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EMC Test report for Mixer

Models: EV160; EV160B; MX160

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By order of LEE YEONG INDUSTRIAL CO., LTD.



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DEKRA Testing and Certification (Shanghai) Ltd.

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Document

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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 Mixer, models EV160; EV160B and MX160 intended for residential use. The EUT has electronic control but no earth connection.

According to the declaration from manufacturer, EV160, EV160B and MX160 were designed with same motor and gear box so that their max speed and rating power were same. The differences were their enclosure and handle. EV160 and EV160B have brush caps.

Therefore, model EV160 was selected for the full test and the results are also 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	Mixer
Trade mark	AGP
Tested Type	EV160
Representative Types	EV160B; MX160
Ratings	220-240 Vac; 50-60 Hz; 1600 W; n_0 : 180-350 / 280-550 min ⁻¹ ; 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	2018-07 (samples provided by applicant)
Date (s) of performance of tests	2018-07
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 $\pm 4\%$.

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	2019.07.30
Coaxial Cable	Harbour	RG-400	SR2-H	2019.08.14
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	2019.01.15

Voltage fluctuation and flicker / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMC Emission Tester	EMC-Partner	HAR-1000-1P	109	2019.01.15

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		

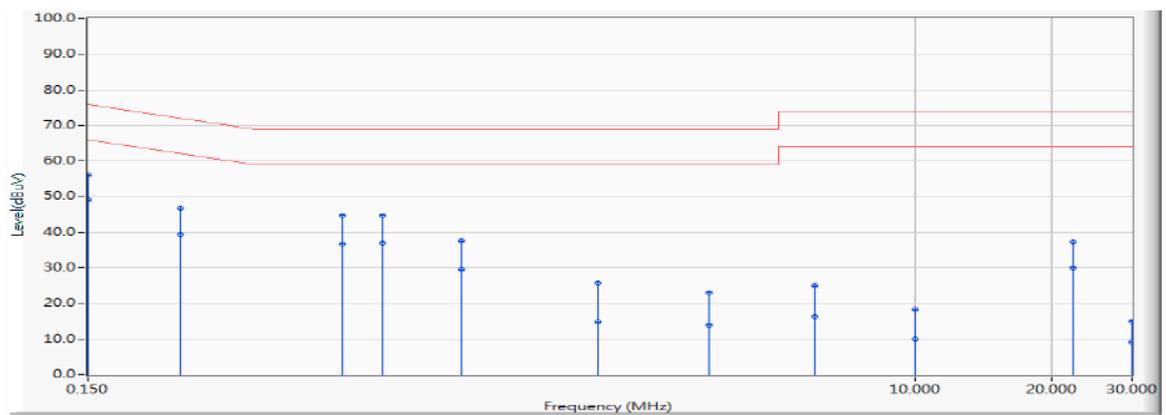
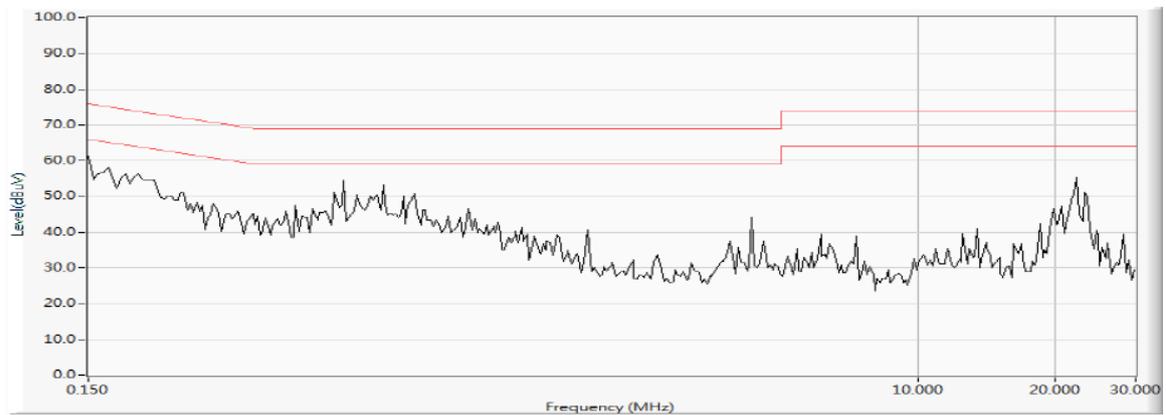
*) Limits decreasing linearly with the logarithm of the frequency

	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

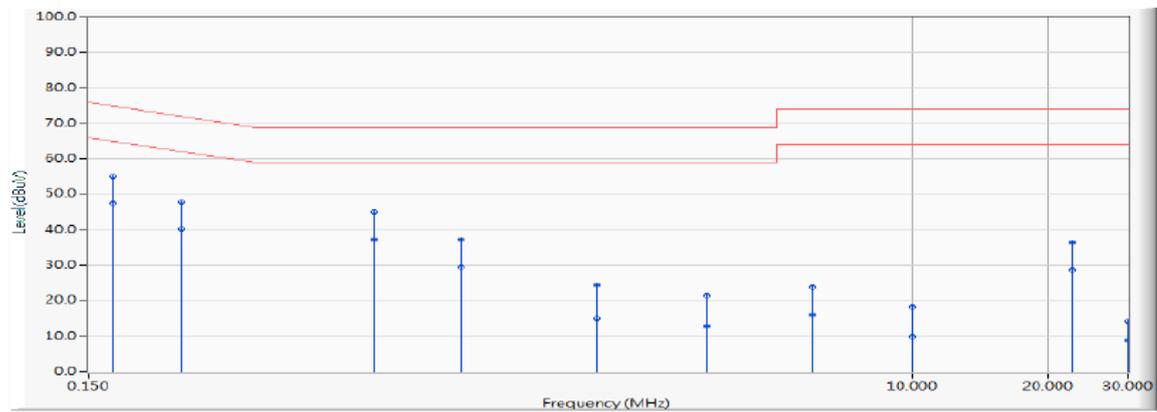
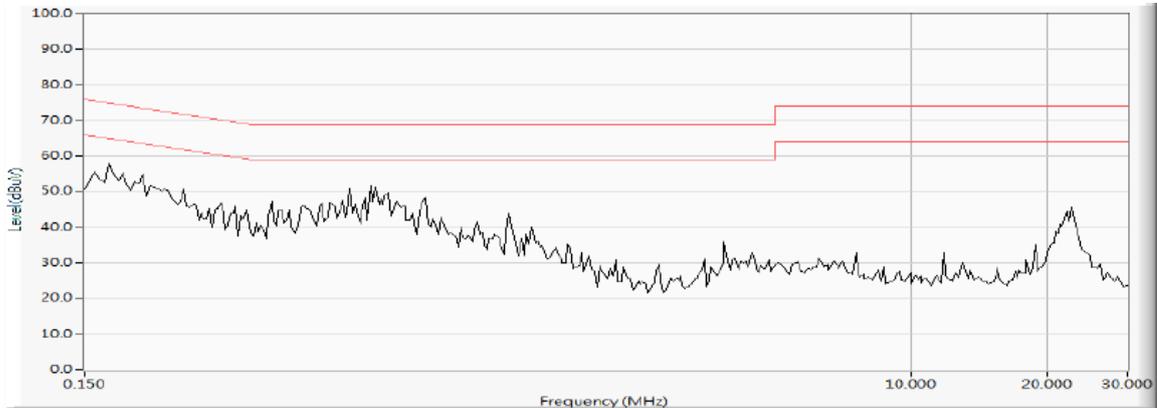
Port	AC mains, 230 Vac
Test method	LISN
Mode	On mode with an artificial hand, no load

Results

Line



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.150	9.678	48.470	58.148	-19.854	78.000	QUASIPeAK
2		0.150	9.678	39.280	48.958	-20.044	69.000	AVERAGE
3		0.240	9.690	38.830	48.520	-25.597	72.117	QUASIPeAK
4		0.240	9.690	29.850	39.540	-23.913	63.453	AVERAGE
5		0.545	9.701	35.000	44.701	-24.299	69.000	QUASIPeAK
6		0.545	9.701	26.980	36.681	-22.319	59.000	AVERAGE
7		0.670	9.729	35.020	44.748	-24.252	69.000	QUASIPeAK
8		0.670	9.729	27.270	36.998	-22.002	59.000	AVERAGE
9		1.000	9.800	27.780	37.580	-31.440	69.000	QUASIPeAK
10		1.000	9.800	19.790	29.590	-29.410	59.000	AVERAGE
11		2.000	9.810	15.820	25.630	-43.370	69.000	QUASIPeAK
12		2.000	9.810	4.900	14.710	-44.290	59.000	AVERAGE
13		3.500	9.817	13.180	22.977	-46.023	69.000	QUASIPeAK
14		3.500	9.817	4.100	13.917	-45.083	59.000	AVERAGE
15		6.000	9.877	15.040	24.917	-49.083	74.000	QUASIPeAK
16		6.000	9.877	6.520	16.397	-47.603	64.000	AVERAGE
17		10.000	10.070	8.080	18.150	-55.850	74.000	QUASIPeAK
18		10.000	10.070	-0.040	10.030	-53.970	64.000	AVERAGE
19		22.255	10.288	27.040	37.328	-36.674	74.000	QUASIPeAK
20		22.255	10.288	19.610	29.898	-34.104	64.000	AVERAGE
21		30.000	10.370	4.590	14.960	-59.040	74.000	QUASIPeAK
22		30.000	10.370	-1.250	9.120	-54.880	64.000	AVERAGE

Neutral

	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.170	9.680	45.200	54.880	-20.086	74.966	QUASIPeAK
2	*	0.170	37.880	47.560	-19.963	67.523	AVERAGE
3	0.240	9.680	37.930	47.610	-24.507	72.117	QUASIPeAK
4	0.240	9.680	30.460	40.140	-23.313	63.453	AVERAGE
5	0.642	9.712	35.270	44.982	-24.018	69.000	QUASIPeAK
6	0.642	9.712	27.520	37.232	-21.768	59.000	AVERAGE
7	1.000	9.790	27.520	37.310	-31.690	69.000	QUASIPeAK
8	1.000	9.790	19.790	29.580	-29.420	59.000	AVERAGE
9	2.000	9.800	14.680	24.480	-44.520	69.000	QUASIPeAK
10	2.000	9.800	5.200	15.000	-44.000	59.000	AVERAGE
11	3.500	9.807	11.520	21.327	-47.673	69.000	QUASIPeAK
12	3.500	9.807	3.160	12.967	-46.033	59.000	AVERAGE
13	6.000	9.877	13.960	23.837	-50.163	74.000	QUASIPeAK
14	6.000	9.877	6.130	16.007	-47.993	64.000	AVERAGE
15	10.000	10.090	8.260	18.350	-55.650	74.000	QUASIPeAK
16	10.000	10.090	-0.040	10.050	-53.950	64.000	AVERAGE
17	22.486	10.427	26.120	36.547	-37.453	74.000	QUASIPeAK
18	22.486	10.427	18.220	28.647	-35.353	64.000	AVERAGE
19	30.000	10.580	3.620	14.200	-59.800	74.000	QUASIPeAK
20	30.000	10.580	-1.850	8.730	-55.270	64.000	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 *)

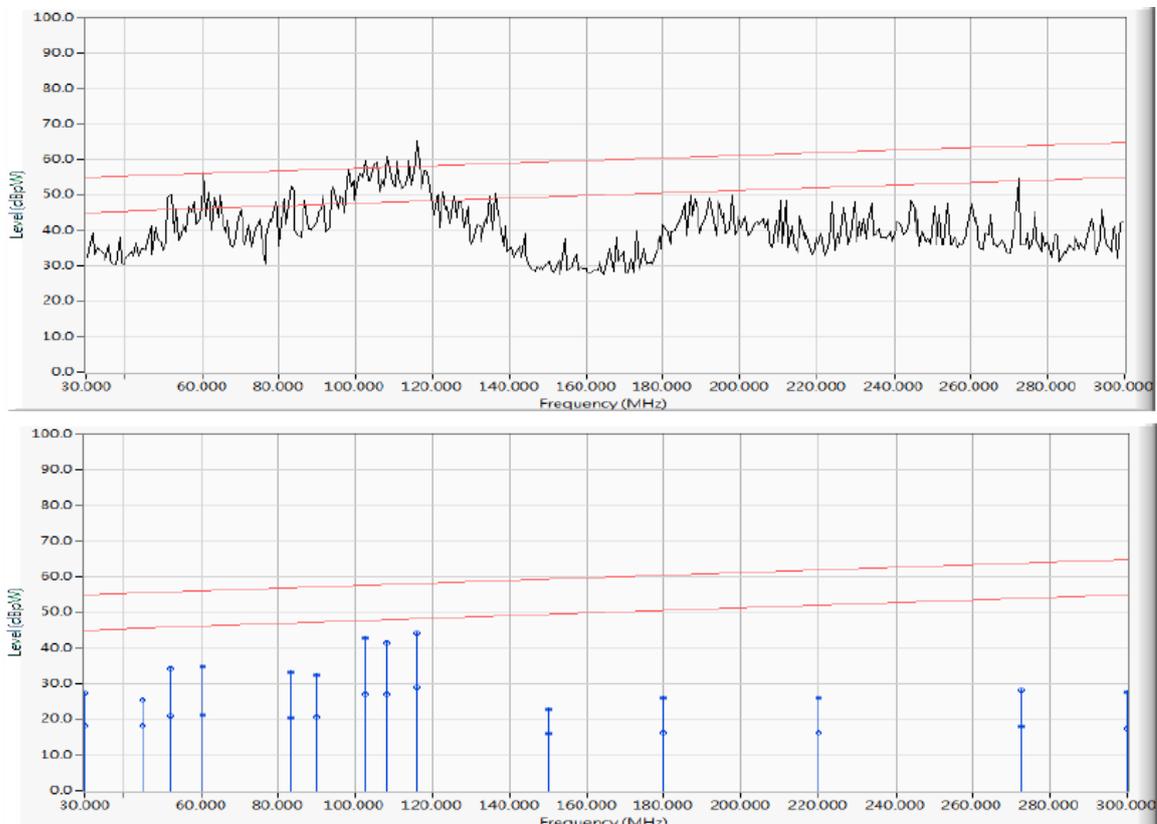
*) Limits increasing linearly with the frequency

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



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dB μ W)	Measure Level (dB μ W)	Margin (dB)	Limit (dB μ W)	Detector Type
1		30.000	8.700	18.690	27.390	-27.610	55.000	QUASPEAK
2		30.000	8.700	9.610	18.310	-26.690	45.000	AVERAGE
3		45.000	7.460	17.930	25.390	-31.371	56.761	QUASPEAK
4		45.000	7.460	10.870	18.330	-28.431	46.761	AVERAGE
5		52.000	7.400	26.960	34.360	-23.029	57.389	QUASPEAK
6		52.000	7.400	13.390	20.790	-26.599	47.389	AVERAGE
7		60.312	7.542	27.280	34.822	-23.211	58.033	QUASPEAK
8		60.312	7.542	13.650	21.192	-26.841	48.033	AVERAGE
9		83.312	6.499	26.710	33.209	-26.227	59.436	QUASPEAK
10		83.312	6.499	13.780	20.279	-29.157	49.436	AVERAGE
11		90.000	6.715	25.690	32.405	-27.366	59.771	QUASPEAK
12		90.000	6.715	13.980	20.695	-29.076	49.771	AVERAGE
13		102.750	6.690	36.270	42.960	-17.387	60.347	QUASPEAK
14		102.750	6.690	20.420	27.110	-23.237	50.347	AVERAGE
15		108.187	6.709	34.780	41.489	-19.082	60.571	QUASPEAK
16		108.187	6.709	20.340	27.049	-23.522	50.571	AVERAGE
17	*	115.875	6.736	37.390	44.126	-16.743	60.869	QUASPEAK
18		115.875	6.736	22.210	28.946	-21.923	50.869	AVERAGE
19		150.000	5.755	17.020	22.775	-39.215	61.990	QUASPEAK
20		150.000	5.755	10.440	16.195	-35.795	51.990	AVERAGE
21		180.000	5.171	20.780	25.951	-36.831	62.782	QUASPEAK
22		180.000	5.171	11.270	16.441	-36.341	52.782	AVERAGE
23		220.000	5.174	20.710	25.884	-37.769	63.653	QUASPEAK
24		220.000	5.174	11.260	16.434	-37.219	53.653	AVERAGE
25		272.625	6.199	21.850	28.049	-36.535	64.584	QUASPEAK
26		272.625	6.199	11.860	18.059	-36.525	54.584	AVERAGE
27		300.000	5.585	22.020	27.605	-37.395	65.000	QUASPEAK
28		300.000	5.585	11.850	17.435	-37.565	55.000	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:

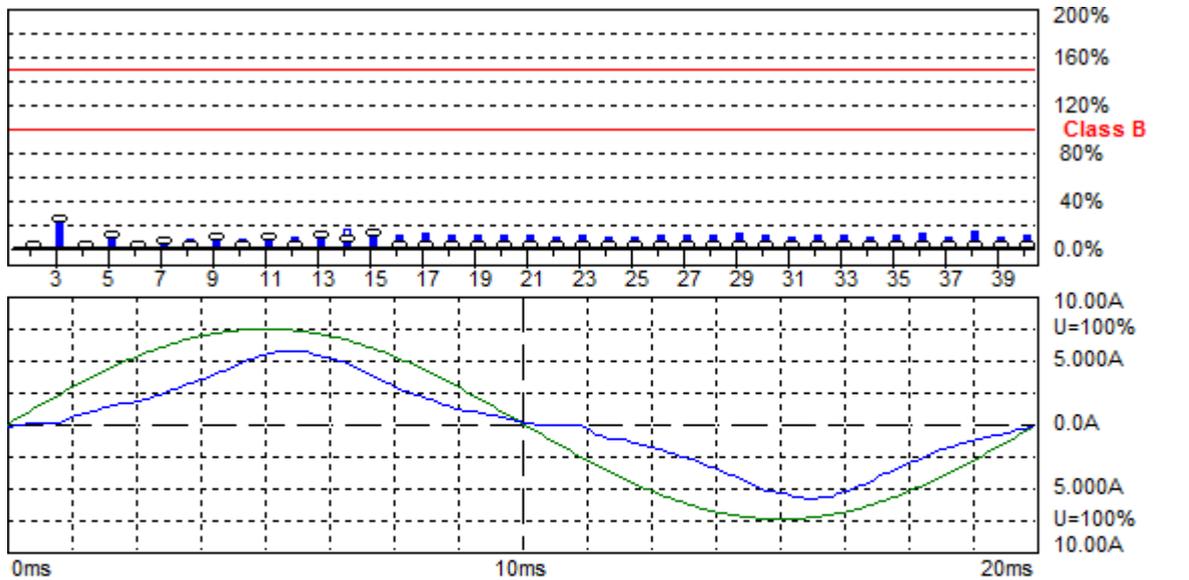
PASS

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



Harmonic Emission - IEC 61000-3-2, EN 61000-3-2, (EN60555-2)

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Urms = 231.1 V P = 721.1 W THC = 0.768 A
 Irms = 3.242 A pf = 0.962

Range: 10 A
 V-nom: 231 V
 TestTime: 5 min (100%)

Test completed, Result: PASSED

HAR-1000 EMC-Partner

Urms = 231.1V Freq = 49.987 Range: 10 A
 Irms = 3.242A lpk = 5.894A cf = 1.818
 P = 721.1W S = 749.2VA pf = 0.962
 THDi = 24.4 % 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	3.1547	0.0220	0.6777		3.1934	98.494		
2	100	0.0000	0.0159	0.4895	0.9796	0.0159	0.4895	0.9796	1.6200
3	150	0.7612	0.7483	23.080	21.690	0.7733	23.852	22.415	3.4500
4	200	0.0000	0.0140	0.4330	2.1764	0.0159	0.4895	2.4603	0.6450
5	250	0.1390	0.1367	4.2169	7.9952	0.1410	4.3486	8.2451	1.7100
6	300	0.0000	0.0171	0.5271	3.7977	0.0183	0.5648	4.0690	0.4500
7	350	0.0411	0.0427	1.3178	3.6991	0.0439	1.3554	3.8048	1.1550
8	400	0.0000	0.0165	0.5083	4.7767	0.0171	0.5271	4.9536	0.3450
9	450	0.0402	0.0452	1.3931	7.5277	0.0464	1.4307	7.7311	0.6000
10	500	0.0000	0.0122	0.3765	4.4228	0.0128	0.3953	4.6440	0.2760
11	550	0.0335	0.0366	1.1295	7.3982	0.0391	1.2048	7.8914	0.4950
12	600	0.0000	0.0116	0.3577	5.0420	0.0140	0.4330	6.1035	0.2300
13	650	0.0265	0.0293	0.9036	9.3006	0.0299	0.9224	9.4944	0.3150
14	700	0.0088	0.0159	0.4895	8.0496	0.0256	0.7907	13.003	0.1971
15	750	0.0209	0.0226	0.6965	10.037	0.0232	0.7154	10.308	0.2250
16	800	0.0000	0.0128	0.3953	7.4304	0.0140	0.4330	8.1380	0.1725
17	850	0.0000	0.0183	0.5648	9.2231	0.0189	0.5836	9.5305	0.1985
18	900	0.0000	0.0098	0.3012	6.3689	0.0122	0.3765	7.9611	0.1533
19	950	0.0000	0.0153	0.4706	8.5901	0.0159	0.4895	8.9337	0.1776
20	1000	0.0000	0.0085	0.2636	6.1920	0.0110	0.3389	7.9611	0.1380
21	1050	0.0000	0.0116	0.3577	7.2157	0.0128	0.3953	7.9753	0.1607
22	1100	0.0000	0.0092	0.2824	7.2977	0.0092	0.2824	7.2977	0.1255
23	1150	0.0000	0.0098	0.3012	6.6551	0.0116	0.3577	7.9029	0.1467
24	1200	0.0000	0.0073	0.2259	6.3689	0.0085	0.2636	7.4304	0.1150
25	1250	0.0000	0.0085	0.2636	6.3296	0.0092	0.2824	6.7817	0.1350
26	1300	0.0000	0.0067	0.2071	6.3247	0.0085	0.2636	8.0496	0.1062
27	1350	0.0000	0.0085	0.2636	6.8359	0.0104	0.3200	8.3008	0.1250
28	1400	0.0000	0.0073	0.2259	7.4304	0.0079	0.2447	8.0496	0.0986
29	1450	0.0000	0.0092	0.2824	7.8668	0.0116	0.3577	9.9646	0.1164
30	1500	0.0000	0.0061	0.1883	6.6343	0.0073	0.2259	7.9611	0.0920
31	1550	0.0000	0.0079	0.2447	7.2880	0.0079	0.2447	7.2880	0.1089
32	1600	0.0000	0.0055	0.1694	6.3689	0.0067	0.2071	7.7842	0.0862
33	1650	0.0000	0.0073	0.2259	7.1615	0.0085	0.2636	8.3550	0.1023
34	1700	0.0000	0.0055	0.1694	6.7669	0.0061	0.1883	7.5188	0.0812
35	1750	0.0000	0.0067	0.2071	6.9625	0.0073	0.2259	7.5955	0.0964
36	1800	0.0000	0.0067	0.2071	8.7572	0.0079	0.2447	10.349	0.0767
37	1850	0.0000	0.0061	0.1883	6.6913	0.0067	0.2071	7.3604	0.0912
38	1900	0.0000	0.0073	0.2259	10.084	0.0085	0.2636	11.765	0.0726
39	1950	0.0000	0.0055	0.1694	6.3477	0.0061	0.1883	7.0530	0.0865
40	2000	0.0000	0.0055	0.1694	7.9611	0.0055	0.1694	7.9611	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

Tmax (dt > 3,3%)	0,0 ms
Maximum voltage change d _{MAX}	1,82%
Relative Voltage change d _c	0,74%
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 μ s
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	EN 55014-2			
AC input power port			50 Hz	60 Hz
	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

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