	Pass

Section	Test full name	Result
16	Revision History	

3 Client Information

This EUT was tested at the request of:

Client: Hunter Fan Company, Inc.
7130 Goodlett Farms Pkwy Ste 400
Cordova, TN 38016-4991
USA

Contact: Julian Martin
Telephone: (901) 248-2810
Email: jmartin@hunterfan.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Hunter Fan Company, Inc.
7130 Goodlett Farms Pkwy Ste 400
Cordova, TN 38016-4991
USA

Equipment Under Test				Sample ID
Description	Manufacturer	Model Number	Serial Number	
One Industrial Fan and Driver System	Hunter Fan Company, Inc.	Titan Fan System	---	DAL2003041703-001

Receive Date:	4-17-2020
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The Hunter Fan Company, Inc. Industrial Fan and Driver System is Fan & Driver.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
240 VAC	5A	50/60 Hz	Single Phase

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	EUT was fully operational and running at max RPM speed

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

5 System Setup and Method

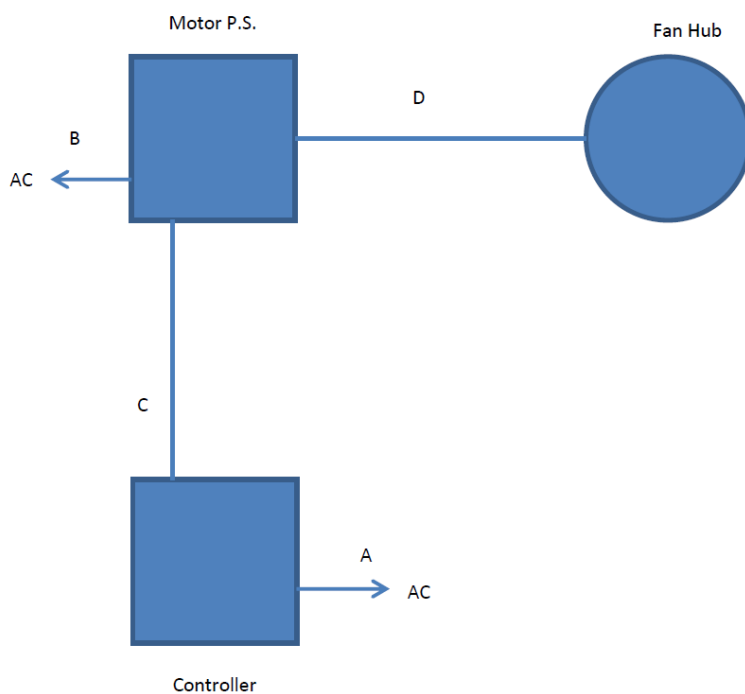
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
A	AC Power Controller	<3	No	No	Controller
B	AC Power Fan PS	<3	No	No	Fan PS
C	COMM Interface Cable	>3	No	No	Fan PS
D	COMM 1 Interface Cable	<3	No	No	Fan Hub

Support Equipment			
Description	Manufacturer	Model Number	Serial Number

5.1 Method:

Configuration as required by IEC 61800-3

5.2 EUT Block Diagram:



5.3 EUT Performance Criteria and Monitoring:

Performance as required by IEC 61800-3

Product Specific Performance:

No.	Description
1	Fan speed should remain steady at selected speed

Description of how performance was observed during testing:

No.	Description
1	Visually on Fan Hub and Controller Display

General notes:

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

72255, 72256, 72257, 72258, 72259, 72261, 72262, 72263, 72264, 72273, 72274, 72275, 72276, 72277, 72278, 72279, 72280, 72281, 72282, 72283, 72284, 72285, 72286, 72287, 72288.

6 Radiated Emissions

6.1 Method

Tests are performed in accordance with CISPR 11.

TEST SITE: 3m SAC

Site Designation: The Panashield 3 meter Semi Anechoic Chamber has a bore sight antenna and a 2 meter turntable with a 4400lbs capability.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 3m	10kHz-30 MHz	4.2 dB	N/A dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 1m	1-18 GHz	3.9 dB	5.5 dB
Radiated Emissions, 3m	1-18 GHz	3.5 dB	5.5 dB
Radiated Emissions, 1m	18-26 GHz	3.9 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
4134	RF Cable	MegaPhase	F520-N1N1-118	17174601003	10/29/2019	10/29/2020
4135	RF cable	MegaPhase	F520-N1N1-118	17174601004	10/29/2019	10/29/2020
4138	RF cable	MegaPhase	F520-N1N1-276	17174602001	10/29/2019	10/29/2020
1179	Preamplifier 1-1000MHz 33dB Typical Gain	Com Power	PAM-103	441028	12/19/2019	12/18/2020
3005	EMI Receiver- Freq Range 20Hz to 40GHz	Rhode & Schwarz	ESU 40	100136	3/24/2020	3/24/2021
188	Turntable/Tower Controller	Sunol	SC99V	020201-1	VBU	VBU
3566	Mast controller	ETS Lindgren	2090	205641	VBU	VBU
1324	Antenna - 20 MHz to 6 GHz	Sunol Sciences	JB6	A101612	1/6/2020	1/6/2021
2943	Ambient Data Logger	Extech	SD700	781533	2/21/2020	2/21/2021
4207	Humidity and Temperature	Extech	445580	1097752	1/20/2020	1/20/2021

Software Utilized:

Name	Manufacturer	Asset #	Version
Total Integrated Laboratory Environment	ETS-Lindgren	1330	6.0

Profile

Name	Manufacturer	Asset #	Version/Rev
Master Radiated Emissions	ETS-Lindgren	1330-004	11/11

6.3 Results:

The sample tested was found to Comply.

6.4 Setup Photographs:



Figure 6-1 Radiated Emissions Test Setup

6.5 Plots/Data:

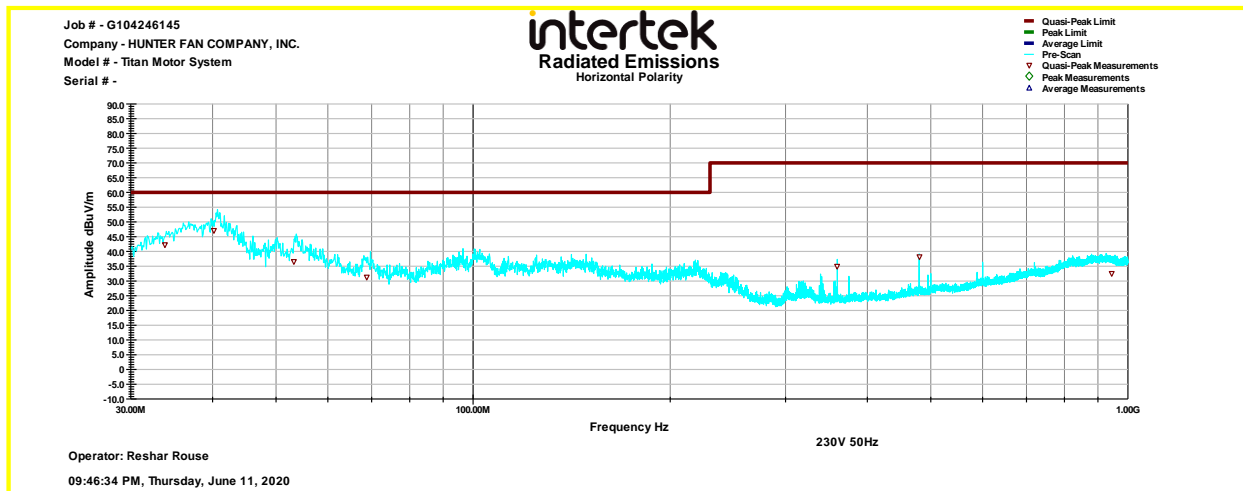


Figure 6-2 Radiated Emissions 400V 50Hz Horizontal Polarity

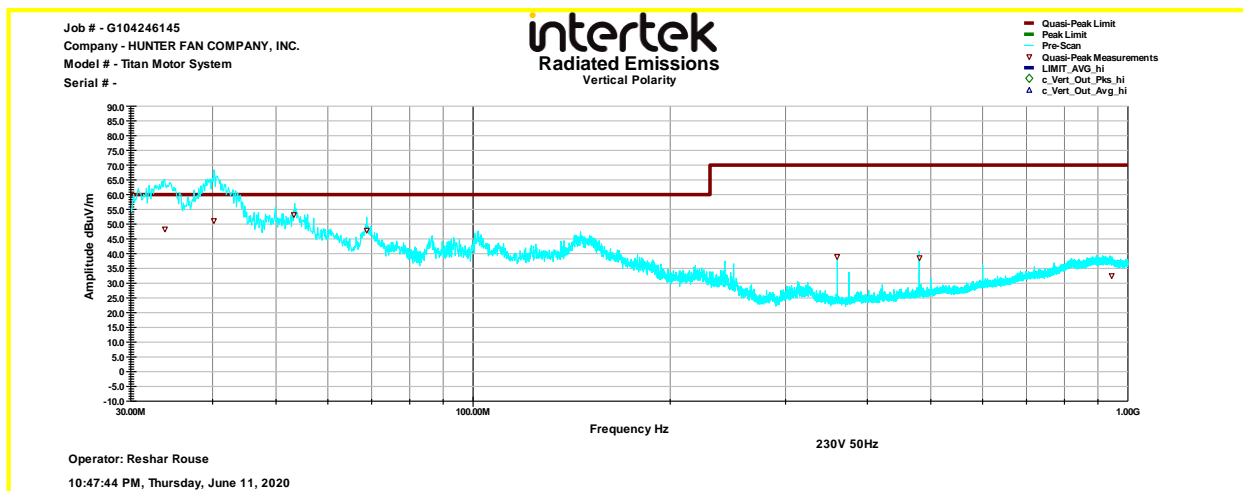


Figure 6-3 Radiated Emissions 400V 50Hz Vertical Polarity

Table 6-1 Radiated Emissions 230V 50Hz Quasi-Peak Measurements 3m Horizontal

Freq. MHz	Antenna Height cm	Azimuth degrees	Receiver Reading dBuV/m	Antenna Factor dB	PreAmp Factor dB	Cable Factor dB	Final QP Reading dBuV/m	Limit QP dBuV/m	Margin QP dB
33.81	0	223	51.6	25.4	35.6	0.9	42.2	60	-17.8
40.25	0	208	61.1	20.6	35.6	1	47	60	-13
53.35	0	206	57	13.8	35.5	1.1	36.4	60	-23.6
68.81	0	204	51.5	14.2	35.6	1.3	31.4	60	-28.6
360.01	0	90	45.2	21.6	35	3	34.9	70	-35.1
480.01	0	149	45.4	24.1	34.7	3.5	38.3	70	-31.7
945.25	0	355	29.9	29.9	32.3	5	32.4	70	-37.6

Table 6-2 Radiated Emissions 230V 50Hz Quasi-Peak Measurements 3m Vertical

Freq. MHz	Antenna Height cm	Azimuth degrees	Receiver Reading dBuV/m	Antenna Factor dB	PreAmp Factor dB	Cable Factor dB	Final QP Reading dBuV/m	Limit QP dBuV/m	Margin QP dB
33.77	161	54	57.7	25.4	35.6	0.9	48.4	60	-11.6
40.22	161	119	65	20.6	35.6	1	51	60	-9
53.36	165	189	73.8	13.8	35.5	1.1	53.2	60	-6.8
68.83	150	60	67.9	14.2	35.6	1.3	47.8	60	-12.2
360.01	154	93	49.1	21.6	35	3	38.8	70	-31.2
480	205	38	45.8	24.1	34.7	3.5	38.7	70	-31.3
945.18	210	310	29.9	29.9	32.3	5	32.4	70	-37.6

Test Personnel: Reshar Rouse RJR

Test Date: June 11, 2020

Supervising/Reviewing

Engineer:

(Where Applicable)

Product Standard: IEC 61800-3

Limit Applied: CAT 3

Input Voltage: 230V 50Hz

Ambient Temperature: 22.5°C

Pretest Verification w/

Relative Humidity: 49.1%

Ambient Signals or

Atmospheric Pressure: 999.0mbars

BB Source: Yes

Deviations, Additions, or Exclusions: None

7 AC Mains Conducted Emissions

7.1 Method

Tests are performed in accordance with CISPR 11.

TEST SITE: Vertical Ground Reference Plane

Site Designation: The Vertical Ground Reference Plane is Intertek built Vertical and Horizontal Planes greater than 2m X 2m.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
AC Line Conducted Emissions	9 kHz - 150 kHz	3.43 dB	3.8dB
AC Line Conducted Emissions	150 kHz - 30 MHz	2.85 dB	3.4dB
Telco Port Emissions	150 kHz - 30 MHz	1.92 dB	5.0dB
AC Line Conducted Emissions with a Current Probe	150 kHz - 30 MHz	1.8	2.9

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculations

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
4240	LISN	Com Power	LI-220	192056	2/14/2020	2/14/2021
4134	RF Cable	MegaPhase	F520-N1N1-118	17174601003	10/29/2019	10/29/2020
4201	7 Meter 0-18 GHz RF Cable	Maury Microwave	UC-N-MM-276	1741481	4/13/2020	4/13/2021
77	EMI Receiver rated: 10KHz-7GHz	Rohde & Schwarz	ESI 7	100044	11/27/2019	11/27/2020
3611	Transient Limiter	Hewlett-Packard	11947A	3107A01975	6/14/2019	6/14/2020
4333	Ambient Data Logger	Extech	SD700	A.086409	4/24/2020	4/24/2021

Software Utilized:

Name	Manufacturer	Asset #	Version
Total Integrated Laboratory Environment	ETS-Lindgren	1330	6.0

Profile

Name	Manufacturer	Asset #	Version/Rev
Master Conducted Emissions	ETS-Lindgren	1330-002	Ver11 Rev12

7.3 Results:

The sample tested was found to Comply.

7.4 Setup Photographs:



Figure 7-1 Conducted Emissions Test Setup

7.1 Plots/Data:

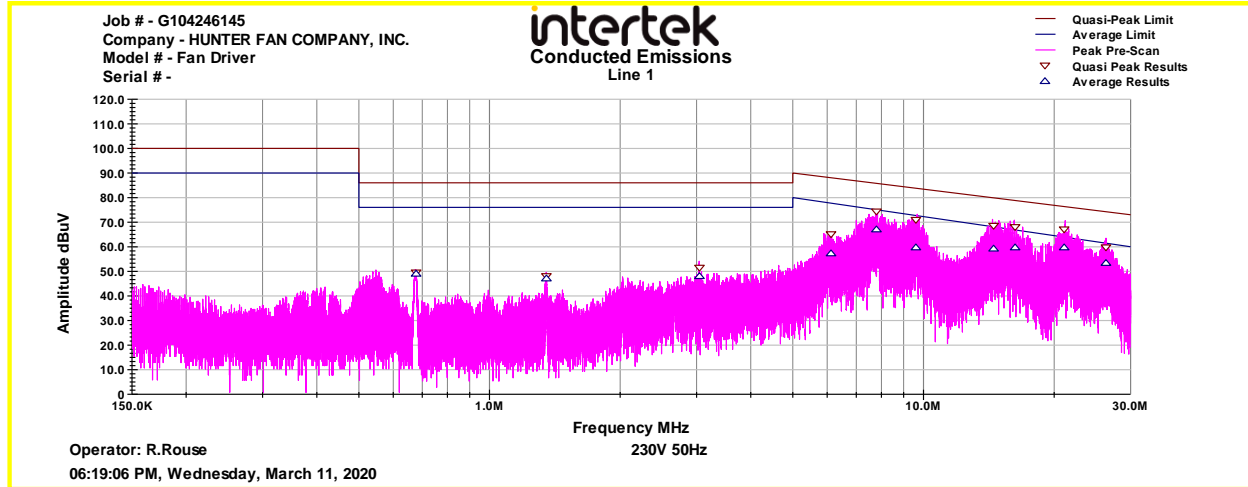


Figure 7-2 Conducted Emissions Fan Controller Line 1

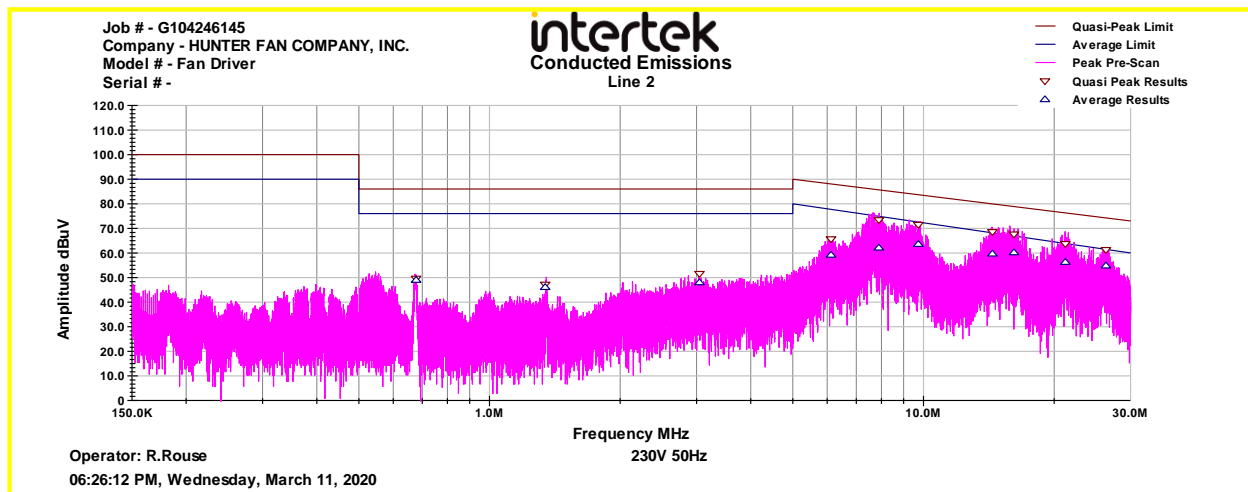


Figure 7-3 Conducted Emissions Fan Controller Line 2

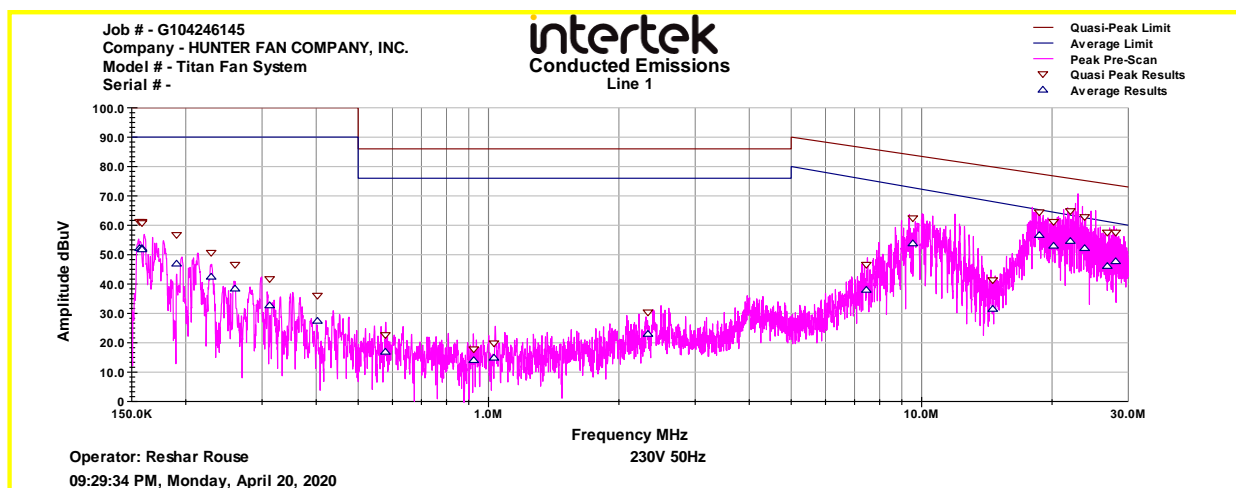


Figure 7-4 Conducted Emissions 230V 50Hz Line 1

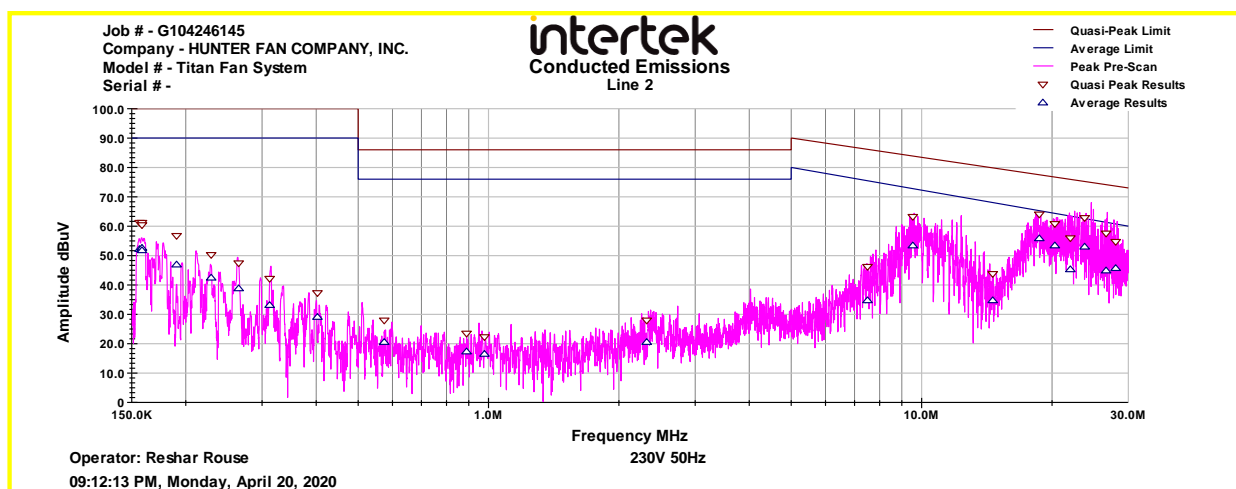


Figure 7-5 Conducted Emissions 230V 50Hz Line 2

Table 7-1 Conducted Emissions Fan Controller Line 1

Freq. MHz	QP Reading dBuV	Avg Reading dBuV	Cable Factor dB	Limiter Factor dB	Lisn Factor dB	Final QP Reading dBuV	Limit QP dBuV	Margin QP dB	Final Avg dBuV	Limit Avg dBuV	Margin Avg dB
0.68	39.106	38.928	0.260	9.930	0.030	49.326	86.000	-36.674	49.147	76.000	-26.853
1.35	37.786	36.780	0.282	9.922	0.048	48.038	86.000	-37.962	47.032	76.000	-28.968
3.04	41.087	38.047	0.308	9.910	0.042	51.347	86.000	-34.653	48.307	76.000	-27.693
6.10	54.615	46.923	0.331	9.901	0.030	64.877	88.107	-23.230	57.185	77.773	-20.588
7.79	64.170	56.640	0.339	9.902	0.020	74.431	85.794	-11.363	66.901	75.051	-8.150
9.62	60.656	49.506	0.346	9.900	0.010	70.912	83.791	-12.879	59.762	72.696	-12.934
14.46	58.370	48.811	0.359	9.895	0.030	68.654	79.922	-11.268	59.095	68.143	-9.048
16.21	57.518	49.336	0.378	9.898	0.050	67.843	78.840	-10.996	59.661	66.870	-7.209
21.15	56.275	49.374	0.439	9.891	0.290	66.895	76.318	-9.423	59.995	63.904	-3.909
26.36	49.098	42.624	0.490	9.894	0.300	59.781	74.228	-14.447	53.307	61.445	-8.138

Table 7-2 Conducted Emissions Fan Controller Line 2

Freq. MHz	QP Reading dBuV	Avg Reading dBuV	Cable Factor dB	Limiter Factor dB	Lisn Factor dB	Final QP Reading dBuV	Limit QP dBuV	Margin QP dB	Final Avg dBuV	Limit Avg dBuV	Margin Avg dB
0.68	39.501	38.74	0.26	9.930	0.01	49.704	86.00	-36.30	48.94	76.00	-27.06
1.35	36.973	35.66	0.28	9.922	0.03	47.206	86.00	-38.79	45.89	76.00	-30.11
3.04	41.268	37.75	0.31	9.910	0.03	51.516	86.00	-34.48	48.00	76.00	-28.00
6.11	55.285	49.05	0.33	9.901	0.01	65.527	88.10	-22.57	59.29	77.77	-18.48
7.87	63.330	52.07	0.34	9.901	0.00	73.571	85.70	-12.13	62.31	74.94	-12.62
9.72	60.937	53.46	0.35	9.900	0.01	71.193	83.70	-12.50	63.71	72.58	-8.87
14.43	58.018	49.44	0.36	9.896	0.04	68.312	79.95	-11.63	59.73	68.17	-8.44
16.19	57.440	49.75	0.38	9.898	0.05	67.766	78.85	-11.08	60.07	66.88	-6.81
21.20	53.078	45.92	0.44	9.892	0.22	63.630	76.29	-12.66	56.48	63.87	-7.40
26.36	50.383	44.05	0.49	9.894	0.23	60.998	74.23	-13.23	54.66	61.44	-6.78

Table 7-3 Conducted Emissions 230V 50Hz Line 1

Freq. MHz	QP Reading dBuV	Avg Reading dBuV	Cable Factor dB	Limiter Factor dB	Lisn Factor dB	Final QP Reading dBuV	Limit QP dBuV	Margin QP dB	Final Avg dBuV	Limit Avg dBuV	Margin Avg dB
0.16	50.64	41.622	0.175	9.93	0.518	61.263	100	-38.737	52.246	90	-37.754
0.16	50.52	41.637	0.176	9.93	0.518	61.144	100	-38.856	52.26	90	-37.74
0.16	50.52	41.637	0.176	9.93	0.518	61.144	100	-38.856	52.26	90	-37.74
0.16	50.52	41.637	0.176	9.93	0.518	61.144	100	-38.856	52.26	90	-37.74
0.16	50.001	41.247	0.176	9.93	0.517	60.624	100	-39.376	51.87	90	-38.13
0.19	46.14	36.362	0.184	9.93	0.508	56.762	100	-43.238	46.984	90	-43.016
0.23	39.778	31.953	0.191	9.93	0.5	50.398	100	-49.602	42.574	90	-47.426
0.26	36.053	27.926	0.196	9.93	0.494	46.673	100	-53.327	38.546	90	-51.454
0.31	31.002	22.215	0.204	9.93	0.485	41.621	100	-58.379	32.833	90	-57.167
0.4	25.496	17.021	0.214	9.93	0.473	36.113	100	-63.887	27.637	90	-62.363
0.58	12.039	6.268	0.228	9.93	0.455	22.653	86	-63.347	16.882	76	-59.118
0.92	7.357	3.471	0.247	9.93	0.382	17.917	86	-68.083	14.031	76	-61.969
1.03	9.044	4.25	0.252	9.929	0.361	19.586	86	-66.414	14.792	76	-61.208
2.33	19.852	12.504	0.285	9.91	0.266	30.313	86	-55.687	22.965	76	-53.035
7.46	36.03	27.628	0.332	9.905	0.246	46.514	86.208	-39.694	38.111	75.539	-37.428
9.56	51.944	43.346	0.342	9.9	0.25	62.436	83.855	-21.419	53.837	72.77	-18.933
14.59	30.67	21.014	0.359	9.894	0.25	41.173	79.841	-38.668	31.517	68.048	-36.531
18.66	53.884	46.258	0.401	9.89	0.26	64.435	77.504	-13.07	56.808	65.299	-8.491
20.23	50.597	42.427	0.416	9.89	0.262	61.166	76.737	-15.571	52.996	64.397	-11.401
22.09	54.245	43.891	0.433	9.899	0.27	64.847	75.904	-11.057	54.492	63.416	-8.924
23.79	52.158	41.553	0.446	9.89	0.27	62.764	75.201	-12.437	52.159	62.589	-10.429
26.81	46.866	35.686	0.469	9.898	0.28	57.513	74.066	-16.553	46.333	61.254	-14.921
28.06	46.99	36.919	0.477	9.9	0.28	57.647	73.635	-15.988	47.577	60.747	-13.17

Table 7-4 Conducted Emissions 230V 50Hz Line 1

Freq. MHz	QP Reading dBuV	Avg Reading dBuV	Cable Factor dB	Limiter Factor dB	Lisn Factor dB	Final QP Reading dBuV	Limit QP dBuV	Margin QP dB	Final Avg dBuV	Limit Avg dBuV	Margin Avg dB
0.16	50.425	41.68	0.18	9.93	0.52	61.048	100	-38.95	52.31	90	-37.69
0.16	50.546	41.85	0.18	9.93	0.52	61.169	100	-38.83	52.47	90	-37.53
0.16	50.546	41.85	0.18	9.93	0.52	61.169	100	-38.83	52.47	90	-37.53
0.16	50.546	41.85	0.18	9.93	0.52	61.169	100	-38.83	52.47	90	-37.53
0.16	49.853	41.37	0.18	9.93	0.52	60.476	100	-39.52	52	90	-38
0.19	46.212	36.26	0.18	9.93	0.51	56.834	100	-43.17	46.88	90	-43.12
0.23	39.748	31.9	0.19	9.93	0.5	50.369	100	-49.63	42.53	90	-47.47
0.26	36.562	28.28	0.2	9.93	0.49	47.182	100	-52.82	38.9	90	-51.1
0.31	31.669	22.47	0.2	9.93	0.48	42.288	100	-57.71	33.09	90	-56.91
0.4	26.646	18.45	0.21	9.93	0.47	37.263	100	-62.74	29.06	90	-60.94
0.58	17.104	10.08	0.23	9.93	0.46	27.718	86	-58.28	20.7	76	-55.3
0.89	13.062	6.73	0.25	9.93	0.39	23.627	86	-62.37	17.29	76	-58.71
0.98	11.669	6.15	0.25	9.93	0.37	22.22	86	-63.78	16.7	76	-59.3
2.31	17.304	10.07	0.28	9.91	0.27	27.765	86	-58.24	20.53	76	-55.47
7.48	35.512	24.24	0.33	9.905	0.25	45.996	86.17	-40.18	34.73	75.5	-40.77
9.54	52.643	43.14	0.34	9.9	0.25	63.135	83.87	-20.74	53.63	72.79	-19.16
14.58	33.062	24.25	0.36	9.894	0.25	43.565	79.85	-36.28	34.75	68.05	-33.3
18.68	53.403	45.29	0.4	9.89	0.26	63.954	77.5	-13.54	55.84	65.29	-9.45
20.27	50.244	42.71	0.42	9.89	0.26	60.814	76.72	-15.91	53.28	64.38	-11.09
22.1	45.38	34.55	0.43	9.899	0.27	55.982	75.9	-19.92	45.15	63.41	-18.26
23.82	52.147	42.26	0.45	9.89	0.27	62.753	75.19	-12.43	52.86	62.57	-9.71
26.74	46.912	34.1	0.47	9.897	0.28	57.557	74.09	-16.53	44.74	61.28	-16.54
28.01	43.952	35.08	0.48	9.9	0.28	54.61	73.65	-19.04	45.74	60.77	-15.03

7.2

Test Personnel:	Reshar Rouse RJR	Test Date:	April 20, 2020
Supervising/Reviewing Engineer:			
(Where Applicable)		Limit Applied:	CAT 3
Product Standard:	IEC 61800-3	Ambient Temperature:	23.1°C
Input Voltage:	230V 50Hz	Relative Humidity:	45.6%
Pretest Verification w/ Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	993.1mbars

Deviations, Additions, or Exclusions: None

8 Harmonics

NA

This fan is considered professional equipment and has a rated power greater than over 1kW with blades attached, this fan is exempt from the IEC 61000-3-2 Harmonics requirements as stated in Section 4 and 7, respectively.

9 Flicker

9.1 Method

Tests are performed in accordance with IEC 61000-3-3.

TEST SITE: Immunity Room

Measurement Uncertainty

Measurement	Parameter	Expanded Uncertainty (k=2)	Permitted Error
Flicker	Pst	0.4 %	±8.0%
Flicker	dc	0.4%	±8.0%

As shown in the table above our Expanded Measurement Uncertainty for Pst and dc U_{lab} is less than the corresponding measurement error allowed by IEC 61000-3-3, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required. There are currently no U_{CISPR} reference values in CISPR 16 for Flicker.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
4333	Ambient Data Logger	Extech	SD700	A.0864 32	4/5/2019	4/5/2020
1496	Model MX30K0C4Y20400 & CIC-PC-PCX Power Analyzer	Ametek	MX30K0C4Y 20400	1247A0 2352	11/13/2018	11/13/2019

Software Utilized:

Name	Manufacturer	Version
CTSMXL2	California Instruments Corp.	2.13.1

9.3 Results:

The sample tested was found to Comply.

9.4 Setup Photographs:



Figure 9-1 Flicker Test Setup

9.5 Plots/Data:

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: Titan System Fan Controller

Tested by: Reshar Rouse

Test category: All parameters (European limits)

Test Margin: 100

Test date: 3/10/2020

Start time: 8:22:30 PM

End time: 10:24:03 PM

Test duration (min): 120

Data file name: CTSMXL_F-000087.cts_data

Comment: 230V 50Hz

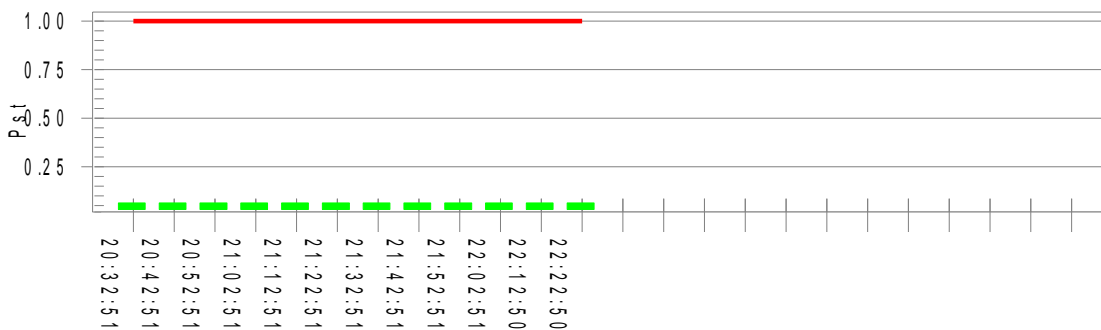
Customer: Hunter Fan

Test Result: Pass

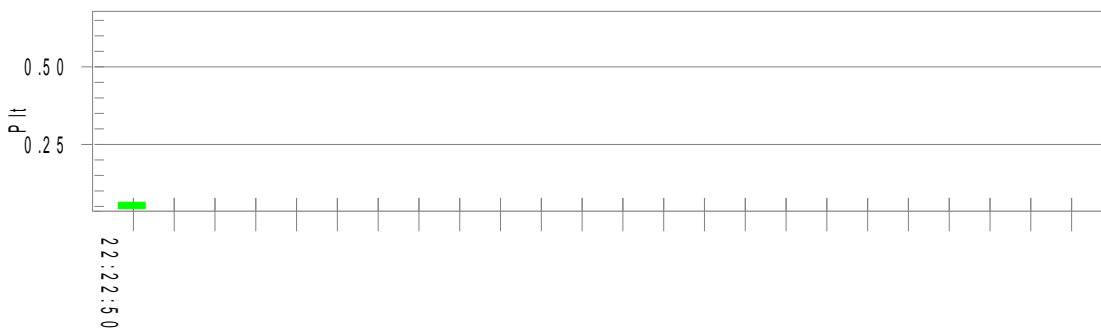
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.31

T-max (mS):

0.0

Test limit (mS):

500.0

Pass

Highest dc (%):

0.00

Test limit (%):

3.30

Pass

Highest dmax (%):	0.06	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.064	Test limit:	0.650	Pass

Test Personnel: Reshar Rouse RJR

Test Date: March 10, 2020

Supervising/Reviewing

Engineer:

(Where Applicable)

Limit Applied:

Product Standard: IEC 61800-3

A

Input Voltage: 230V 50Hz

Ambient

Temperature: 23.3°C

Relative Humidity: 46.9%

Pretest Verification w/

Atmospheric

Artifact: NA

Pressure: 994.2mbars

Deviations, Additions, or Exclusions: None

10 Electrostatic Discharge Immunity Test

10.1 Method

Tests are performed in accordance with IEC 61000-4-2.

TEST SITE: Vertical Ground Reference Plane

Site Designation: The Vertical Ground Reference Plane is Intertek built Vertical and Horizontal Planes greater than 2m X 2m.

10.2 Test Equipment Used:

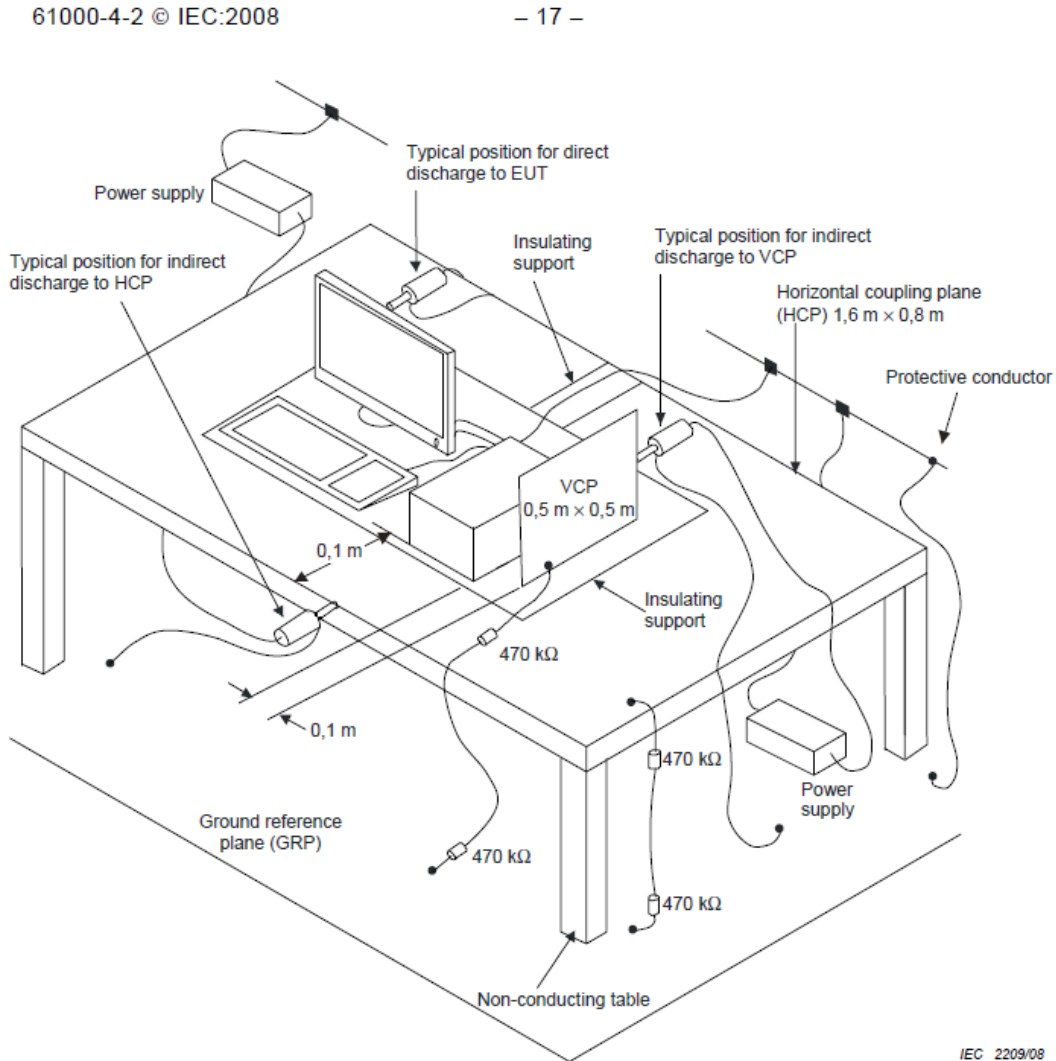
Software Utilized:

Name	Manufacturer	Version
None		

10.3 Results:

The sample tested was found to Comply.

10.4 Setup Photographs:



10.5 Data:

Environmental phenomenon	Test Specification	Basic Standard	Remarks	Performance criterion required
Electrostatic discharge	±2,4 kV (contact discharge) ±2, 4, 8 kV (air discharge)	IEC 61000-4-2	<i>ESD was applied to areas accessible to operators during normal EUT operation, such as enclosure, accessible screw heads, indicator lights and buttons, etc..</i>	A

Test Personnel: Reshar Rouse RJR
Supervising/Reviewing Engineer:
(Where Applicable)
Product Standard: IEC 61800-3
Input Voltage: 400V 50Hz
Waveform Verified on Oscilloscope: NA
470k x 2 Strap(s)
Verified: 940kΩ

Test Date: March 13, 2020
Required Performance: B
Test Levels: See Table Above
Ambient Temperature: 22.3°C
Relative Humidity: 48.9%
Atmospheric Pressure: 995.0mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

11 Radiated, radio-frequency, electromagnetic field immunity test

11.1 Method

Tests are performed in accordance with IEC 61000-4-3.

TEST SITE: Compact Chamber.

Site Designation: The Compact Chamber is a Braden Shielding Systems 3meter Semi Anechoic Chamber for performing a 16 point calibrated field immunity test.

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
4743	Power Meter	Boonton	4541	14364	10/14/2019	10/14/2020
4742	Peak Power Sensor	Boonton	56318	333	10/14/2019	10/14/2020
569	Signal Generator	Rhode & Schwarz	SMR20	101111	1/8/2020	1/8/2021
4286	Power Amplifier 100watts 700MHz to 6GHz	Com Power	ARI-6000- 100W	1005	VBU	VBU
3555	Broadband amplifier (80MHz - 1GHz) OLD Den ID 18779	Amplifier Research	200W1000M 7A	16049	VBU	VBU
3613	Directional Coupler (80-1000 MHz) Old Den 18762	Werlatone	C5982	10385	8/26/2019	8/26/2020
1075	Bi-Directional Coupler	Werlatone	C8000-102	2426	4/30/2020	4/30/2021
4471	Laser Powered EMF Field Probe	ETS LINDGREN	HI-6113	219145	1/14/2020	1/14/2021
207	Antenna	Amplifier Research	AT5080	306847	VBU	VBU
3568	Bore Sight Antenna Mast	Maury Microwave	US-N-MM- 196	16 07 151	VBU	VBU
3044	2 Meter RF Cable 18GHz EMC lab	Maury Microwave	UC-N-MM- 78	14.01.3 91	8/14/2019	8/14/2020
4199	2 Meter 0-18GHz RF Cable	Maury Microwave	UC-N-MM- 78	172811 6	4/14/2020	4/14/2021
271	Double Ridge Guide Horn Antenna	A H Systems	SAS-571	787	VBU	VBU
4333	Ambient Data Logger	Extech	SD700	A.0864 09	4/24/2020	4/24/2021

Software Utilized:

Name	Manufacturer	Asset #	Version
Total Integrated Laboratory Environment	ETS-Lindgren	1330	6.0

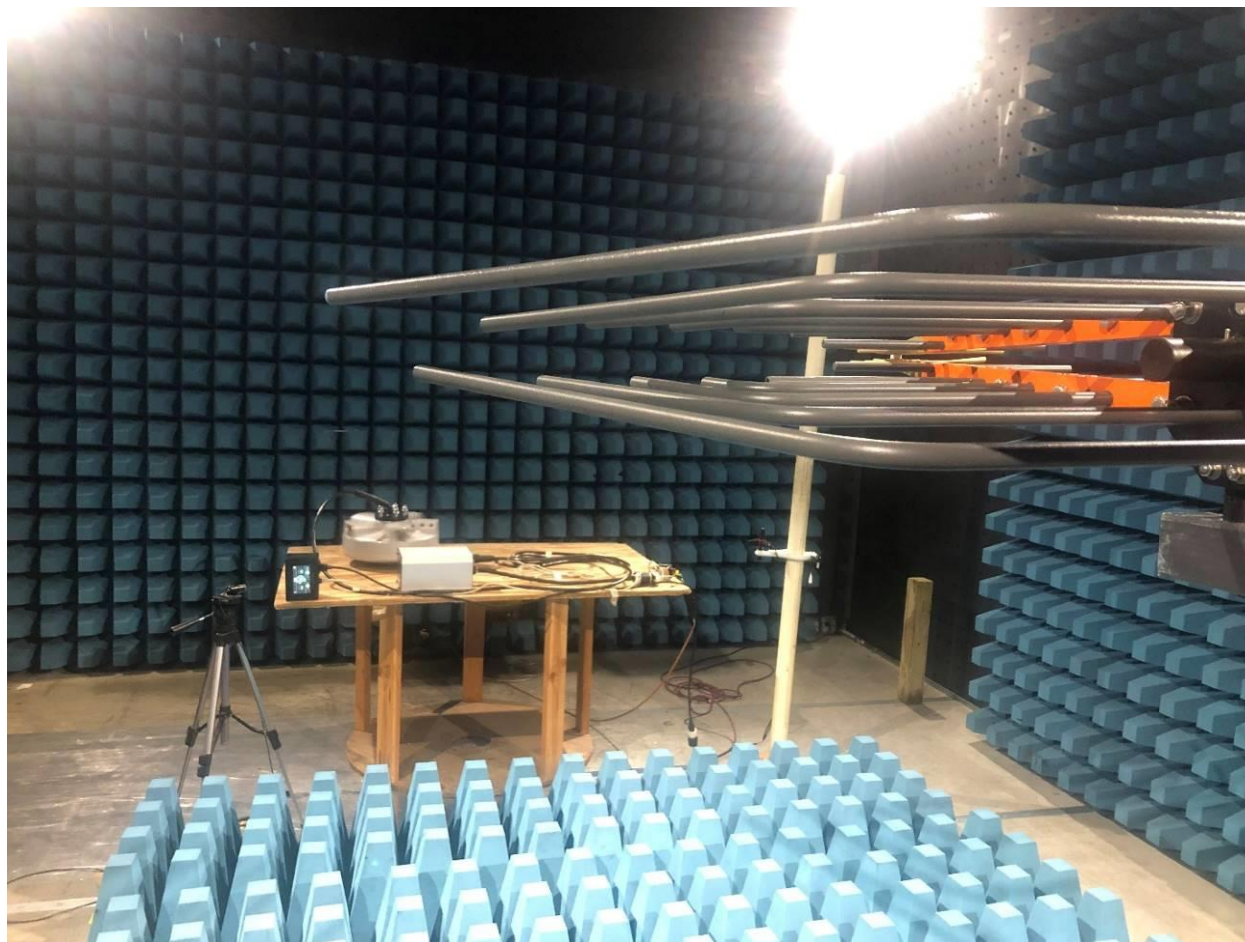
Profile

Name	Manufacturer	Asset #	Version/Rev
Master Radiated Immunity	ETS-Lindgren	1330-005	11/7

11.1 Results:

The sample tested was found to Comply.

11.2 Setup Photographs:



**Figure 11-1 Radiated Immunity Test Setup
Front**



Figure 11-2 Radiated Immunity Test Setup Rear

11.3 Data:

Field Level (V/m)	Frequency Range MHz	Antenna Polarity, Azimuths and Result Classification							
		Vertical				Horizontal			
		0	90	180	270	0	90	180	270
10	80-1000	A	A	A	A	A	A	A	A
3	1400-2000	A	A	A	A	A	A	A	A
1	2000-2700	A	A	A	A	A	A	A	A

Test Personnel: Reshar Rouse RJR

Supervising/Reviewing

Engineer:

(Where Applicable)

Product Standard: IEC 61800-3

Input Voltage: 230V 50Hz

Field Level Monitored: Yes

Test Date: March 20, 2020

Modulation: 1 kHz

Required

Performance: A

Test Levels: See Table Above

Ambient

Temperature: 23.6°C

Relative Humidity: 47.7%

Atmospheric Pressure: 994.5mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

12 Electrical Fast Transient/Burst Immunity Test

12.1 Method

Tests are performed in accordance with IEC 61000-4-4.

TEST SITE: Vertical Ground Reference Plane

Site Designation: The Vertical Ground Reference Plane is Intertek built Vertical and Horizontal Planes greater than 2m X 2m.

12.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
3721	EMC Pro Surge/EFT Generator OLD DEN ID 18813	Keytech	EMC Pro	9904187	3/19/2020	3/19/2021
4333	Ambient Data Logger	Extech	SD700	A.086409	4/24/2020	4/24/2021

Software Utilized:

Name	Manufacturer	Version
CEWare32	Thermo Electron Corp.	Version 4.00

12.3 Results:

The sample tested was found to Comply.

12.4 Setup Photographs:



Figure 12-1 EFT Test Setup

12.5 Test Data:

Test Point	Coupling Method	Test Voltages, Polarities, and Result Classification									
		0.25kV		0.5kV		1 kV		2 kV		4 kV	
		pos	neg	pos	neg	pos	neg	pos	neg	pos	neg
Fan Power											
Power L1	Direct			A	A	A	A				
Power L2	Direct			A	A	A	A				
Power PE	Direct			A	A	A	A				
Controller Power											
Cable 1	Direct			A	A	A	A				
Cable 2	Direct			A	A	A	A				
Cable 3	Direct			A	A	A	A				
COMM Interface Cable (Close to Controller)	Clamp	A	A	A	A						
COMM 1 Interface Cable (Close TITAN 20 Box)	Clamp	A	A	A	A						

Test Personnel:	Reshar Rouse RJR	Test Date:	March 13, 2020
Supervising/Reviewing Engineer:		Pulse Repetition Frequency::	5kHz
(Where Applicable)		Required Performance	B
Product Standard:	IEC 61800-3	Test Levels:	See Table Above
Input Voltage:	230V 50Hz	Ambient Temperature:	24.3°C
Waveform Verified on Oscilloscope:	Yes	Relative Humidity:	47.5%
		Atmospheric Pressure:	994.5mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

13 Immunity to Surge

13.1 Method

Tests are performed in accordance with IEC 61000-4-5.

TEST SITE: Vertical Ground Reference Plane

Site Designation: The Vertical Ground Reference Plane is Intertek built Vertical and Horizontal Planes greater than 2m X 2m.

13.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
3721	EMC Pro Surge/EFT Generator OLD DEN ID 18813	Keytech	EMC Pro	9904187	3/19/2020	3/19/2021
4333	Ambient Data Logger	Extech	SD700	A.086409	4/24/2020	4/24/2021

Software Utilized:

Name	Manufacturer	Version
CEWare32	Thermo Electron Corp.	Version 4.00

13.3 Results:

The sample tested was found to Comply.

13.4 Setup Photographs:



Figure 13-1 Surge Test Setup

13.5 Test Data:

Test	Test Voltages, Polarities, and Result Classification							
	0.5kV		1kV		2kV		4kV	
	pos	neg	pos	neg	pos	neg	pos	neg
Controller/Display Power								
L1-PE, at 0 deg	A	A	A	A	A	A		
L1-PE, at 90 deg	A	A	A	A	A	A		
L1-PE, at 180 deg	A	A	A	A	A	A		
L1-PE, at 270 deg	A	A	A	A	A	A		
N-PE, at 0 deg	A	A	A	A	A	A		
N-PE, at 90 deg	A	A	A	A	A	A		
N-PE, at 180 deg	A	A	A	A	A	A		
N-PE, at 270 deg	A	A	A	A	A	A		
L1-N, at 0 deg	A	A	A	A				
L1-N, at 90 deg	A	A	A	A				
L1-N, at 180 deg	A	A	A	A				
L1-N, at 270 deg	A	A	A	A				
Fan Power								
L1-PE, at 0 deg					A	A		
L1-PE, at 90 deg					A	A		
L1-PE, at 180 deg					A	A		
L1-PE, at 270 deg					A	A		
N-PE, at 0 deg					A	A		
N-PE, at 90 deg					A	A		
N-PE, at 180 deg					A	A		
N-PE, at 270 deg					A	A		
L1-N, at 0 deg			A	A				
L1-N, at 90 deg			A	A				
L1-N, at 180 deg			A	A				
L1-N, at 270 deg			A	A				

Test Personnel: Reshar Rouse RJR

Test Date: March 13, 2020

Supervising/Reviewing Engineer:

(Where Applicable)

Required Performance: B

Product Standard:

IEC 61800-3 Table 12, 2nd Environment

Test Levels:

See Table Above

Input Voltage:

230V 50Hz

Ambient Temperature:

24.2°C

Waveform Verified on

Relative Humidity:

47.3%

Oscilloscope:

Yes

Atmospheric Pressure:

994.5mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

14 Conducted, radio-frequency, electromagnetic field immunity test

14.1 Method

Tests are performed in accordance with IEC 61000-4-6.

TEST SITE: Vertical Ground Reference Plane

Site Designation: The Vertical Ground Reference Plane is Intertek built Vertical and Horizontal Planes greater than 2m X 2m.

14.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
978	RF Power Meter	Hewlett Packard	437B	3125U2 6228	3/10/2020	3/10/2021
95	Power Sensor	HP	HP 8482H	3318A0 7268	6/13/2019	6/13/2020
83	Signal Generator rated: 9 kHz - 2080 MHz	Rohde & Schwarz	SMY02	DE2366 2	1/7/2020	1/7/2021
3082	Power Amplifier 100watts 150HKz- 250MHz	Com-Power Corp	ACS-250- 100w	711970	VBU	VBU
88	"Coupling Decoupling Network	FCC	FCC-801-M3- 25A	01027	12/26/2019	12/26/2020
3042	1 Meter RF Cable 18GHz EMC lab	Maury Microwave	UC-N-MM- 36	14.04.1 14	6/28/2019	6/28/2020
4197	2 Meter 0-18GHz RF Cable	Maury Microwave	UC-N-MM- 78	172811 8	4/14/2020	4/14/2021
102	Passive Impedance Adapter rated: 150- 50 Ohm	FCC	FCC-801- 150-50-CDN	04091	1/10/2020	1/10/2021
103	Passive Impedance Adapter rated: 150- 50 Ohm	FCC	FCC-801- 150-50-CDN	04092	1/10/2020	1/10/2021
308	20 Db Attenuator 25 W	Weinschel Corp	34-20-34	BP6373	11/15/2019	11/15/2020
4293	6dB 300W Attenuator	JFW	50FH-006- 300	none	4/14/2020	4/14/2021
4333	Ambient Data Logger	Extech	SD700	A.0864 09	4/24/2020	4/24/2021
76	EM Injection Clamp	FCC	F-2031- 23mm	357	10/20/2019	10/21/2020

Software Utilized:

Name	Manufacturer	Asset #	Version
Total Integrated Laboratory Environment	ETS Lindgren	1330	Version 6

Profile:

Name	Manufacturer	Asset #	Version/Rev
Master Conducted Immunity	ETS Lindgren	1330-002	11/3

14.1 Results:

The sample tested was found to Comply.

14.2 Setup Photographs:

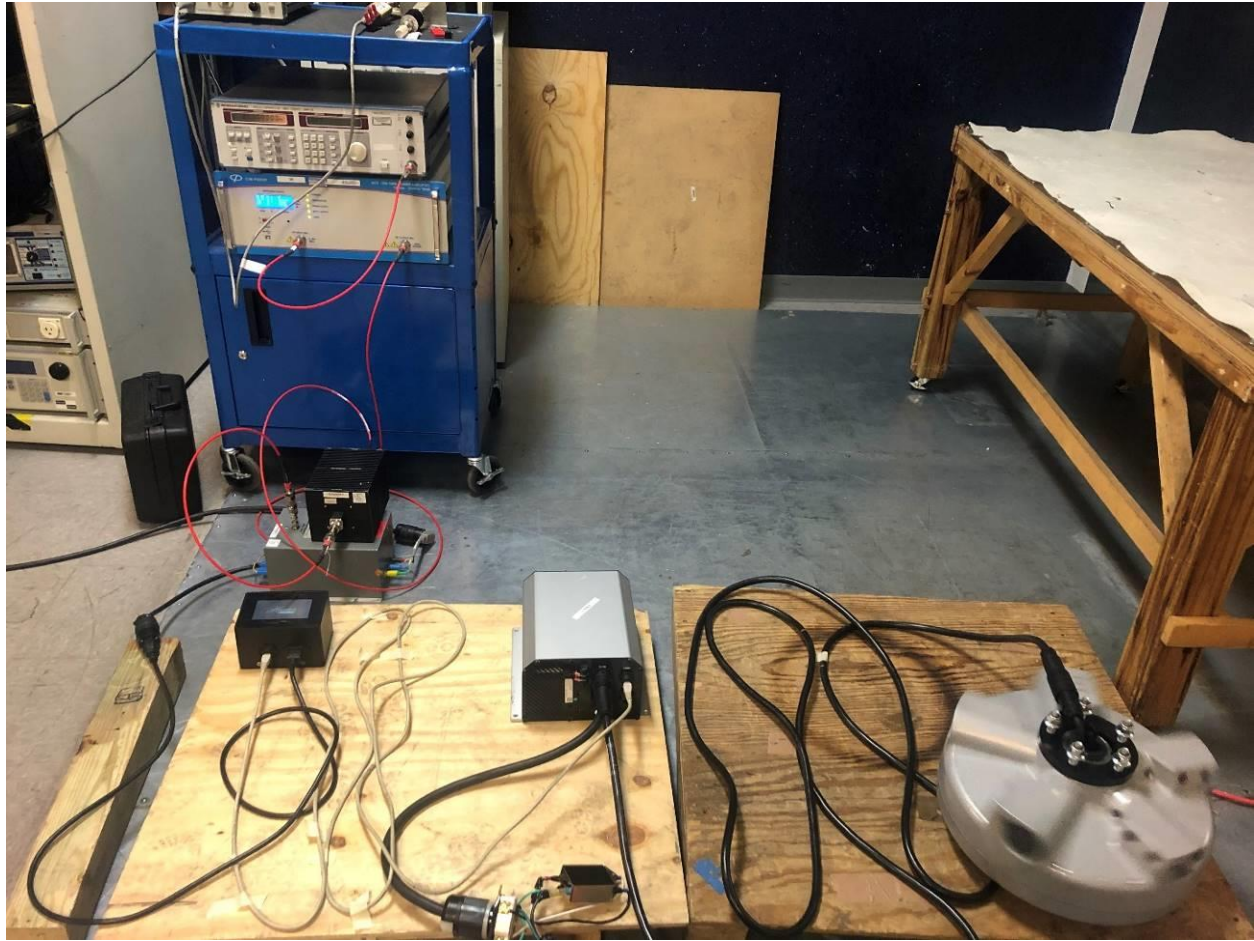


Figure 14-1 Conducted Immunity Test Setup

14.3 Test Data:

Injection Device Type	Port Description	Test Level (Vrms)	Result Classification
Controller Power			
CDN	AC Power Line	3	A
CCC	COMM Interface Cable (Close to Controller) 3	3	A
CCC	COMM 1 Interface Cable (Close TITAN 20 Box)	3	A
Fan Power			
CCC	AC Power Line	3	A

Test Personnel:	Reshar Rouse RJR	Test Date:	March 13, 2020
Supervising/Reviewing Engineer:		Modulation:	1kHz
(Where Applicable)		Required Performance	A
Product Standard:	IEC 61800-3 Table 12, 2nd Environment	Test Levels:	See Table Above
Input Voltage:	230V 50Hz	Ambient Temperature:	24.0°C
Test Level Verification Performed:	Yes	Relative Humidity:	47.9%
		Atmospheric Pressure:	994.5mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

15 Voltage Dips / Interruptions Immunity Tests

15.1 Method

Tests are performed in accordance with IEC 61000-4-11.

TEST SITE: Immunity Lab.

15.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
3769	Programmable AC Power supply with Harmonics and Flicker Old Den 18815	California Inst.	5001 iX / PACS-1	HK5328 6 X71643	11/12/2019	11/12/2020
4333	Ambient Data Logger	Extech	SD700	A.0864 09	4/24/2020	4/24/2021

Software Utilized:

Name	Manufacturer	Version
MX Series MXGUI	California Instruments	2.2.0.9 Feb. 22, 2010

15.3 Results:

The sample tested was found to Comply.

15.4 Setup Photographs:



Figure 15-1 Voltage Dips and Interrupts Test Setup

15.5 Test Data:

Motor Controller

Specification	Rated Voltage (Vac)	Frequency (Hz)	Voltage Test Level (%)	Voltage Dip (%)	Test Voltage (Vac)	Duration	Result Classification	
							0 deg	180 deg
0%UT for 0.5 Cycles	230	50	0	100	0.0	0.5 Cycle	A	A
40%UT for 10 Cycles	230	50	40	60	92	10 Cycles	A	A
70%UT for 25 Cycles	230	50	70	30	161	25 Cycles	A	A
0%UT for 250 Cycles	230	50	0	100	0.0	250 Cycles	A	A

Fan Driver

Specification	Rated Voltage (Vac)	Frequency (Hz)	Voltage Test Level (%)	Voltage Dip (%)	Test Voltage (Vac)	Duration	Result Classification	
							0 deg	180 deg
0%UT for 0.5 Cycles	230	50	0	100	0.0	0.5 Cycle	A	A
40%UT for 10 Cycles	230	50	40	60	92	10 Cycles	A	A
70%UT for 25 Cycles	230	50	70	30	161	25 Cycles	A	A
0%UT for 250 Cycles	230	50	0	100	0.0	250 Cycles	A	A

Test Personnel:	Reshar Rouse RJR	Test Date:	March 13, 2020
Supervising/Reviewing Engineer:			
(Where Applicable)		Required Performance:	C
Product Standard:	IEC 61800-3 Table 12, 2 nd Environment	Test Levels:	See Table Above
Input Voltage:	230V 50Hz	Ambient Temperature:	24.3C
Waveform Verified on Oscilloscope:	N/A	Relative Humidity:	47.7%
		Atmospheric Pressure:	993.9mbars

Notes:

(A) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

16 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	07/9/2020	104246145DAL-002	RJR	WBC	Original Issue