

EMC Test Report

Application No. : HX1805033757

Applicant : Kunshan Taihan Electronics Co.,Ltd

Equipment Under Test (EUT)

EUT Name : Digital Ultrasonic Cleaner

Model No. : TH-020A

Serial No. : See Page 4

Brand Name :  / multool/ **FLOUREON**[®]

Receipt Date : 2018-05-22

Test Date : 2018-05-22 to 2018-05-29

Issue Date : 2018-05-29

Standards : EN 55014-1: 2017;
EN 61000-3-2: 2014;
EN 61000-3-3: 2013;
EN 55014-2: 2015.

Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above. The EUT technically complies with the 2014/30/EU directive requirements.

Test/Witness Engineer

Tim

Approved & Authorized

Andy



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TABLE OF CONTENTS

1.	GENERAL INFORMATION	4
1.1.	Client Information	4
1.2.	General Description of EUT (Equipment Under Test)	4
1.3.	Block Diagram Showing the Configuration of System Tested	4
1.4.	Description of Support Units	4
1.5.	Performance Criterion.....	4
1.6.	Classification of Apparatus	5
1.7.	Test Facility	5
2.	TEST RESULTS SUMMARY	6
3.	TEST EQUIPMENT USED	7
4.	CONDUCTED EMISSION TEST	9
4.1.	Test Standard and Limit	9
4.2.	Test Setup	9
4.3.	Test Procedure	9
4.4.	Test Condition.....	10
4.5.	Test Data	10
5.	DISTURBANCE POWER MEASUREMENT	13
5.1.	Test Standard and Limit	13
5.2.	Test Setup	13
5.3.	Test Procedure	13
5.4.	Test Condition.....	14
5.5.	Test Data	14
6.	RADIATED EMISSION TEST	16
6.1.	Test Standard and Limit	16
6.2.	Test Setup	16
6.3.	Test Procedure	16
6.4.	Test Condition.....	17
6.5.	Test Data	17
7.	HARMONIC CURRENT EMISSION TEST	20
7.1.	Test Standard and Limit	20
7.2.	Test Setup	20
7.3.	Test Procedure	21
7.4.	Test Condition.....	21
7.5.	Test Data	21
8.	VOLTAGE FLUCTUATION AND FLICKER TEST	25
8.1.	Test Standard and Limit	25
8.2.	Test Setup	25
8.3.	Test Procedure	25
8.4.	Test Condition.....	25
8.5.	Test Data	26
9.	ELECTROSTATIC DISCHARGE IMMUNITY TEST	28
9.1.	Test Requirements.....	28
9.2.	Test Setup	28
9.3.	Test Procedure	28
9.4.	Test Data	29



10.	RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST	31
10.1.	Test Requirements	31
10.2.	Test Setup	31
10.3.	Test Procedure	31
10.4.	Test Data	32
11.	ELECTRICAL FAST TRANSIENT/BURST TEST	33
11.1.	Test Requirements	33
11.2.	Test Setup	33
11.3.	Test Procedure	33
11.4.	Test Data	34
12.	SURGE IMMUNITY TEST	36
12.1.	Test Requirements	36
12.2.	Test Setup	36
12.3.	Test Procedure	36
12.4.	Test Data	37
13.	CONDUCTED IMMUNITY TEST	39
13.1.	Test Requirements	39
13.2.	Test Setup	39
13.3.	Test Procedure	39
13.4.	Test Data	40
14.	VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY TEST	42
14.1.	Test Requirements	42
14.2.	Test Setup	42
14.3.	Test Procedure	42
14.4.	Test Data	42
15.	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	44

1. General Information

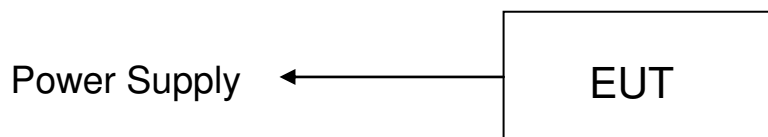
1.1. Client Information

Applicant	:	Kunshan Taihan Electronics Co.,Ltd
Address	:	Room 464, 1st Floor. Zhenyang Road, Zhangpu Town, Kunshan, Suzhou, Jiangsu, China.
Manufacturer	:	Kunshan Taihan Electronics Co.,Ltd
Address	:	Room 464, 1st Floor. Zhenyang Road, Zhangpu Town, Kunshan, Suzhou, Jiangsu, China.

1.2. General Description of EUT (Equipment Under Test)

EUT Name	:	Digital Ultrasonic Cleaner
Model No.	:	TH-020A
Serial No.	:	TH-008M, TH-008A, TH-010A, TH-030A, TH-040A, TH-060A, TH-080A, TH-100A
Brand Name	:	 / multool/ 
Power Supply	:	AC230V/50Hz 50W
<p>Remark: All above models are identical in schematic, structure and critical components except for different control methods and the appearance, therefore, EMC testing was performed with TH-020A only.</p>		

1.3. Block Diagram Showing the Configuration of System Tested



1.4. Description of Support Units

The EUT has been tested as an independent unit, and with the max power.

1.5. Performance Criterion

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be

restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

1.6. Classification of Apparatus

Category I: Apparatus containing no electronic control circuitry.

Category II: Transformer toys, dual supply toys, mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example-UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.

Category III: Battery powered apparatus (with built-in batteries or external batteries), which in normal use is not connected to the mains, containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.

This category includes apparatus provided with rechargeable batteries which can be charged by connecting the apparatus to the mains power. However, this apparatus shall also be tested as an apparatus in category III while it is connected to the mains network.

Category IV: All other apparatus covered by the scope of this standard.

1.7. Test Facility

The testing report were performed by the Shenzhen HX Detect Certification Co., Ltd., in their facilities located at 8/F, Haoyunlai Building B, Baomin 2th Road, Xixiang Street, Baoan District, Shenzhen, China.

2. Test Results Summary

EMISSION		
Description of test items	Standards	Results
Conducted disturbance at mains terminals	EN 55014-1: 2017	Pass
Disturbance Power	EN 55014-1: 2017	Pass
Click measurement	EN 55014-1: 2017	N/A
Radiated disturbance	EN 55014-1: 2017	Pass
Harmonic current emissions	EN 61000-3-2: 2014	N/A
Voltage fluctuation and flicker	EN 61000-3-3: 2013	Pass
IMMUNITY		
Description of test items	Basic Standards	Results
Electrostatic Discharge (ESD)	EN61000-4-2: 2009	Pass
Radio-frequency, Continuous Radiated Disturbance	EN61000-4-3: 2006+A1:2008 +A2:2010	N/A
EFT/B Immunity	EN61000-4-4: 2012	Pass
Surge Immunity	EN61000-4-5: 2006	Pass
Conducted RF Immunity	EN61000-4-6: 2014	Pass
Voltage dips, 40% reduction	EN61000-4-11: 2004	Pass
Voltage dips, 70% reduction		
Voltage interruptions		
Note: N/A is an abbreviation for Not Applicable.		

3. Test Equipment Used

3.1. Test Equipment Used to Measure Conducted Emission					
No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC001	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.02, 2018	1 Year
HX-EMC002	AMN	Rohde & Schwarz	ENV216	Jan.02, 2018	1 Year
HX-EMC003	AMN	SCHWARZBECK	NNBL 8226	Jan.02, 2018	1 Year
3.2. Test Equipment Used to Measure Disturbance Power					
No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC001	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.02, 2018	1 Year
HX-EMC028	Power Clamp	Luthi	MDS-21	Jan.02, 2018	1 Year
3.3. Test Equipment UseTest Equipment Used to Measure Radiated Emission					
No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC004	EMI Test Receiver	Rohde & Schwarz	ESI26	Jan.02, 2018	1 Year
HX-EMC005	Bilog Antenna	SCHWARZBECK	VULB9163	Jan.02, 2018	1 Year
HX-EMC006	Positioning Controller	C&C	CC-C-1F	N/A	N/A
3.4. Test Equipment Used to Measure Harmonic Current/ Voltage Fluctuation and Flicker					
No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC007	Harmonic Flicker Test System	CI	5001ix-CTS-40	Jan.02, 2018	1 Year
3.5. Test Equipment Used to Measure Electrostatic Discharge Immunity					
No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC008	ESD Tester	TESEQ	NSG437	Jan.02, 2018	1 Year
3.6. Test Equipment Used to Measure Conducted Immunity					
HX-EMC009	RF Generator	FRANKONIA	CIT-10/75	Jan.02, 2018	1 Year
HX-EMC010	Attenuator	FRANKONIA	59-6-33	Jan.02, 2018	1 Year
HX-EMC011	M-CDN	LUTHI	M2/M3	Jan.02, 2018	1 Year
HX-EMC012	CDN	LUTHI	AF2	Jan.02, 2018	1 Year
HX-EMC013	EM Injection Clamp	LUTHI	EM101	Jan.02, 2018	1 Year

3.7. Test Equipment Used to Measure Radio Frequency Electromagnetic Fields Immunity

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC014	Signal Generator	Rohde & Schwarz	SMT03	Jan.02, 2018	1 Year
HX-EMC015	Power Meter	Rohde & Schwarz	NRVD	Jan.02, 2018	1 Year
HX-EMC016	Voltage Probe	Rohde & Schwarz	URV5-Z2	Jan.02, 2018	1 Year
HX-EMC017	Voltage Probe	Rohde & Schwarz	URV5-Z2	Jan.02, 2018	1 Year
HX-EMC018	Power Amplifier	AR	150W1000	Jan.02, 2018	1 Year
HX-EMC019	Bilog Antenna	Chase	CBL6111C	Jan.02, 2018	1 Year

3.8. Test Equipment Used to Measure Electrical Fast Transient/Burst Immunity

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC020	Simulator	EMTEST	UCS500N5	Jan.02, 2018	1 Year
HX-EMC021	Auto-transformer	EMTEST	V4780S2	Jan.02, 2018	1 Year

3.9. Test Equipment Used to Measure Surge Immunity

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC022	Simulator	EMTEST	UCS500N5	Jan.02, 2018	1 Year
HX-EMC023	Coupling Clamp	EMTEST	HFK	Jan.02, 2018	1 Year

3.10. Test Equipment Used to Measure Voltage Dips and Interruptions Immunity

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
HX-EMC022	Simulator	EMTEST	UCS500N5	Jan.02, 2018	1 Year
HX-EMC023	Coupling Clamp	EMTEST	HFK	Jan.02, 2018	1 Year

4. Conducted Emission Test

4.1. Test Standard and Limit

4.1.1. Test Standard

EN 55014-1: 2017.

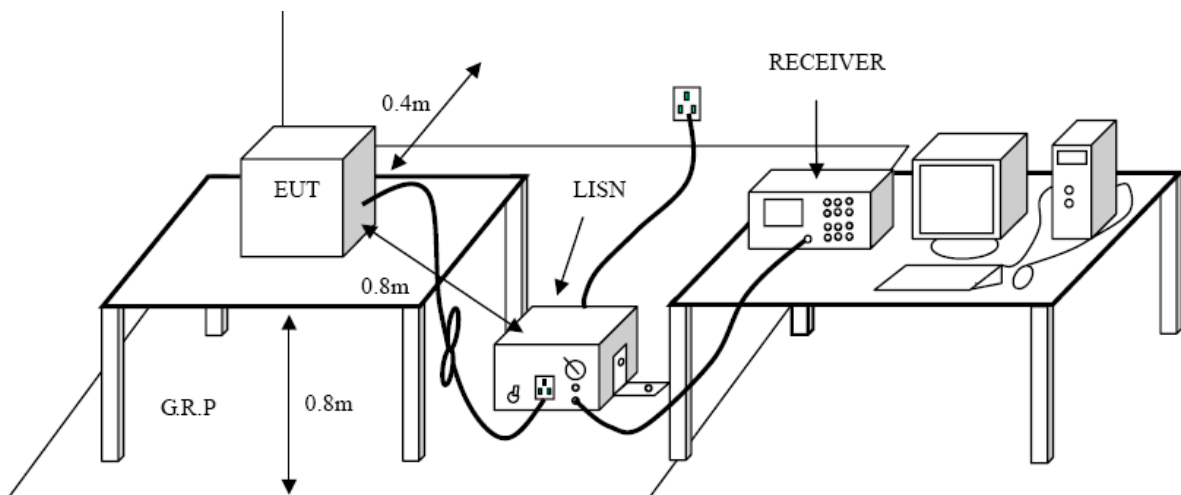
4.1.2. Test Limit

Conducted Disturbance Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	Quasi-peak Level	Average Level
150kHz~350kHz	66 ~ 56*	56 ~ 46 *
350kHz~5MHz	56	46
5MHz~30MHz	60	50

Remark: “*” Decreasing linearly with logarithm of the frequency

4.2. Test Setup



4.3. Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The

overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

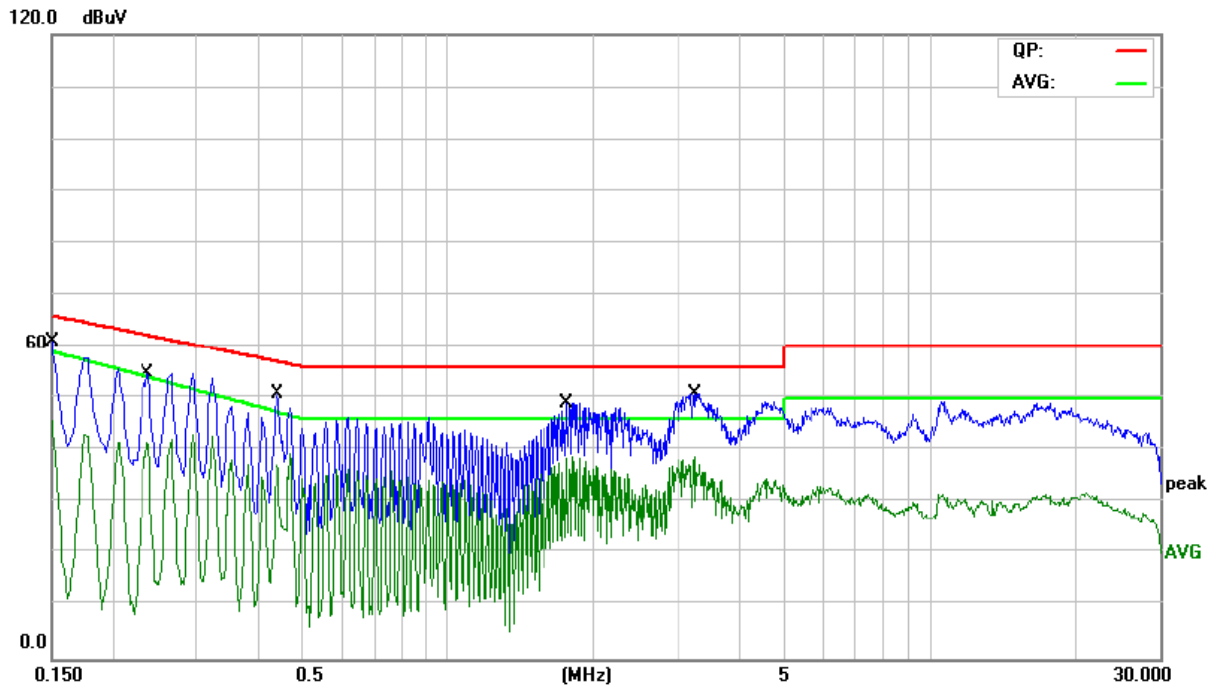
4.4. Test Condition

Temperature	:	25 °C
Relative Humidity	:	48 %
Pressure	:	1010 hPa
Test Power	:	AC 230V/50Hz

4.5. Test Data

Please refer to the following pages.

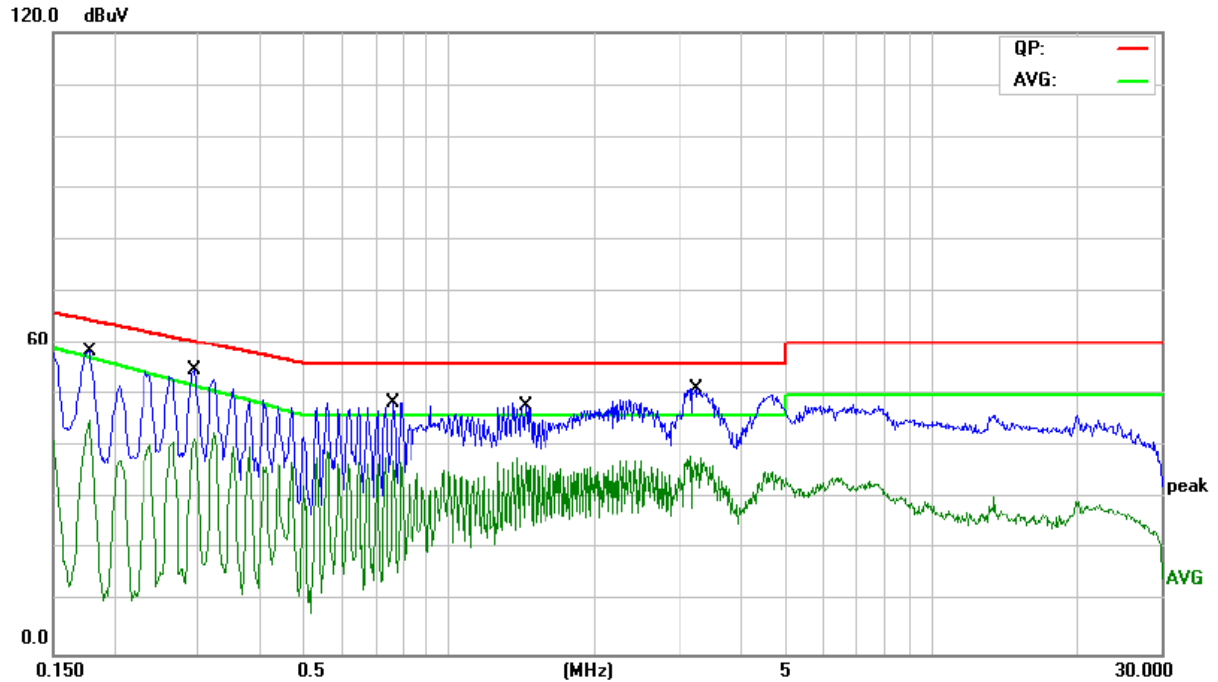
Operating Condition: Normal
Test Specification: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1500	50.18	10.90	61.08	65.99	-4.91	QP	
2		0.1500	35.00	10.90	45.90	58.99	-13.09	AVG	
3		0.2366	44.84	10.05	54.89	62.21	-7.32	QP	
4		0.2366	31.41	10.05	41.46	54.07	-12.61	AVG	
5		0.4420	41.19	9.55	50.74	57.02	-6.28	QP	
6		0.4420	27.36	9.55	36.91	47.33	-10.42	AVG	
7		1.7580	39.73	9.33	49.06	56.00	-6.94	QP	
8		1.7660	22.33	9.33	31.66	46.00	-14.34	AVG	
9		3.2580	41.45	9.39	50.84	56.00	-5.16	QP	
10		3.2620	21.08	9.39	30.47	46.00	-15.53	AVG	

Operating Condition: Normal

Test Specification: N



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1780	47.67	10.60	58.27	64.57	-6.30	QP	
2		0.1785	32.53	10.60	43.13	57.12	-13.99	AVG	
3		0.2940	45.05	9.81	54.86	60.41	-5.55	QP	
4		0.2940	31.61	9.81	41.42	51.73	-10.31	AVG	
5		0.7620	39.03	9.45	48.48	56.00	-7.52	QP	
6		0.7620	27.98	9.45	37.43	46.00	-8.57	AVG	
7		1.4380	38.49	9.34	47.83	56.00	-8.17	QP	
8		1.4380	27.84	9.34	37.18	46.00	-8.82	AVG	
9	*	3.2540	41.71	9.42	51.13	56.00	-4.87	QP	
10		3.2620	24.39	9.42	33.81	46.00	-12.19	AVG	

5. Disturbance Power Measurement

5.1. Test Standard and Limit

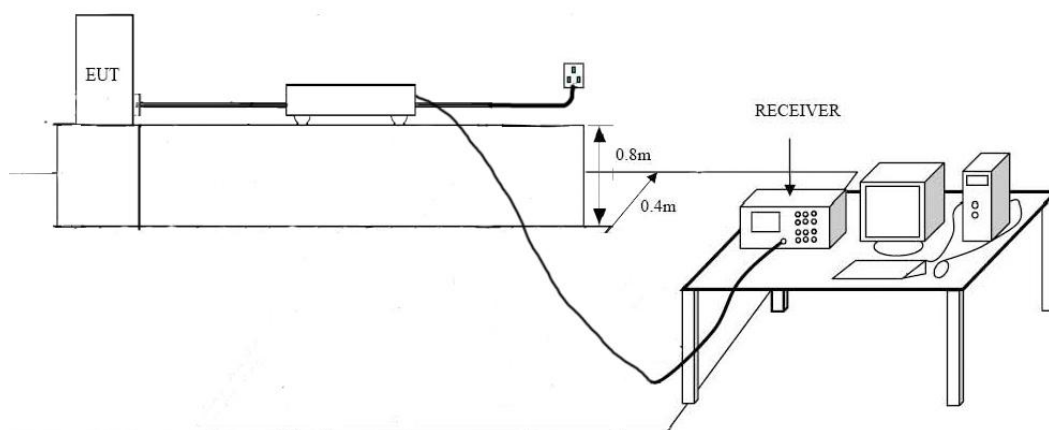
5.1.1. Test Standard

EN 55014-1: 2017.

5.1.2. Test Limit

1	Household and similar appliances		Tools					
	2	3	4	5	6	7	8	9
Frequency range			Rated motor power not exceeding 700W		Rated motor power above 700W and not exceeding 1000W		Rated motor power above 1000W	
(MHz)	dB(pW) Quasi-peak	dB(pW) Avergge ^a	dB(pW) Quasi-peak	dB(pW) Avergge ^a	dB(pW) Quasi-peak	dB(pW) Avergge ^a	dB(pW) Quasi-peak	dB(pW) Avergge ^a
30 to 300	Increasing linearly with the frequency from:							
	45 to 55	35 to 45	45 to 55	35 to 45	49 to 59	39 to 49	55 to 65	45 to 55
^a If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out. At the transition frequency the lower limit applies.								

5.2. Test Setup



5.3. Test Procedure

The EUT is placed on the plane 0.8m high above the ground by insulating support and away from other metallic surface at least 0.4m. It is connected to the power mains through an extension cord of 6m min. The absorber clamp clamps the cord and moves from the far end to the EUT to measure the disturbing energy emitted from the cord.

The bandwidth of the field strength meter is set at 120kHz.

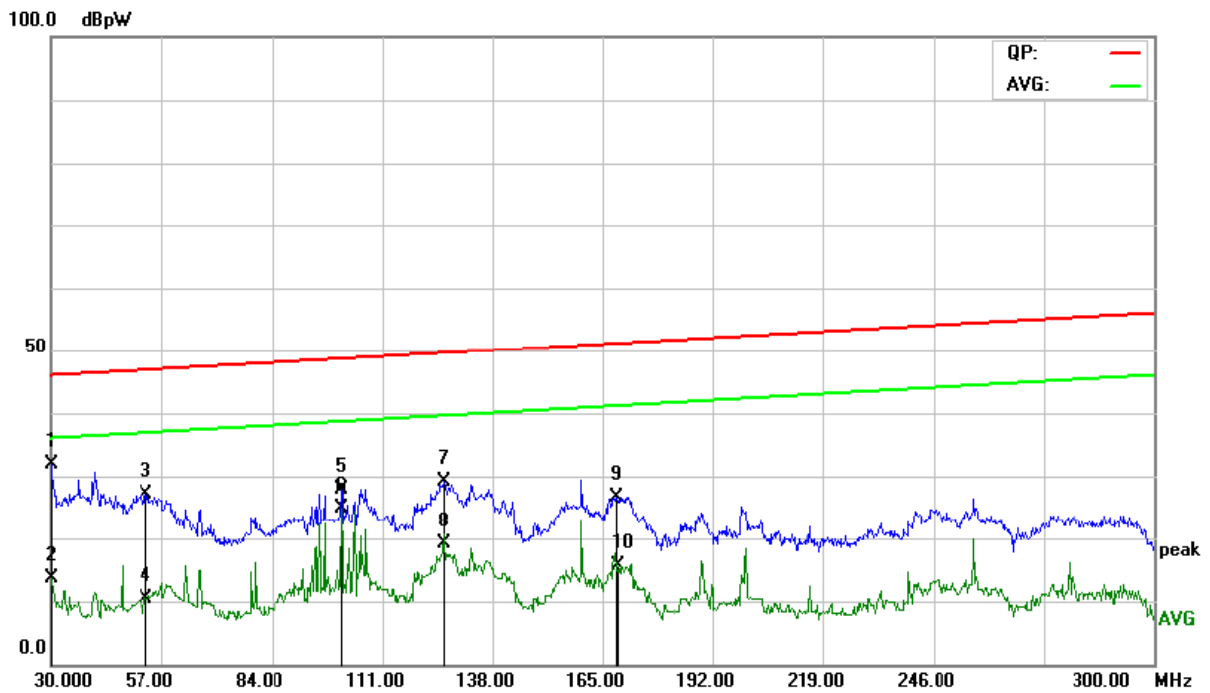
5.4. Test Condition

Temperature	:	25 °C
Relative Humidity	:	48 %
Pressure	:	1010 hPa
Test Power	:	AC 230V/50Hz

5.5. Test Data

Please refer to the following pages.

Operating Condition: Normal
Test Specification: AC Mains



No.	Mk.	Freq. MHz	Reading Level dBpW	Correct Factor dB	Measure- ment dBpW	Limit dBpW	Over dB	Detector	Position cm	Comment
1		30.0399	1.89	29.89	31.78	46.00	-14.22	QP		
2		30.0399	-16.36	29.89	13.53	36.00	-22.47	AVG		
3		53.4799	2.37	24.69	27.06	46.87	-19.81	QP		
4		53.4799	-14.29	24.69	10.40	36.87	-26.47	AVG		
5		101.2000	5.41	22.49	27.90	48.64	-20.74	QP		
6	*	101.2000	2.30	22.49	24.79	38.64	-13.85	AVG		
7		126.4000	5.81	23.29	29.10	49.57	-20.47	QP		
8		126.4000	-4.10	23.29	19.19	39.57	-20.38	AVG		
9		168.2400	3.18	23.48	26.66	51.12	-24.46	QP		
10		168.6799	-7.93	23.44	15.51	41.14	-25.63	AVG		

6. Radiated Emission Test

6.1. Test Standard and Limit

6.1.1. Test Standard

EN 55014-1: 2017.

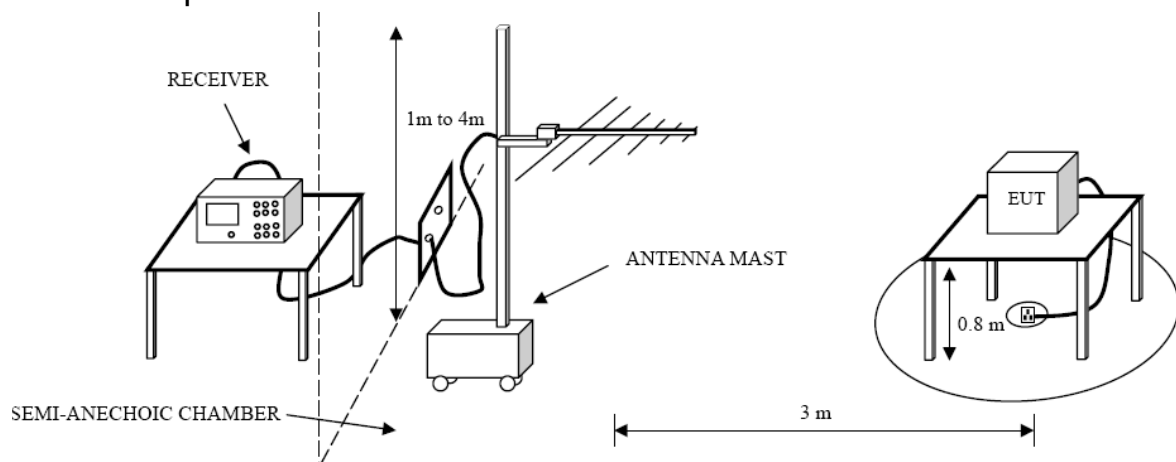
6.1.2. Test Limit

Radiated Disturbance Test Limit

Frequency	Limit (dB μ V/m)
	Quasi-peak Level
30MHz~230MHz	40
230MHz~1000MHz	47

Remark: 1. The lower limit shall apply at the transition frequency.
2. The test distance is 3m.

6.2. Test Setup



6.3. Test Procedure

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m. The table was rotated 360 degrees to determine the position of the highest radiation.

The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range.

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

6.4. Test Condition

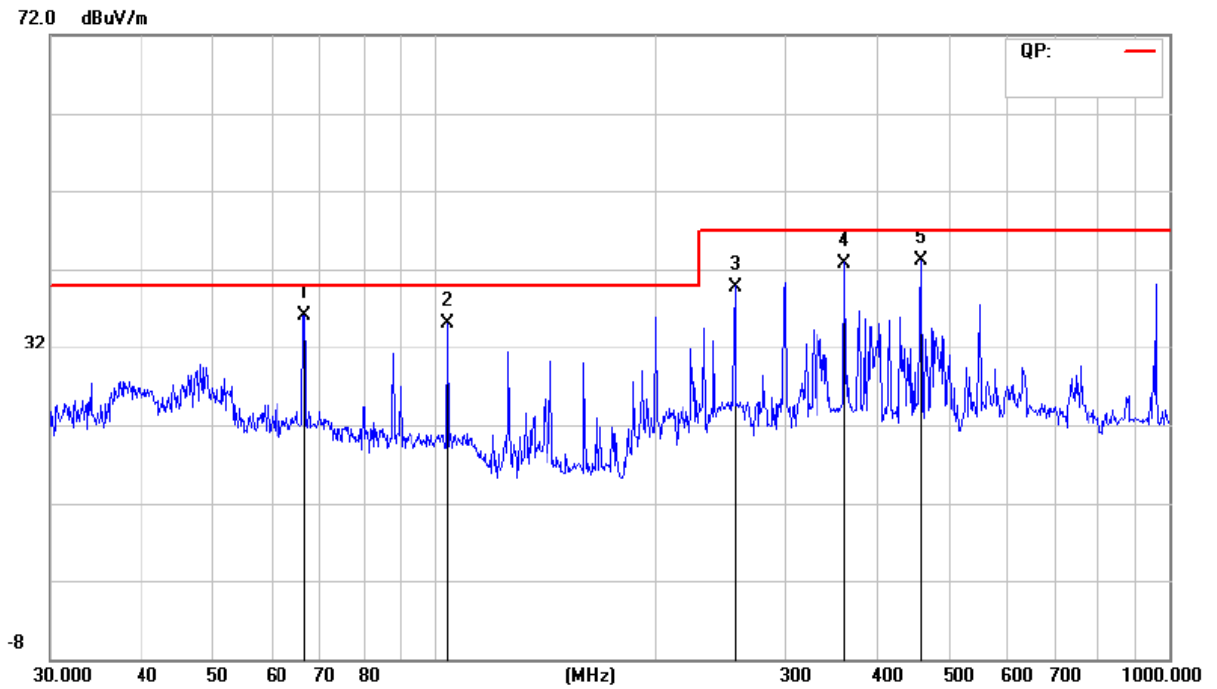
Temperature	:	23 °C
Relative Humidity	:	52 %
Pressure	:	1010 hPa
Test Power	:	AC 230V/50Hz

6.5. Test Data

Please refer to the following pages.

Operating Condition: Normal

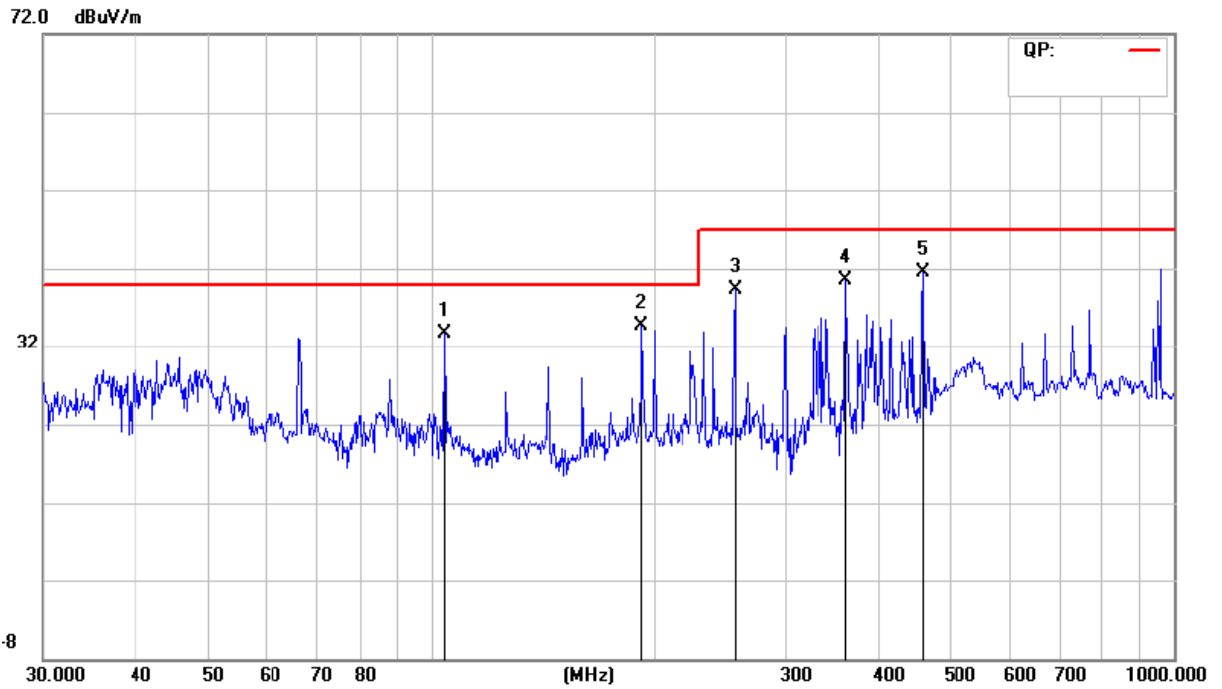
Test Specification: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	66.4989	15.79	20.41	36.20	40.00	-3.80	peak	
2		104.1701	17.29	17.78	35.07	40.00	-4.93	peak	
3		256.5210	22.57	17.23	39.80	47.00	-7.20	peak	
4		361.7139	21.17	21.63	42.80	47.00	-4.20	peak	
5		459.1143	20.01	23.05	43.06	47.00	-3.94	peak	

Operating Condition: Normal

Test Specification: Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		104.1701	15.93	17.78	33.71	40.00	-6.29	peak	
2	*	191.7450	19.09	15.64	34.73	40.00	-5.27	peak	
3		256.5211	21.98	17.23	39.21	47.00	-7.79	peak	
4		361.7139	18.89	21.63	40.52	47.00	-6.48	peak	
5		459.1144	18.41	23.05	41.46	47.00	-5.54	peak	

7. Harmonic Current Emission Test

7.1. Test Standard and Limit

7.1.1. Test Standard

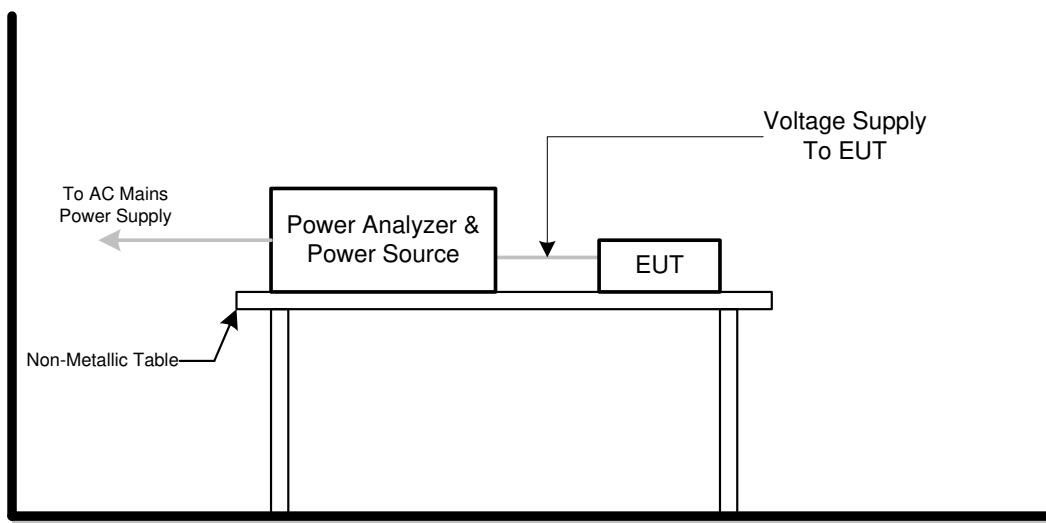
EN 61000-3-2: 2014

7.1.2. Limits

Harmonic Current Test Limit (Class A)

Harmonic order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \times 15/n$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \times 8/n$

7.2. Test Setup



7.3. Test Procedure

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.

The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools. Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

7.4. Test Condition

Temperature	:	25 °C
Relative Humidity	:	48 %
Pressure	:	1010 hPa
Test Power	:	AC 230V/50Hz

7.5. Test Data

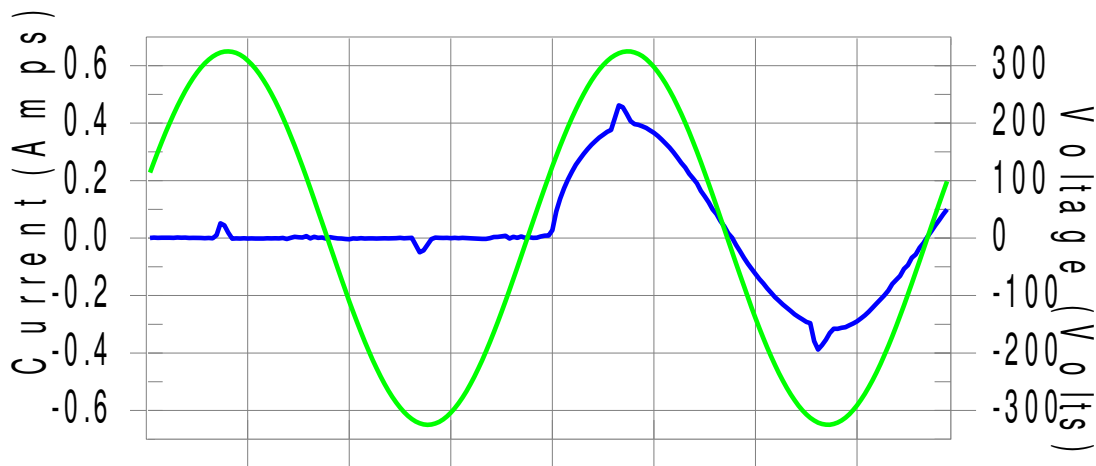
Please refer to the following pages.

Harmonics – Class-A per Ed. 3.0 (2014)(Run time)

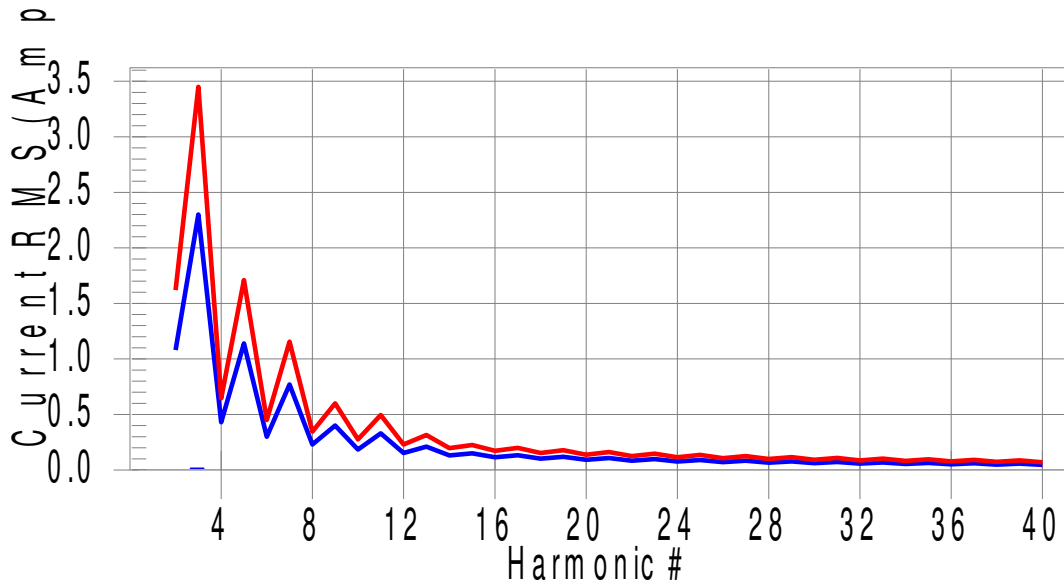
Test category: Class-A per Ed. 3.0 (2014) (European limits)
 Test Margin: 100 Tested by: HX
 Start time: 10:54:53 End time: 10:05:14
 Test duration (min): 10 Data file name: H-000108.cts_data

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass Worst harmonic was #9 with 1.37% of the limit.

Current Test Result Summary (Run time)

Test category: Class-A per Ed. 3.0 (2014) (European limits)
 Test Margin: 100 Tested by: HX
 Start time: 10:54:53 End time: 10:05:14
 Test duration (min): 10 Data file name: H-000108.cts_data

Test Result: Pass Source qualification: Normal
 THC(A): 0.02 I-THD(%): 7.76 POHC(A): 0.000 POHC Limit(A): 0.320

Highest parameter values during test:
 V_RMS (Volts): 229.92 Frequency(Hz): 50.00
 I_Peak (Amps): 0.594 I_RMS (Amps): 0.237
 I_Fund (Amps): 0.236 Crest Factor: 5.523
 Power (Watts): 53.7 Power Factor: 0.990

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	0.0	0.002	1.620	0.11	Pass
3	0.015	2.300	0.6	0.016	3.450	0.46	Pass
4	0.001	0.430	0.0	0.001	0.645	0.14	Pass
5	0.007	1.140	0.6	0.007	1.710	0.43	Pass
6	0.000	0.300	0.0	0.000	0.450	0.08	Pass
7	0.006	0.770	0.7	0.006	1.155	0.50	Pass
8	0.000	0.230	0.0	0.000	0.345	0.07	Pass
9	0.005	0.400	1.4	0.006	0.600	0.94	Pass
10	0.000	0.184	0.0	0.000	0.276	0.12	Pass
11	0.005	0.330	0.0	0.005	0.495	0.97	Pass
12	0.000	0.153	0.0	0.000	0.230	0.09	Pass
13	0.004	0.210	0.0	0.004	0.315	1.42	Pass
14	0.000	0.131	0.0	0.000	0.197	0.09	Pass
15	0.004	0.150	0.0	0.004	0.225	1.73	Pass
16	0.000	0.115	0.0	0.000	0.173	0.10	Pass
17	0.003	0.132	0.0	0.003	0.199	1.68	Pass
18	0.000	0.102	0.0	0.000	0.153	0.17	Pass
19	0.003	0.118	0.0	0.003	0.178	1.52	Pass
20	0.000	0.092	0.0	0.000	0.138	0.09	Pass
21	0.002	0.107	0.0	0.002	0.161	1.35	Pass
22	0.000	0.084	0.0	0.000	0.125	0.10	Pass
23	0.002	0.098	0.0	0.002	0.147	1.18	Pass
24	0.000	0.077	0.0	0.000	0.115	0.11	Pass
25	0.001	0.090	0.0	0.001	0.135	0.97	Pass
26	0.000	0.071	0.0	0.000	0.106	0.10	Pass
27	0.001	0.083	0.0	0.001	0.125	0.88	Pass
28	0.000	0.066	0.0	0.000	0.099	0.12	Pass
29	0.001	0.078	0.0	0.001	0.116	0.83	Pass
30	0.000	0.061	0.0	0.000	0.092	0.10	Pass
31	0.001	0.073	0.0	0.001	0.109	0.79	Pass
32	0.000	0.058	0.0	0.000	0.086	0.16	Pass
33	0.001	0.068	0.0	0.001	0.102	0.90	Pass
34	0.000	0.054	0.0	0.000	0.081	0.11	Pass
35	0.001	0.064	0.0	0.001	0.096	0.94	Pass
36	0.000	0.051	0.0	0.000	0.077	0.17	Pass
37	0.001	0.061	0.0	0.001	0.091	0.94	Pass
38	0.000	0.048	0.0	0.000	0.073	0.12	Pass
39	0.001	0.058	0.0	0.001	0.087	0.97	Pass
40	0.000	0.046	0.0	0.000	0.069	0.18	Pass

Voltage Source Verification Data (Run time)

Test category: Class-A per Ed. 3.0 (2014) (European limits)
 Test Margin: 100 Tested by: HX
 Start time: 10:54:53 End time: 10:05:14
 Test duration (min): 10 Data file name: H-000108.cts_data

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 229.92	Frequency(Hz): 50.00
I_Peak (Amps): 0.594	I_RMS (Amps): 0.237
I_Fund (Amps): 0.236	Crest Factor: 5.523
Power (Watts): 53.7	Power Factor: 0.990

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.061	0.460	13.18	OK
3	0.537	2.069	25.95	OK
4	0.055	0.460	11.86	OK
5	0.051	0.919	5.50	OK
6	0.019	0.460	4.18	OK
7	0.024	0.690	3.47	OK
8	0.009	0.460	2.06	OK
9	0.024	0.460	5.22	OK
10	0.012	0.460	2.56	OK
11	0.011	0.230	4.86	OK
12	0.008	0.230	3.54	OK
13	0.010	0.230	4.48	OK
14	0.004	0.230	1.77	OK
15	0.009	0.230	3.83	OK
16	0.009	0.230	3.71	OK
17	0.007	0.230	2.97	OK
18	0.008	0.230	3.48	OK
19	0.009	0.230	4.13	OK
20	0.009	0.230	3.94	OK
21	0.006	0.230	2.50	OK
22	0.003	0.230	1.18	OK
23	0.005	0.230	2.23	OK
24	0.003	0.230	1.33	OK
25	0.004	0.230	1.75	OK
26	0.002	0.230	0.84	OK
27	0.006	0.230	2.47	OK
28	0.003	0.230	1.18	OK
29	0.004	0.230	1.94	OK
30	0.003	0.230	1.31	OK
31	0.002	0.230	1.03	OK
32	0.002	0.230	0.82	OK
33	0.002	0.230	0.96	OK
34	0.002	0.230	0.78	OK
35	0.002	0.230	0.85	OK
36	0.002	0.230	0.78	OK
37	0.003	0.230	1.44	OK
38	0.002	0.230	0.89	OK
39	0.004	0.230	1.70	OK
40	0.004	0.230	1.85	OK

8. Voltage Fluctuation and Flicker test

8.1. Test Standard and Limit

8.1.1. Test Standard

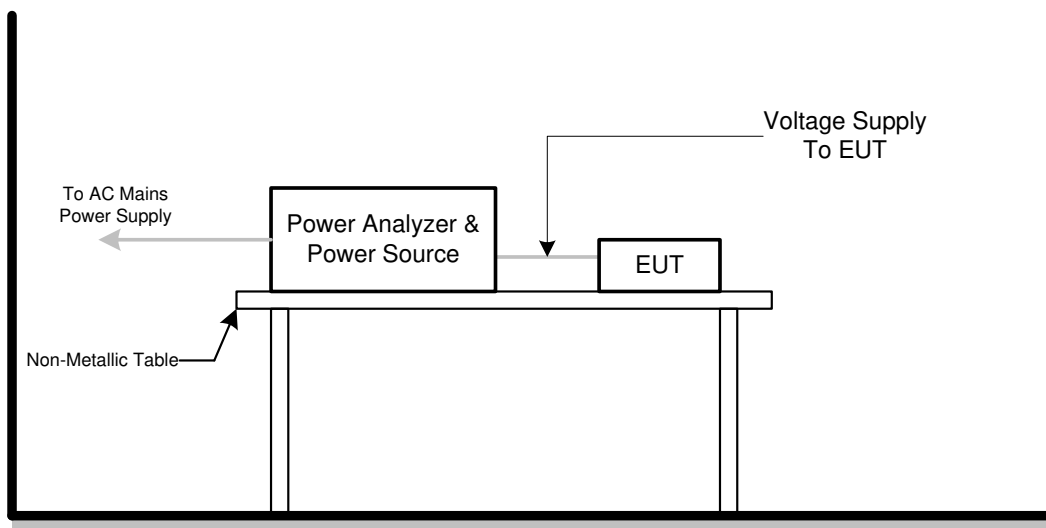
EN 61000-3-3: 2013

8.1.2. Limit

Flicker Test Limit

Test items	Limits
Pst	1.0
dc	3.3%
dmax	4.0%
dt	Not exceed 3.3% for 500ms

8.2. Test Setup



8.3. Test Procedure

8.3.1. Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

8.3.2. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

8.3.3. For the actual test configuration, please refer to the related Item –Block Diagram of system tested.

8.4. Test Condition

Temperature	:	25 °C
Relative Humidity	:	48 %
Pressure	:	1010 hPa
Test Power	:	AC 230V/50Hz

8.5. Test Data

Flicker Test Summary per EN/IEC61000-3-3 (Run time)

Test category: All parameters (European limits)
Test Margin: 100 **Tested by:** HX
Start time: 11:04:54 **End time:** 11:15:15
Test duration (min): 10 **Data file name:** F-000110.cts_data

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):	229.94			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650	Pass

9. Electrostatic Discharge Immunity Test

9.1. Test Requirements

9.1.1. Test Standard

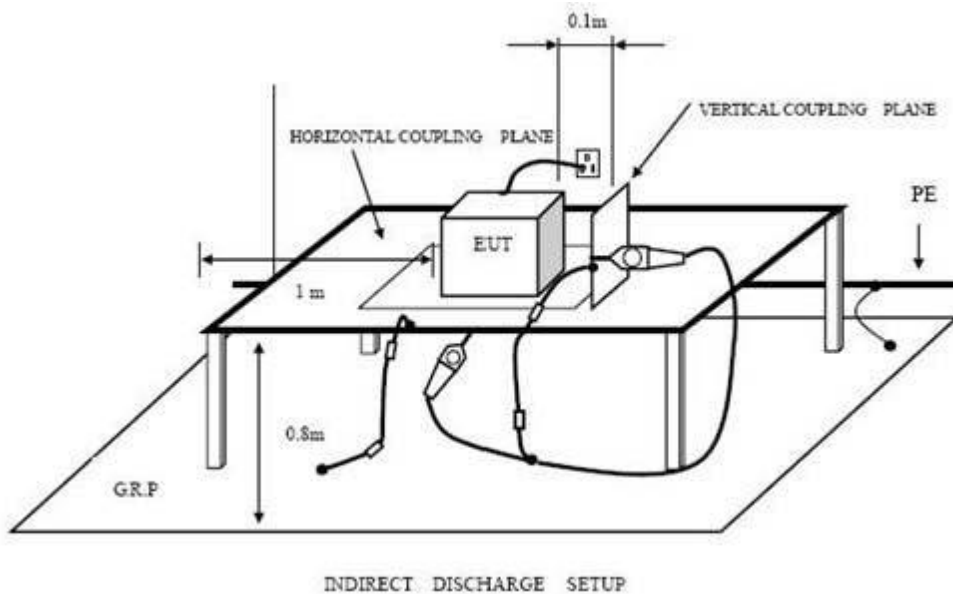
EN 55014-2: 2015 (EN 61000-4-2: 2009)

9.1.2. Test Level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.0	±2	±2
2.0	±4	±4
3.0	±6	±8
4.0	±8	±15
X	Special	Special

9.1.3. Performance criterion: B

9.2. Test Setup



9.3. Test Procedure

9.3.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

9.3.2. Contact Discharge:

All the procedure shall be same as air discharge. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

9.3.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

9.3.4. Indirect discharge for vertical coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.4. Test Data

Please refer to the following page.

Electrostatic Discharge Test Result

EUT	: <u>Digital Ultrasonic Cleaner</u>	M/N	: <u>TH-020A</u>
Temperature	: <u>22°C</u>	Humidity	: <u>50%</u>
Power supply	: <u>AC 230V/50Hz</u>	Test Mode	: <u>Normal</u>
Criterion: B			
Air Discharge: ±8kV Contact Discharge: ±4kV			
For each point positive 10 times and negative 10 times discharge.			
Location	Kind A-Air Discharge C-Contact Discharge	Result	
Slot of the EUT	A	PASS	
Button	A	PASS	
Switch	A	PASS	
Screw	C	PASS	
Metal	C	PASS	
HCP	C	PASS	
VCP of front	C	PASS	
VCP of rear	C	PASS	
VCP of left	C	PASS	
VCP of right	C	PASS	
Remark:			

10. Radiated Electromagnetic Field Immunity test

10.1. Test Requirements

10.1.1. Test Standard

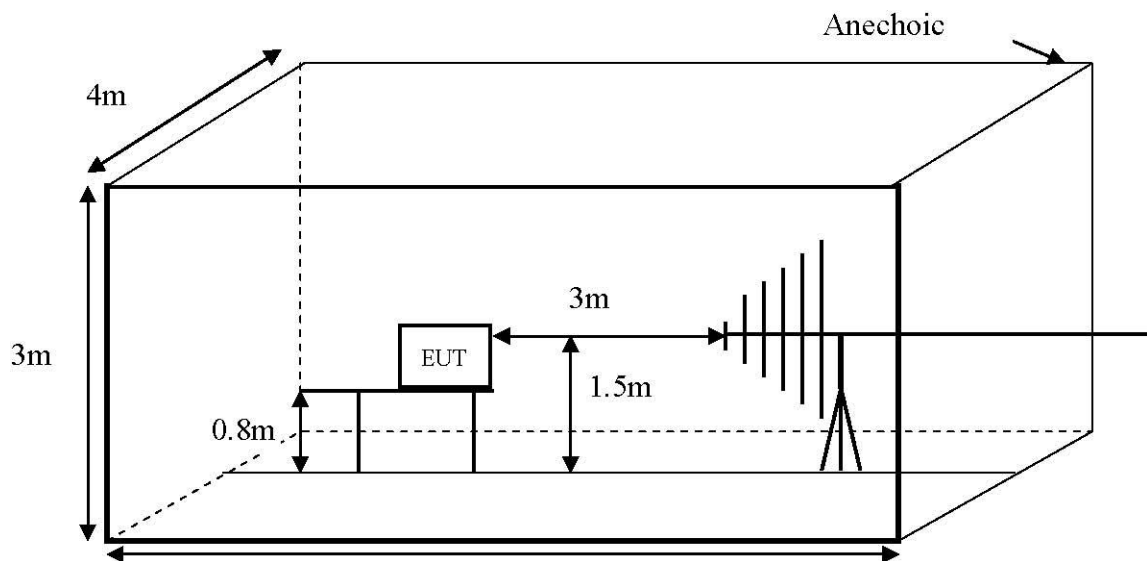
EN 55014-2: 2015 (EN 61000-4-3: 2006 + A1: 2008 + A2: 2010)

10.1.2. Test Level

Level	Field Strength V/m
1.0	1
2.0	3
3.0	10
X	Special

10.1.3. Performance criterion: A

10.2. Test Setup



10.3. Test Procedure

The EUT are placed on a table, which is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna, which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a camera is used to monitor its screen.

All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	3V/m (Severity Level 2)
2. Radiated Signal	Modulated
3. Scanning Frequency	80-1000MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	1 Sec.

10.4. Test Data

Please refer to the following page.

The EUT is of Category II product, so this item is not applicant.

11. Electrical Fast Transient/Burst Test

11.1. Test Requirements

11.1.1. Test Standard

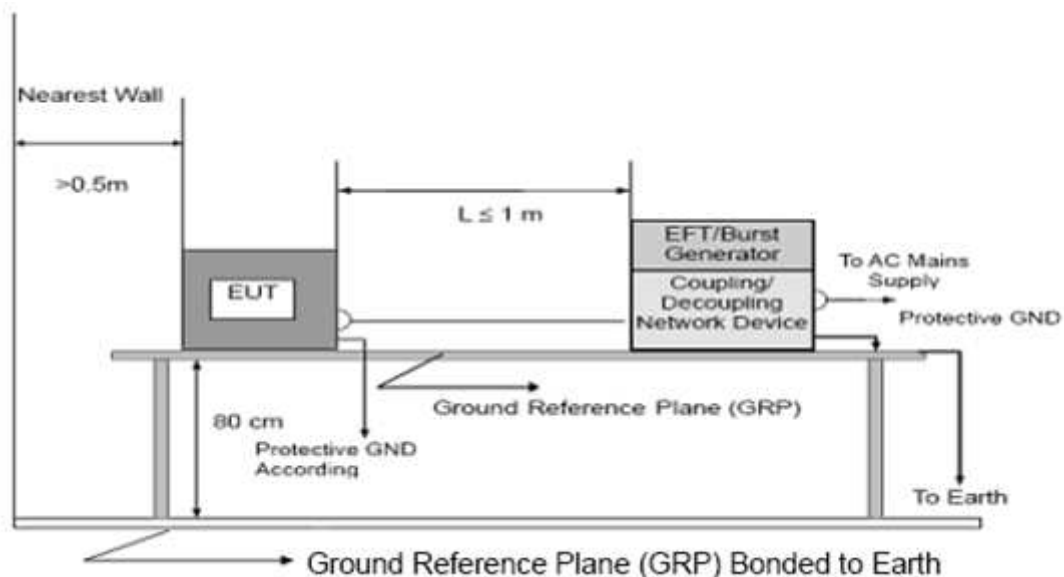
EN 55014-2: 2015 (EN 61000-4-4: 2012)

11.1.2. Level

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Switching Adapter Lines	On I/O (Input/Output) Signal data and control lines
1.	0.5 KV	0.25 KV
2.	1 KV	0.5 KV
3.	2 KV	1 KV
4.	4 KV	2 KV
X	Special	Special

11.1.3. Performance criterion: B

11.2. Test Setup



11.3. Test Procedure

11.3.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2minute.

11.3.2. For signal lines and control lines ports:

A coupling clamp is use to couple the EFT interference signal to the signal and control lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minute.

11.3.3. For DC input and DC output power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to DC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minute.

11.4. Test Data

Please refer to the following page.

Electrical Fast Transient/Burst Test Results

EUT : <u>Digital Ultrasonic Cleaner</u>	M/N : <u>TH-020A</u>		
Temperature : <u>22°C</u>	Humidity : <u>50%</u>		
Power supply : <u>AC 230V/50Hz</u>	Test Mode : <u>Normal</u>		
Criterion: B			
Line : <input checked="" type="checkbox"/> AC Mains Coupling : <input checked="" type="checkbox"/> Direct			
Line : <input type="checkbox"/> Signal <input type="checkbox"/> I/O Cable Coupling : <input type="checkbox"/> Capacitive			
Line	Voltage(kV)	Result(+)	Result(-)
L	1	PASS	PASS
N	1	PASS	PASS
L-N	1	PASS	PASS
PE	1	PASS	PASS
L-PE	1	PASS	PASS
N-PE	1	PASS	PASS
L-N-PE	1	PASS	PASS

12. Surge Immunity Test

12.1. Test Requirements

12.1.1. Test Standard

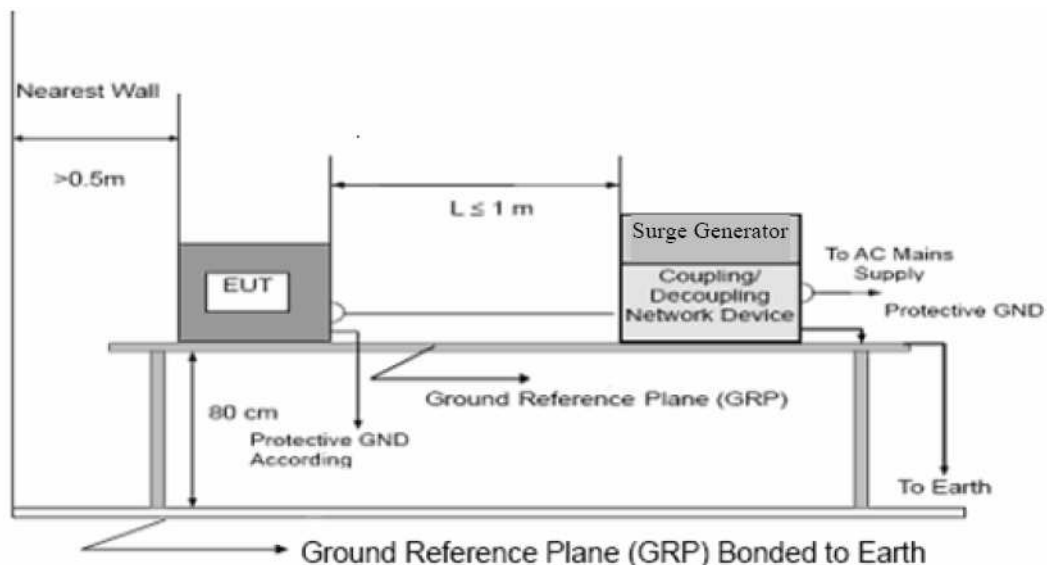
EN 55014-2: 2015 (EN 61000-4-5: 2014)

12.1.2. Level

Severity Level	Open-Circuit Test Voltage KV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

12.1.3. Performance criterion: B

12.2. Test Setup



12.3. Test Procedure

12.3.1. Set up the EUT and test generator.

12.3.2. For line to line coupling mode, provide a 1.0 KV 1.2/50us voltage surge

12.3.3. (at open-circuit condition) and 8/20us current surge to EUT selected points.

12.3.4. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

12.3.5. Different phase angles are done individually.

12.3.6. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.4. Test Data

Please refer to the following page.

Surge Immunity Test Results

EUT : Digital Ultrasonic Cleaner M/N : TH-020A

Temperature : 22°C Humidity : 50%

Power supply : AC 230V/50Hz Test Mode : Normal

Criterion: B

Injected Line	Voltage(kV)	Phase	Result	
			(+)	(-)
L-N	1	0°	PASS	PASS
		90°	PASS	PASS
		180°	PASS	PASS
		270°	PASS	PASS
L-PE	2	0°	PASS	PASS
		90°	PASS	PASS
		180°	PASS	PASS
		270°	PASS	PASS
N-PE	2	0°	PASS	PASS
		90°	PASS	PASS
		180°	PASS	PASS
		270°	PASS	PASS
L-N-PE	2	0°	PASS	PASS
		90°	PASS	PASS
		180°	PASS	PASS
		270°	PASS	PASS

13. Conducted Immunity Test

13.1. Test Requirements

13.1.1. Test Standard

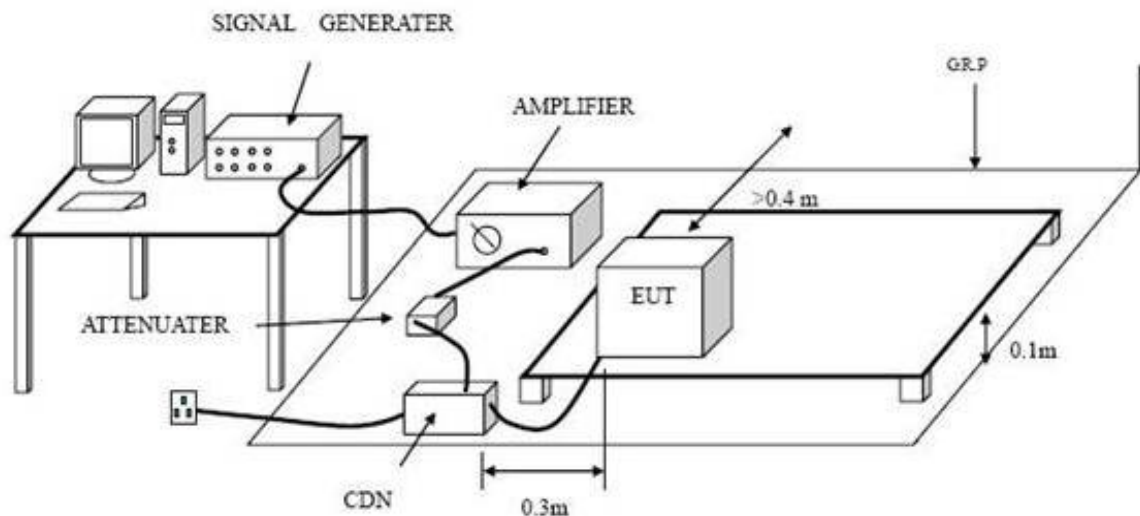
EN 55014-2: 2015 (EN 61000-4-6: 2014)

13.1.2. Level

Level	Voltage Level (e.m.f.) V
1.	1
2.	3
3.	10
X	Special

13.1.3. Performance criterion: A

13.2. Test Setup



13.3. Test Procedure

13.3.1. Set up the EUT, CDN and test generators.

13.3.2. Let the EUT work in test mode and test it.

13.3.3. The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

13.3.4. The disturbance signal description below is injected to EUT through CDN.

- 13.3.5. The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 13.3.6. The frequency range is swept from 0.150MHz to 230MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 13.3.7. The rate of sweep shall not exceed $1.5 \cdot 10^{-3}$ decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 13.3.8. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

13.4. Test Data

Please refer to the following page.

Injected Currents Susceptibility Test Results

EUT : <u>Digital Ultrasonic Cleaner</u>	M/N : <u>TH-020A</u>		
Temperature : <u>22°C</u>	Humidity : <u>50%</u>		
Power supply : <u>AC 230V/50Hz</u>	Test Mode : <u>Normal</u>		
Criterion: A			
Frequency Range (MHz)	Injected Position	Voltage Level (e.m.f.)	Result
0.15 ~ 230	AC Mains	3V(rms), Unmodulated	PASS
0.15 ~ 230	DC Mains	1V(rms), Unmodulated	/
0.15 ~ 230	Signal Line	1V(rms), Unmodulated	/

14. Voltage Dips and Interruptions Immunity Test

14.1. Test Requirements

14.1.1. Test Standard

EN 55014-2: 2015 (EN 61000-4-11: 2004)

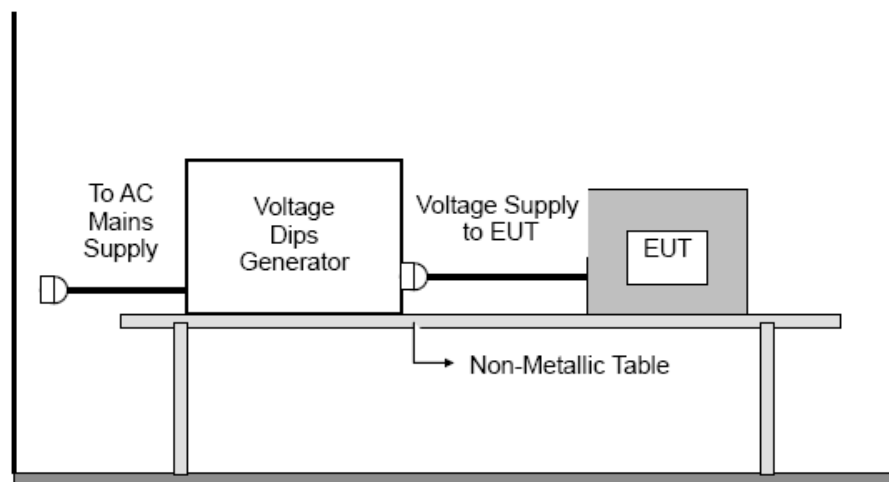
14.1.2. Level

Test Level for Voltage Dips and Interruptions

Test Level %U _T	Voltage dip and short interruptions %U _T	Duration (in period)
0	100	0.5
40	60	10
70	30	25

14.1.3. Performance criterion: C

14.2. Test Setup



14.3. Test Procedure

Set up the EUT and test generator as shown above. The EUT is tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10s minimum.

14.4. Test Data

Please refer to the following page.

Voltage Dips and Interruptions Test Results

EUT : <u>Digital Ultrasonic Cleaner</u>	M/N : <u>TH-020A</u>			
Temperature : <u>22°C</u>	Humidity : <u>50%</u>			
Power supply : <u>AC 230V/50Hz</u>	Test Mode : <u>Normal</u>			
Criterion: C				
Test Level % U_T	Voltage Dips & Short Interruptions % U_T	Duration (in period)	Phase Angle	Result
0	100	0.5P	0°~360°	PASS
40	60	10P	0°~360°	PASS
70	30	50P	0°~360°	PASS
Remark: U_T is the rated voltage for the equipment.				

15. Photographs - Constructional Details

Photo 1 Appearance of EUT

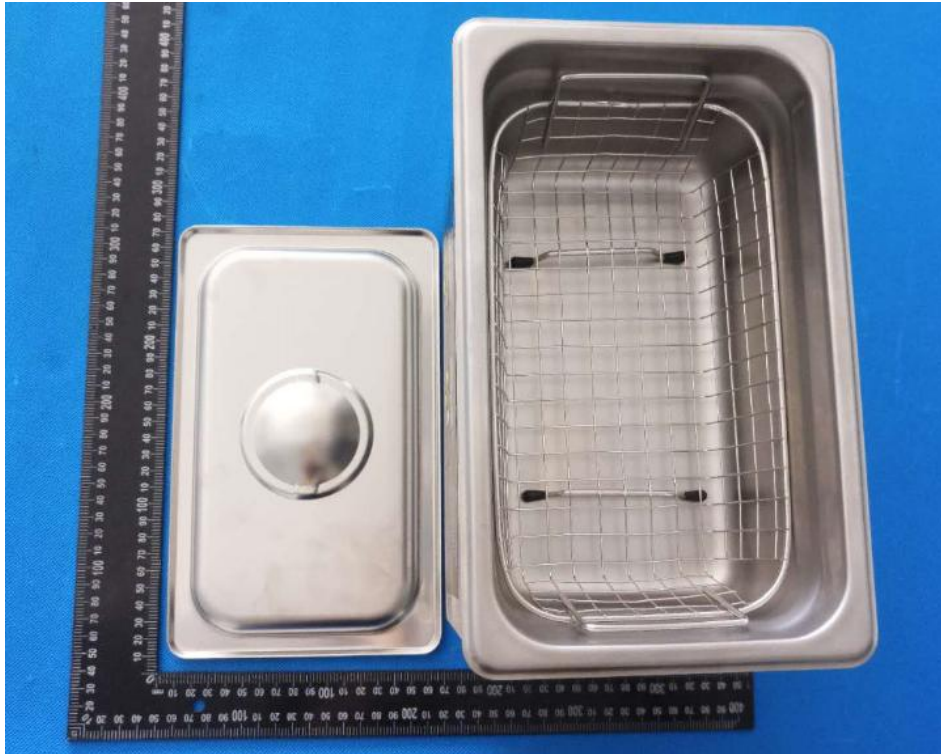


Photo 2 Appearance of EUT



Photo 3 Appearance of EUT

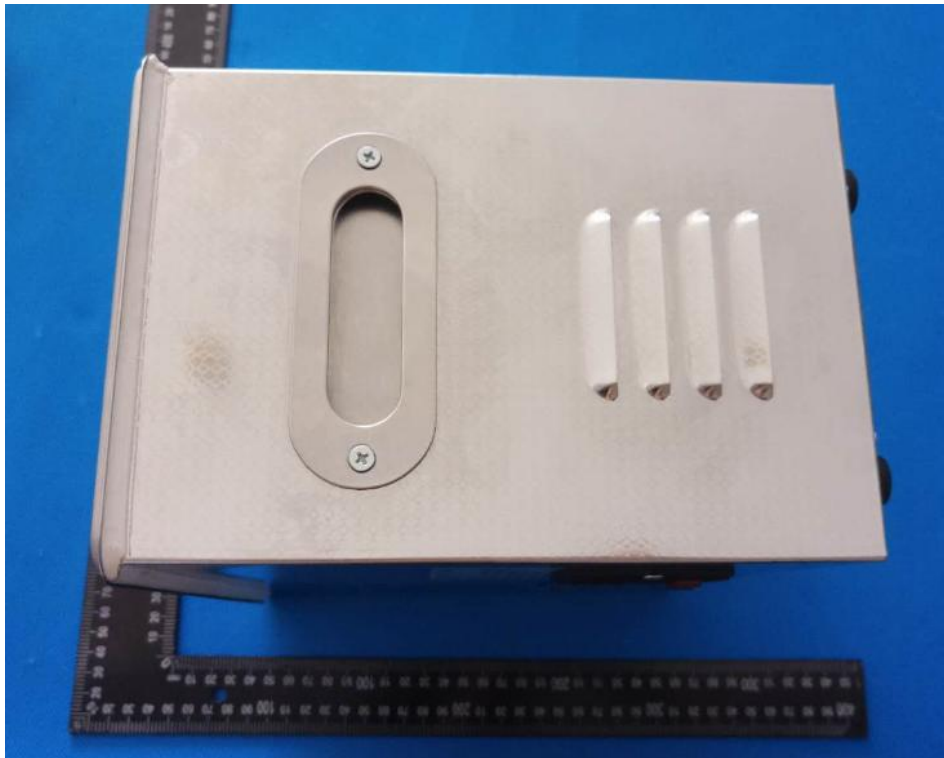


Photo 4 Appearance of EUT



Photo 5 Appearance of EUT

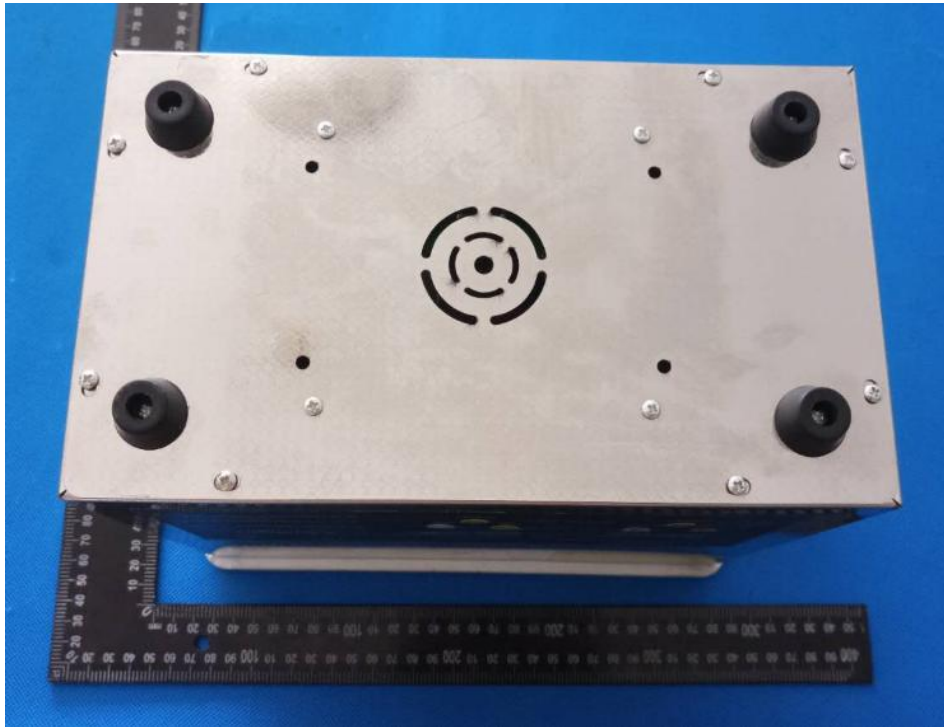


Photo 6 Appearance of EUT



END OF REPORT