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Ningbo HengChuang Electric Appliance Co., LTD.

TEST REPORT

SCOPE OF WORK:
EMC report

Model:
HC-6001, HC-6001-1, HC-6001E, HC-6001E-1

REPORT NUMBER
2305A0601SHA-001

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Report no. 2305A0601SHA-001

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Manufacturer	:	**Ningbo HengChuang Electric Appliance Co., LTD.** **469 Huancheng East Road, Zhouxiang Town, Cixi City, Zhejiang Province, P. R. China**
Factory	:	**Ningbo HengChuang Electric Appliance Co., LTD.** **469 Huancheng East Road, Zhouxiang Town, Cixi City, Zhejiang Province, P. R. China**

Summary

The equipment complies with the requirements according to the following standard(s) or Specification:
EN IEC 55014-1:2021: Electromagnetic compatibility-Requirements for household appliances, electric tools and similar apparatus Part 1: Emission **EN IEC 55014-2:2021**: Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity – Product family standard **EN IEC 61000-3-2:2019+A1:2021**: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16A per phase) **EN 61000-3-3:2013+A1:2019+A2:2021**: Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16A per phase and not subject to conditional connection

PREPARED BY:	**REVIEWED BY:**
Reggie Yuan	
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Project Engineer	Reviewer

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Revision History

Report No.	Version	Description	Issued Date
2305A0601SHA-001	Rev. 01	Initial issue of report	July 18, 2023

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Mains terminal continuous disturbance voltage	Pass	
Mains terminal discontinuous disturbance voltage/click	Pass	
Continuous disturbance power	Pass	
Radiated Emission	Pass	
Harmonics	Pass	
Voltage fluctuation-Flicker	Pass	
Electrostatic Discharge (ESD)	Pass	
Radio frequency electromagnetic fields	NA	
Fast transients	Pass	
Surges	Pass	
Injected Current	Pass	
Voltage dips	Pass	

Notes:

1. NA =Not Applicable
2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.
3. Additions, Deviations and Exclusions from Standards: None.

1. GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name : Hot-air fryer

Type/Model : HC-6001, HC-6001-1, HC-6001E, HC-6001E-1

Description of EUT : Models covered by this report is portable Hot-air fryers for household indoor use only. It employed interlock switch and thermal link to safeguard the appliances.

HC-6001, HC-6001-1, HC-6001E and HC-6001E-1 are similar in appearance except for the following:

Model	Electrical control	Mechanical Control	Window-viewable basket	Thermal link
HC-6001		√	√	√
HC-6001-1		√		√
HC-6001E	√		√	√
HC-6001E-1	√			√

All models use the same motor.

HC-6001, HC-6001-1 is same as HC-6001E, HC-6001E-1, except for HC-6001, HC-6001-1 controlled by mechanical switches, HC-6001E, HC-6001E-1 use electronic control.

HC-6001 is same as HC-6001-1 except with Window-viewable basket. So do HC-6001E and HC-6001E-1.

After technical evaluation, model HC-6001E was chosen to test in the report as representative.

Rating : 220-240V~, 50/60Hz, Class I, 1300W

Highest clock frequency : <15MHz

Brand name : /

Mains lead : 1.2m, (un)shielded, (non)detachable

Data cable : /

EUT type : ☒ Table-top
☐ Floor standing

Sample received date : May 26, 2023

Sample Identification No. : A230526-01-001

Date of test : June 01-June 02, 2023

1.2 Description of Test Facility

Name	:	Intertek Testing Services Shanghai
Address	:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone	:	86 21 61278200
Telefax	:	86 21 54262353
The test facility is recognized, certified, or accredited by these organizations	:	CNAS Accreditation Lab Registration No. CNAS L0139 FCC Accredited Lab Designation Number: CN0175 IC Registration Lab CAB identifier.: CN0014 VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252 A2LA Accreditation Lab Certificate Number: CN0175

2. TEST SPECIFICATIONS

2.1 Normative Standards

IEC 61000-4-2:2008: Electromagnetic Compatibility (EMC) – Part 4-2: testing and measurement techniques – electrostatic discharge immunity test

IEC 61000-4-3:2006+A1:2007+A2:2010: Electromagnetic Compatibility (EMC) – Part 4-3: testing and measurement techniques – radiated, radio frequency, electromagnetic field immunity test

IEC 61000-4-4:2012: Electromagnetic Compatibility (EMC) – Part 4-4: testing and measurement techniques – electric fast transient/burst immunity test

IEC 61000-4-5:2014+A1:2017: Electromagnetic Compatibility (EMC) – Part 4-5: testing and measurement techniques – section 5: surge immunity test

IEC 61000-4-6:2013: Electromagnetic Compatibility (EMC) – Part 4-6: testing and measurement techniques – section 6: immunity to conducted disturbance, induced by radio frequency field

IEC 61000-4-11:2020: Electromagnetic Compatibility (EMC) – Part 4-11: testing and measurement techniques –voltage dips, short interruption and voltage variations immunity test

IEC 61000-4-20:2010: Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides

IEC 61000-4-22:2010 : Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques − Radiated emissions and immunity measurements in fully anechoic rooms (FARs)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test Peripherals used

Item No	Description	Band and Model	S/No
1	-	-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Mains terminal continuous disturbance voltage	22	42	NA
Mains terminal discontinuous disturbance voltage/click	22	42	NA
Continuous disturbance power	22	42	NA
Radiated Emission	NA	NA	NA
Harmonics	22	40	NA
Voltage fluctuation-Flicker	22	40	NA
Electrostatic Discharge (ESD)	23	45	101
RF electromagnetic field susceptibility	NA	NA	NA
Electric Fast Transient /Burst (EFT/B)	23	45	NA
Surge	23	45	NA
Injected Current	23	45	NA
Voltage dips and interruption	23	45	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-18
☑	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☑	Absorbing clamp	R&S	MDS 21	EC 2108	2024-06-04
Discontinuous Disturbance Voltage					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Click meter	AFJ	DDA55	EC 5320	2023-12-07
☑	A.M.N.	AFJ	LS16C	EC 5320-1	2023-11-09
Harmonics / Flicker					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Three phase Harmonic-flicker system	EM TEST	DPA503N	EC 5383	2023-07-17
		EM TEST	NETWAVE-30-400	EC 5383-2	2023-07-17
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	ESD generator	TESEQ	NSG 437	EC 4792-4	2023-07-17
EFT/Surge Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Conduct immunity system	EM TEST	UCS 500M6B	EC 2958	2024-03-20
☑	Automatic transformer	EM TEST	MV2616	EC 2957	2024-03-20
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Signal generator	R&S	SML 01	EC 2338	2023-11-07
☑	Power amplifier	AR	75A250	EC 3043-1	2023-07-17
☑	Attenuator	EM TEST	ATT6/75	EC 3043-3	2024-02-07
☑	CDN	Frankonia	CDN M2M316	EC 5969	2024-02-09
Test Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Shielded room	Zhongyu	-	EC 2838	2024-01-10
☑	Shielded room	Zhongyu	-	EC 2839	2024-01-10
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-23

☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2024-03-07
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2024-01-02
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2024-03-07
☑	Pressure meter	YM3	Shanghai Mengde	EC 4620	2023-09-13

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Continuous disturbance voltage at telecom ports	150kHz ~ 30MHz	3.64 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.62 dB
Mains terminal discontinuous disturbance voltage/click	-	3.76 dB
Continuous disturbance power	30MHz ~ 300MHz	4.35 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%
ESD	-	6.65%
Radiated susceptibility	-	2.38%
EFT test at main terminal	-	11.57%
EFT test at signal/telecom terminal	-	11.62%
Surge test at main terminal	-	11.57%
Injected current test at main terminal	-	1.88 dB
Injected current test at unshielded signal terminal	-	3.41 dB
Voltage dips and interruption	-	6.05%

Emission Test

3. Mains/Load/Control Terminal Continuous Disturbance Voltage

Test result: **PASS**

3.1 Terminal Voltage Limits for the frequency range 9kHz to 30MHz

3.1.1 General limits

Frequency range (MHz)	Mains ports		Auxiliary ports			
	Disturbance voltage		Disturbance voltage		Disturbance current	
	Limits dB(μV)		Limits dB(μV)		Limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	59 ~ 46 *	80	70	40 ~ 30 *	30 ~ 20 *
0.5 ~ 5.0	56	46	74	64	30	20
5.0 ~ 30	60	50	74	64		

Notes:
1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.
2. If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

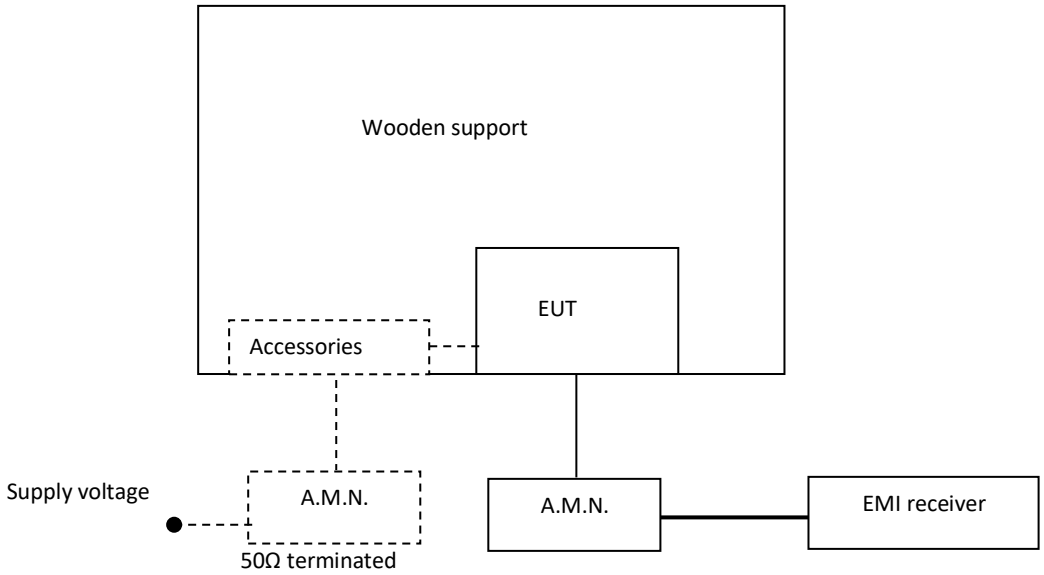
3.1.2 Limits for mains port of motor operated tools

	P ⩽ 700 W		700 W < P ⩽ 1 000 W		P > 1 000 W	
Frequency range (MHz)	Limits dB(μV)		Limits dB(μV)		Limits dB(μV)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.35	66 ~ 59*	59 ~ 49*	70 ~ 63*	63 ~ 53*	76 ~ 69*	69 ~ 59 *
0.35 ~ 5	59	49	63	53	69	59
5 ~ 30	64	54	68	58	74	64

Notes:
1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.35MHz.
2. If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

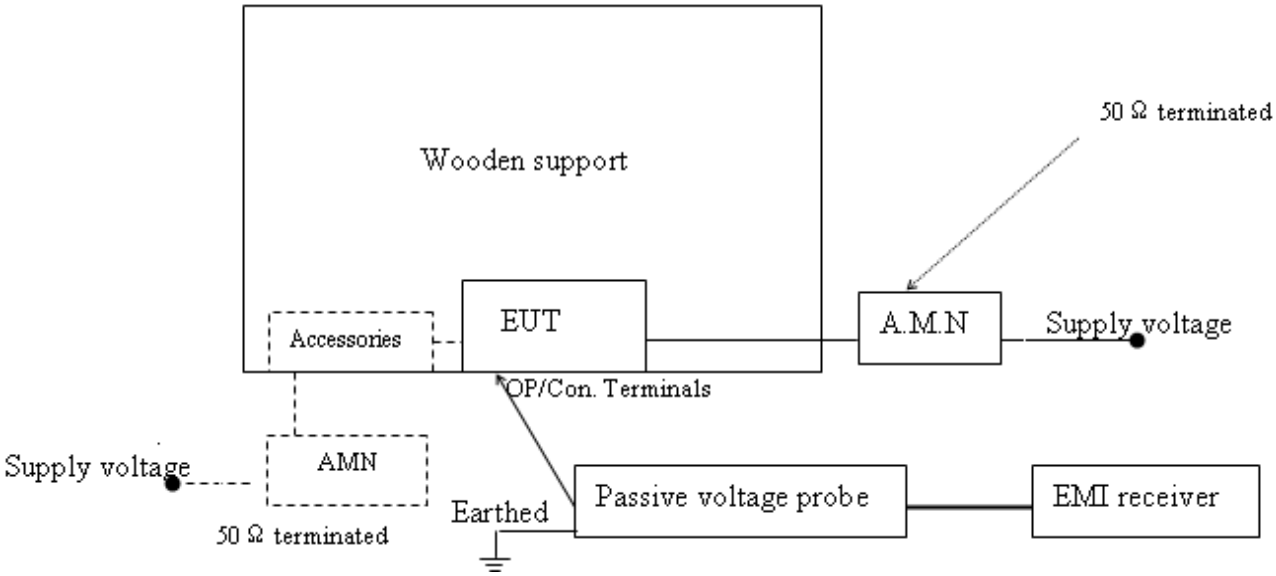
3.2 Block Diagram of Test Setup

☒ At mains terminal



For table top equipment, wooden support is 0.8m height table.
For floor standing equipment, wooden support is 0.1m height rack.

☐ At Associated ports



Note: ——— : power line
——— : signal line
- - - - - : means the test setup while available

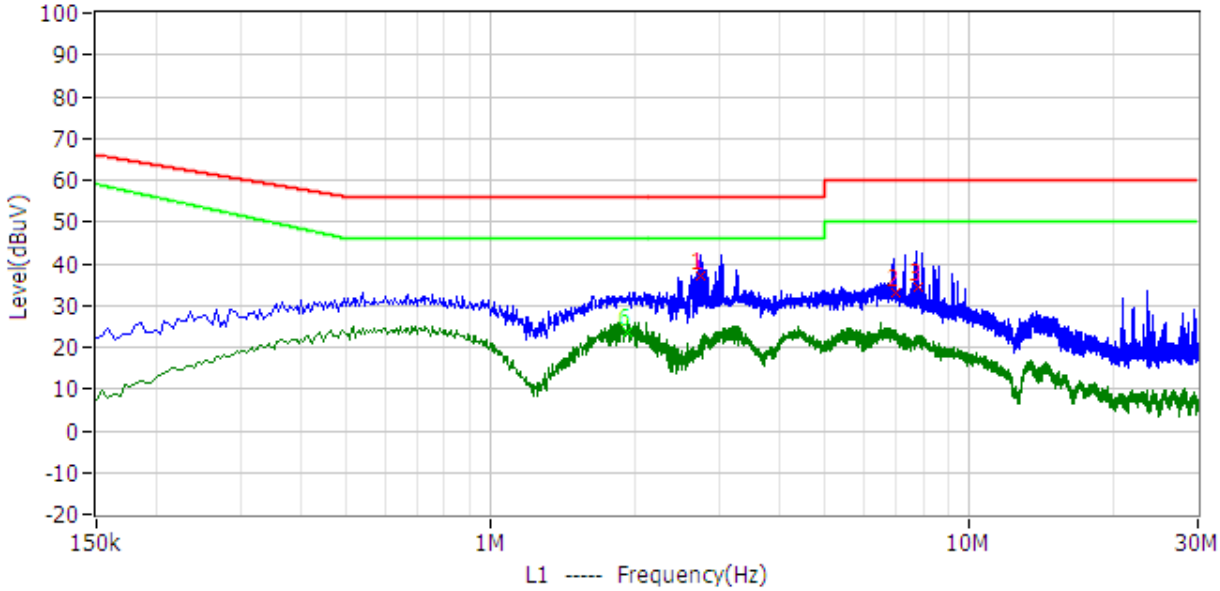
3.3 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.
Detailed test procedure and arrangement was according to clause 5.2 of EN 55014-1.
Measurement methods was according to clause 5.4 of EN 55014-1.
Operation conditions of EUT was according to clause 6 of EN 55014-1.
Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

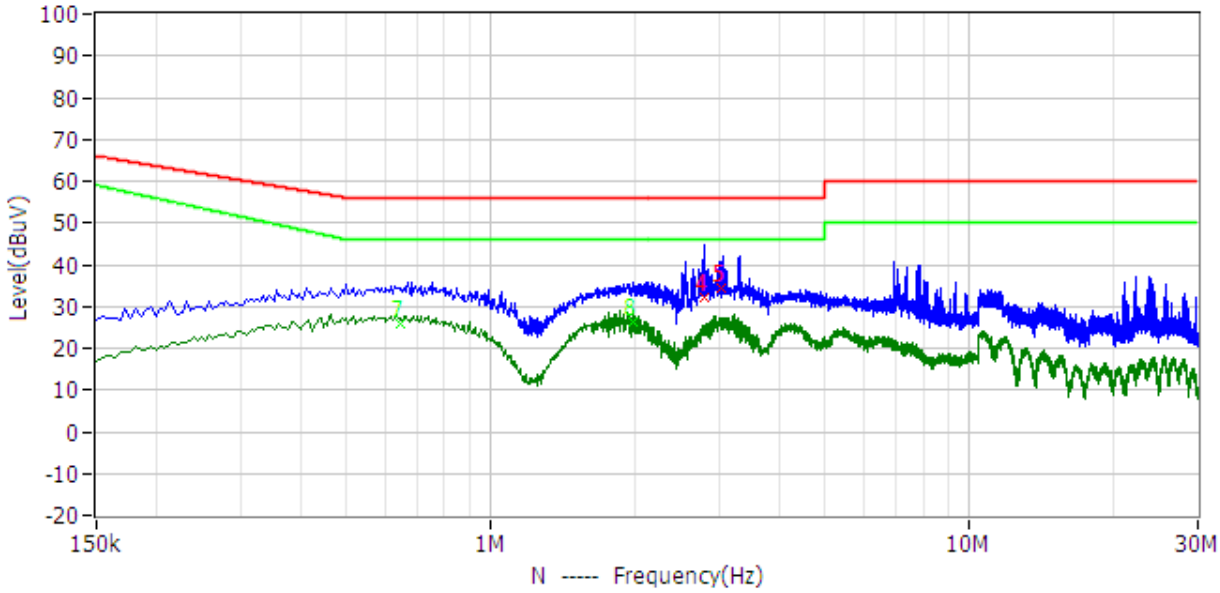
3.4 Test Protocol

For Mains ports: Pass

L line



N line



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Phase
1	2.751MHz	56.0	37.2	-18.8	10.3	QP	L1
2	6.990MHz	60.0	33.2	-26.8	10.5	QP	L1
3	7.814MHz	60.0	34.4	-25.6	10.5	QP	L1
4	2.783MHz	56.0	32.0	-24.0	10.4	QP	N
5	3.035MHz	56.0	34.3	-21.7	10.4	QP	N
6	1.932MHz	46.0	23.6	-22.4	10.3	CAV	L1
7	645.000kHz	46.0	26.0	-20.0	10.3	CAV	N
8	1.982MHz	46.0	26.2	-19.8	10.4	CAV	N

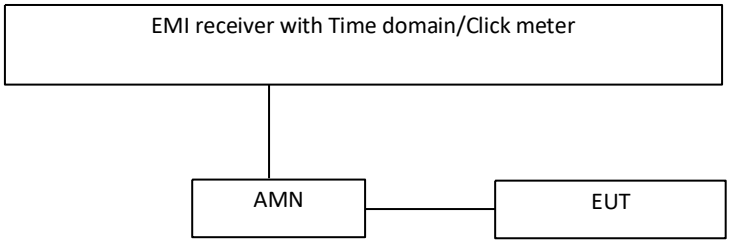
For Associated ports: NA

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBμV)	Limit (dBμV)	Margin (dB)	Corrected Reading (dBμV)	Limit (dBμV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

4. Mains terminal discontinuous disturbance voltage/click

Test result: PASS

4.1 Block Diagram of Test Setup



4.2 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.
Detailed test procedure and arrangement was according to clause 5.2 of EN 55014-1.
Measurement methods was according to clause 5.4 of EN 55014-1.
Operation conditions of EUT was according to clause 6 of EN 55014-1.
0.15MHz, 0.5MHz, 1.4MHz and 30MHz were spot checked, and upper quartile methods used during measurement.
The final judgment of test result was according to figure 6 of EN 55014-1.

4.3 Test Protocol

Frequency (MHz)	0.15	0.5	1.4	30.0
Permitted limit for continuous interference (dBµV)	66.0	56.0	56.0	60.0
Counted click number	40	30	26	0
Observed time (min)	44	44	44	44
Click duration (ms)	<10	<10	<10	-
Click rate N	<5	<5	<5	<5
Factor	-	-	-	-
Permitted limits for clicks (dBµv)	-	-	-	-
Counted clicks exceeding the limits	-	-	-	-
Test result	Pass	Pass	Pass	Pass
Any other descriptions: The click rated is less than 5, all caused clicks have a duration less than 10ms, so, it complied the standard without further test.				

5. Continuous disturbance power

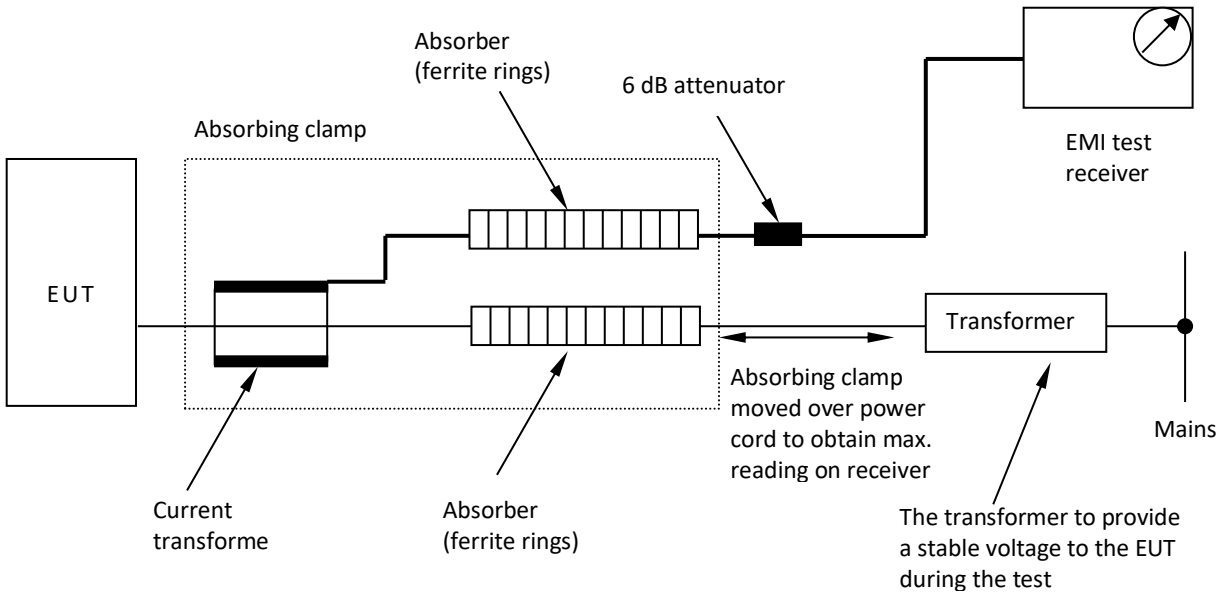
Test result: **PASS**

5.1 Continuous disturbance power limit

	General		P ⩽ 700 W		700 W < P ⩽ 1 000 W		P > 1 000 W	
Frequency range (MHz)	Limits dB(pW) Quasi-peak	Average	Limits dB(pW) Quasi-peak	Average	Limits dB(pW) Quasi-peak	Average	Limits dB(pW) Quasi-peak	Average
30 ~ 300	45 ~ 55*	35 ~ 45*	45 ~ 55*	35 ~ 45*	49 ~ 59*	39 ~ 49*	55 ~ 65*	45 ~ 55*

Notes:
1. * means the limit decreasing linearly with the logarithm of the frequency in the range 30MHz to 300MHz.
2. If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

5.2 Block diagram of test set up

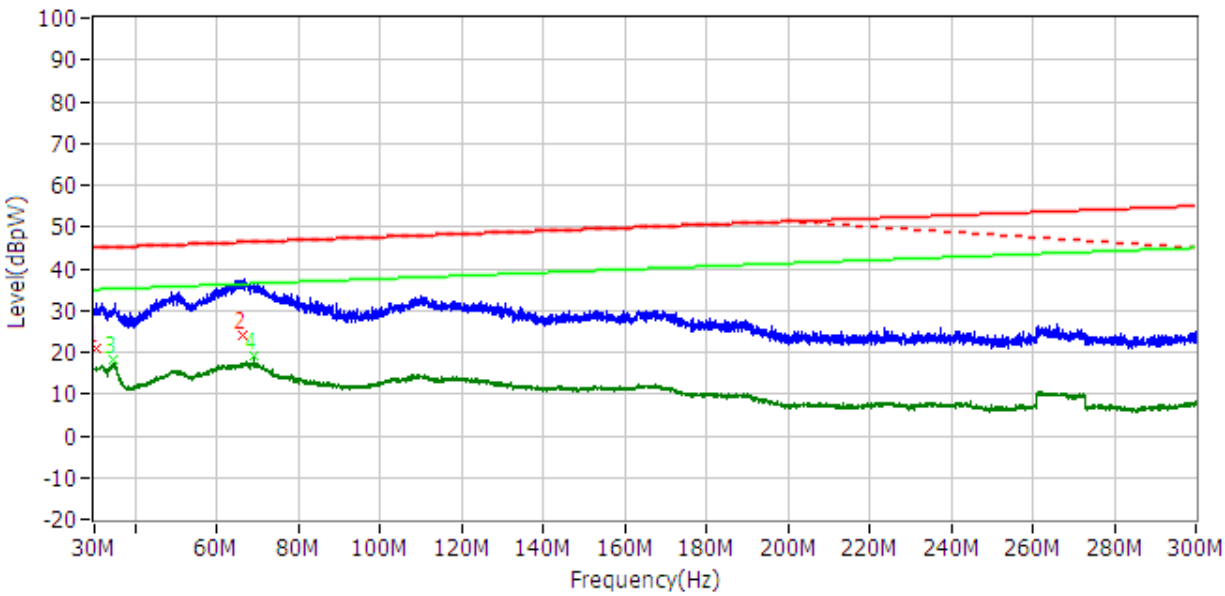


5.3 Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.
Detailed test procedure and arrangement was according to clause 5.3 of EN 55014-1.
Measurement methods was according to clause 5.4 of EN 55014-1.
Operation conditions of EUT was according to clause 6 of EN 55014-1.
Frequency range 30MHz – 300MHz was checked and EMI receiver measurement bandwidth was set to 120kHz.

5.4 Test Protocol

For Mains ports: Pass



No.	Frequency	Limit dBpW	Level dBpW	Delta dB	Factor dB	Detector
1	30.420MHz	45.0	21.0	-24.0	10.1	QP
2	66.180MHz	46.3	24.1	-22.2	9.8	QP
3	34.740MHz	35.2	18.2	-17.0	9.9	CAV
4	69.060MHz	36.4	19.1	-17.3	10.3	CAV

For Associated ports: NA

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBpW)	Limit (dBpW)	Margin (dB)	Corrected Reading (dBpW)	Limit (dBpW)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

6. Radiated emission

Test result: **PASS**

☒ As for in the disturbance power test all emission readings from the EUT are lower than the applicable limits (Table 7) reduced by the margin (Table 8) and the maximum clock frequency is less than 30MHz, the EUT is deemed to comply with the Radiated Emission requirement without test.

6.1 Limit

☐ Radiated emission limit from frequency range 30MHz – 1000MHz

Frequency (MHz)	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 3m	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 10m
30 ~ 230	40	30
230 ~ 1000	47	37
Notes: 1. For the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades. 2. The gray rows are selected items.		

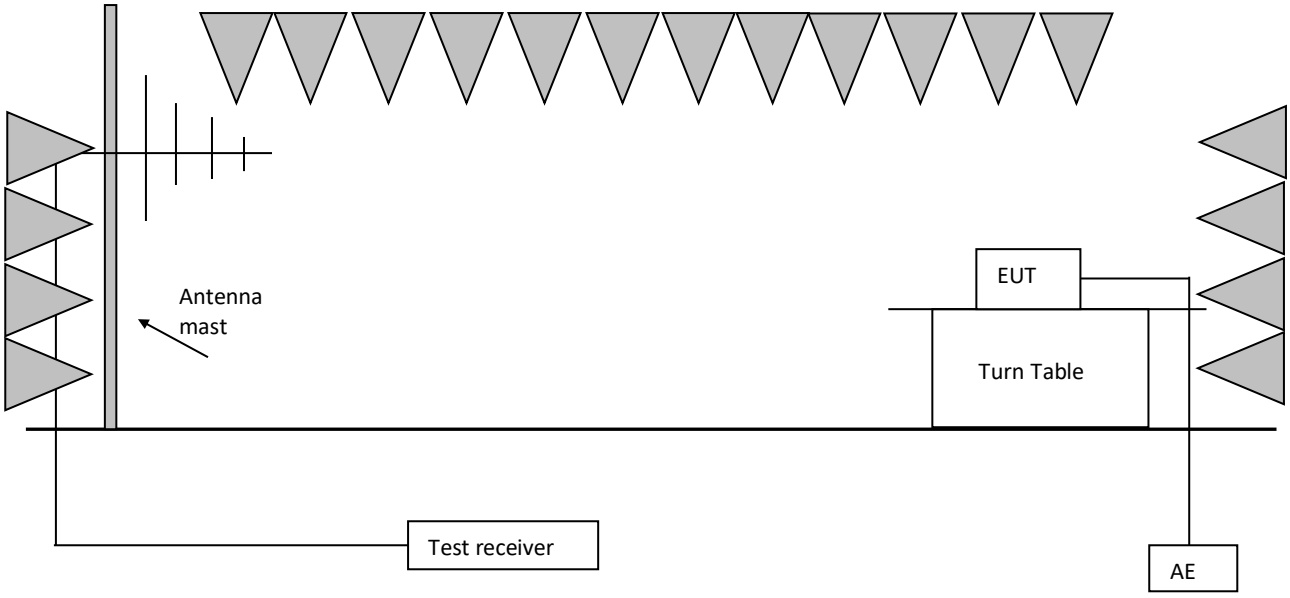
☐ Radiated emission limit from frequency range 1GHz – 6GHz

Frequency (MHz)	Permitted limit in dBμV/m (Average) of Measurement Distance 3m	Permitted limit in dBμV/m (Peak) of Measurement Distance 3m
1000 ~ 3000	50	70
3000 ~ 6000	54	74
Notes: 1. For the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades. 2. The gray rows are selected items.		

Required highest frequency for radiated electric field strength measurements

Highest clock frequency (F_x)	Highest measurement frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz < $F_x \leq 500$ MHz	2 GHz
500 MHz < $F_x \leq 1$ GHz	5 GHz
$F_x > 1$ GHz	$5 \times F_x$ up to a maximum of 6 GHz

6.2 Block diagram and test set up



The measurement was applied in a semi-anechoic chamber.
Operation conditions of EUT was according to clause 6 of EN 55014-1.
Measurement was performed according to clause 10 of CISPR 32.
Setting of EUT is according to clause 5.3.4.3 of EN 55014-1.
The bandwidth setting on test receiver was 120kHz.
The frequency range from 30MHz to 6GHz was checked.

6.3 Test Protocol

Horizontal

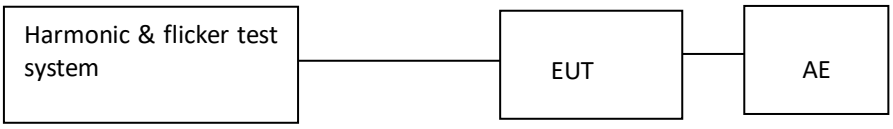
Vertical

Polarization	Frequency (MHz)	Corrected Reading (dBμV/m)	Corrected Factor (dB/m)	Limits (dBμV/m)	Margin (dBμV/m)
Horizontal					
Vertical					

7. Harmonics

Test result: PASS

7.1 Block Diagram of Test Setup



7.2 Test Setup and Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.
Measuring instrumentation according to IEC 61000-4-7:2002+A1:2008

7.3 Test Protocol

☐ This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit apply according to EN 61000-3-2

☐ The EUT is kitchen machines as listed in the scope of IEC 60335-2-14, therefore, is deemed to conform to the harmonic current limits of this standard without further testing.

Power and THD results

True power P:	1.254kW	Apparent power S:	1.254kVA
Reactiv power Q:	23.92var	Power factor:	1.000
THD (U):	0.001	THD (I):	0.004
Crest Factor (U):	1.414	Crest Factor (I):	1.435

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	3.764			
2	5.539E-3			PASS
3	11.998E-3			PASS
4	5.112E-3			PASS
5	4.446E-3			PASS
6	4.940E-3			PASS
7	3.030E-3			PASS
8	4.452E-3			PASS
9	4.153E-3			PASS
10	4.237E-3			PASS
11	3.525E-3			PASS
12	3.611E-3			PASS
13	4.544E-3			PASS
14	3.567E-3			PASS
15	3.523E-3			PASS
16	2.903E-3			PASS
17	2.956E-3			PASS
18	2.727E-3			PASS
19	2.237E-3			PASS
20	2.378E-3			PASS
21	2.291E-3			PASS
22	1.885E-3			PASS
23	2.021E-3			PASS
24	1.593E-3			PASS
25	2.246E-3			PASS
26	1.328E-3			PASS
27	1.975E-3			PASS
28	1.258E-3			PASS
29	1.032E-3			PASS
30	1.132E-3			PASS
31	841.816E-6			PASS
32	1.130E-3			PASS
33	1.691E-3			PASS
34	977.636E-6			PASS
35	1.480E-3			PASS
36	1.119E-3			PASS
37	1.096E-3			PASS
38	950.856E-6			PASS
39	1.151E-3			PASS
40	968.756E-6			PASS

Maximum harmonic current results

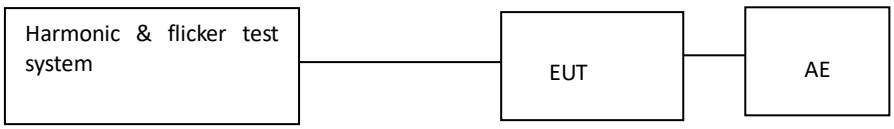
Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	5.432			
2	45.290E-3	2.796	1.62	PASS
3	44.214E-3	1.282	3.45	PASS
4	28.833E-3			PASS
5	23.382E-3			PASS
6	20.212E-3			PASS
7	15.976E-3			PASS
8	15.354E-3			PASS
9	13.545E-3			PASS
10	12.760E-3			PASS
11	11.004E-3			PASS
12	10.713E-3			PASS
13	10.911E-3			PASS
14	9.350E-3			PASS
15	9.052E-3			PASS
16	8.199E-3			PASS
17	7.765E-3			PASS
18	7.402E-3			PASS
19	6.434E-3			PASS
20	6.530E-3			PASS
21	6.229E-3			PASS
22	5.708E-3			PASS
23	5.689E-3			PASS
24	5.192E-3			PASS
25	5.632E-3			PASS
26	4.851E-3			PASS
27	5.290E-3			PASS
28	4.072E-3			PASS
29	3.970E-3			PASS
30	4.063E-3			PASS
31	3.730E-3			PASS
32	4.107E-3			PASS
33	4.412E-3			PASS
34	3.589E-3			PASS
35	4.328E-3			PASS
36	3.711E-3			PASS
37	3.807E-3			PASS
38	3.564E-3			PASS
39	3.769E-3			PASS
40	3.464E-3			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

8. Voltage Fluctuations-Flicker

Test result: **PASS**

8.1 Block Diagram of Test Setup



8.2 Test Setup and Test Procedure

8.2.1 Definition

Flicker: impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Pst: Short-term flicker severity.

Plt: long-term flicker severity.

dc: maximum steady state voltage change during an observation period.

dmax: maximum absolute voltage change during an observation period.

d(t): time function of the relative r.m.s. voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage, except during time interval in which the voltage is a steady-state condition for at least 1s.

8.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes.

8.3 Test Protocol

The tested object operated under the operating condition specified in EN 61000-3-3
The following limits apply

- the value of Pst shall not be greater than 1,0.
- the value of Plt shall not be greater than 0,65.
- Tmax, the accumulated time value of d(t) with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms.
- the maximum relative steady-state voltage change, dc, shall not exceed 3,3 %.
- the maximum relative voltage change dmax, shall not exceed:

☒ 4% without additional conditions.
☐ 6 % for equipment which is:
– switched manually, or
– switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
☐ 7 % for equipment which is:
– attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
– switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.
☐ for manual switch, dmax is measured in accordance with Annex B of standard, average dmax is calculated from 24 times measurement.
☐ The rate power of the EUT is no greater than 75W, which is unlikely to produce significant voltage fluctuations or flicker by technical analysis and evaluation. So it is deemed to fulfil the requirements without testing.

	EUT values	Limit	Result
Pst	0.387	1.00	PASS
Plt	0.374	0.65	PASS
dc [%]	0.963	3.30	PASS
dmax [%]	1.014	4.00	PASS
dt [s]	0.000	0.50	PASS

Immunity Test

Performance criteria

The performance criteria are based on the general criteria of the standard and derived from the product specification

Criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after the test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

Categories of apparatus

☐ **Category I:** equipment containing no electronic control circuitry. (fulfill the relevant immunity requirements without testing)

☒ **Category II:** mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 230 MHz), Surge, Voltage dips)

☐ **Category III:** battery operated equipment not included in Category I. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to (F) MHz), Surge)

Note: For Category III toys, the radio frequency electromagnetic fields test shall be applicable only for ride on toys.

☐ **Category IV:** mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to 1000 MHz), Surge, Voltage dips)

☐ **Category V:** mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to 6 GHz), Surge, Voltage dips)

9. Electrostatic Discharge (ESD)

Test result: **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

1a – Contact discharge		1b – Air discharge	
Level	Test voltage kV	Level	Test voltage kV
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special

Notes:
1. "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
2. The gray rows were the selected test level.

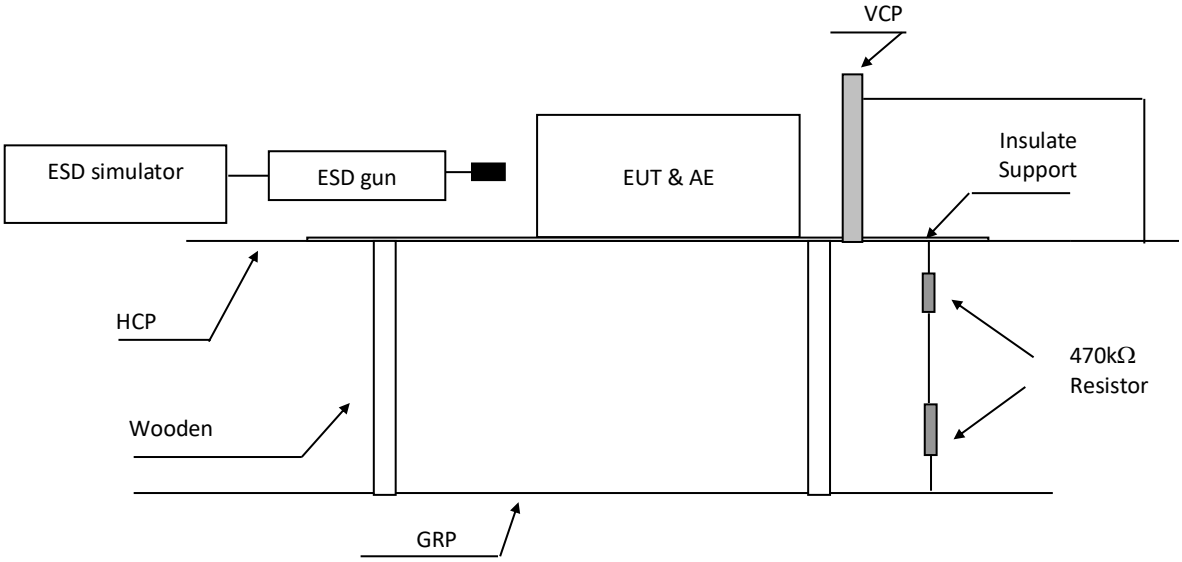
9.1.2 Performance Criterion

Performance criterion: **B/C***

*: Performance criterion C may be applied to toys not using score or data entered by the user (e.g. musical soft toys and sounding toys).

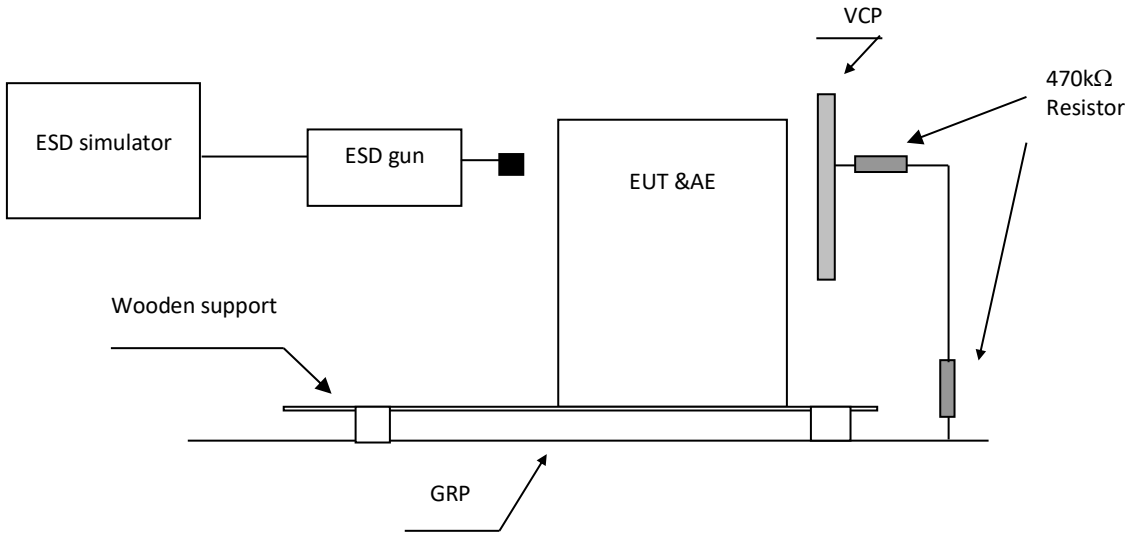
9.2 Block Diagram of Test Setup

For table-top equipment



Note: HCP means Horizontal Coupling Plane
VCP means Vertical Coupling Plane
GRP means Ground Reference Plane
Wooden support is a 0.8m height table

For floor standing equipment



Note: VCP means Vertical Coupling Plane
GRP means Ground Reference Plane
Wooden support is a 0.1m height rack

9.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to IEC 61000-4-2 Clasuse 7.
The test method and equipment was specified by IEC 61000-4-2 with the modifications by EN 55014-2 clause 5.1.

9.4 Test Protocol

Direct discharges were applied at the following selected points:

Test point #	Test level [kV]	Air/ Contact	Polarity (+/-)	Pass/Fail/NA	Comment
A	4	Contact	+/-	Pass	All touchable screws of enclosure
B	4	Contact	+/-	Pass	Accessible metal parts of the EUT
C	8	Air	+/-	Pass	Air gap of the switch, button
D	8	Air	+/-	Pass	The air in-taking opening
E	8	Air	+/-	Pass	Slots around the EUT

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

Point	Description	Point	Pass/Fail/NA
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	Pass
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	Pass
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	Pass
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	Pass

For table top equipment

Point	Description	Point	Pass/Fail/NA
HCP f	0,1m from the front of the EUT	Edge of centre, corner on HCP	Pass
HCP b	0,1m from the back of the EUT	Edge of centre, corner on HCP	Pass
HCP r	0,1m from the right side of the EUT	Edge of centre, corner on HCP	Pass
HCP l	0,1m from the left side of the EUT	Edge of centre, corner on HCP	Pass

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements.

10. Radio frequency electromagnetic fields

Test result: **NA**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

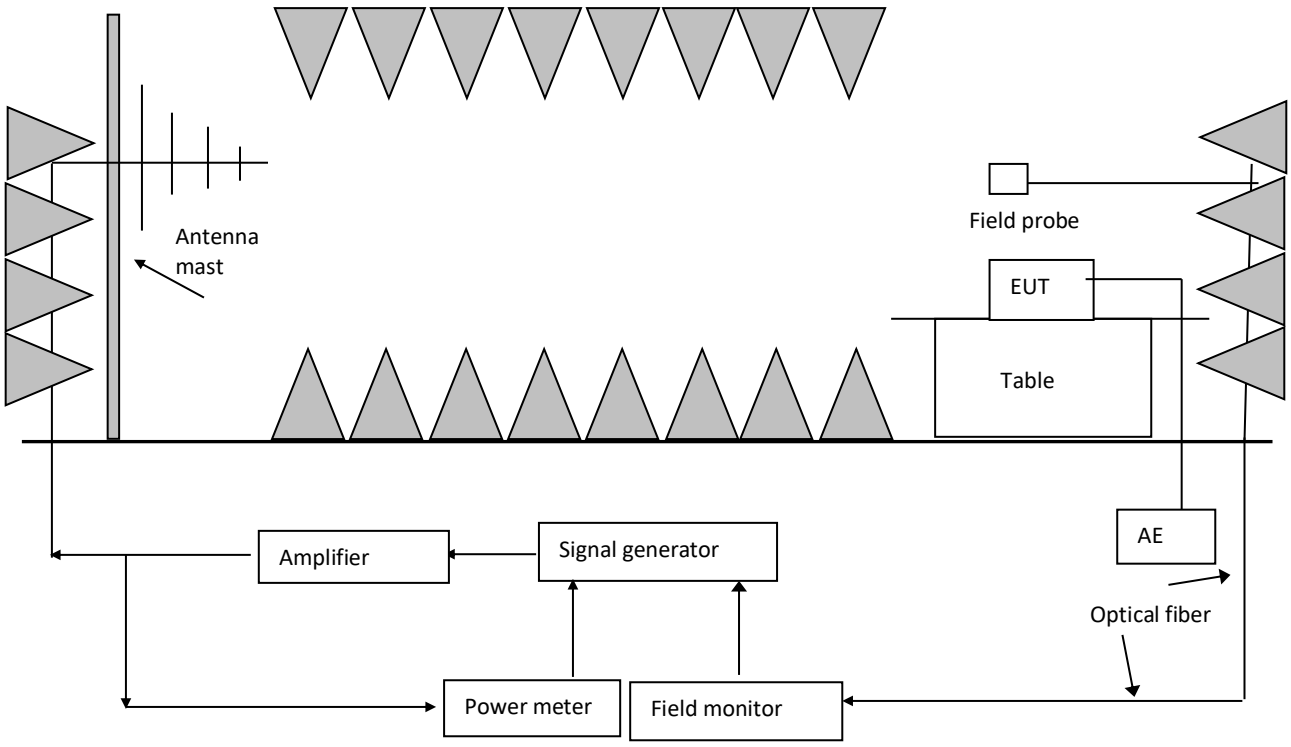
Level	Test field strength V/m
1	1
2	3
3	10
X	Special

Notes:
1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

Performance criterion: **A**

10.2 Block diagram of test setup



10.3 Test Setup and Test Procedure

Measurement was performed in full-anechoic chamber.
Measurement and setting of EUT was applied according to IEC 61000-4-3 clause 7.
The test method and equipment was specified by IEC 61000-4-3 with additions and modifications by EN 55014-2 clause 5.5.

10.4 Test Protocol

Test no.:	Frequency (MHz)	Polarization	Test level V/m	Modulation	Exposed location	Pass/Fail/NA	Comment
1	80-1000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides		-
1	1000-6000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides		-

Observation:
Conclusion:

11. Fast transients

Test result: **PASS**

11.1 Severity Level and Performance Criterion

11.1.1 Test level

Open circuit output test voltage (±10%) and repetition rate of the impulses (±20%)				
Level	Input and output AC power ports		Input and output DC power ports Signal ports, control ports and wired network ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5	0.25	5
2	1	5	0.5	5
3	2	5	1	5
4	4	5	2	5
X	Special	Special	Special	Special

Notes :
1. "X" is an open level. The level has to be specified in the dedicated equipment specification.
2. The gray rows were the selected test level.

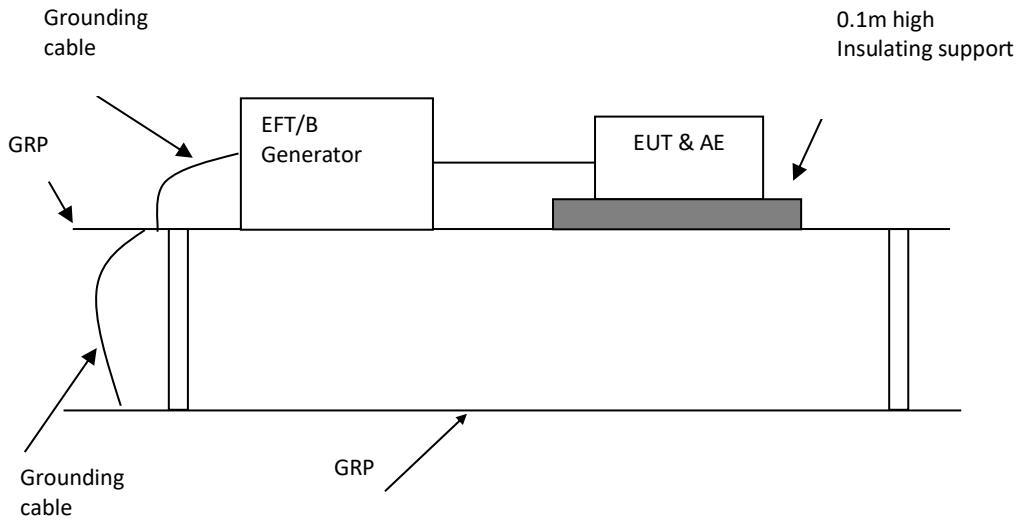
11.1.2 Performance Criterion

Performance criterion **B**

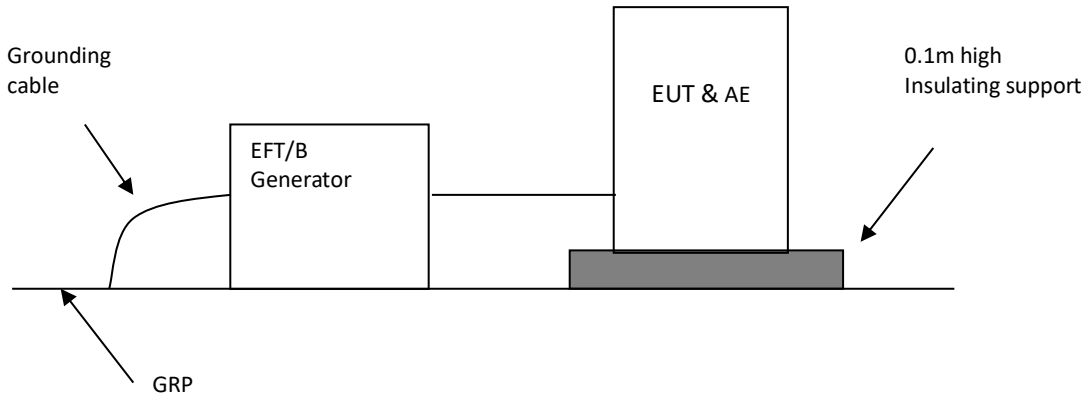
11.2 Block Diagram of Test Setup

11.2.1 Block Diagram for input a.c./d.c. power line

For table-top equipment

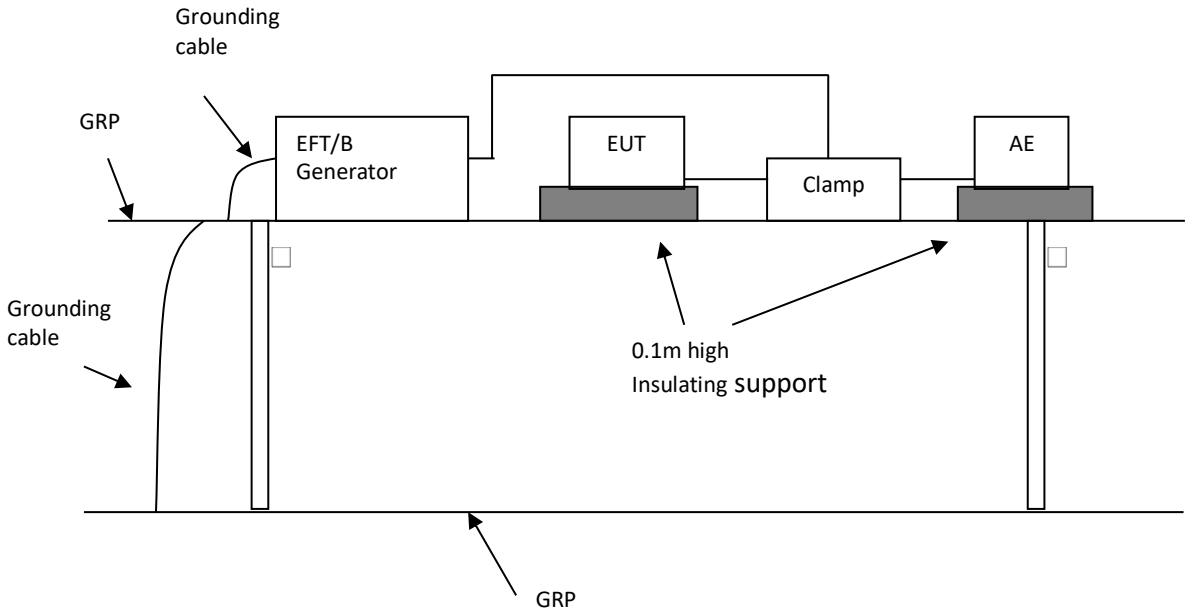


For floor standing equipment

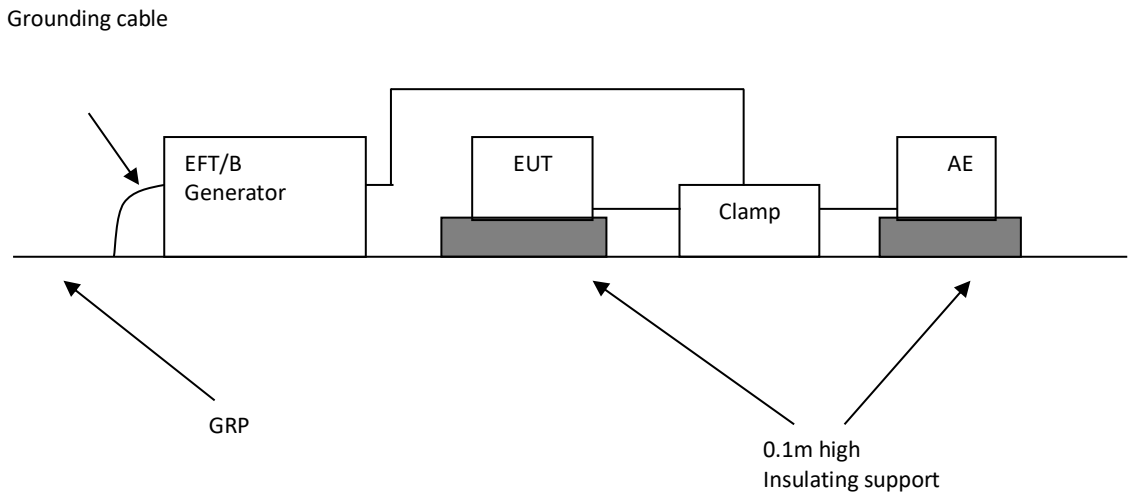


11.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

For table-top equipment



For floor standing equipment



11.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to IEC 61000-4-4 clause 7.
The test method and equipment was specified by IEC 61000-4-4 with additions and modifications by EN 55014-2 clause 5.2.

11.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Repetition rate kHz	Line for test	Pass/Fail/NA
1	1	+/-	5	Input and output AC power ports	Pass
2	0.5	+/-	5	Input and output DC power ports	NA
3	0.5	+/-	5	Signal ports, control ports and wired network ports	NA

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements.

12. Surges

Test result: **PASS**

12.1 Severity Level and Performance Criterion

12.1.1 Test level

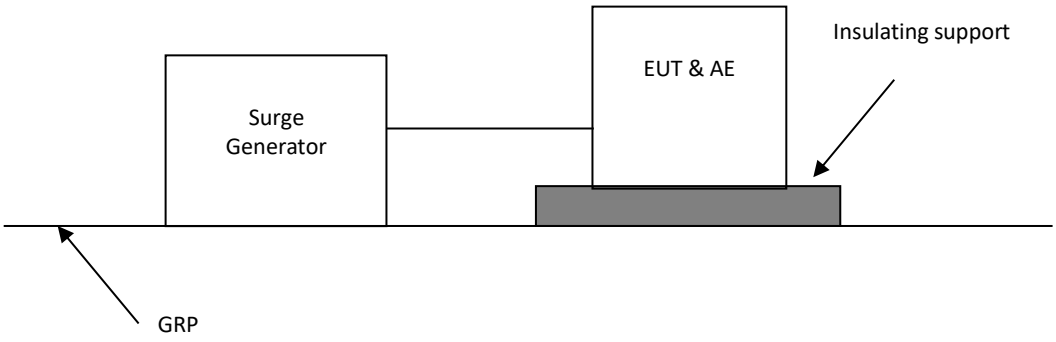
Level	Open-circuit test voltage ±10% kV
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

Notes:
1."X" is an open class. This level can be specified in the product Specification
2. The gray rows are the selected level.

12.1.2 Performance Criterion

Performance criterion **B**

12.2 Block Diagram of Test Setup



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to IEC 61000-4-5 clause 7.
The test method and equipment was specified by IEC 61000-4-5 with modifications by EN 55014-2 clause 5.6.

12.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Angle	Line for test	Pass/Fail/NA
1	1	+ -	90^0 270^0	Input AC power ports (line to line)	Pass
2	2	+ -	90^0 270^0	Input AC power ports (line to earth)	Pass
3	1	+ -	90^0 270^0	Wired network ports (line-to-earth (unshielded))	NA
4	0.5	+ -	90^0 270^0	Wired network ports (shield-to-earth (shielded)	NA

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements.

13. Injected Current

Test result: **PASS**

13.1 Severity Level and Performance Criterion

13.1.1 Test level

Frequency range 150kHz – 230MHz		
Level	Voltage level (e.m.f.) U_0 [dB(uV)]	U_0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special
Notes: 1. "X" is an open level. 2. The gray row is the selected test level.		

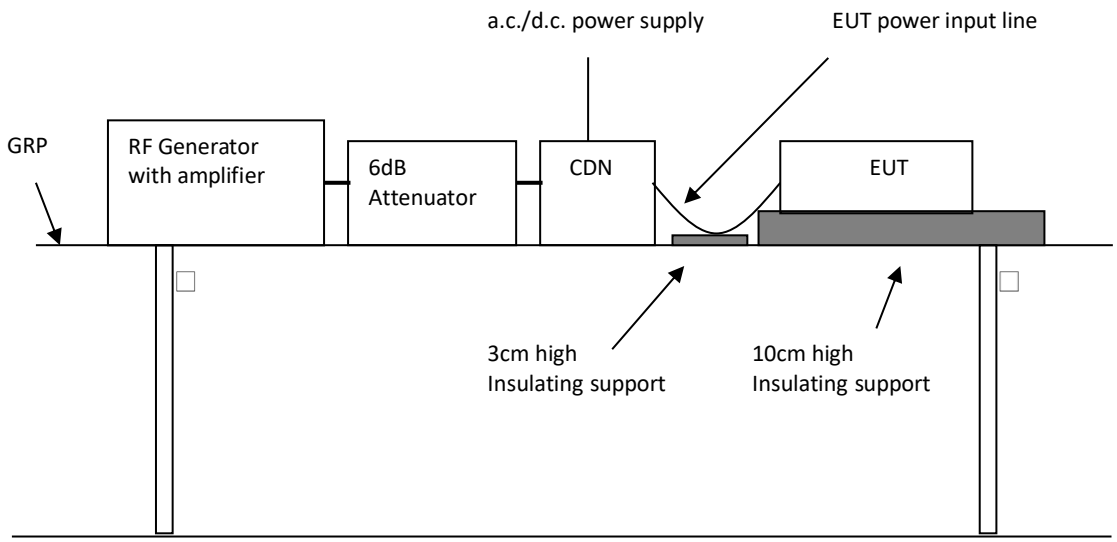
13.1.2 Performance Criterion

Performance criterion: **A**

13.2 Block Diagram of Test Setup

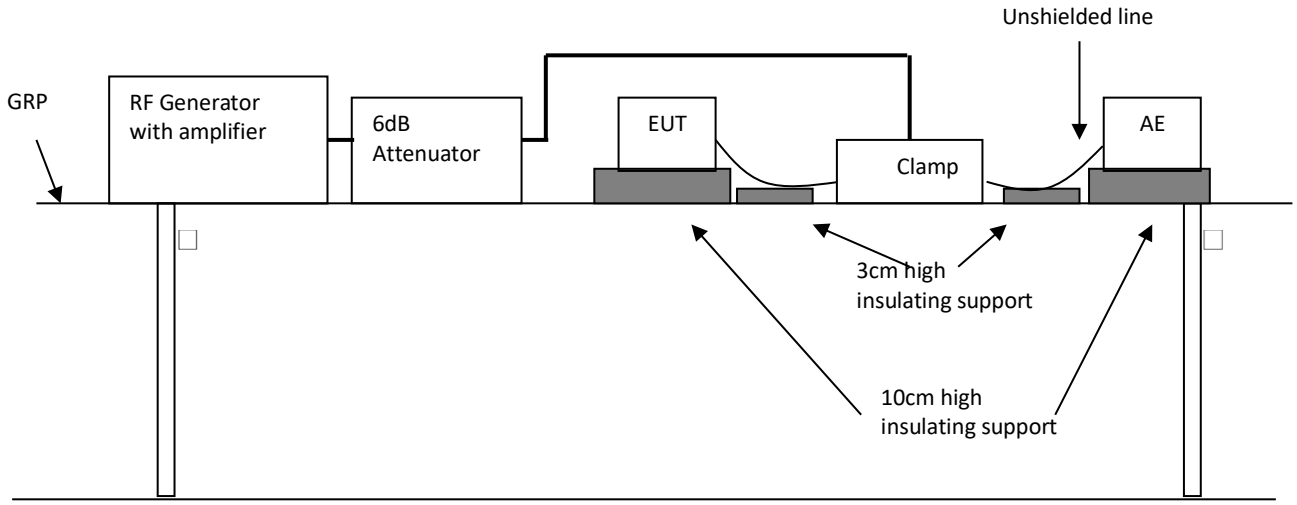
13.2.1 Block Diagram for a.c./d.c input power line

☒ Block Diagram for a.c./d.c input power line

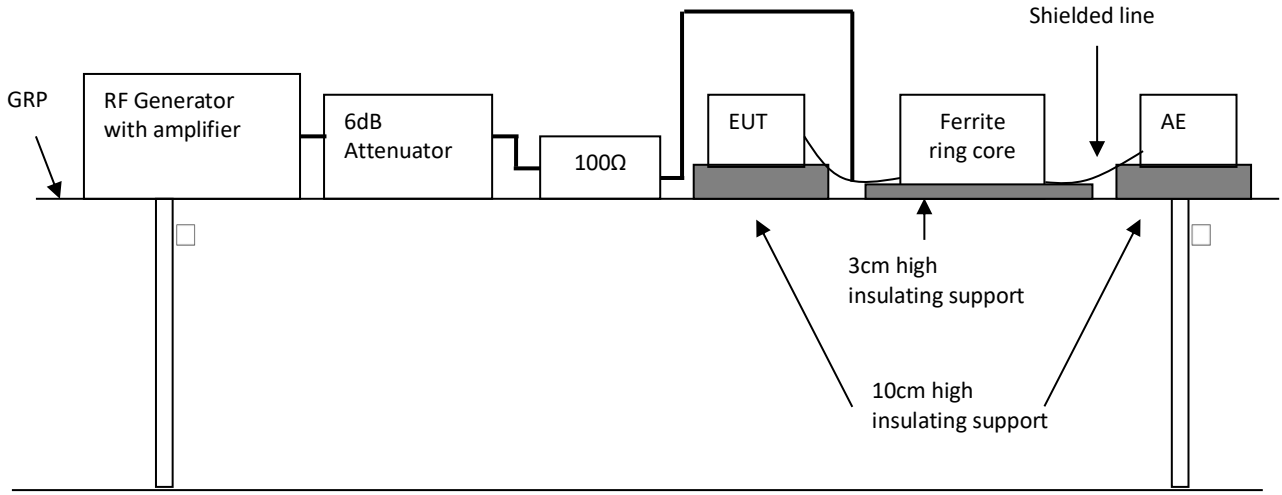


13.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

☐ Unshielded line



☐ Shielded line



13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to IEC 61000-4-6 clause 7.
The test method and equipment was specified by IEC 61000-4-6 with additions and modifications by EN 55014-2 clause 5.3, 5.4.

13.4 Test Protocol

☒ EUT is not required for Radio frequency electromagnetic fields

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~230	3	1kHz, 80%, SW, AM, 1% step size	Input and output AC power ports	Pass
2	0.15~230	1	1kHz, 80%, SW, AM, 1% step size	Input and output DC power ports	NA
3	0.15~230	1	1kHz, 80%, SW, AM, 1% step size	Signal ports, control ports and wired network ports	NA

☐ For EUT test Radio frequency electromagnetic fields

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	1kHz, 80%, SW, AM, 1% step size	Input and output AC power ports	NA
2	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	Input and output DC power ports	NA
3	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	Signal ports, control ports and wired network ports	NA

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements.

14. Voltage Dips

Test result: **PASS**

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level % U_T	Voltage dip % U_T	Duration (in period)	
		50Hz	60Hz
0	100	0.5 cycle	0.5 cycle
40	60	10 cycles	12 cycles
70	30	25 cycles	30 cycles

Notes:

1.“*” for 0.5 period, the test shall be made in positive and negative polarity, i.e. starting at 0° and 180°, respectively.

2. “**” means “x” is an open duration. This duration can be given in the product specification. Utilities in Europe have measured dips and short interruptions of duration between ½ a period and 3000 periods, but duration less than 50 periods are most common.

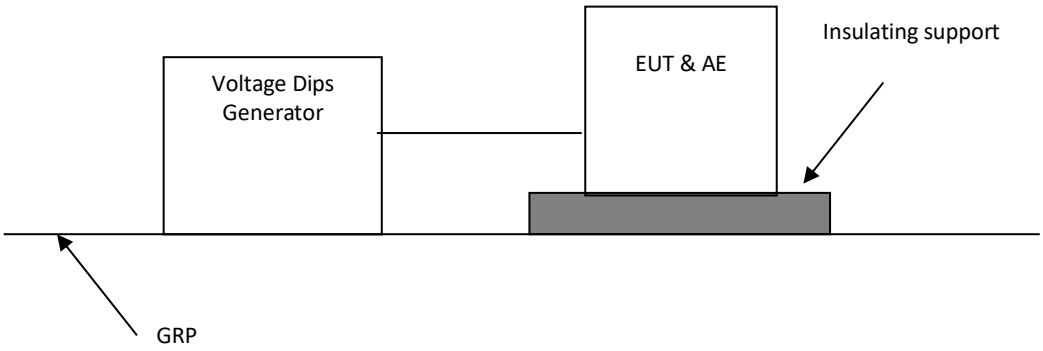
3. If the EUT is tested for voltage dips of 100%, it is generally unnecessary to test for other levels for the same durations. However, for some cases (safeguard systems or electro-mechanical devices) it is not true. The product specification or product committee shall give an indication of the applicability of this note.

4. The gray rows are selected test level.

14.1.2 Performance Criterion

Performance criterion: **C**

14.2 Block diagram of test setup



14.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to IEC 61000-4-11 clause 7.
The test method and equipment was specified by IEC 61000-4-11 with additions and modifications by EN 55014-2 clause 5.7.

14.4 Test Protocol

Test no.	% U_T	Voltage dips % U_T	Duration (in periods)	Pass/Fail/NA
1	70	30%	25 cycles at 50Hz	Pass
			30 cycles at 60Hz	Pass
2	40	60%	10 cycles at 50Hz	Pass
			12 cycles at 60Hz	Pass
3	0	100%	0.5 cycle at 50Hz	Pass
			0.5 cycle at 60Hz	Pass

Observation: During test, the EUT worked unsteadily. Once the interference is removed, it recovered its normal mode at once.
Conclusion: The EUT met the requirements.

Appendix I: Photograph of equipment under test

Photo 1.

Description: Overall view for HC-6001E

Photo 2.

Description: Overall view for HC-6001E

Photo 3.
Description: Overall view for HC-6001E

Photo 4.
Description: Overall view for HC-6001E, HC-6001E-1

Photo 5.
Description: Overall view for HC-6001E

Photo 6.
Description: Bottom view for HC-6001E, HC-6001E-1

Photo 7.
Description: Top view for HC-6001E, HC-6001E-1

Photo 8.
Description: Power connection view for all models

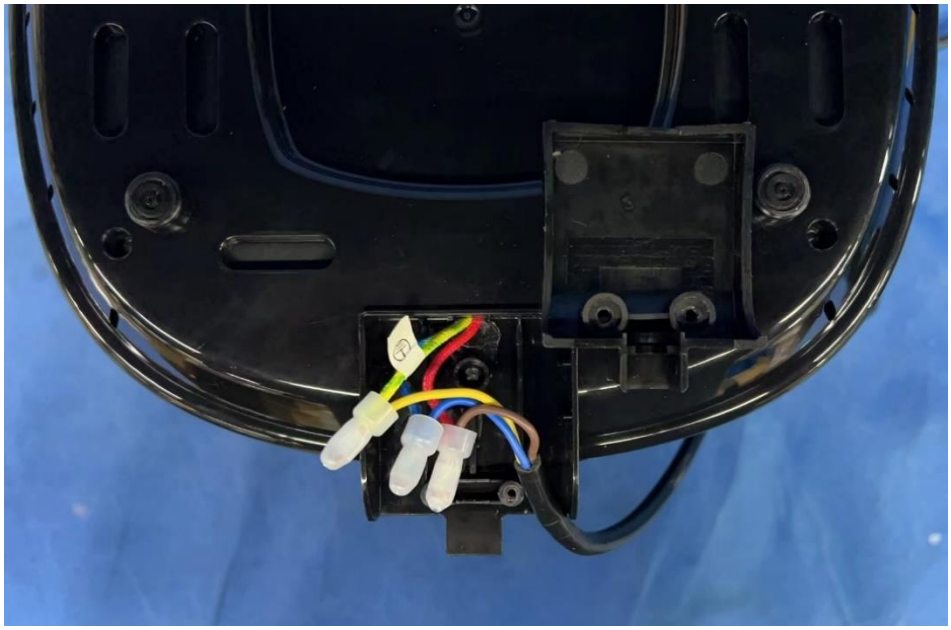


Photo 9.
Description: Internal view for all models

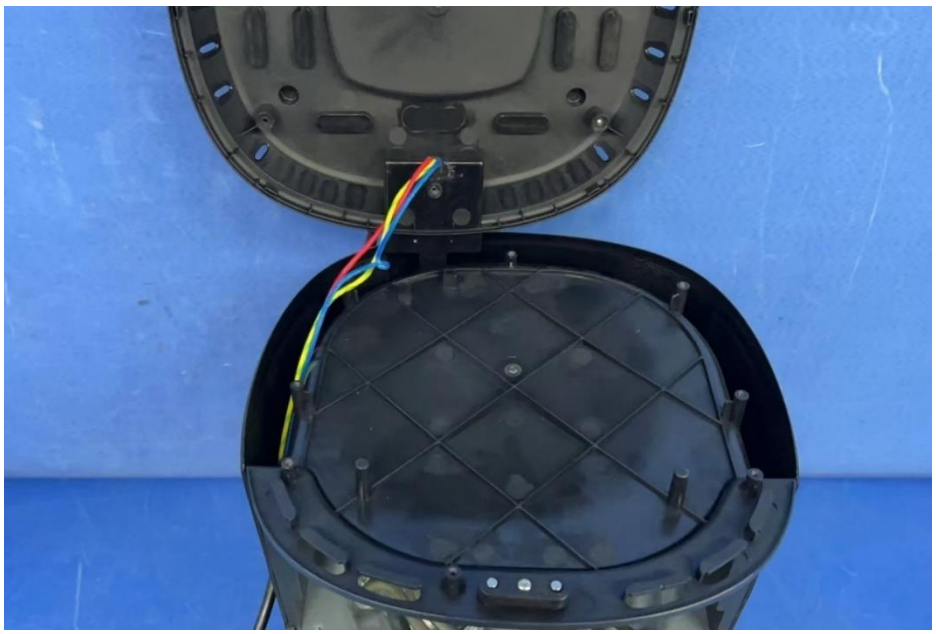


Photo 10.
Description: Internal view for HC-6001E, HC-6001E-1

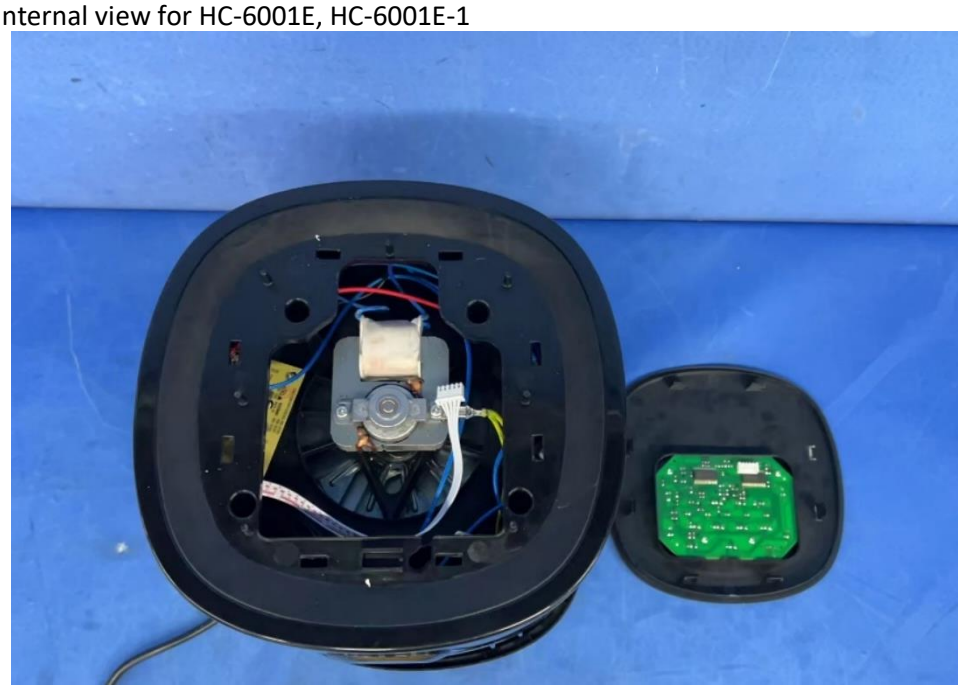


Photo 11.
Description: Internal view for HC-6001E, HC-6001E-1

Photo 12.
Description: Control panel PCB view for HC-6001E, HC-6001E-1

Photo 13.
Description: Control panel PCB view for HC-6001E, HC-6001E-1

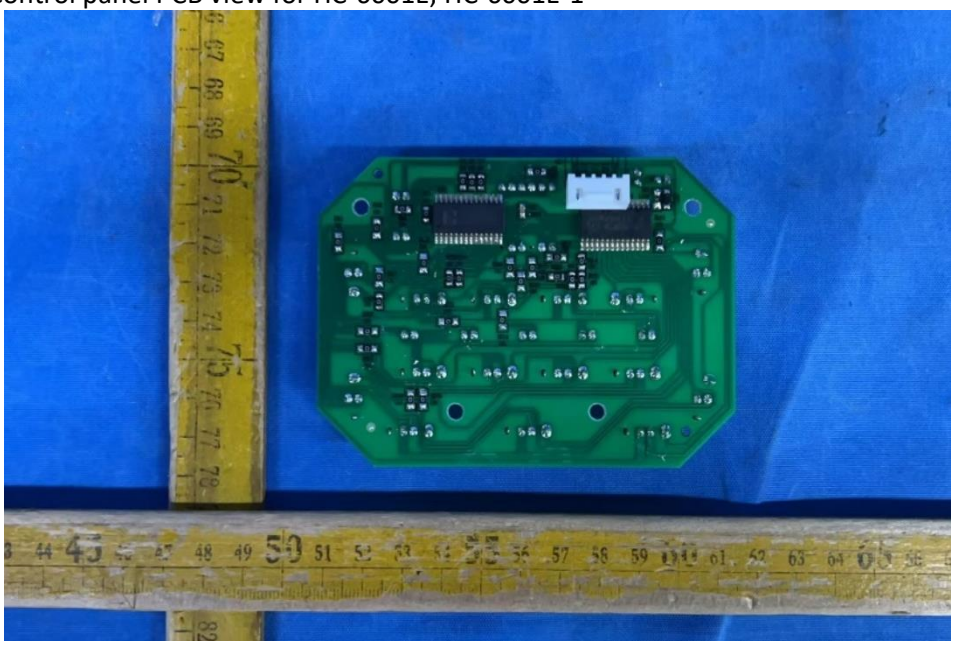


Photo 14.
Description: Internal for HC-6001E

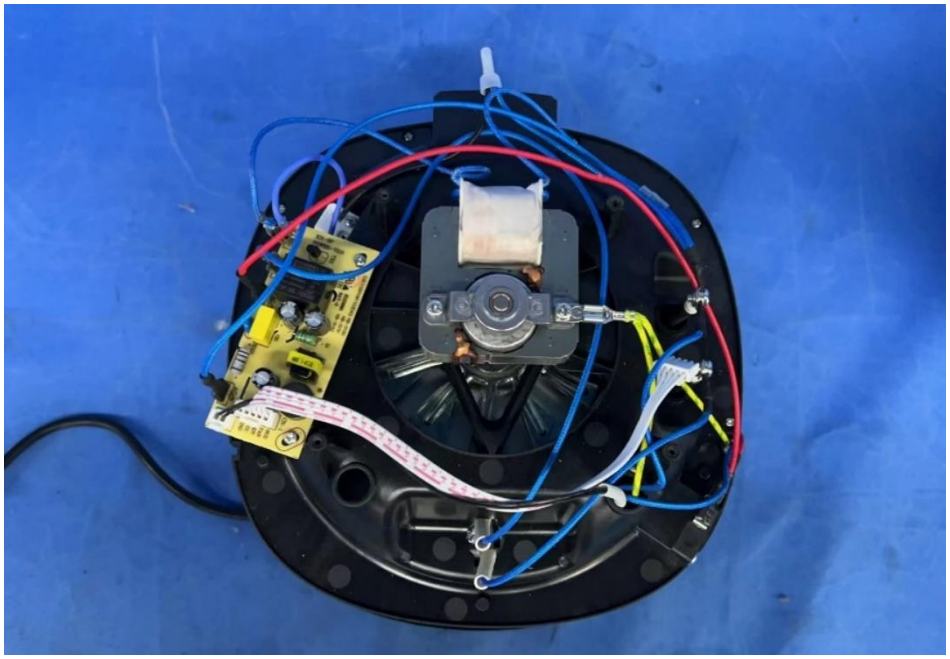


Photo 15.
Description: Interlock switch view for all models

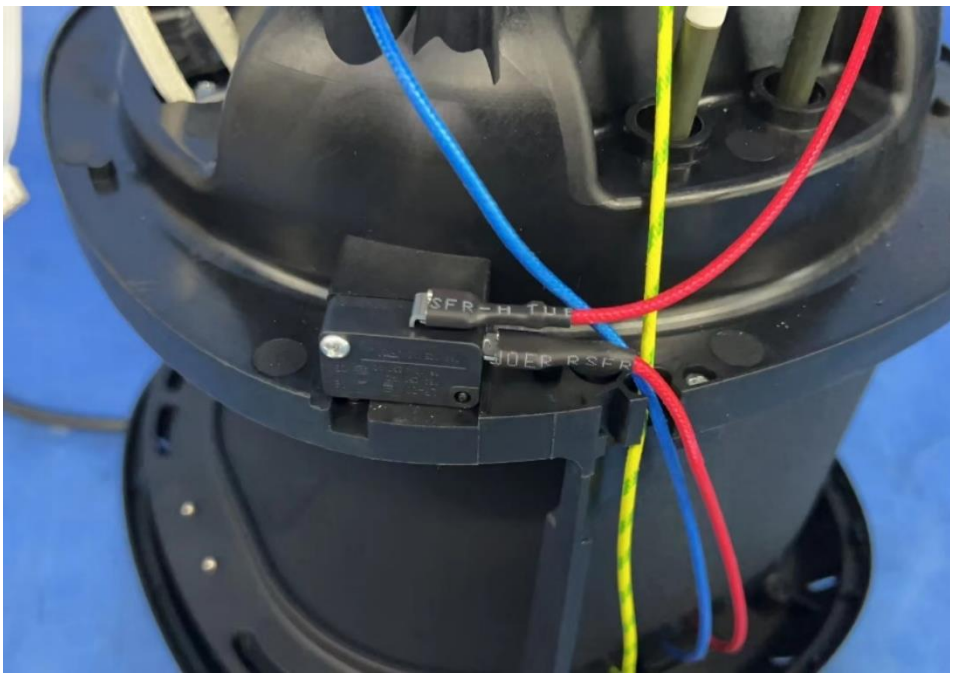


Photo 16.
Description: Thermal link view for HC-6001E, HC-6001E-1

Photo 17.
Description: Power PCB view for HC-6001E, HC-6001E-1

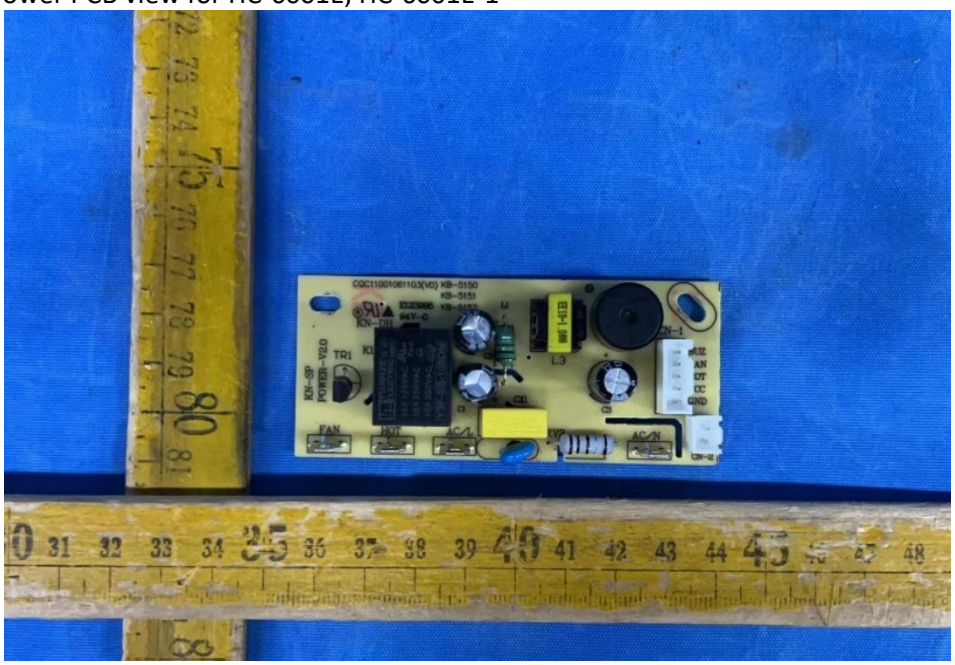


Photo 18.
Description: Power PCB view for HC-6001E, HC-6001E-1

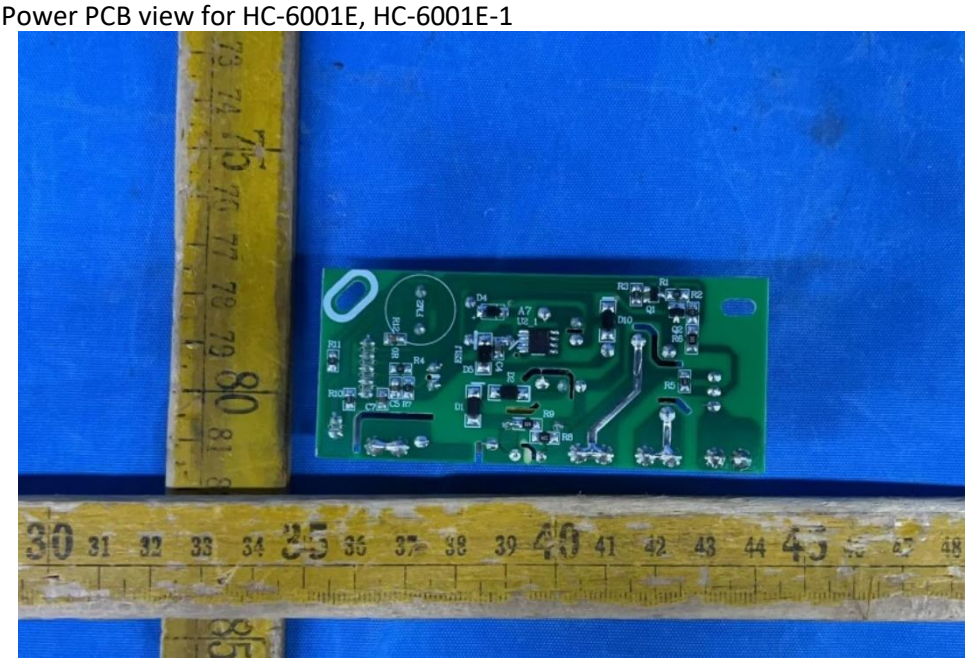


Photo 19.
Description: Internal view for HC-6001E

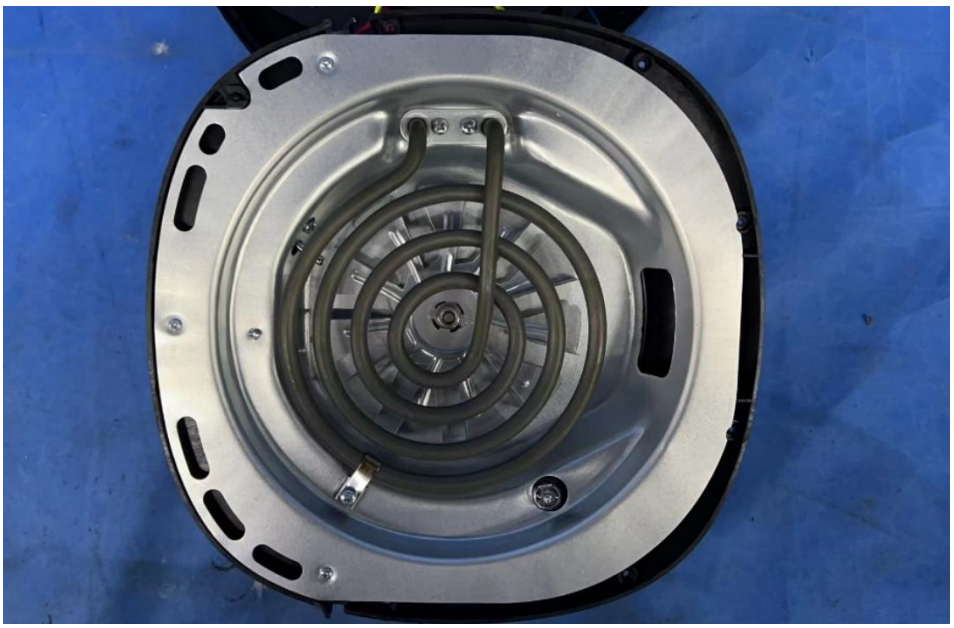


Photo 20.
Description: Thermal link view for HC-6001E, HC-6001E-1

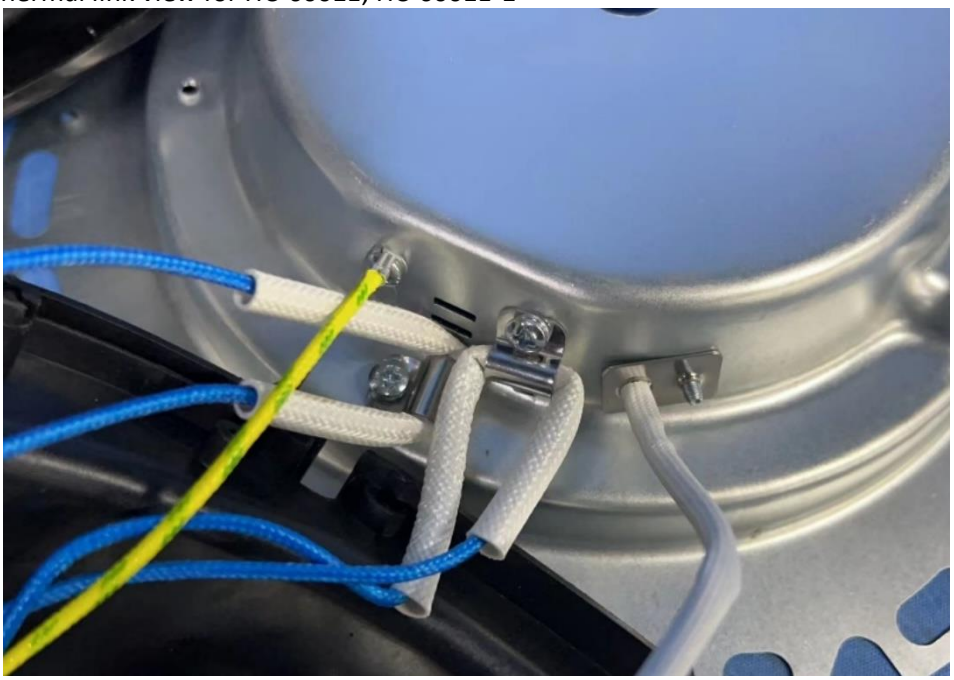


Photo 21.
Description: Internal view for HC-6001E, HC-6001E-1

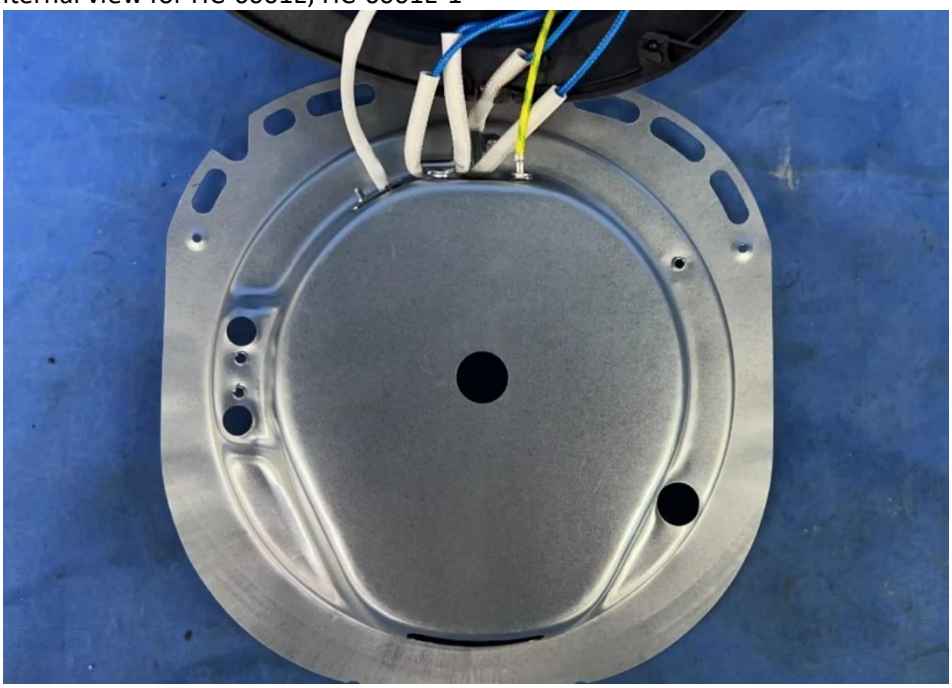


Photo 22.
Description: Internal view for HC-6001E, HC-6001E-1

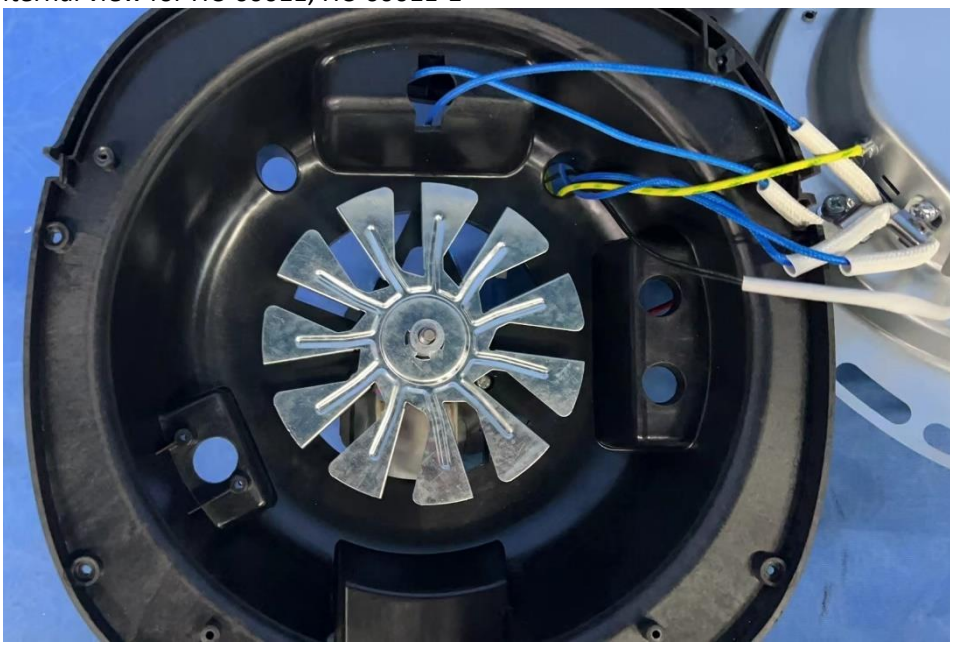


Photo 23.
Description: Heater element view for all models

Photo 24.
Description: Floodlight view for HC-6001E, HC-6001

Photo 25.
Description: Motor view for all models

Photo 26.
Description: Motor view for all models

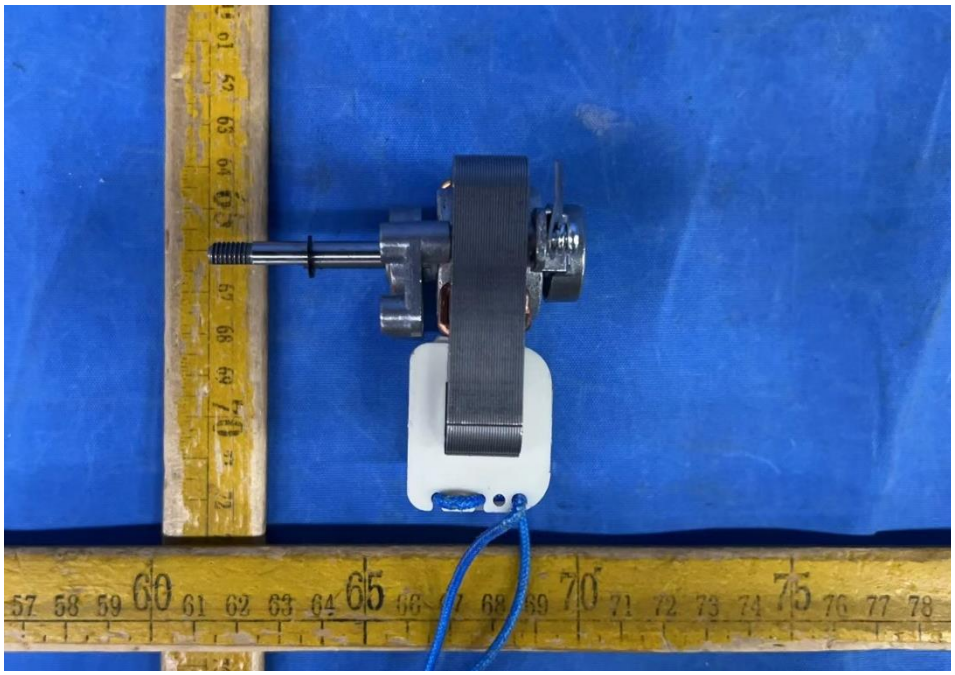


Photo 27.
Description: Motor view for all models

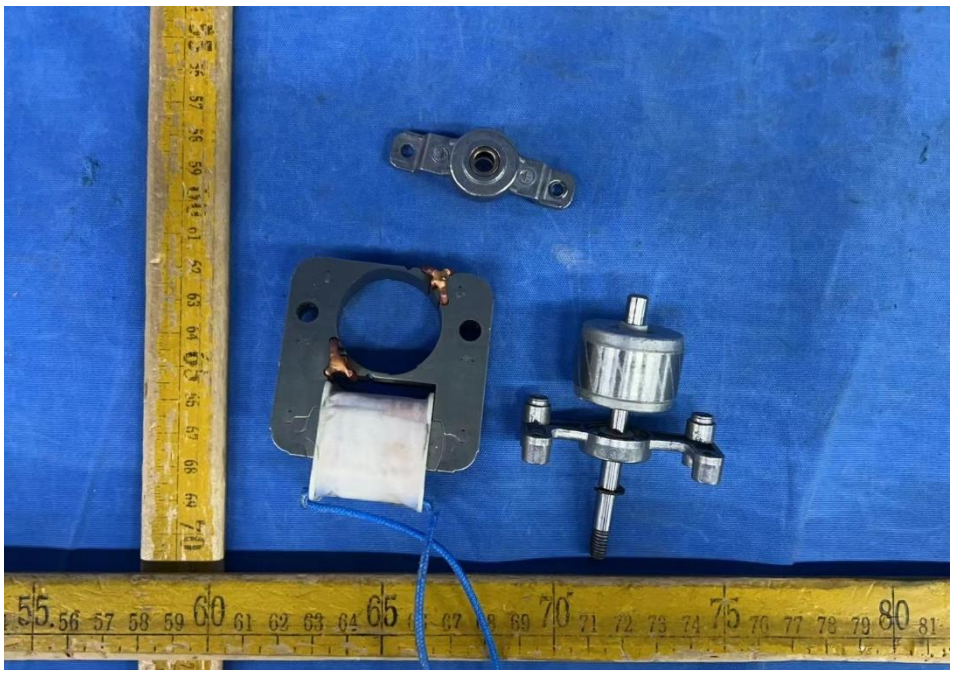


Photo 28.
Description: Motor view for all models

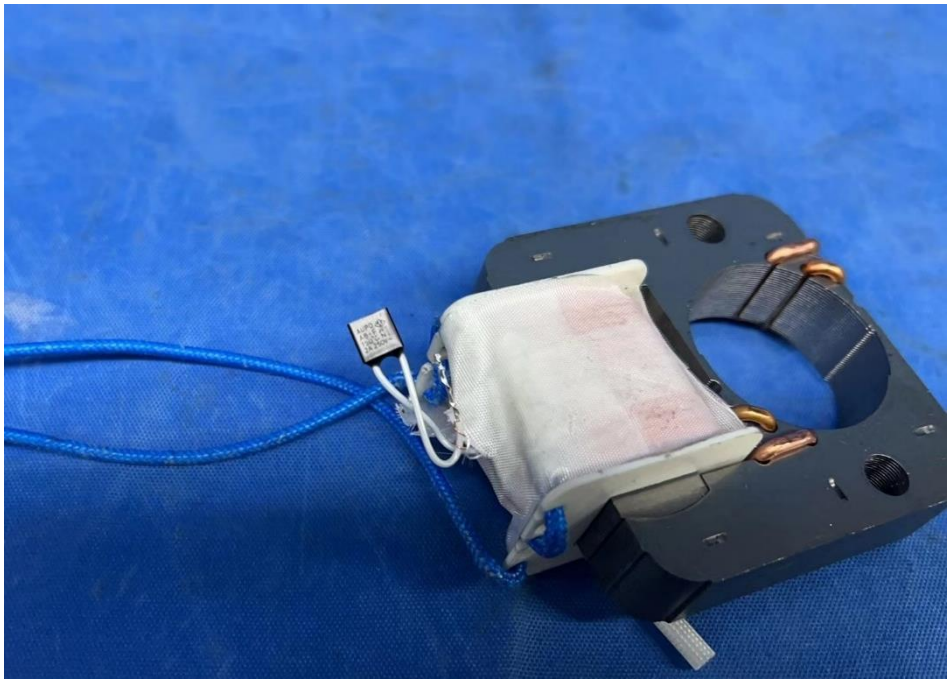


Photo 29.
Description: Overall view for HC-6001E-1

Photo 30.
Description: Overall view for HC-6001E-1

Photo 31.
Description: Overall view for HC-6001E-1

Photo 32.
Description: Overall view for HC-6001E-1

Photo 33.
Description: Internal view for HC-6001E-1

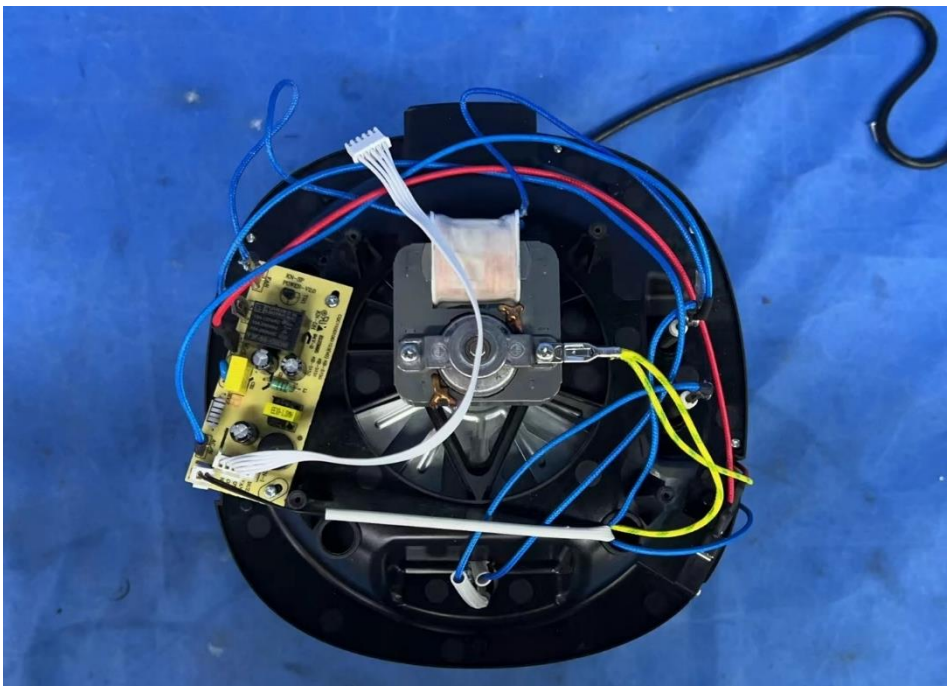


Photo 34.
Description: Internal view for HC-6001E-1

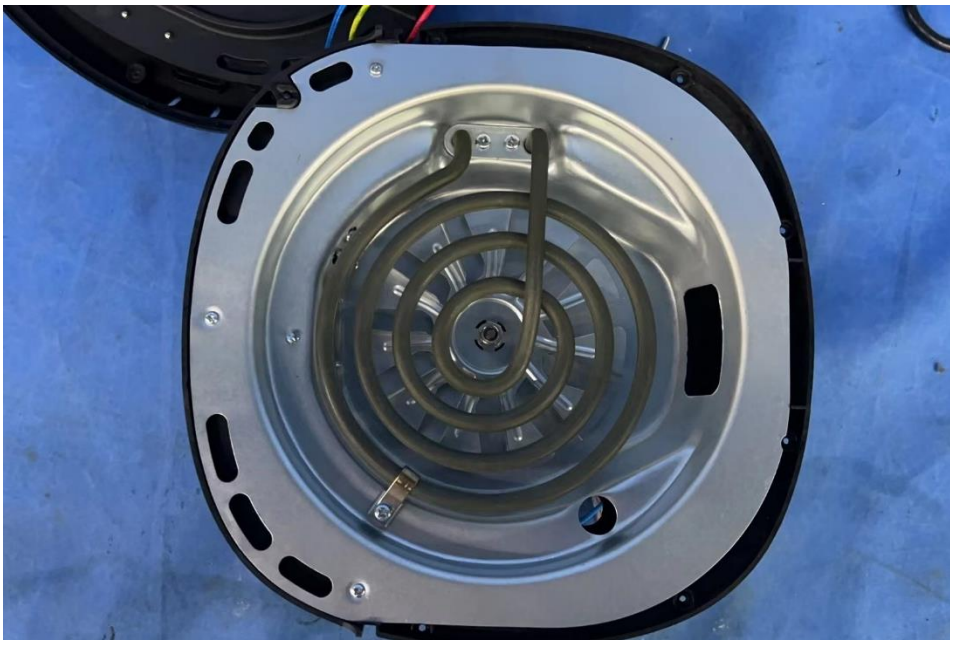


Photo 35.
Description: Overall view for HC-6001

Photo 36.
Description: Overall view for HC-6001

Photo 37.
Description: Overall view for HC-6001

Photo 38.
Description: Overall view for HC-6001

Photo 39.
Description: Overall view for HC-6001, HC-6001-1

Photo 40.
Description: Bottom view for HC-6001, HC-6001-1

Photo 41.
Description: Top view for HC-6001, HC-6001-1

Photo 42.
Description: Internal view for HC-6001, HC-6001-1

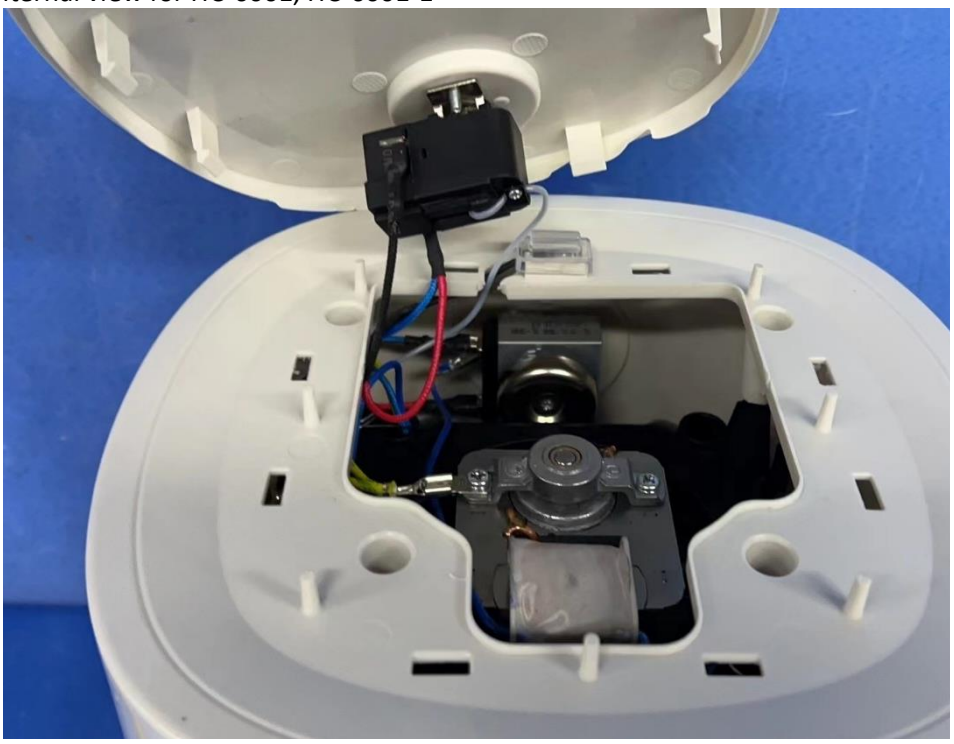


Photo 43.
Description: light cover view for HC-6001, HC-6001-1

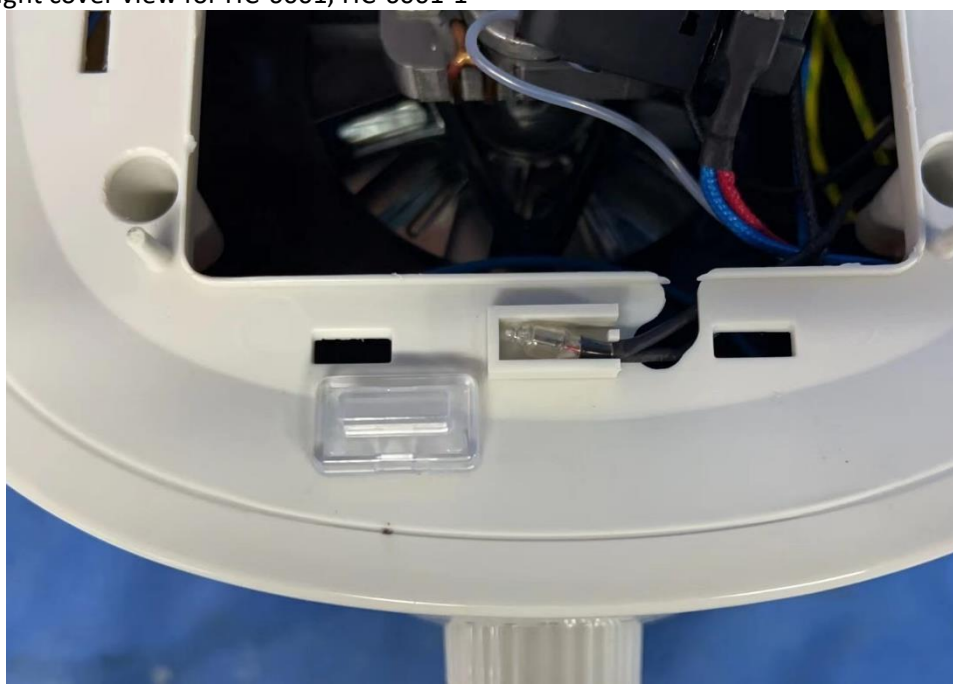


Photo 44.
Description: Internal view for HC-6001

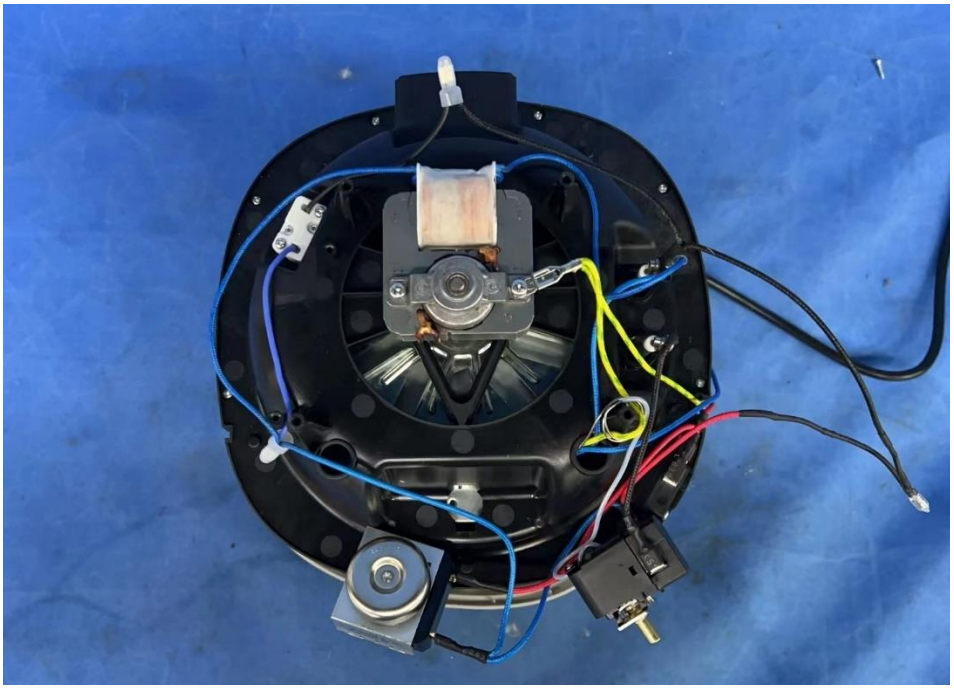


Photo 45.
Description: Timer(left) and Thermostat(right) and view for HC-6001, HC-6001-1

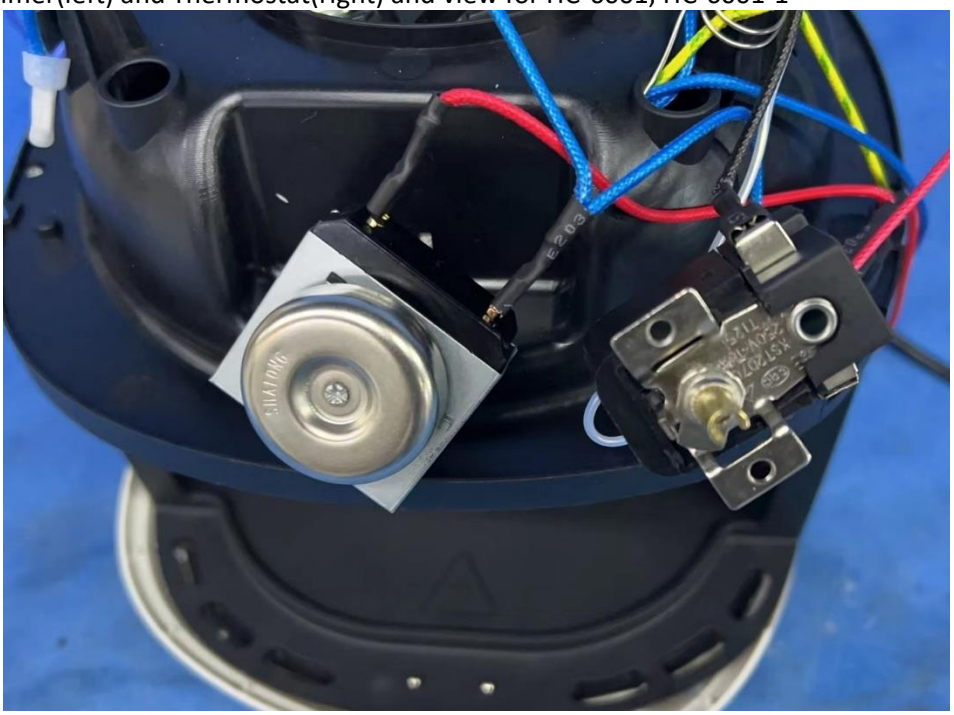


Photo 46.
Description: Internal view for HC-6001

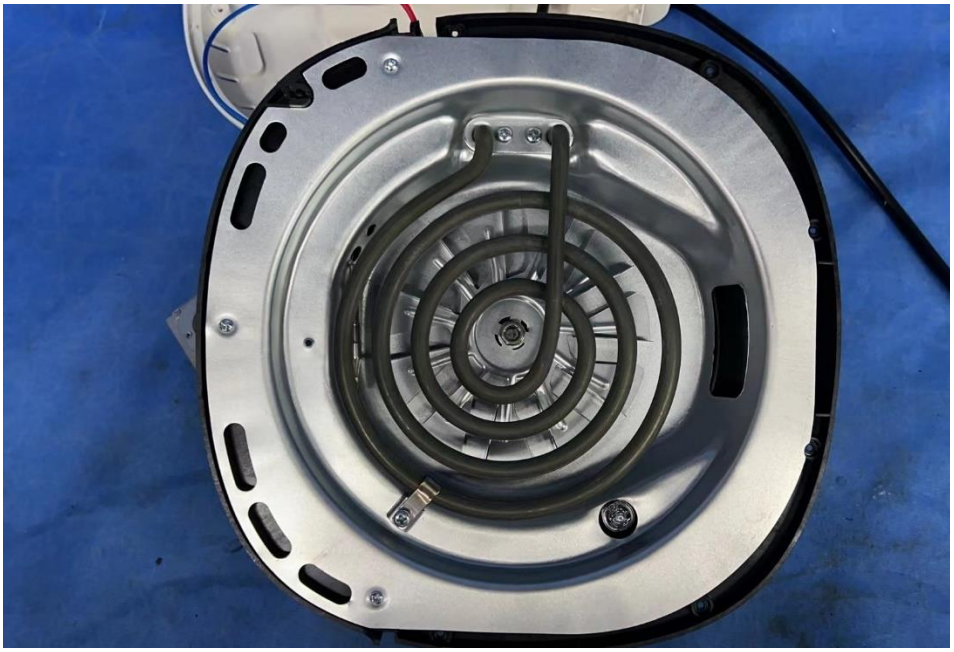


Photo 47.
Description: Internal view for HC-6001

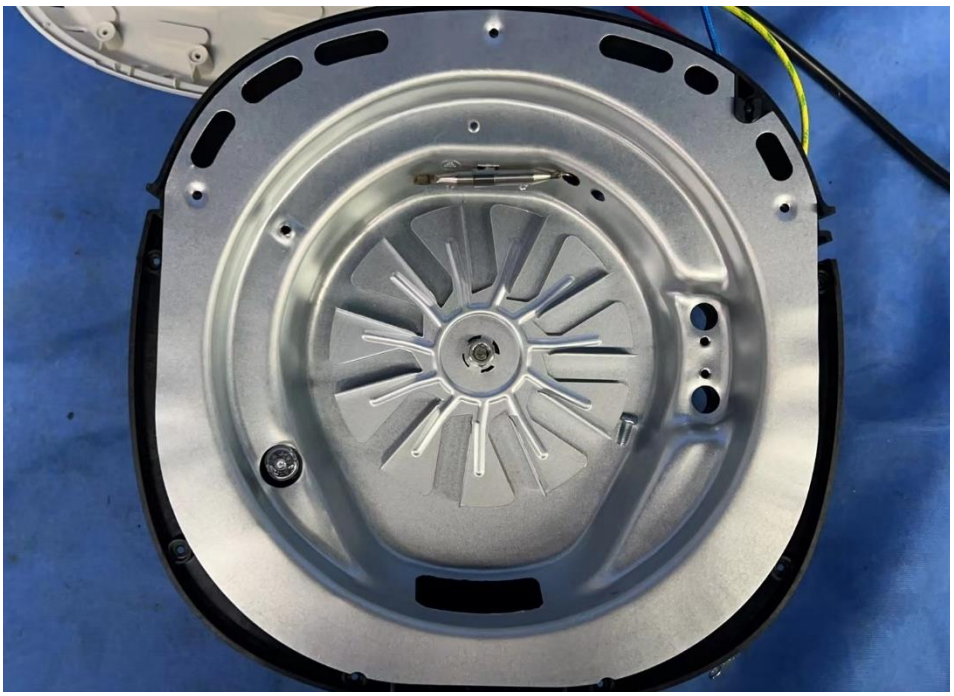


Photo 48.
Description: Internal view for HC-6001, HC-6001-1

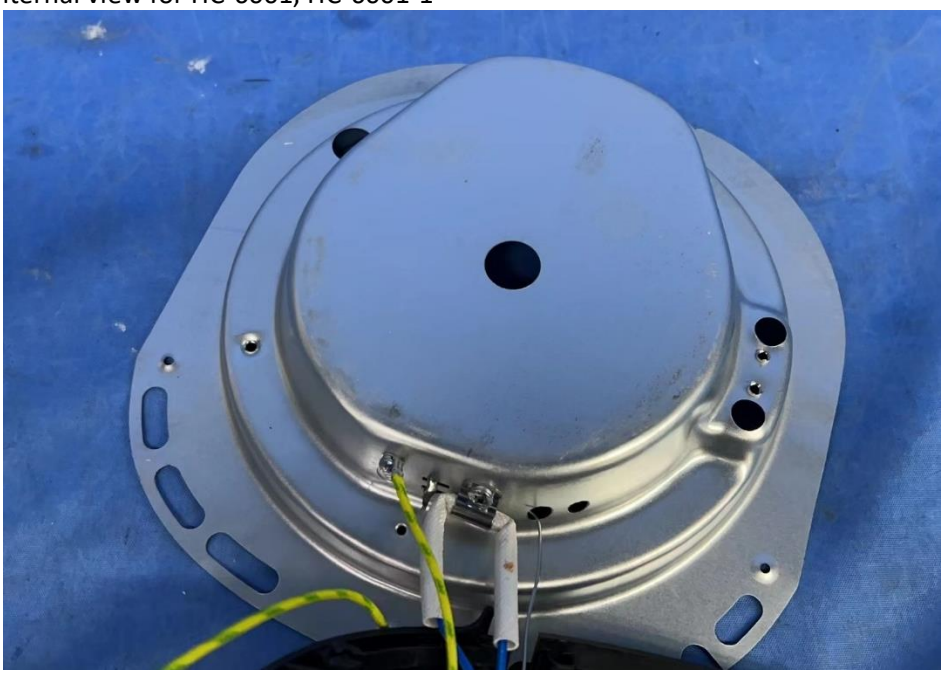


Photo 49.
Description: Internal view for HC-6001, HC-6001-1

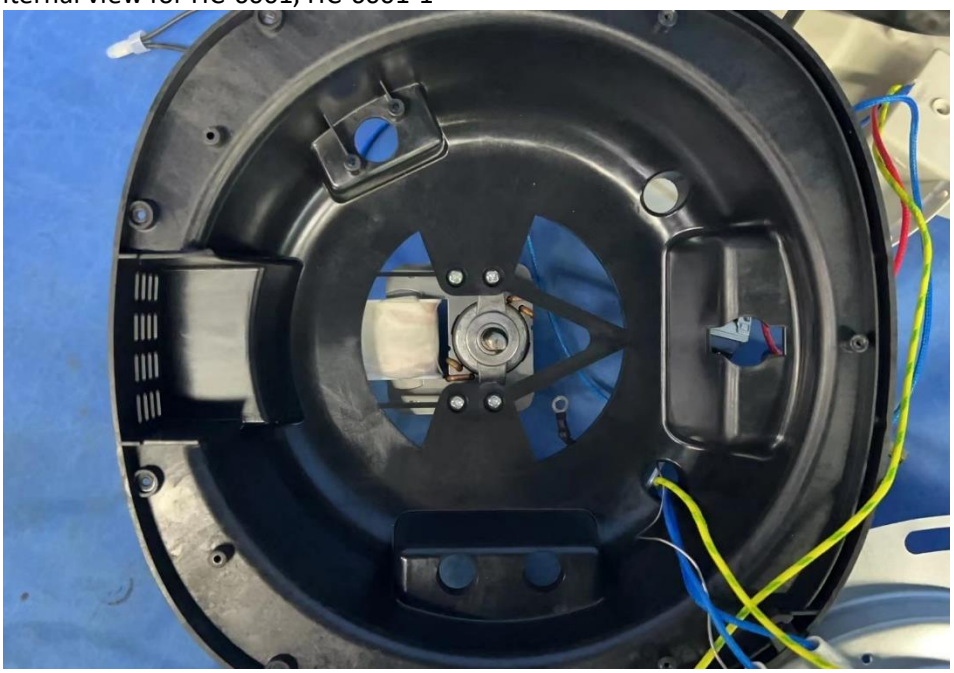


Photo 50.
Description: Overall view for HC-6001-1

Photo 51.
Description: Overall view for HC-6001-1

Photo 52.
Description: Overall view for HC-6001-1

Photo 53.
Description: Overall view for HC-6001-1

Photo 54.
Description: Internal view for HC-6001-1

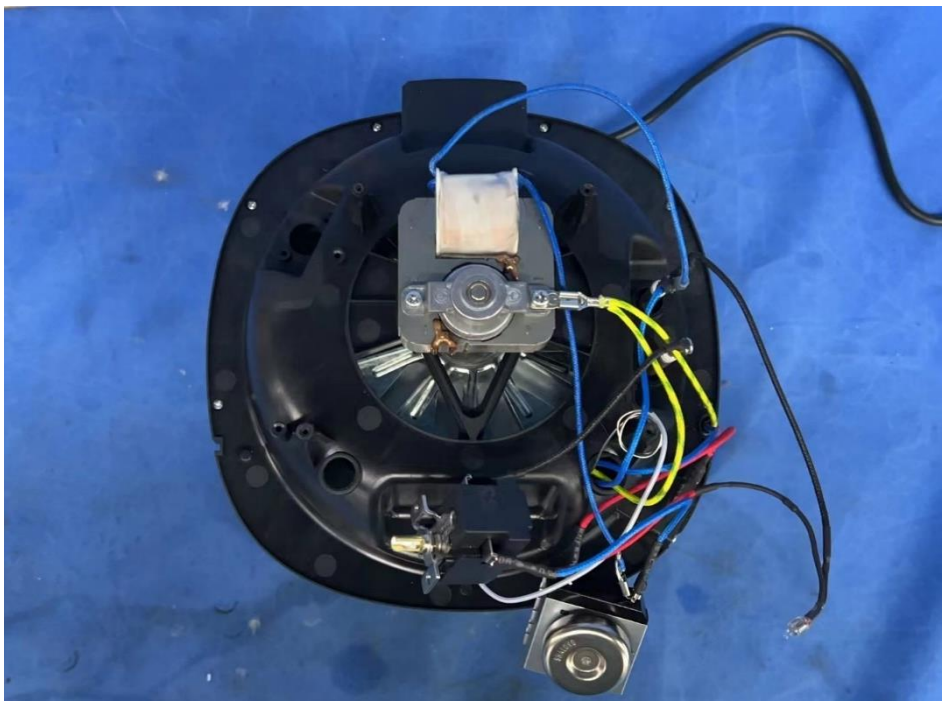


Photo 55.
Description: Internal view for HC-6001-1

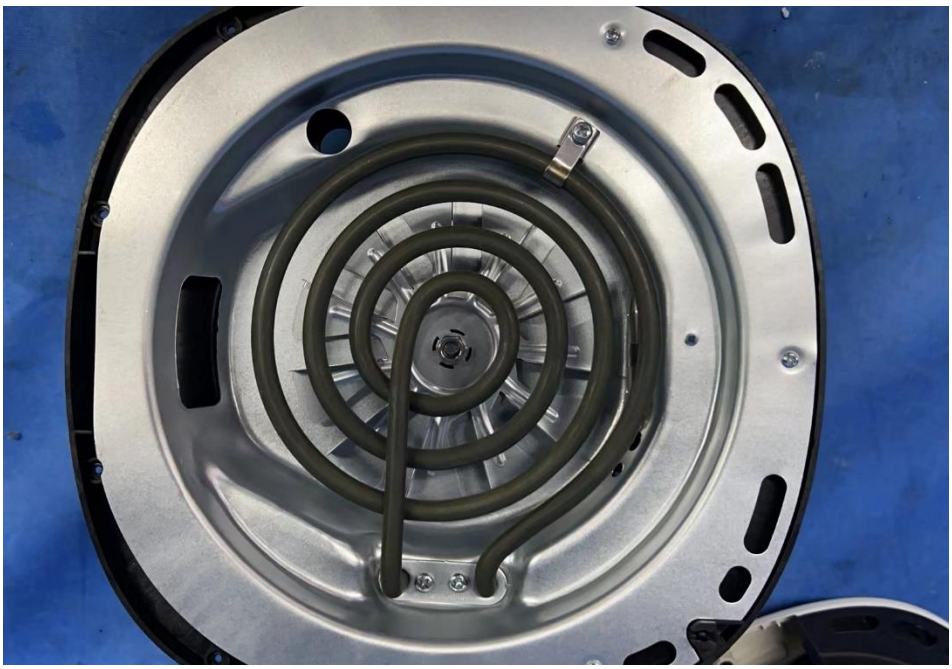
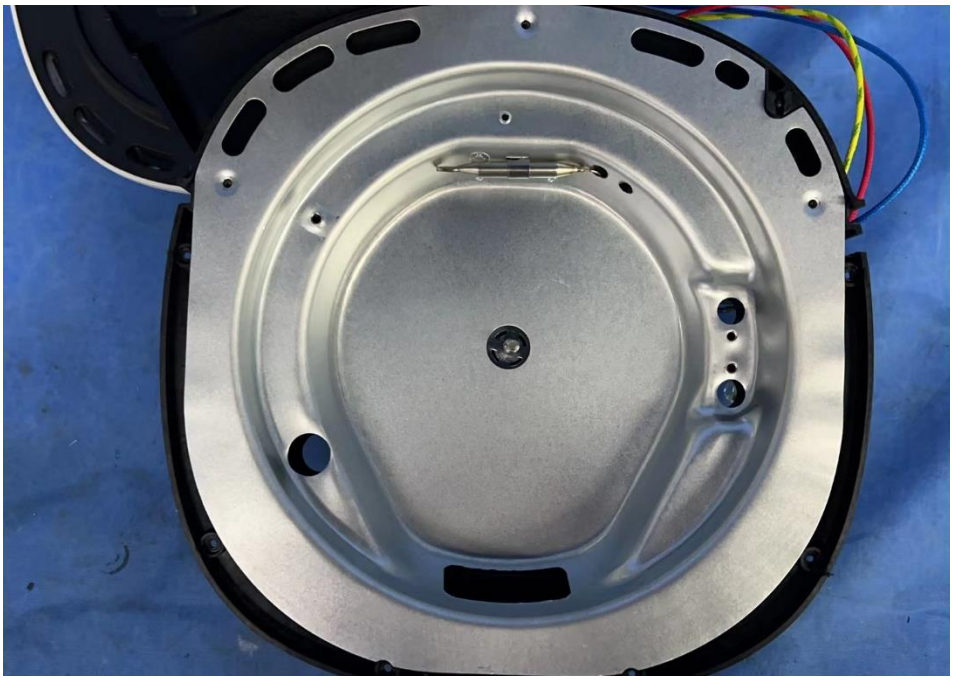


Photo 56.
Description: Internal view for HC-6001-1



END of the report