



6032237.50

EMC Test report for Tapper

**Models: T14; T16; PT14; ET14; T1416; PT1416; ET1416;
3860014; GSM PRO and GS18**

Shanghai, date of issue: 2018-06-04

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By order of Lee Yeong Industrial Co., Ltd.

A handwritten signature in black ink that reads 'Kaiyuan Dai'.

A handwritten signature in black ink that reads 'Zuyao Fan'.

author : Kaiyuan Dai

reviewed : Zuyao Fan

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DEKRA Testing and Certification (Shanghai) Ltd.

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Document

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1 CONCLUSION

The report is issued to base on original test report Ref. No. 3159488.50 dated on 2015-11-18 including the following modifications:

- Update the standard: EN 55014-2:2015.
- Considered the standard: EN 55014-1:2017.
- Add new model name: GS18.

Model GS 18 is identical with other models except the model name.
After review, no test is considered necessary.

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 tapper; model T14 intended for residential use. This product has electronic control circuit but no earth connection.

According to the declaration from manufacturer, all models T14; T16; PT14; ET14; T1416; PT1416; ET1416; 3860014; GSMPRO are identical except the model name.

Due to the similarity between them, model T14 was selected for the full tests and the corresponding data is representative for other models as well.



Figure 1 Overview

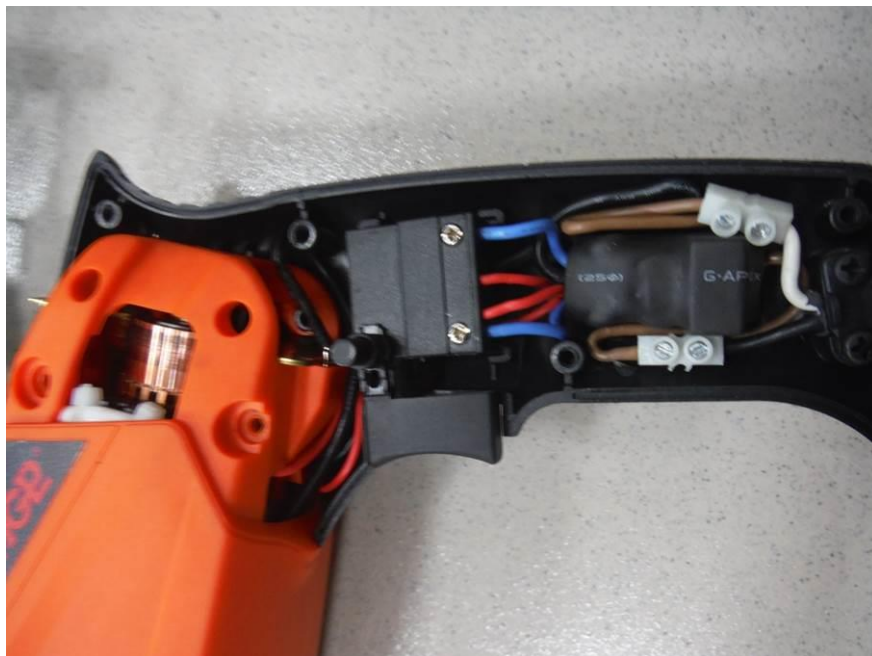


Figure 2 Internal view

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 with no internal clock higher than 15 MHz.
	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	2006	Emission – Electrical motor-operated and thermal appliances for household and similar purposes, electrical tools and similar electrical apparatus
A1	2009	
A2	2011	
EN 55014-1	2017	
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	Tapper
Trade mark	AGP
Tested Type	T14
Representative types	T16; PT14; ET14; T1416; PT1416; ET1416; 3860014; GSMPRO; GS18
Ratings	110-120 V; 50-60 Hz; 450 W; Ø14 mm; Class II 220-240 V; 50-60 Hz; 450 W; Ø14 mm; Class II

3.2 Customer Information

Applicant	Lee Yeong Industrial Co., Ltd.
Address	No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan

Manufacturer	Lee Yeong Industrial Co., Ltd.
Address	No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan

Factory	Lee Yeong Industrial Co., Ltd.
Address	No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan

3.3 Test data

Location	DEKRA Testing and Certification (Shanghai) Ltd.
Address	1 F., No. 250, Jiangchangsan Road, Shanghai, China
Date	Jun. 2015
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 Emission Expanded Uncertainty: $U = 3.22$ dB

Disturbance Power Expanded Uncertainty: $U = 2.38$ dB

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

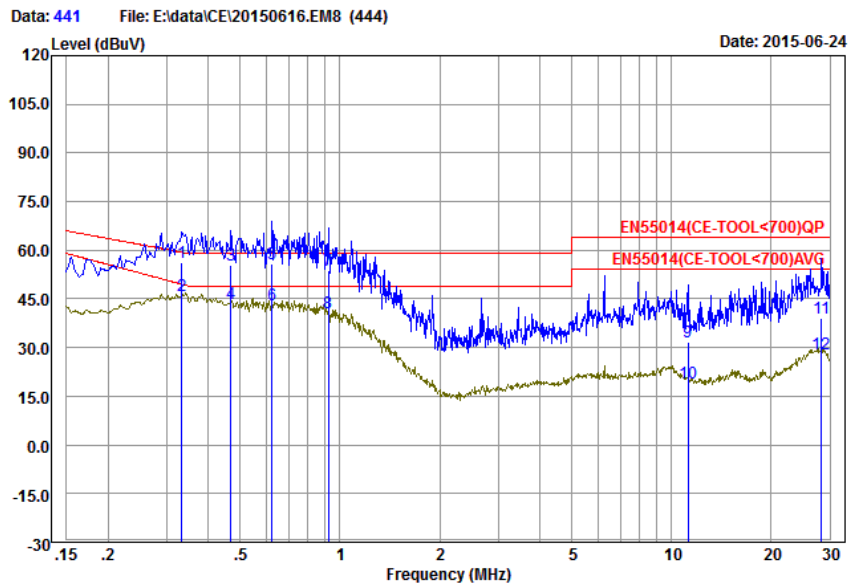
*) Limits decreasing linearly with the logarithm of the frequency

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

Port	AC mains
Test method	LISN
Mode	On mode

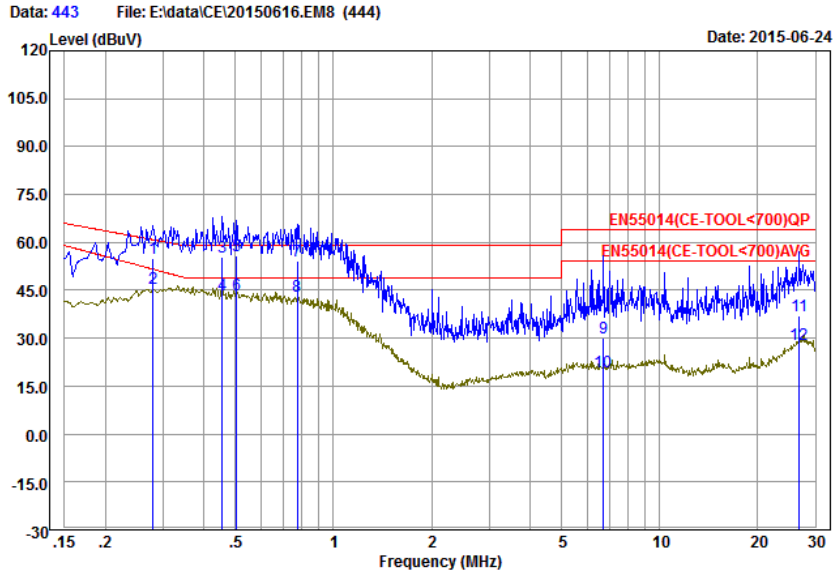
Result with 110-120 V

Line



	Freq	Limit	Read	Cable	Over	Remark	
	MHz	Line	Level	Level	Factor	Loss	Limit
		dBuV	dBuV	dBuV	dB	dB	dB
1	0.33	59.39	56.14	45.26	10.88	1.10	-3.25 QP
2 av	0.33	49.56	45.86	34.98	10.88	1.10	-3.70 Average
3	0.47	59.00	55.46	44.56	10.90	1.10	-3.54 QP
4	0.47	49.00	43.55	32.65	10.90	1.10	-5.45 Average
5 pp	0.62	59.00	55.89	44.89	11.00	1.20	-3.11 QP
6	0.62	49.00	43.19	32.19	11.00	1.20	-5.81 Average
7	0.92	59.00	53.61	42.56	11.05	1.30	-5.39 QP
8	0.92	49.00	40.63	29.58	11.05	1.30	-8.37 Average
9	11.20	64.00	31.78	20.50	11.28	1.48	-32.22 QP
10	11.20	54.00	19.18	7.90	11.28	1.48	-34.82 Average
11	28.30	64.00	38.89	28.50	10.39	0.35	-25.11 QP
12	28.30	54.00	27.99	17.60	10.39	0.35	-26.01 Average

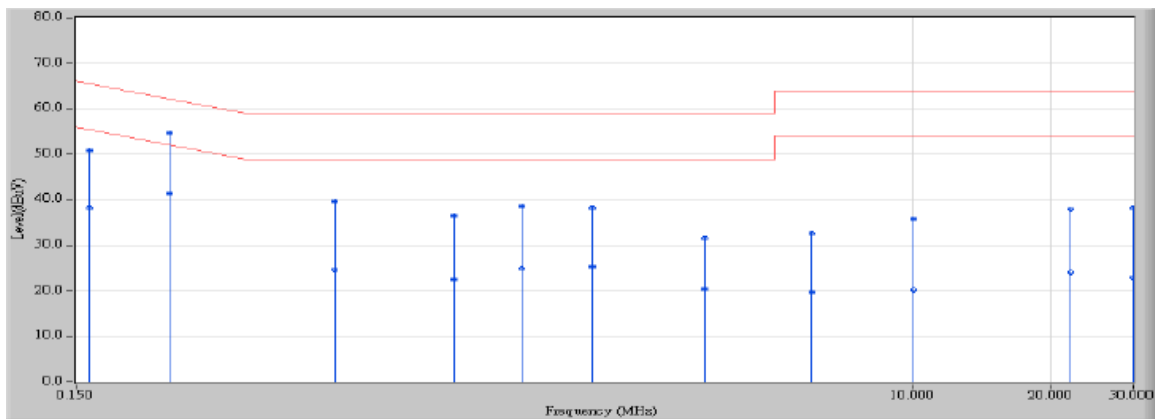
Neutral



	Freq	Limit	Read	Cable	Over	Over	Remark
	MHz	dBuV	Level	Level	Factor	Loss	Limit
			dBuV	dBuV	dB	dB	dB
1	0.28	60.83	54.84	43.89	10.95	1.10	-5.99 QP
2	0.28	51.62	45.80	34.85	10.95	1.10	-5.82 Average
3	0.46	59.00	55.48	44.56	10.92	1.10	-3.52 QP
4 av	0.46	49.00	43.61	32.69	10.92	1.10	-5.39 Average
5 pp	0.50	59.00	55.81	44.89	10.92	1.10	-3.19 QP
6	0.50	49.00	43.50	32.58	10.92	1.10	-5.50 Average
7	0.78	59.00	54.20	43.15	11.05	1.28	-4.80 QP
8	0.78	49.00	43.03	31.98	11.05	1.28	-5.97 Average
9	6.73	64.00	29.99	18.96	11.03	1.34	-34.01 QP
10	6.73	54.00	19.28	8.25	11.03	1.34	-34.72 Average
11	26.84	64.00	36.97	26.58	10.39	0.27	-27.03 QP
12	26.84	54.00	27.87	17.48	10.39	0.27	-26.13 Average

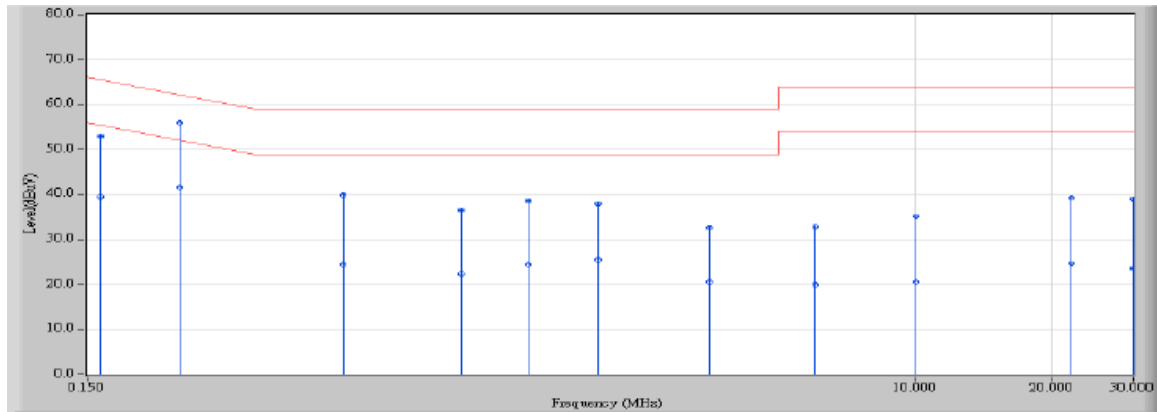
Result with 220-240 V

Line



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.160	9.760	41.130	50.890	-14.577	65.467	QUASPEAK
2	0.160	9.760	28.430	38.190	-20.048	58.238	AVERAGE
3	* 0.240	9.758	44.930	54.688	-7.429	62.117	QUASPEAK
4	0.240	9.758	31.710	41.468	-11.985	53.453	AVERAGE
5	0.550	9.763	29.870	39.632	-19.368	59.000	QUASPEAK
6	0.550	9.763	14.990	24.752	-24.248	49.000	AVERAGE
7	1.000	9.860	26.560	36.420	-22.580	59.000	QUASPEAK
8	1.000	9.860	12.590	22.450	-26.550	49.000	AVERAGE
9	1.400	9.864	28.710	38.574	-20.426	59.000	QUASPEAK
10	1.400	9.864	14.980	24.844	-24.156	49.000	AVERAGE
11	2.000	9.870	28.200	38.070	-20.930	59.000	QUASPEAK
12	2.000	9.870	15.430	25.300	-23.700	49.000	AVERAGE
13	3.500	9.927	21.580	31.507	-27.493	59.000	QUASPEAK
14	3.500	9.927	10.530	20.457	-28.543	49.000	AVERAGE
15	6.000	10.017	22.630	32.647	-31.353	64.000	QUASPEAK
16	6.000	10.017	9.750	19.767	-34.233	54.000	AVERAGE

Neutral



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.160	9.810	43.210	53.020	-12.447	65.467	QUASIPeAK
2	0.160	9.810	29.670	39.480	-18.758	58.238	AVERAGE
3	* 0.240	9.812	46.230	56.042	-6.075	62.117	QUASIPeAK
4	0.240	9.812	31.850	41.662	-11.791	53.453	AVERAGE
5	0.550	9.830	30.110	39.940	-19.060	59.000	QUASIPeAK
6	0.550	9.830	14.670	24.500	-24.500	49.000	AVERAGE
7	1.000	9.920	26.640	36.560	-22.440	59.000	QUASIPeAK
8	1.000	9.920	12.420	22.340	-26.660	49.000	AVERAGE
9	1.400	9.924	28.770	38.694	-20.306	59.000	QUASIPeAK
10	1.400	9.924	14.600	24.524	-24.476	49.000	AVERAGE
11	2.000	9.930	28.020	37.950	-21.050	59.000	QUASIPeAK
12	2.000	9.930	15.550	25.480	-23.520	49.000	AVERAGE
13	3.500	9.995	22.510	32.505	-26.495	59.000	QUASIPeAK
14	3.500	9.995	10.530	20.525	-28.475	49.000	AVERAGE
15	6.000	10.093	22.650	32.743	-31.257	64.000	QUASIPeAK
16	6.000	10.093	9.810	19.903	-34.097	54.000	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 *)

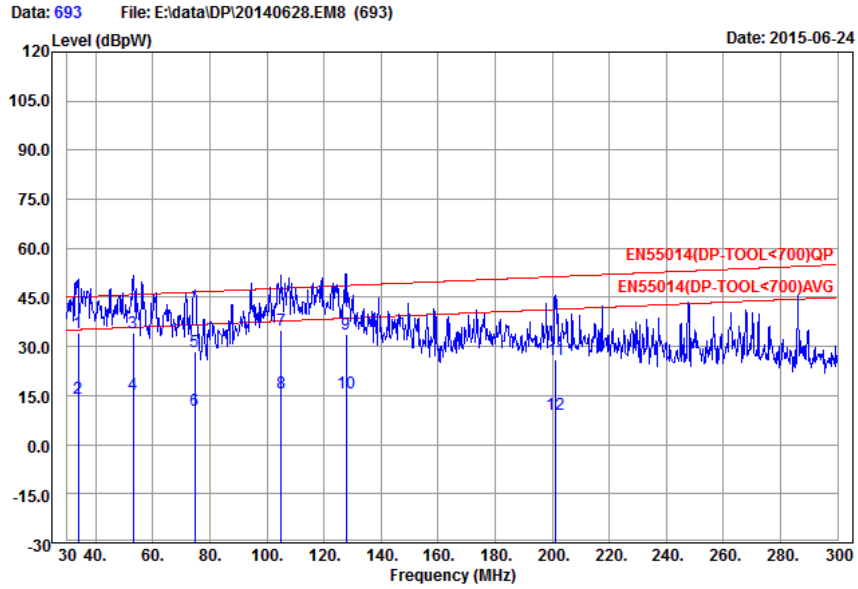
*) Limits increasing linearly with the frequency

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 power above 1000 W	Limits +10 dB

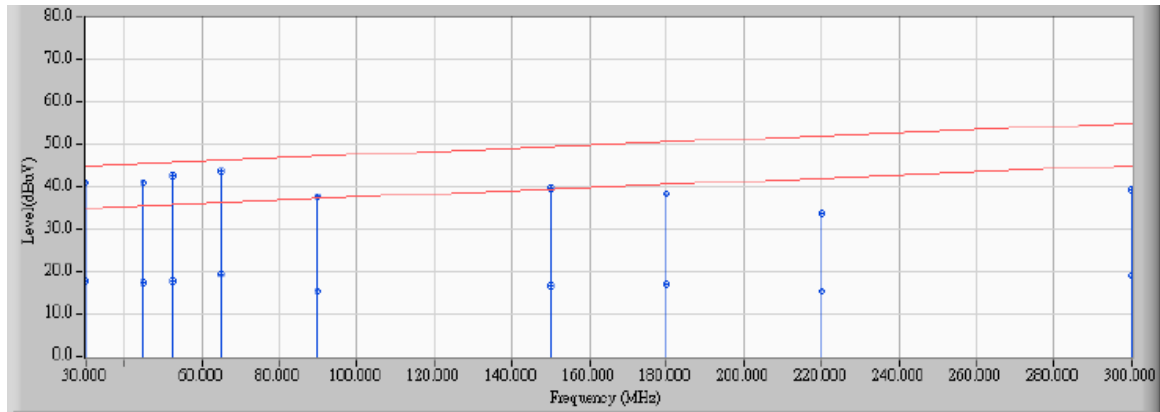
Port	AC Mains
Mode	On mode with no load

Results with 110-120 V



	Freq	Limit	Read	Cable	Over	Remark			
	MHz	Line	Level	Loss	Limit				
			dBpW	Factor	dB				
			dBpW	dB					
1	pp	33.78	45.15	34.28	13.21	21.07	0.88	-10.87	QP
2		33.78	35.15	13.98	-7.09	21.07	0.88	-21.17	Average
3		53.22	45.87	34.32	14.61	19.71	1.22	-11.55	QP
4	av	53.22	35.87	15.32	-4.39	19.71	1.22	-20.55	Average
5		74.82	46.67	28.61	9.81	18.80	1.21	-18.06	QP
6		74.82	36.67	10.41	-8.39	18.80	1.21	-26.26	Average
7		105.06	47.79	35.19	16.81	18.38	1.54	-12.60	QP
8		105.06	37.79	15.89	-2.49	18.38	1.54	-21.90	Average
9		127.74	48.63	33.95	15.61	18.34	1.43	-14.68	QP
10		127.74	38.63	15.85	-2.49	18.34	1.43	-22.78	Average
11		201.18	51.35	26.07	6.90	19.17	2.37	-25.28	QP
12		201.18	41.35	9.07	-10.10	19.17	2.37	-32.28	Average

Results with 220-240 V



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Measure Level (dBµV)	Margin (dB)	Limit (dBµV)	Detector Type
1	*	30.000	-2.400	43.500	41.100	-3.900	45.000	QUASIPeAK
2		30.000	-2.400	20.050	17.650	-17.350	35.000	AVERAGE
3		45.000	-0.540	41.690	41.150	-5.611	46.761	QUASIPeAK
4		45.000	-0.540	18.030	17.490	-19.271	36.761	AVERAGE
5		52.625	-0.581	43.160	42.579	-4.862	47.441	QUASIPeAK
6		52.625	-0.581	18.390	17.809	-19.632	37.441	AVERAGE
7		65.000	0.310	43.230	43.540	-4.818	48.358	QUASIPeAK
8		65.000	0.310	19.000	19.310	-19.048	38.358	AVERAGE
9		90.000	0.703	36.970	37.673	-12.098	49.771	QUASIPeAK
10		90.000	0.703	14.640	15.343	-24.428	39.771	AVERAGE
11		150.000	2.680	36.950	39.630	-12.360	51.990	QUASIPeAK
12		150.000	2.680	14.020	16.700	-25.290	41.990	AVERAGE
13		180.000	3.768	34.730	38.498	-14.283	52.782	QUASIPeAK
14		180.000	3.768	13.300	17.068	-25.713	42.782	AVERAGE
15		220.000	3.478	30.280	33.758	-19.895	53.653	QUASIPeAK
16		220.000	3.478	11.920	15.398	-28.255	43.653	AVERAGE

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

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

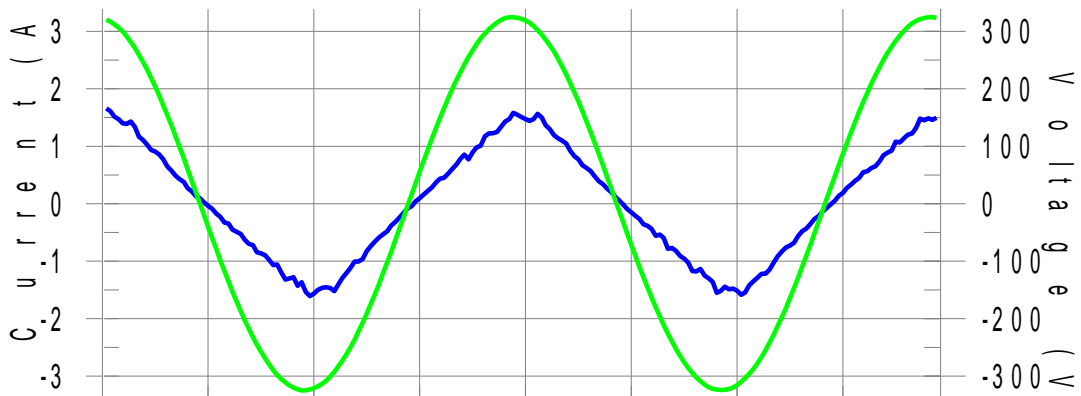
4.3 Harmonic currents

Standard	EN 61000-3-2
Port	AC Mains supply
Rated power	450 W

	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

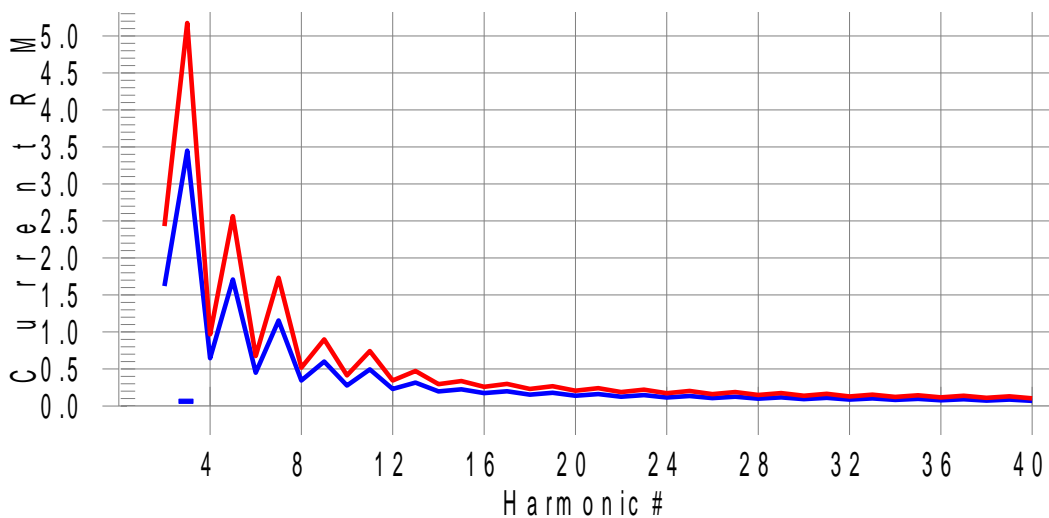
Results

Current & voltage waveforms



Harmonics and Class B limit line

European Limits



Test result: Pass Worst harmonic was #33 with 6.4% of the limit.

Test Result: Pass Source qualification: Normal

THC(A): 0.097 I-THD(%): 10.1 POHC(A): 0.009 POHC Limit(A): 0.377

Highest parameter values during test:

V_RMS (Volts): 229.73	Frequency(Hz): 50.00
I_Peak (Amps): 1.761	I_RMS (Amps): 0.980
I_Fund (Amps): 0.975	Crest Factor: 1.819
Power (Watts): 222.3	Power Factor: 0.989

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.002	1.620	N/A	0.003	2.430	N/A	Pass
3	0.093	3.450	2.7	0.098	5.175	1.9	Pass
4	0.003	0.645	N/A	0.003	0.968	N/A	Pass
5	0.019	1.710	1.1	0.020	2.565	0.8	Pass
6	0.004	0.450	N/A	0.005	0.675	N/A	Pass
7	0.004	1.155	N/A	0.005	1.733	N/A	Pass
8	0.003	0.345	N/A	0.005	0.518	N/A	Pass
9	0.002	0.600	N/A	0.003	0.900	N/A	Pass
10	0.002	0.276	N/A	0.003	0.414	N/A	Pass
11	0.002	0.495	N/A	0.003	0.743	N/A	Pass
12	0.002	0.230	N/A	0.003	0.345	N/A	Pass
13	0.003	0.315	N/A	0.004	0.473	N/A	Pass
14	0.002	0.197	N/A	0.004	0.295	N/A	Pass
15	0.003	0.225	N/A	0.004	0.338	N/A	Pass
16	0.002	0.173	N/A	0.003	0.260	N/A	Pass
17	0.003	0.199	N/A	0.003	0.299	N/A	Pass
18	0.002	0.153	N/A	0.004	0.230	N/A	Pass
19	0.003	0.178	N/A	0.003	0.267	N/A	Pass
20	0.002	0.138	N/A	0.003	0.207	N/A	Pass
21	0.003	0.161	N/A	0.003	0.241	N/A	Pass
22	0.002	0.125	N/A	0.004	0.188	N/A	Pass
23	0.002	0.147	N/A	0.003	0.221	N/A	Pass
24	0.002	0.115	N/A	0.003	0.173	N/A	Pass
25	0.003	0.135	N/A	0.003	0.203	N/A	Pass
26	0.003	0.106	N/A	0.006	0.159	N/A	Pass
27	0.003	0.125	N/A	0.007	0.188	N/A	Pass
28	0.004	0.099	N/A	0.007	0.149	N/A	Pass
29	0.004	0.116	N/A	0.009	0.174	N/A	Pass
30	0.004	0.092	N/A	0.009	0.138	N/A	Pass
31	0.006	0.110	5.2	0.009	0.164	5.5	Pass
32	0.005	0.086	N/A	0.010	0.129	N/A	Pass
33	0.006	0.102	6.2	0.010	0.153	6.4	Pass
34	0.003	0.081	N/A	0.010	0.122	N/A	Pass
35	0.003	0.096	N/A	0.004	0.144	N/A	Pass
36	0.003	0.077	N/A	0.004	0.116	N/A	Pass
37	0.003	0.092	N/A	0.004	0.137	N/A	Pass
38	0.002	0.073	N/A	0.003	0.110	N/A	Pass
39	0.002	0.087	N/A	0.003	0.131	N/A	Pass
40	0.002	0.069	N/A	0.002	0.104	N/A	Pass

Conclusion:

PASS

4.4 Voltage fluctuations (Flicker)

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

P _{ST}	Not applicable*
P _{LT}	Not applicable*
T _{max} (dt > 3,3%)	≤ 500 ms
d _C	≤ 3,3%
d _{MAX}	≤ 7%

Results

T _{max} (dt > 3,3%)	0,0 ms
Maximum voltage change d _{MAX}	1,838%
Relative Voltage change d _C	0,360%
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	21 °C							
Relative Humidity air	48%							

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 (Line to line)

Performed tests

Tested Voltage; Port	1 kV; AC input power port (Line to line)		
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	$U_{NOM} - 30\%$	(50 periods)	(60 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
	$U_{NOM} - 30\%$ (50 periods)		$U_{NOM} - 30\%$ (60 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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