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EMC Test report for Wall chaser

Models: CG150; CG6; CW150; CW6; SL-1505; MSZ-2500

Shanghai, date of issue: 2018-05-11

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By order of LEE YEONG INDUSTRIAL CO., LTD.

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Document

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CONTENTS

1 CONCLUSION

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA. As far as the tests were based on certain specifications, these are mentioned in the report.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

1.1 Model description

The apparatus as supplied for the test is a Wall chaser, models CG150; CG6; CW150; CW6; SL-1505 and MSZ-2500 intended for residential use. The EUT has electronic control but no earth connection.

According to the declaration from manufacturer, all models are identical with each other except model numbers.

Due to the similarity of them, model CG150 was selected for the full tests and the corresponding data is representative for other models as well.

Figure 1 Overview

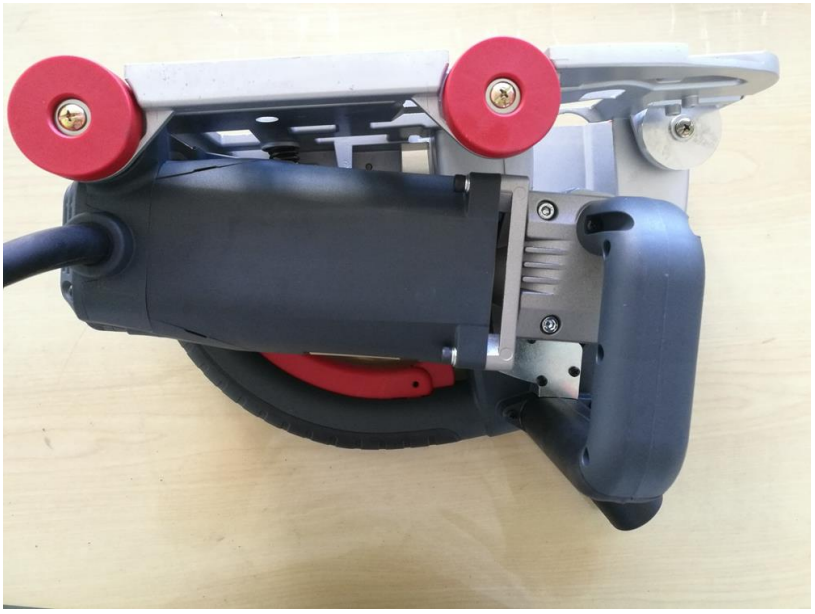


Figure 2 Overview

1.2 Environment

The requirements and standards apply to equipment intended for use in:

✓	Residential (domestic) environment
	Commercial and light-industrial environment
	Industrial environment
	Medical environment

1.3 Classification

The standard EN 55014-2 is subdivided in four categories. For each category, the specific immunity requirements are formulated.

	Category 1	Apparatus containing no electronic control circuitry
✓	**Category 2**	Apparatus containing electronic control circuitry with no internal clock or oscillator frequency higher than 15 MHz.
	Category 3	Battery powered apparatus containing electronic control circuitry.
	Category 4	All other apparatus.

2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

2.1 Applied standards

Standard	Year	Title
EN 55014-1	2017	Emission – Electrical motor-operated and thermal appliances for household and similar purposes, electrical tools and similar electrical apparatus
EN 55014-2	2015	Immunity - Household appliances, electric tools and similar
EN 61000-3-2	2014	Limits for harmonic currents emissions
EN 61000-3-3	2013	Limitation of voltage fluctuations and flicker

2.2 Overview of results

Emission tests	Result
Mains conducted disturbance voltage	**PASS**
Disturbance power	**PASS**
Harmonic current emission	**PASS**
Limitation of voltage fluctuations (flicker)	**PASS**

Immunity tests	Result
Electrostatic Discharges (ESD)	**PASS**
Electrical fast transient (EFT)	**PASS**
Surge transients	**PASS**
Conducted RF disturbances	**PASS**
Power supply voltage interruptions & dips	**PASS**

3 GENERAL INFORMATION

3.1 Product Information

Equipment under test	Wall chaser
Trade mark	AGP
Tested Type	CG150
Representative Type	CG6; CW150; CW6; SL-1505; MSZ-2500
Ratings	220-240 V; 50/60 Hz; 2500 W; n=6500 min^{-1}; Ø150 mm 110-120 V; 50/60 Hz; 2300 W; n=6500 min^{-1}; Ø150 mm Class II

3.2 Customer Information

Applicant	LEE YEONG INDUSTRIAL CO., LTD.
Address	No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

Manufacturer	LEE YEONG INDUSTRIAL CO., LTD.
Address	No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

Factory	LEE YEONG INDUSTRIAL CO., LTD.
Address	No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

3.3 Test data

Location	DEKRA Testing and Certification Co.,Ltd.
Address	No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C
Date of receipt of test item	2017-07 (samples provided by applicant)
Date (s) of performance of tests	2017-07
Supervised by	Zuyao Fan

3.4 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

3.5 Measurement Uncertainty

Conducted Emissions
The measurement uncertainty is evaluated as ± 2.26 dB.

Harmonic Current Emission
The measurement uncertainty is evaluated as 0.1%.

Voltage Fluctuation Flicker
The measurement uncertainty is evaluated as ± 4%.

3.6 Equipment List

Conducted Emission / SR2-H

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Test Receiver	R&S	ESCS 30	825442/014	2019.03.12
Artificial Mains Network	R&S	ENV4200	848411/010	2019.01.21
LISN	R&S	ENV216	100092	2018.07.30
Coaxial Cable	Harbour	RG-400	SR2-H	2018.08.14
Quietek EMI system	Quietek	Version 2.2	SR2-H	N/A

Power Harmonics /SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMC Emission Tester	EMC-Partner	HAR-1000-1P	109	2018.01.15

Voltage fluctuation and flicker / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMC Emission Tester	EMC-Partner	HAR-1000-1P	109	2018.01.15

4 EMISSION TEST RESULTS

4.1 Mains conducted disturbance voltage

Standard	EN 55014-1 (Tools)	
Frequency [MHz]	QP [dB(μV)]	AV [dB(μV)]
0,15 – 0,35	66 – 59 *)	59 – 49 *)
0,35 – 5	59	49
5 – 30	64	54

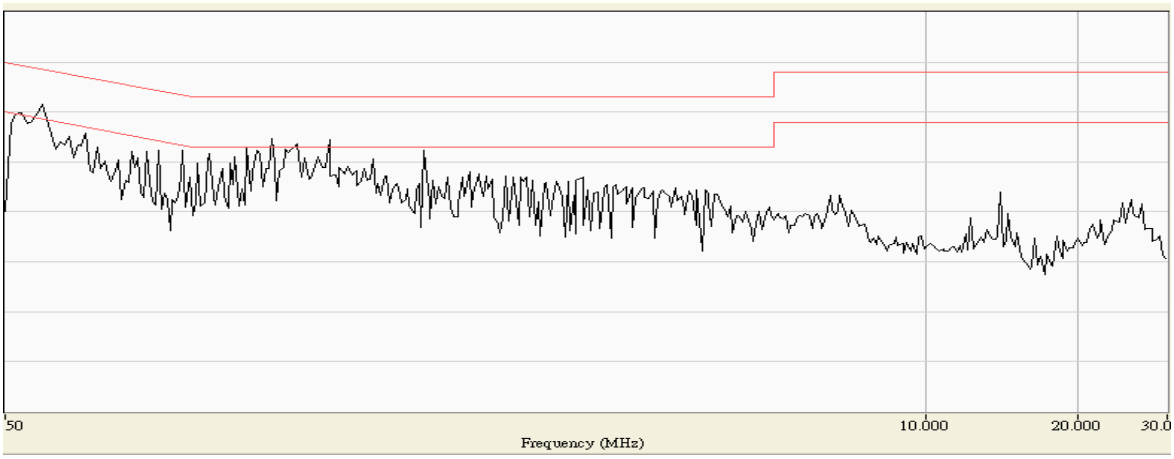
*) Limits decreasing linearly with the logarithm of the frequency

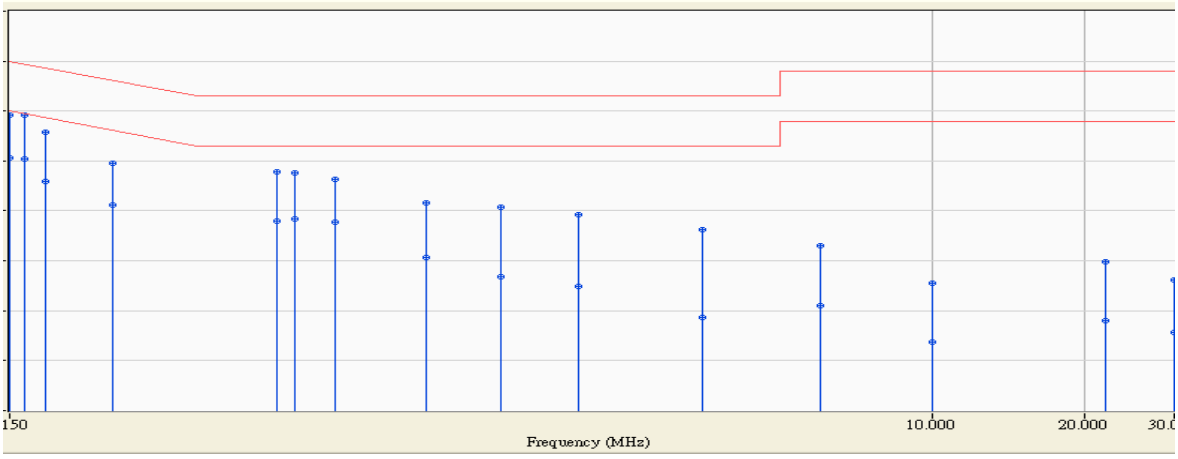
	Rated motor power not exceeding 700 W	Limits as above
	Rated motor power above 700 and not exceeding 1000 W	Limits +4 dB
✓	Rated motor power above 1000 W	Limits +10 dB

Port	AC mains, 230/110 Vac
Test method	LISN
Mode	On mode with an artificial hand, no load

Results for 220v-240v model

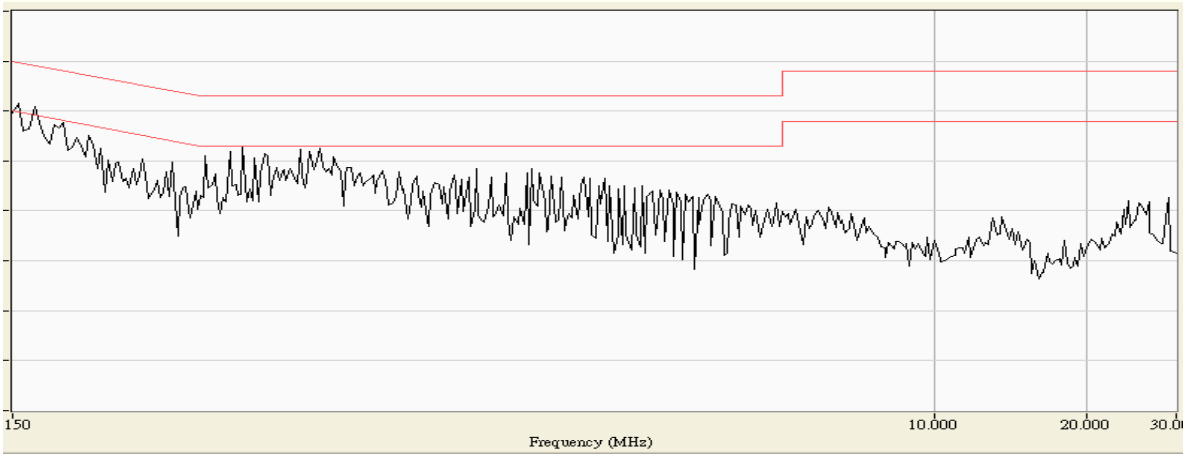
Line





	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.15	9.741	49.43	59.171	-16.829	76	QUASIPEAK
2	0.15	9.741	40.91	50.651	-18.349	69	AVERAGE
3	0.16	9.754	49.5	59.254	-16.213	75.467	QUASIPEAK
4	0.16	9.754	40.58	50.334	-17.904	68.238	AVERAGE
5	0.177	9.752	46.03	55.782	-18.835	74.617	QUASIPEAK
6	0.177	9.752	36.09	45.842	-21.182	67.024	AVERAGE
7	0.24	9.746	39.75	49.496	-22.621	72.117	QUASIPEAK
8	0.24	9.746	31.38	41.126	-22.327	63.453	AVERAGE
9	0.505	9.73	38.09	47.82	-21.18	69	QUASIPEAK
10	0.505	9.73	28.29	38.02	-20.98	59	AVERAGE
11	0.55	9.737	37.95	47.687	-21.313	69	QUASIPEAK
12	0.55	9.737	28.63	38.367	-20.633	59	AVERAGE
13	0.658	9.757	36.63	46.387	-22.613	69	QUASIPEAK
14	0.658	9.757	28.04	37.797	-21.203	59	AVERAGE
15	1	9.82	31.8	41.62	-27.38	69	QUASIPEAK
16	1	9.82	20.83	30.65	-28.35	59	AVERAGE
17	1.4	9.836	30.91	40.746	-28.254	69	QUASIPEAK
18	1.4	9.836	17.01	26.846	-32.154	59	AVERAGE
19	2	9.86	29.43	39.29	-29.71	69	QUASIPEAK
20	2	9.86	15.09	24.95	-34.05	59	AVERAGE
21	3.5	9.905	26.38	36.285	-32.715	69	QUASIPEAK
22	3.5	9.905	8.85	18.755	-40.245	59	AVERAGE
23	6	9.963	23.1	33.063	-40.937	74	QUASIPEAK
24	6	9.963	11.08	21.043	-42.957	64	AVERAGE
25	10	10.13	15.41	25.54	-48.46	74	QUASIPEAK
26	10	10.13	3.56	13.69	-50.31	64	AVERAGE
27	22	10.332	19.52	29.852	-44.148	74	QUASIPEAK
28	22	10.332	7.59	17.922	-46.078	64	AVERAGE
29	30	10.37	15.88	26.25	-47.75	74	QUASIPEAK
30	30	10.37	5.19	15.56	-48.44	64	AVERAGE

Neutral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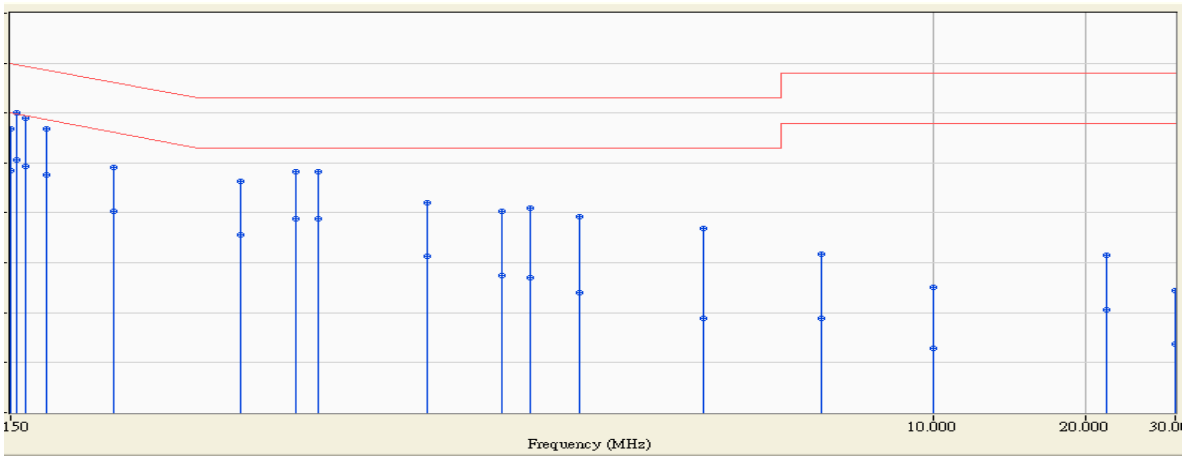
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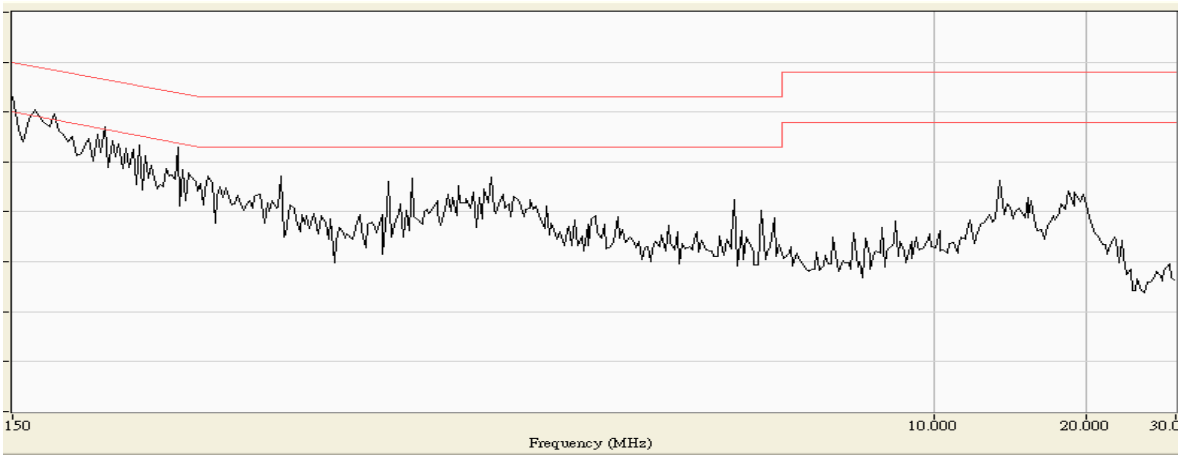
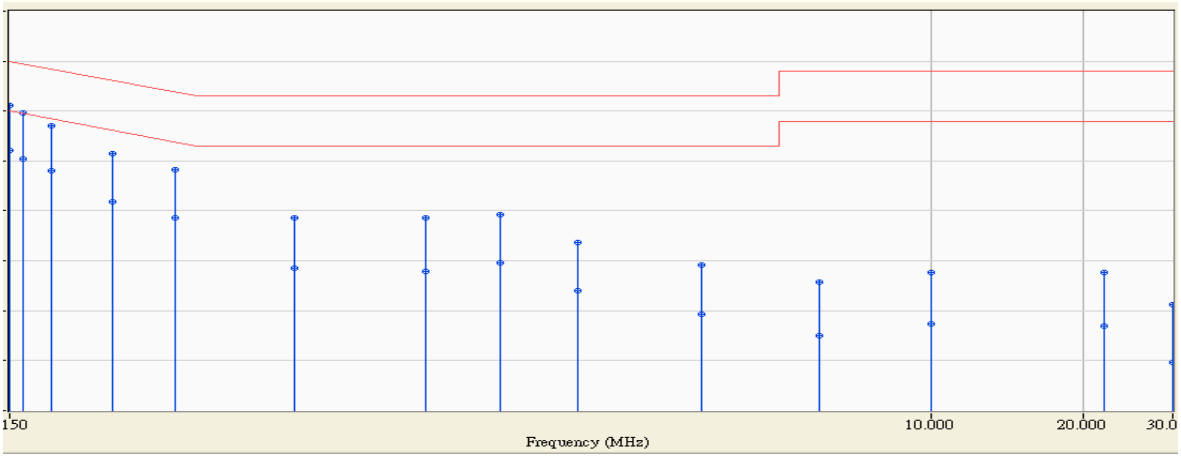
Frequency (MHz)

	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.15	9.741	47.17	56.911	-19.089	76	QUASIPEAK
2	0.15	9.741	38.73	48.471	-20.529	69	AVERAGE
3	0.154	9.747	50.39	60.136	-15.652	75.788	QUASIPEAK
4	0.154	9.747	40.88	50.626	-18.071	68.697	AVERAGE
5	0.16	9.754	49.31	59.064	-16.403	75.467	QUASIPEAK
6	0.16	9.754	39.49	49.244	-18.994	68.238	AVERAGE
7	0.177	9.752	47.03	56.782	-17.827	74.609	QUASIPEAK
8	0.177	9.752	37.89	47.642	-19.371	67.013	AVERAGE
9	0.24	9.75	39.28	49.03	-23.087	72.117	QUASIPEAK
10	0.24	9.75	30.48	40.23	-23.223	63.453	AVERAGE
11	0.427	9.749	36.59	46.339	-22.661	69	QUASIPEAK
12	0.427	9.749	25.8	35.549	-23.451	59	AVERAGE
13	0.55	9.752	38.55	48.302	-20.698	69	QUASIPEAK
14	0.55	9.752	29.03	38.782	-20.218	59	AVERAGE
15	0.607	9.761	38.5	48.261	-20.739	69	QUASIPEAK
16	0.607	9.761	29	38.761	-20.239	59	AVERAGE
17	1	9.82	32.19	42.01	-26.99	69	QUASIPEAK
18	1	9.82	21.45	31.27	-27.73	59	AVERAGE
19	1.4	9.832	30.44	40.272	-28.728	69	QUASIPEAK
20	1.4	9.832	17.59	27.422	-31.578	59	AVERAGE
21	1.595	9.838	31.06	40.898	-28.102	69	QUASIPEAK
22	1.595	9.838	17.19	27.028	-31.972	59	AVERAGE
23	2	9.85	29.49	39.34	-29.66	69	QUASIPEAK
24	2	9.85	14.24	24.09	-34.91	59	AVERAGE
25	3.5	9.843	27.11	36.953	-32.047	69	QUASIPEAK
26	3.5	9.843	8.95	18.793	-40.207	59	AVERAGE
27	6	9.917	21.85	31.767	-42.233	74	QUASIPEAK
28	6	9.917	8.99	18.907	-45.093	64	AVERAGE
29	10	10.15	15.01	25.16	-48.84	74	QUASIPEAK
30	10	10.15	2.72	12.87	-51.13	64	AVERAGE
31	22	10.512	20.99	31.502	-42.498	74	QUASIPEAK
32	22	10.512	10.04	20.552	-43.448	64	AVERAGE
33	30	10.7	13.65	24.35	-49.65	74	QUASIPEAK
34	30	10.7	3.03	13.73	-50.27	64	AVERAGE

Results for 110v-120v model

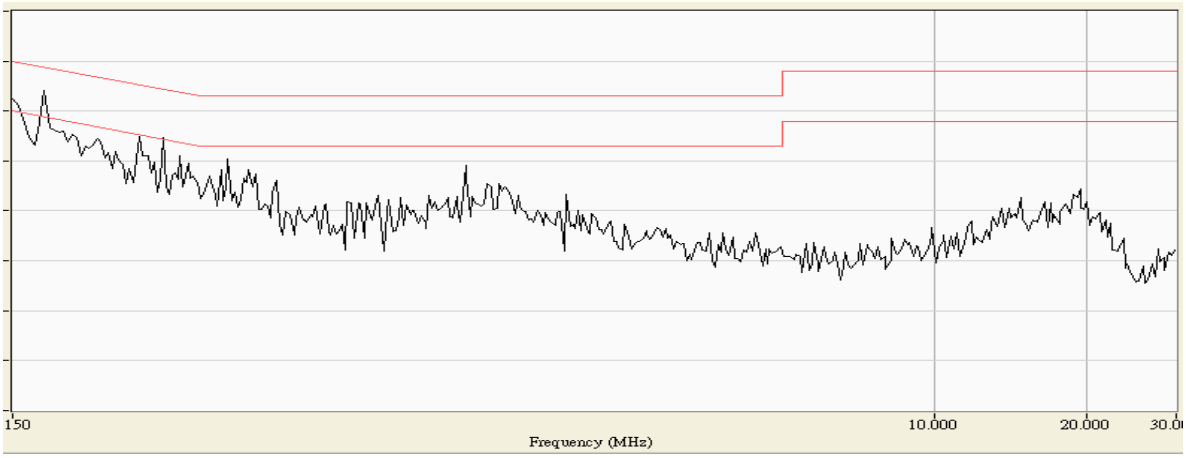
Line





	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.15	9.741	51.39	61.131	-14.869	76	QUASIPEAK
2	0.15	9.741	42.37	52.111	-16.889	69	AVERAGE
3	0.16	9.754	49.8	59.554	-15.927	75.481	QUASIPEAK
4	0.16	9.754	40.63	50.384	-17.875	68.259	AVERAGE
5	0.181	9.752	47.25	57.002	-17.446	74.448	QUASIPEAK
6	0.181	9.752	38.36	48.112	-18.671	66.783	AVERAGE
7	0.24	9.746	41.8	51.546	-20.571	72.117	QUASIPEAK
8	0.24	9.746	32.05	41.796	-21.657	63.453	AVERAGE
9	0.318	9.738	38.61	48.348	-21.445	69.793	QUASIPEAK
10	0.318	9.738	28.85	38.588	-21.545	60.133	AVERAGE
11	0.55	9.737	28.83	38.567	-30.433	69	QUASIPEAK
12	0.55	9.737	18.7	28.437	-30.563	59	AVERAGE
13	1	9.82	28.69	38.51	-30.49	69	QUASIPEAK
14	1	9.82	18.11	27.93	-31.07	59	AVERAGE
15	1.4	9.836	29.52	39.356	-29.644	69	QUASIPEAK
16	1.4	9.836	19.72	29.556	-29.444	59	AVERAGE
17	2	9.86	23.9	33.76	-35.24	69	QUASIPEAK
18	2	9.86	14.1	23.96	-35.04	59	AVERAGE
19	3.5	9.905	19.19	29.095	-39.905	69	QUASIPEAK
20	3.5	9.905	9.32	19.225	-39.775	59	AVERAGE
21	6	9.963	15.85	25.813	-48.187	74	QUASIPEAK
22	6	9.963	5.02	14.983	-49.017	64	AVERAGE
23	10	10.13	17.62	27.75	-46.25	74	QUASIPEAK
24	10	10.13	7.19	17.32	-46.68	64	AVERAGE
25	22	10.332	17.29	27.622	-46.378	74	QUASIPEAK
26	22	10.332	6.6	16.932	-47.068	64	AVERAGE
27	30	10.37	10.76	21.13	-52.87	74	QUASIPEAK
28	30	10.37	-0.82	9.55	-54.45	64	AVERAGE

Neutral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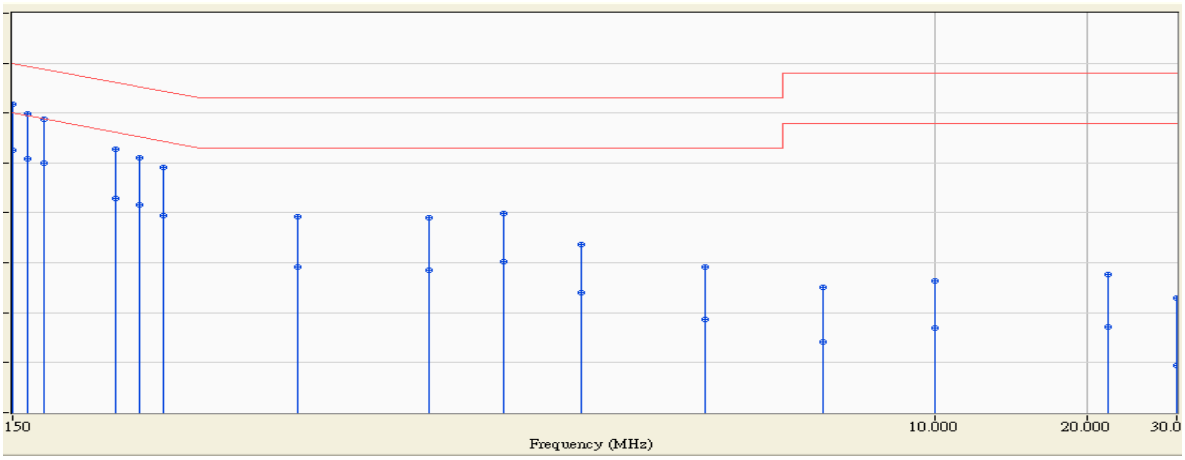
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10.000
20.000
30.0
Frequency (MHz)

	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.15	9.741	51.99	61.731	-14.269	76	QUASIPEAK
2	0.15	9.741	42.79	52.531	-16.469	69	AVERAGE
3	0.16	9.754	50.08	59.834	-15.634	75.468	QUASIPEAK
4	0.16	9.754	41.03	50.784	-17.456	68.24	AVERAGE
5	0.173	9.753	49.03	58.783	-16.038	74.821	QUASIPEAK
6	0.173	9.753	40.32	50.073	-17.243	67.316	AVERAGE
7	0.24	9.75	43.05	52.8	-19.318	72.118	QUASIPEAK
8	0.24	9.75	33.07	42.82	-20.634	63.454	AVERAGE
9	0.267	9.75	41.21	50.96	-20.276	71.236	QUASIPEAK
10	0.267	9.75	31.93	41.68	-20.515	62.195	AVERAGE
11	0.298	9.75	39.28	49.03	-21.299	70.329	QUASIPEAK
12	0.298	9.75	29.64	39.39	-21.508	60.898	AVERAGE
13	0.55	9.752	29.48	39.232	-29.768	69	QUASIPEAK
14	0.55	9.752	19.42	29.172	-29.828	59	AVERAGE
15	1	9.82	29.28	39.1	-29.9	69	QUASIPEAK
16	1	9.82	18.7	28.52	-30.48	59	AVERAGE
17	1.4	9.832	30.07	39.902	-29.098	69	QUASIPEAK
18	1.4	9.832	20.5	30.332	-28.668	59	AVERAGE
19	2	9.85	23.85	33.7	-35.3	69	QUASIPEAK
20	2	9.85	14.24	24.09	-34.91	59	AVERAGE
21	3.5	9.843	19.37	29.213	-39.787	69	QUASIPEAK
22	3.5	9.843	8.79	18.633	-40.367	59	AVERAGE
23	6	9.917	15.19	25.107	-48.893	74	QUASIPEAK
24	6	9.917	4.18	14.097	-49.903	64	AVERAGE
25	10	10.15	16.29	26.44	-47.56	74	QUASIPEAK
26	10	10.15	6.72	16.87	-47.13	64	AVERAGE
27	22	10.512	17.2	27.712	-46.288	74	QUASIPEAK
28	22	10.512	6.55	17.062	-46.938	64	AVERAGE
29	30	10.7	12.16	22.86	-51.14	74	QUASIPEAK
30	30	10.7	-1.17	9.53	-54.47	64	AVERAGE

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

4.2 Disturbance power

Standard	EN 55014-1	
Frequency [MHz]	QP [dB(pW)]	AV [dB(pW)]
30 – 300	45 – 55 *)	35 – 45 *)

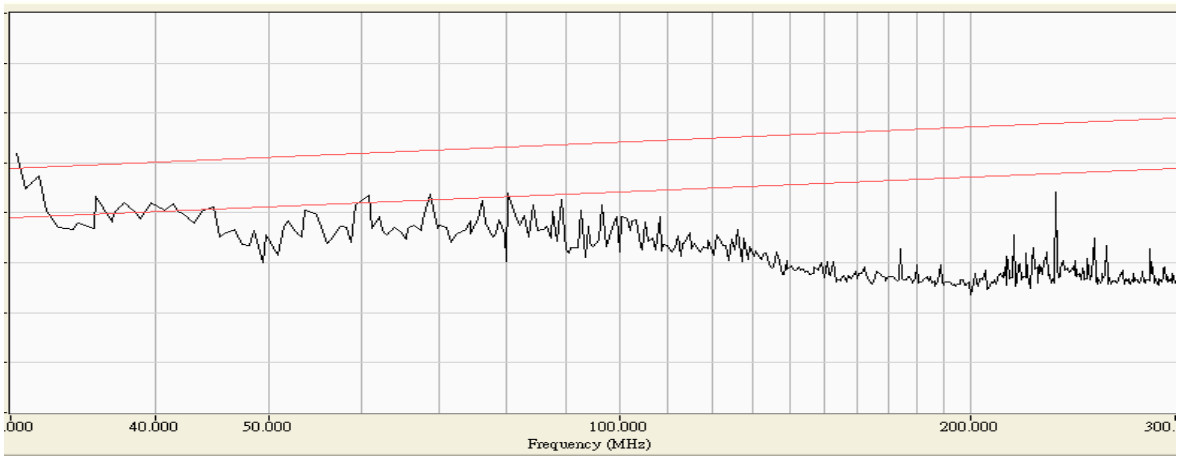
*) Limits increasing linearly with the frequency

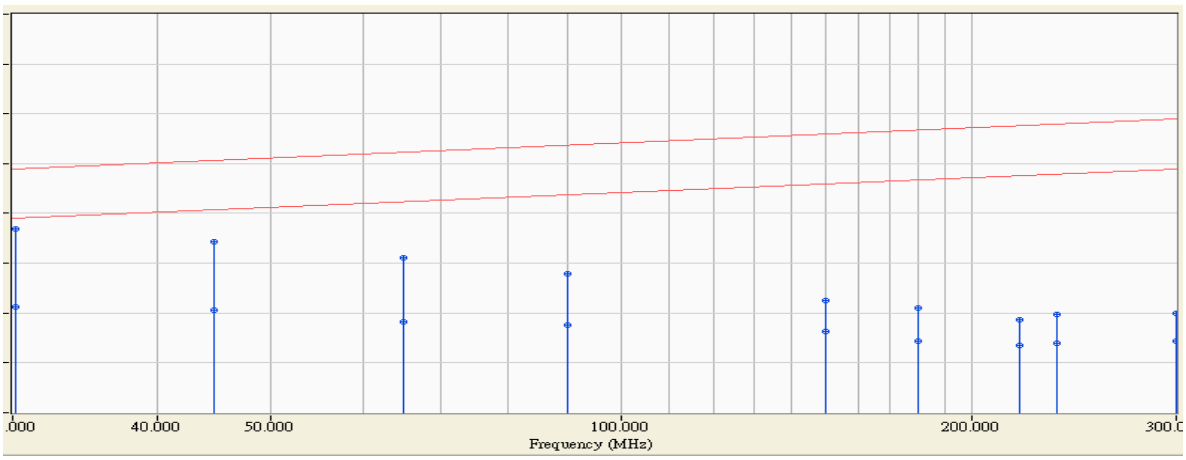
For tools the following limits apply to the AC Mains port:

	Rated motor power not exceeding 700 W	Limits as above
	Rated motor power above 700 and not exceeding 1000 W	Limits +4 dB
✓	Rated motor power above 1000 W	Limits +10 dB

Port	AC Mains, 230 Vac
Mode	On mode with no load

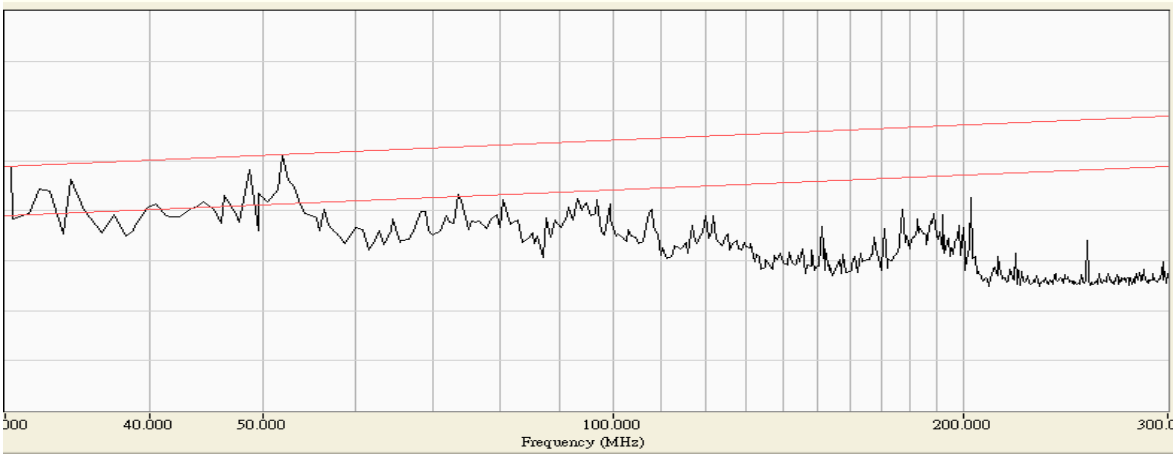
Results for 110v-120v model

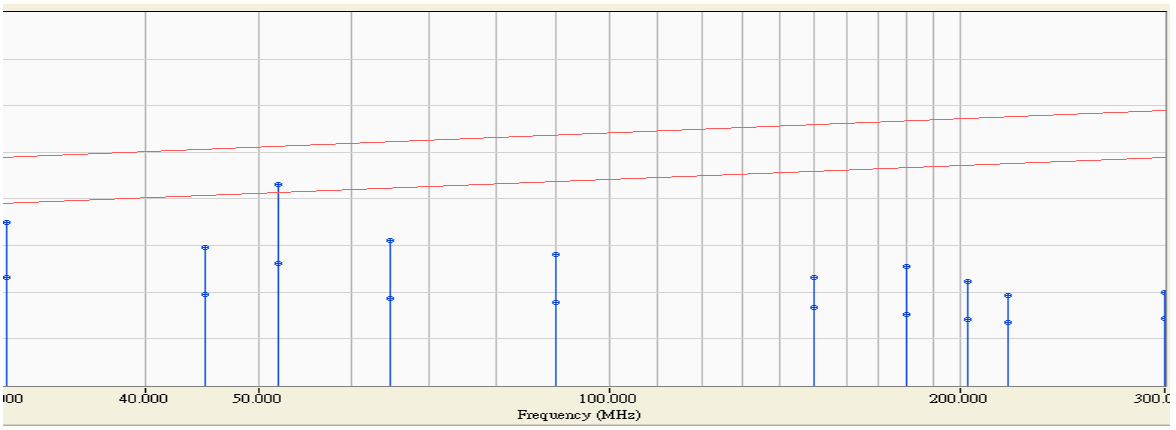




	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBpW)	Measure Level (dBpW)	Margin (dB)	Limit (dBuV)	Detector Type
1	30.21	9.922	27.05	36.972	-18.058	55.03	QUASIPEAK
2	30.21	9.922	11.39	21.312	-23.718	45.03	AVERAGE
3	44.687	6.984	27.32	34.305	-22.426	56.731	QUASIPEAK
4	44.687	6.984	13.69	20.675	-26.056	46.731	AVERAGE
5	65	5.785	25.33	31.115	-27.243	58.358	QUASIPEAK
6	65	5.785	12.41	18.195	-30.163	48.358	AVERAGE
7	89.895	5.62	22.25	27.87	-31.896	59.766	QUASIPEAK
8	89.895	5.62	11.88	17.5	-32.266	49.766	AVERAGE
9	149.898	4.213	18.24	22.453	-39.534	61.987	QUASIPEAK
10	149.898	4.213	12.16	16.373	-35.614	51.987	AVERAGE
11	179.898	3.372	17.64	21.013	-41.766	62.779	QUASIPEAK
12	179.898	3.372	11.01	14.383	-38.396	52.779	AVERAGE
13	219.898	2.584	16.04	18.623	-45.028	63.651	QUASIPEAK
14	219.898	2.584	10.84	13.423	-40.228	53.651	AVERAGE
15	236.833	2.71	17.12	19.83	-44.143	63.973	QUASIPEAK
16	236.833	2.71	11.2	13.91	-40.063	53.973	AVERAGE
17	299.897	3.231	16.77	20	-44.999	64.999	QUASIPEAK
18	299.897	3.231	11.13	14.36	-40.639	54.999	AVERAGE

Results for 220v-240v model





	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBpW)	Measure Level (dBpW)	Margin (dB)	Limit (dBuV)	Detector Type
1	30.375	9.885	25.04	34.924	-20.13	55.054	QUASIPEAK
2	30.375	9.885	13.21	23.094	-21.96	45.054	AVERAGE
3	44.895	6.955	22.66	29.615	-27.136	56.751	QUASIPEAK
4	44.895	6.955	12.62	19.575	-27.176	46.751	AVERAGE
5	51.937	6.118	37.06	43.177	-14.207	57.384	QUASIPEAK
6	51.937	6.118	19.98	26.097	-21.287	47.384	AVERAGE
7	64.823	5.781	25.41	31.192	-27.154	58.346	QUASIPEAK
8	64.823	5.781	12.79	18.572	-29.774	48.346	AVERAGE
9	89.897	5.62	22.46	28.08	-31.686	59.766	QUASIPEAK
10	89.897	5.62	12.24	17.86	-31.906	49.766	AVERAGE
11	149.895	4.214	18.89	23.103	-38.884	61.987	QUASIPEAK
12	149.895	4.214	12.5	16.713	-35.274	51.987	AVERAGE
13	179.898	3.372	22.25	25.623	-37.156	62.779	QUASIPEAK
14	179.898	3.372	11.84	15.213	-37.566	52.779	AVERAGE
15	202.898	2.751	19.65	22.401	-40.901	63.302	QUASIPEAK
16	202.898	2.751	11.33	14.081	-39.221	53.302	AVERAGE
17	219.898	2.584	16.62	19.203	-44.448	63.651	QUASIPEAK
18	219.898	2.584	10.89	13.473	-40.178	53.651	AVERAGE
19	299.895	3.231	16.79	20.02	-44.978	64.998	QUASIPEAK
20	299.895	3.231	11.24	14.47	-40.528	54.998	AVERAGE

Refer to chapter 6 for the test set-up.

According to clause 4.1.2.3.2 (EN 55014-1):

Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz if both of the following conditions (1) and 2)) are fulfilled:

1) all emission readings from the equipment under test shall be lower than the applicable limits (Table 2a) reduced by the margin (Table 2b);
2) the maximum clock frequency shall be less than 30 MHz.

Conclusion:

PASS

4.3 Harmonic currents

Standard	EN 61000-3-2
Port	AC Mains supply
Mode	On mode

	Class A	All apparatus not classified as Class B, C or D
✓	Class B	Portable tools
	Class C	Lighting equipment
	Class D	Personal computers, television receivers

Results for 220-240 model

Urms =	229.9V	Freq =	50.000	Range:	10 A
Irms =	4.023A	Ipk =	7.690A	cf =	1.911
P =	832.5W	S =	925.0VA	pf =	0.900
THDi =	36.2 %	THDu =	0.10 %	Class B	

Test - Time : 5min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [%]	Imax%L [%]	Limit [A]
1	50	3.8770	3.7921	94.251		9.7882	243.28		
2	100	0.0000	0.0165	0.4096	1.0173	0.0262	0.6523	1.6201	1.6200
3	150	1.3993	1.3458	33.450	39.009	1.5112	37.561	43.804	3.4500
4	200	0.0000	0.0110	0.2731	1.7033	0.0195	0.4854	3.0281	0.6450
5	250	0.2226	0.1978	4.9150	11.565	0.2649	6.5837	15.491	1.7100
6	300	0.0000	0.0073	0.1820	1.6276	0.0134	0.3337	2.9839	0.4500
7	350	0.0882	0.0977	2.4272	8.4551	0.0989	2.4575	8.5608	1.1550
8	400	0.0000	0.0061	0.1517	1.7691	0.0110	0.2731	3.1844	0.3450
9	450	0.0436	0.0500	1.2439	8.3415	0.0513	1.2743	8.5449	0.6000
10	500	0.0000	0.0067	0.1669	2.4326	0.0092	0.2275	3.3171	0.2760
11	550	0.0336	0.0391	0.9709	7.8914	0.0391	0.9709	7.8914	0.4950
12	600	0.0000	0.0092	0.2275	3.9806	0.0104	0.2579	4.5113	0.2300
13	650	0.0374	0.0421	1.0467	13.370	0.0427	1.0619	13.563	0.3150
14	700	0.0000	0.0171	0.4248	8.6688	0.0195	0.4854	9.9072	0.1971
15	750	0.0386	0.0403	1.0012	17.904	0.0635	1.5777	28.212	0.2250
16	800	0.0167	0.0403	1.0012	23.353	0.0415	1.0316	24.060	0.1725
17	850	0.0317	0.0317	0.7888	15.987	0.0464	1.1529	23.365	0.1985
18	900	0.0120	0.0281	0.6978	18.311	0.0446	1.1074	29.058	0.1533
19	950	0.0001	0.0220	0.5461	12.370	0.0256	0.6371	14.431	0.1776
20	1000	0.0000	0.0079	0.1972	5.7497	0.0208	0.5158	15.038	0.1380
21	1050	0.0000	0.0195	0.4854	12.153	0.0201	0.5006	12.533	0.1607
22	1100	0.0000	0.0079	0.1972	6.3247	0.0116	0.2882	9.2437	0.1255
23	1150	0.0000	0.0214	0.5309	14.558	0.0214	0.5309	14.558	0.1467
24	1200	0.0000	0.0079	0.1972	6.8996	0.0104	0.2579	9.0226	0.1150
25	1250	0.0000	0.0195	0.4854	14.468	0.0201	0.5006	14.920	0.1350
26	1300	0.0000	0.0061	0.1517	5.7497	0.0104	0.2579	9.7745	0.1062
27	1350	0.0000	0.0159	0.3944	12.695	0.0159	0.3944	12.695	0.1250
28	1400	0.0000	0.0061	0.1517	6.1920	0.0085	0.2124	8.6688	0.0986
29	1450	0.0000	0.0134	0.3337	11.538	0.0153	0.3792	13.111	0.1164
30	1500	0.0000	0.0067	0.1669	7.2977	0.0128	0.3186	13.932	0.0920
31	1550	0.0005	0.0146	0.3641	13.455	0.0378	0.9405	34.758	0.1089
32	1600	0.0033	0.0098	0.2427	11.322	0.0336	0.8343	38.921	0.0862
33	1650	0.0001	0.0208	0.5158	20.291	0.0293	0.7282	28.646	0.1023
34	1700	0.0004	0.0061	0.1517	7.5188	0.0256	0.6371	31.579	0.0812
35	1750	0.0000	0.0134	0.3337	13.925	0.0134	0.3337	13.925	0.0964
36	1800	0.0000	0.0043	0.1062	5.5728	0.0104	0.2579	13.534	0.0767
37	1850	0.0000	0.0104	0.2579	11.375	0.0104	0.2579	11.375	0.0912
38	1900	0.0000	0.0055	0.1365	7.5631	0.0092	0.2275	12.605	0.0726
39	1950	0.0000	0.0104	0.2579	11.990	0.0104	0.2579	11.990	0.0865
40	2000	0.0000	0.0043	0.1062	6.1920	0.0079	0.1972	11.499	0.0690

Results for 110-120 model

Urms =	109.8V	Freq =	60.038	Range:	25 A
Irms =	7.336A	Ipk =	14.10A	cf =	1.922
P =	710.5W	S =	805.2VA	pf =	0.882
THDi =	35.8 %	THDu =	0.20 %	Class B	

Test - Time : 5min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [%]	Imax%L [%]	Limit [A]
1	60	7.0781	6.9061	94.135		13.481	183.76		
2	120	0.0533	0.0519	0.7072	3.2025	0.0610	0.8319	3.7676	1.6200
3	180	2.4996	2.4323	33.153	70.500	2.6657	36.335	77.267	3.4500
4	240	0.0000	0.0336	0.4576	5.2045	0.0397	0.5408	6.1508	0.6450
5	300	0.3668	0.3616	4.9293	21.148	0.4074	5.5532	23.825	1.7100
6	360	0.0000	0.0137	0.1872	3.0518	0.0214	0.2912	4.7472	0.4500
7	420	0.1493	0.1480	2.0175	12.815	0.1923	2.6206	16.646	1.1550
8	480	0.0000	0.0137	0.1872	3.9806	0.0183	0.2496	5.3074	0.3450
9	540	0.0804	0.0824	1.1231	13.733	0.0916	1.2479	15.259	0.6000
10	600	0.0000	0.0122	0.1664	4.4228	0.0183	0.2496	6.6343	0.2760
11	660	0.0734	0.0641	0.8735	12.947	0.1099	1.4975	22.195	0.4950
12	720	0.0000	0.0137	0.1872	5.9708	0.0183	0.2496	7.9611	0.2300
13	780	0.0601	0.0580	0.7903	18.407	0.0931	1.2687	29.549	0.3150
14	840	0.0000	0.0137	0.1872	6.9660	0.0168	0.2288	8.5140	0.1971
15	900	0.0482	0.0473	0.6448	21.023	0.0565	0.7696	25.092	0.2250
16	960	0.0000	0.0137	0.1872	7.9611	0.0153	0.2080	8.8457	0.1725
17	1020	0.0236	0.0443	0.6032	22.289	0.0610	0.8319	30.744	0.1985
18	1080	0.0000	0.0107	0.1456	6.9660	0.0137	0.1872	8.9562	0.1533
19	1140	0.0000	0.0336	0.4576	18.898	0.0381	0.5200	21.475	0.1776
20	1200	0.0000	0.0122	0.1664	8.8457	0.0137	0.1872	9.9514	0.1380
21	1260	0.0000	0.0214	0.2912	13.292	0.0351	0.4784	21.837	0.1607
22	1320	0.0000	0.0122	0.1664	9.7302	0.0137	0.1872	10.947	0.1255
23	1380	0.0577	0.0626	0.8527	42.634	0.0916	1.2479	62.391	0.1467
24	1440	0.0000	0.0137	0.1872	11.942	0.0168	0.2288	14.595	0.1150
25	1500	0.0765	0.0793	1.0815	58.775	0.1068	1.4559	79.120	0.1350
26	1560	0.0000	0.0137	0.1872	12.937	0.0168	0.2288	15.812	0.1062
27	1620	0.0011	0.0366	0.4992	29.297	0.0595	0.8111	47.607	0.1250
28	1680	0.0000	0.0107	0.1456	10.836	0.0122	0.1664	12.384	0.0986
29	1740	0.0000	0.0198	0.2704	17.045	0.0290	0.3952	24.911	0.1164
30	1800	0.0000	0.0107	0.1456	11.610	0.0122	0.1664	13.269	0.0920
31	1860	0.0000	0.0183	0.2496	16.819	0.0244	0.3328	22.425	0.1089
32	1920	0.0000	0.0107	0.1456	12.384	0.0153	0.2080	17.691	0.0862
33	1980	0.0000	0.0153	0.2080	14.920	0.0244	0.3328	23.872	0.1023
34	2040	0.0000	0.0092	0.1248	11.278	0.0168	0.2288	20.677	0.0812
35	2100	0.0000	0.0183	0.2496	18.989	0.0443	0.6032	45.889	0.0964
36	2160	0.0000	0.0092	0.1248	11.942	0.0122	0.1664	15.922	0.0767
37	2220	0.0000	0.0198	0.2704	21.747	0.0427	0.5824	46.839	0.0912
38	2280	0.0000	0.0092	0.1248	12.605	0.0137	0.1872	18.908	0.0726
39	2340	0.0000	0.0137	0.1872	15.869	0.0229	0.3120	26.449	0.0865
40	2400	0.0000	0.0076	0.1040	11.057	0.0107	0.1456	15.480	0.0690

4.4 Voltage fluctuations (Flicker)

Standard	EN 61000-3-3
Port	AC Mains supply
Voltage	230 V_{AC}
Mode	On mode

P_{st}	N/A
P_{lt}	N/A
Tmax (dt > 3,3%)	≤ 500 ms
d_C	≤ 3,3%
d_{MAX}	≤ 7%

Results for model 220-240V model

Tmax (dt > 3,3%)	0,0 ms
Maximum voltage change d_{MAX}	0,00%
Relative Voltage change d_C	0,02%
Short term flicker P_{ST}	Not applicable
Long term flicker P_{LT}	Not applicable

Results for model 110-120V model

Tmax (dt > 3,3%)	0,0 ms
Maximum voltage change d_{MAX}	0,13%
Relative Voltage change d_C	0,13%
Short term flicker P_{ST}	Not applicable
Long term flicker P_{LT}	Not applicable

In addition, this test was conducted in accordance with Annex B of EN 61000-3-3.

* The EUT belongs to hand-held tools (portable tools without heating elements), according to EN 61000-3-3, clause A.9, P_{ST} and P_{LT} shall not be evaluated.

Conclusion:

PASS

5 IMMUNITY TEST RESULTS

5.1 Electrostatic discharge immunity

Electrostatic discharges (ESD) are the result of persons or objects that accumulate static electricity due to for instance walking on synthetic carpets. The ESD can influence the operation of equipment or damage its electronics, either by a direct discharge or indirectly by coupling or radiation. Both effects are simulated during the tests.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-2
Port	Enclosure
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.
Air discharges	8 kV
Contact discharges	4 kV
Mode	On mode

Performed tests

Air discharges	✓	4 kV	✓	8 kV		15 kV	✓	2 kV
Contact discharges		2 kV	✓	4 kV		8 kV		
Via coupling planes	✓	Horizontal			✓	Vertical		
Polarity	✓	Positive			✓	Negative		
Set-up	✓	Table-top				Floor standing		
Ambient temperature	20 °C							
Relative Humidity air	52 %							

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.2 Electrical Fast Transient immunity

The EFT immunity test simulates disturbances by bursts of very short transients caused for example by switching off loads such as an AC motor or bouncing relay contacts. The transients are likely to disturb electronics but less likely to cause damage.

Requirements

Standard	EN 55014-2			
Basic standard	EN 61000-4-4			
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.			
Pulse characteristics	5/50 ns			
Peak Voltage; Port	1 kV; AC input power port			
Repetition frequency	✓	5 kHz		2,5 kHz

Performed tests

Tested Voltage; Port	1 kV; AC input power port			
Mode	On mode			
Injection method	✓	CDN		Capacitive clamp
Polarity	✓	Positive	✓	Negative
Set-up	✓	Table-top		Floor standing

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.3 Surge transient immunity

The surge transient immunity test simulates the surges that are caused by overvoltage due to indirect (induced) lightning transients. The pulse is a slow transient with high-energy contents and due to its long duration may cause damage to an unprotected EUT.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-5
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.
Pulse characteristics	1,2/50 µs
Peak Voltage; Port	1 kV; AC input power port

Performed tests

Tested Voltage; Port	1 kV; AC input power port			
Mode	On mode			
Polarity	✓	Positive	✓	Negative

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.4 RF Conducted immunity

During this test the immunity of the equipment for induced or conducted electromagnetic fields is checked. Fields generated by radio and other transmitters cause RF voltages in long cables like the mains network. This test reproduces these induced disturbing voltages by injecting them to the EUT via the cabling.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-6
Performance criterion	A; Operation as intended
Frequency range	0,15 – 230 MHz
Modulation	1 kHz – 80% AM
Test level; Port	3 V; AC input power port

Performed tests

Tested level; Port	3 V; AC input power port			
Mode	On mode			
Frequency range	0,15 – 230 MHz			
Dwell time	3 seconds			
Injection method	✓	CDN-M2		EM clamp

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.5 Power supply interruptions and dips

Requirements

Basic standard	EN 61000-4-11
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed. C; Temporary, self-recoverable loss of function is allowed.

Standard			50 Hz	60 Hz
AC input power port	C	U_{NOM} – 30%	(25 periods)	(30 periods)
	C	U_{NOM} – 60%	(10 periods)	(12 periods)
	C	U_{NOM} – 100%	(0,5 period)	(0,5 period)

Performed tests

Tested voltage	AC input power port,	
Mode	On mode	
AC input power port	50 Hz	60 Hz
	U_{NOM} – 30% (25 periods)	U_{NOM} – 30% (30 periods)
	U_{NOM} – 60% (10 periods)	U_{NOM} – 60% (12 periods)
	U_{NOM} – 100% (0,5 period)	U_{NOM} – 100% (0,5 period)

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photograph shows the tested device.

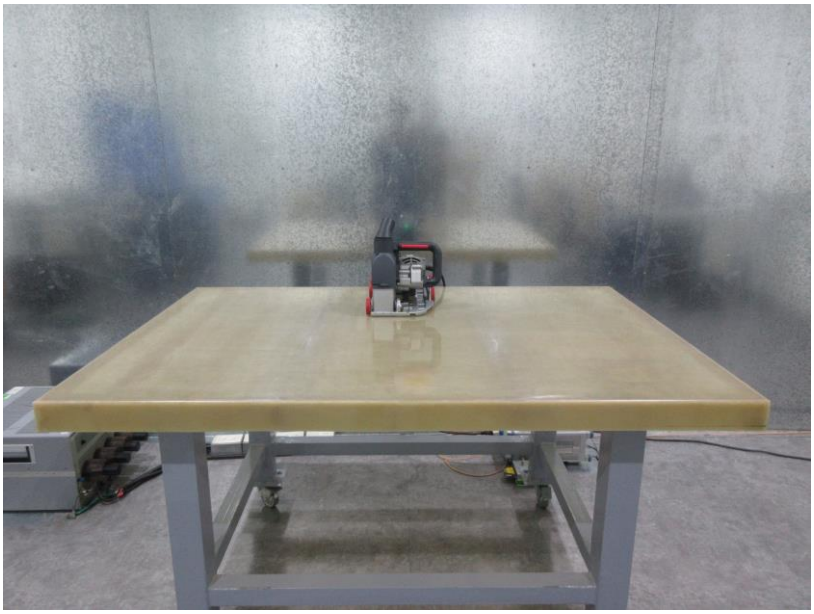


Figure 3 Conducted Emission test setup

Figure 4 Disturbance power test setup

----------END----------