

TEST REPORT

Applicant : NINGBO HIDROTEK CO., LTD.

Address : No.168, Jincheng Road, Zhenhai District, Ningbo, China

Equipment Under Test (EUT):

Name	:	Royal Cloud
Model	:	H04-A, H04-B, H04-C, H04-D, H04-E, H04-F

In Accordance with : EN 55014-1:2017, EN 55014-2:2015
EN 61000-3-2:2014, EN 61000-3-3:2013

Report No : 19PT1205002E 01

Date of Test : December 05, 2019 to December 12, 2019

Date of Issue : February 24, 2020

Test Result : PASS

In the configuration tested, the EUT complied with the standards specified above

Authorized Signature



(Frank)
Engineer



(Jiang Guang)
Manager



The device described above is tested by NINGBO PALTEK CO.,LTD to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and NINGBO PALTEK CO.,LTD is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN55014-1 and EN 55014-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of NINGBO PALTEK CO.,LTD

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APPENDIX I (Photos of EUT) (9 Pages)

Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	19PT1205002E 01	/	Original Report



1. SUMMARY OF TEST RESULT

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Emissions at General Mains port	EN 55014-1:2017	Table 5	Pass
Conducted Emissions at Mains Port for Tools	EN 55014-1:2017	Table 6	N/A
Conducted Emissions at Mains Port for Induction Cooking	EN 55014-1:2017	Table 2	N/A
Conducted Emissions at Associated Ports	EN 55014-1:2017	Table 5	N/A
Click	EN 55014-1:2017	Section 4.4.2	Pass
Disturbance Power	EN 55014-1:2017	Table 7&8	N/A
Magnetic Field Induced Current at Induction Cooking	EN 55014-1:2017	Table 4	N/A
Magnetic Field Strength at Induction Cooking	EN 55014-1:2017	Table 3	N/A
Radiated Emission	EN 55014-1:2017	Table 9	Pass
Harmonic Current Emission	EN 61000-3-2:2014	Class A	Pass
Voltage Fluctuation And Flicker	EN 61000-3-3:2013	Section 5	Pass
IMMUNITY (EN 55014-2:2015, Category III)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio frequency electromagnetic fields (R/S)	IEC 61000-4-3:2006+A1:2007+A2:2010	A	Pass
Electrical Fast Transient / Burst (EFT/B)	IEC 61000-4-4:2012	B	Pass
Surge	IEC 61000-4-5:2014	B	Pass
Injected Current Susceptibility (C/S)	IEC 61000-4-6:2013	A	Pass
Voltage Dips	IEC 61000-4-11:2004	C	Pass
Note: N/A is an abbreviation for Not Applicable.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	: Royal Cloud
Model Number	: H04-A, H04-B, H04-C, H04-D, H04-E, H04-F (Note All models have the same circuit and PCB layout, We prepare H04-A for test.)
Trade Mark	N/A
Power Supply	: AC 230V, 50Hz
Test Voltage	: AC 230V, 50Hz
Highest Frequency	: Below 15MHz
Applicant	: NINGBO HIDROTEK CO., LTD.
Address	: No.168, Jincheng Road, Zhenhai District, Ningbo, China
Manufacturer	: NINGBO HIDROTEK CO., LTD.
Address	: No.168, Jincheng Road, Zhenhai District, Ningbo, China

2.2. Input / Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	Enclosure	N/E	--	--	None
2	AC Mains	AC	No	Unshielded	None

*Note: Use abbreviations:

AC= AC Power port

DC= DC Power port

N/E= Non-Electrical

A/D=Analogue/digital data port (signal/control port, antenna port, wired network port, broadcast receiver tuner port, optical fibre port)

2.3. Test Voltage and Frequency

During the tests, the EUT shall be operated at the rated voltage specified for the equipment.

For single-phase equipment with a rated voltage range in the range between:

- 100 V to 127 V, test at one nominal voltage within this range;
- 200 V to 240 V, test at one nominal voltage within this range;
- 100 V to 240 V, test at two voltages within this range, one test in the range 100 V to 127 V and another test in the range 200 V to 240 V.

The recommended test voltages are 120 V for the range 100 V to 127 V; and 230 V for the range 200 V to 240 V.

Note: The nominal voltages of mains supply networks are 100 V, 110 V, 115 V, 120 V, 127 V, 200 V, 208 V, 220V, 230 V and 240 V.

For battery operation the supply source shall be as specified by the manufacturer.

During the tests the EUT shall be operated at the rated frequency specified for the equipment.

If the equipment has more than one rated frequency (e.g. 50 Hz to 60 Hz), then the EUT shall be tested at one of these frequencies only.

If the equipment has a rated frequency range (e.g. 50 Hz to 60 Hz), then the EUT shall be tested at one frequency within this range

2.4. Summary of Test Result

Description of Test Item	Test mode	Result	Remarks
Conducted Emissions From The AC Mains Power Ports	ON	PASS	
Radiated Emission	ON	N/A	
Disturbance Power	ON	PASS	
Click	ON	PASS	
Harmonic Current Emission	ON	PASS	
Voltage Fluctuation And Flicker	ON	PASS	
Electrostatic Discharge	ON	PASS	
EFT/B	ON	PASS	
Surge	ON	PASS	
Injected Current Susceptibility	ON	PASS	
Voltage Dips	ON	PASS	
RF Field Strength Susceptibility	ON	N/A	
Note: N/A means not applicable			

2.5. Description of Test Facility

Laboratory : Guangdong Tsaint Hi-tech Co., Ltd
1 Floor, No 10, Lelin Street, Tongyi Industrial Zone, Guzhen Town, Zhongshan City, Guangdong Pr., China.

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

2.6. Support Device

N/A

2.7. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 2.15dB (9K-150KHz) 2.36dB (150K-30MHz)
Uncertainty for Click test	: 1.32dB
Disturbance Power Uncertainty	: 2.32dB
Uncertainty for Harmonic test	: 3.65%
Uncertainty for Flicker test	: 0.36%
Uncertainty for ESD Test	: 5.00%
Uncertainty for EFT/B Test	: 3.65%
Uncertainty for Surge Test	: 0.48%
Uncertainty for C/S Test	: 1.52(Using CDN Test)
Uncertainty for DIPS Test	: 2.23%

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1.1. For Power Line Conducted Emission

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Test Receiver	Rohde & Schwarz	ESCI	101108	Valid
2.	L.I.S.N	Rohde & Schwarz	ENV216	101193	Valid
4.	Pulse Limiter	MTS-systemtechnik	IMP-136	2611115-001-0033	Valid
5.	RF Switching unit	CD	RSU-M2	38400	Valid

3.1.2. For Disturbance Power Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Test Receiver	Rohde & Schwarz	ESCI	101108	Valid
2.	L.I.S.N	Rohde & Schwarz	ENV216	101193	Valid
3.	Pulse Limiter	MTS-systemtechnik	IMP-136	2611115-001-0033	Valid

3.1.3. For Click Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	L.I.S.N.	ROHDE & SCHWARZ	ESH2-Z5	985673/008	Valid
2.	Click Switching Operation Box	A.F.J	SW04/32A	SW041412136	Valid
3.	Click Meter	A.F.J	CL55C	55041413215	Valid

3.1.4. For Harmonic Current/Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	AC Power source	California Instruments	5001iX-CTS-400-413	59739	Valid
2.	Harmonic/ flicker analyzer	California Instruments	PACS-1	72795	Valid

3.1.5. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	ESD Tester	Prima	PESD6030	180517	Valid

3.1.6. For Electrical Fast Transient /Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Burst Tester	Prima	PEFT6030	180718	Valid

3.1.7. For Surge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Surge Controller	Prima	PSUG6010	180334	Valid

3.1.8. For Injected Current Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Simulator	SCHLODER	CDG-6000-75	126B1404/2016	Valid
2.	CDN	SCHLODER	CDN-M2+3	A2210415/2016	Valid
3.	Attenuator	SCHLODER	6dB 100W	HA1615	Valid

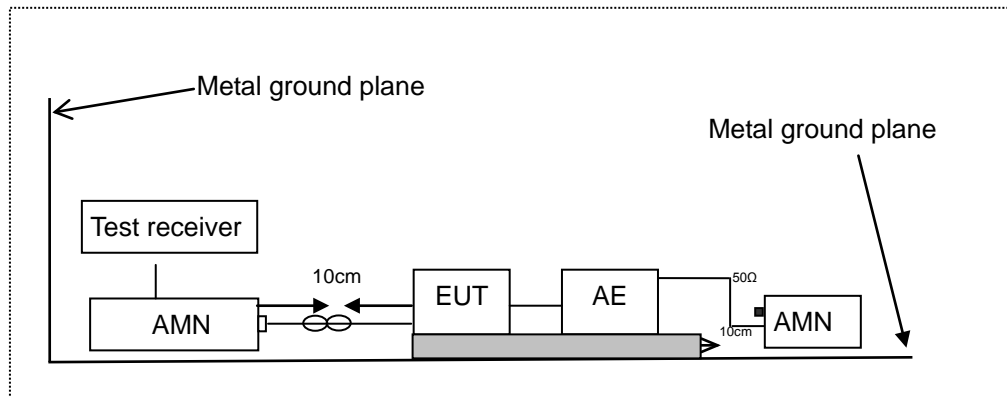
3.1.9. For Voltage Dips and Interruptions Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Dips Tester	Prima	PDIP6010	180294	Valid



4. CONDUCTED EMISSIONS AT MAINS MEASUREMENT

4.1. Block Diagram of Test Setup



AMN: Artificial mains network
 AE: Associated equipment
 EUT: Equipment under test

4.2. Measurement Standard

EN 55014-1:2017

4.3. Measurement Limits

General limits

Frequency range MHz	Quasi-peak dBuV	Average dBuV
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

The lower limit applies at the transition frequencies.

*: Decreasing linearly with logarithm of frequency from

Limits for mains port of tools

Frequency range MHz	<input type="checkbox"/> $P \leq 700W$		<input type="checkbox"/> $700W < P \leq 1000W$		<input type="checkbox"/> $P > 1000W$	
	Quasi-peak dBuV	Average dBuV	Quasi-peak dBuV	Average dBuV	Quasi-peak dBuV	Average dBuV
0.15 to 0.35	66 to 59*	50 to 49*	70 to 63*	63 to 53*	76 to 69*	69 to 59*
0.35 to 5	59	49	63	53	69	59
5 to 30	64	54	68	58	74	64

The lower limit applies at the transition frequencies.

*: Decreasing linearly with logarithm of frequency from

Key: P = rated power of the motor only.

Limits for mains port of Induction Cooking

Frequency range	<input type="checkbox"/> Appliances which are 100 V rated and without ban earth connection		<input type="checkbox"/> All other appliances	
	MHz	dBuV Quasi-peak	dBuV Average	dBuV Quasi-peak
0,009 to 0,050	122	-	110	-
0.050 to 0.150	102 to 92*	-	90 to 80*	-
0.150 to 0.5	72 to 62*	62 to 52*	66 to 56*	56 to 46*
0,5 to 5	56	46	56	46
5 to 30	60	50	60	50

The lower limit applies at the transition frequencies.
 *: Decreasing linearly with logarithm of frequency from

4.4. Test Procedure

The EUT was placed on a desk 0.1 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the power mains through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other AMN.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 50 microhenry should be used.

Both sides of AC line were checked for maximum conducted interference.

For frequency band 9 KHz to 150 KHz, the bandwidth of the test receiver is set at 200Hz. For frequency band 150 KHz to 30MHz, the bandwidth is set at 9 KHz. The frequency range from 9kHz or 150kHz to 30MHz is investigated.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

Test results were obtained from the following equation:

$$\text{Emission Level (dB}\mu\text{V)} = \text{AMN Factor (dB)} + \text{Cable Loss (dB)} + \text{Reading (dB}\mu\text{V)}$$

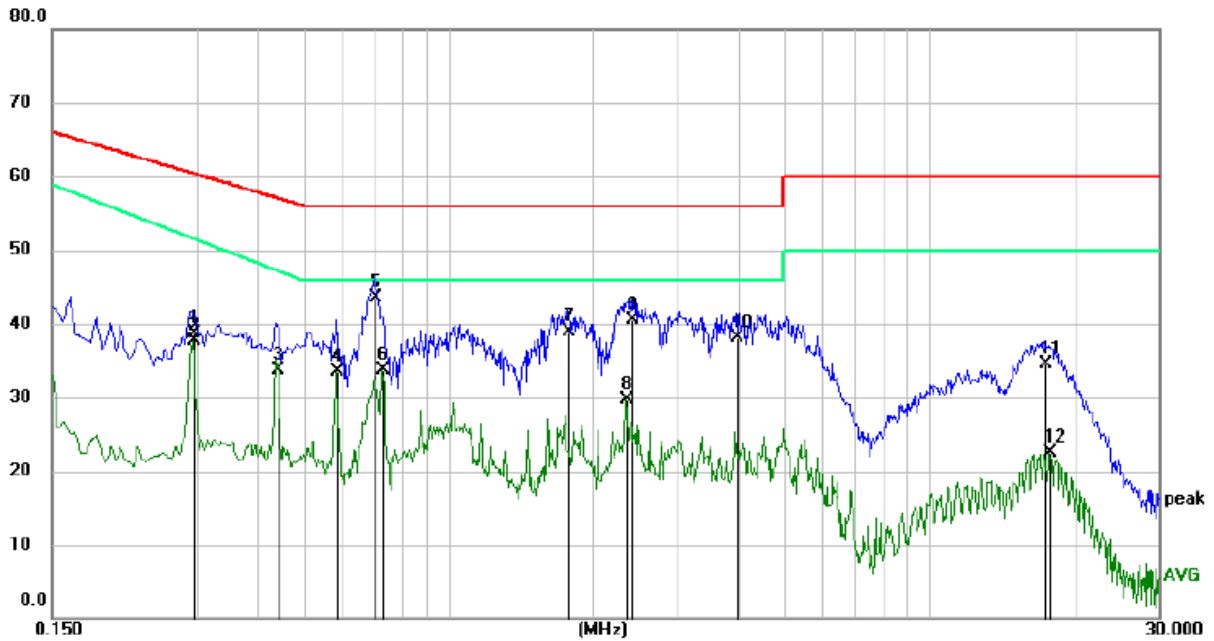
$$\text{Margin (dB)} = \text{Emission Level (dB}\mu\text{V)} - \text{Limit (dB}\mu\text{V)}$$

4.5. Measuring Results

PASS.

Please refer to the following pages.

Test Data:



Site: Shield Room 1#

Phase: *N*

Temperature: 24

Limit: EN55014 QP

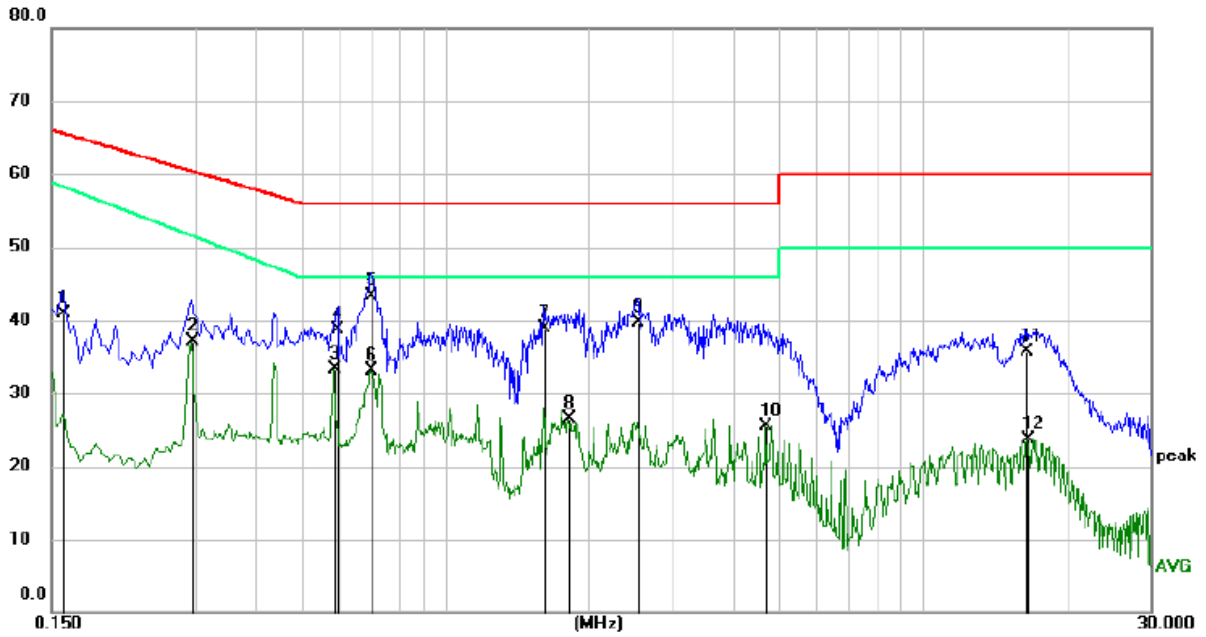
Power: AC230V/50Hz

Humidity: 54 %

Mode: ON

Note:

No.	Mk.	Freq. MHz	Reading Level dB	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2940	29.19	9.51	38.70	60.41	-21.71	QP	
2		0.2940	28.17	9.51	37.68	51.73	-14.05	AVG	
3		0.4425	24.27	9.52	33.79	47.32	-13.53	AVG	
4		0.5865	24.06	9.53	33.59	46.00	-12.41	AVG	
5		0.7035	34.06	9.54	43.60	56.00	-12.40	QP	
6	*	0.7304	24.14	9.54	33.68	46.00	-12.32	AVG	
7		1.7790	29.31	9.59	38.90	56.00	-17.10	QP	
8		2.3415	20.04	9.60	29.64	46.00	-16.36	AVG	
9		2.4090	30.90	9.60	40.50	56.00	-15.50	QP	
10		3.9840	28.55	9.65	38.20	56.00	-17.80	QP	
11		17.4255	24.52	10.08	34.60	60.00	-25.40	QP	
12		17.7630	12.48	10.09	22.57	50.00	-27.43	AVG	



Site Shield Room 1#

Phase: **L1**

Temperature: 24

Limit: EN55014 QP

Power: AC230V/50Hz

Humidity: 54 %

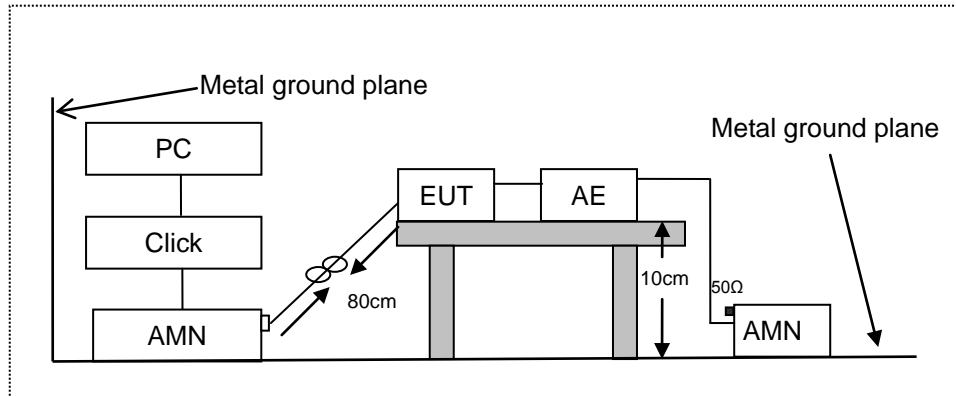
Mode: ON

Note:

No.	Mk.	Freq. MHz	Reading Level dB	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1590	31.54	9.46	41.00	65.52	-24.52	QP	
2		0.2940	27.59	9.51	37.10	51.73	-14.63	AVG	
3		0.5865	23.81	9.53	33.34	46.00	-12.66	AVG	
4		0.5955	29.27	9.53	38.80	56.00	-17.20	QP	
5	*	0.6990	33.86	9.54	43.40	56.00	-12.60	QP	
6		0.6990	23.54	9.54	33.08	46.00	-12.92	AVG	
7		1.6079	29.32	9.58	38.90	56.00	-17.10	QP	
8		1.8150	16.95	9.59	26.54	46.00	-19.46	AVG	
9		2.5350	30.20	9.60	39.80	56.00	-16.20	QP	
10		4.6860	15.85	9.67	25.52	46.00	-20.48	AVG	
11		16.4715	25.73	10.07	35.80	60.00	-24.20	QP	
12		16.5660	13.64	10.07	23.71	50.00	-26.29	AVG	

5. CLICKS MEASUREMENT

5.1. Block Diagram of Test Setup



AMN: Artificial mains network
 AE: Associated equipment
 EUT: Equipment under test
 Click: Click Switching Operation Box and Click Meter

5.2. Measurement Standard

EN 55014-1:2017

5.3. Measurement Limits

According to Clause 4.4.2 of standard EN 55014-1.

5.4. Test Procedure

This test is done when switch operations in thermostatically controlled appliances, automatic program controlled machines and other electrically controlled or operated appliances may generate discontinuous disturbance (Click). The measurement of disturbance shall be performed at the following restricted number of frequencies: 150KHz, 500KHz, 1.4MHz and 30MHz. At each frequency, for appliances, which stop automatically, duration of the minimum number of complete programs necessary to produce 40 counted clicks or, where relevant, 40 counted clicks have not been produced, the test is stopped at the end of the program in course. The relevant click rate N. The appliance under test shall be deemed to comply with the limit if not more than a quarter of the number of the counted click registered during the observation time.

5.5. Test Result

PASS.

Click Test Results of RUN A

Measured Frequency (MHz)	0.15	0.5	1.4	30
Sensitivity(dBuV)	66	56	56	60
Last Time T(min./sec.)	120	120	120	120
Short Click Number n1	8	4	3	0
Long Click Number n2	3	4	4	0
Total Click Number n=n1+n2	11	8	7	0
Click Rated N=F x n/T	0.09	0.07	0.06	0

According to the 4.2.3.3 of EN 55014-1:2017:

- “ - the click rate is not more than 5,
- none of the caused clicks has a duration longer than 20ms,
- 90% of the caused clicks have a duration less than 10ms

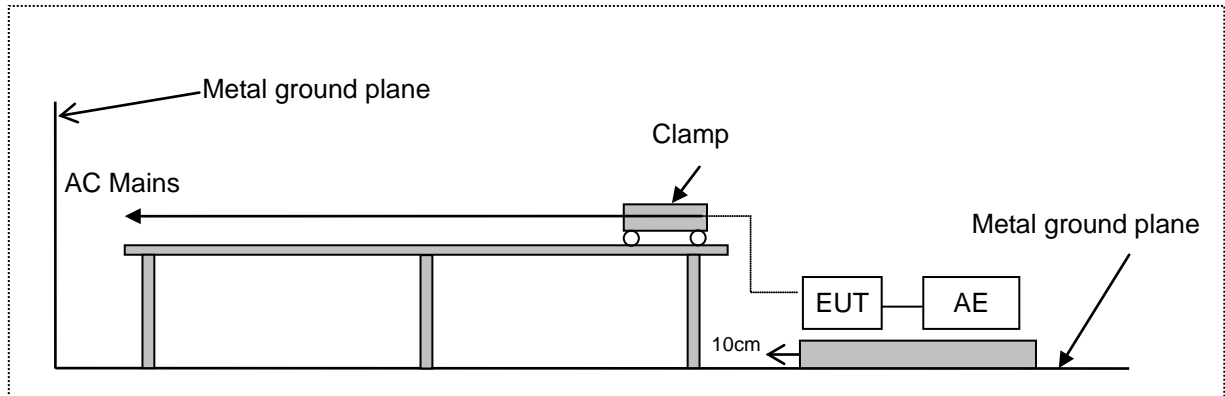
shall be deemed to comply with the limits, independent of the amplitude of the clicks (see table A.1 and A.2). If one of these conditions is not satisfied then limits in accordance with 4.2.2 apply.”

Therefore the EUTs are deemed to fulfill the relevant requirements.



6. DISTURBANCE POWER MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Measurement Standard

EN 55014-1:2017

6.3. Measurement Limits

All emanations from devices or system shall not exceed the level of field strengths specified below:

6.3.1. Limits (Table 7 of standard EN55014-1)

Frequency range	<input checked="" type="checkbox"/> General		Tools					
			<input type="checkbox"/> $P \leq 700W$		<input type="checkbox"/> $700W < P \leq 1000W$		<input type="checkbox"/> $P > 1000W$	
MHz	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW
30 to 300	45 to 55*	35 to 45*	45 to 55*	35 to 45*	49 to 59*	39 to 49*	55 to 65*	45 to 55*

The lower limit applies at the transition frequencies.
 *: Decreasing linearly with logarithm of frequency from
 Key: P = rated power of the motor only.

6.3.2. Margin when performing disturbance power measurement (Table 8 of standard EN55014-1)

Frequency range	<input checked="" type="checkbox"/> General		Tools					
			<input type="checkbox"/> $P \leq 700W$		<input type="checkbox"/> $700W < P \leq 1000W$		<input type="checkbox"/> $P > 1000W$	
MHz	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW
30 to 300	0 to 10*	0	0 to 10*	0	0 to 10*	0	0 to 10*	0

The lower limit applies at the transition frequencies.
 *: Decreasing linearly with logarithm of frequency from
 Key: P = rated power of the motor only.
 Note: This table only applies if method a) specified in 4.3.4.2 is followed.

6.4. Test Procedure

The EUT are placed on an insulating support 0.1m high above a ground reference plane and away from other metallic surface at least 0.8m. 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 receiver is set at 120kHz in 30MHz to 300MHz. The frequency range from 30MHz to 300MHz is investigated.

Test results were obtained from the following equation:

Emission Level (dB μ V) = ANN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)

Margin (dB) = Emission Level (dB μ V) - Limit (dB μ V)

6.5. Test Results

PASS.





Site Shield Room 1#

Temperature: 24

Limit: EN55014 Clamp(QP)

Humidity: 54 %

Mode: ON

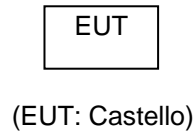
Note: AC Mains

No.	Mk.	Freq. MHz	Reading Level dBpW	Correct Factor dB	Measure- ment dBpW	Limit dBpW	Over dB	Detector	Position cm	Comment
1	*	44.6400	11.54	25.86	37.40	46.73	-9.33	QP		
2		45.5400	-8.80	25.76	16.96	36.81	-19.85	AVG		
3		54.2400	9.33	25.37	34.70	47.57	-12.87	QP		
4		59.1000	8.83	25.27	34.10	47.94	-13.84	QP		
5		73.6200	-6.87	24.38	17.51	38.90	-21.39	AVG		
6		93.3000	-6.52	24.32	17.80	39.93	-22.13	AVG		
7		103.6200	-7.61	23.99	16.38	40.38	-24.00	AVG		
8		106.2000	4.60	23.90	28.50	50.49	-21.99	QP		
9		144.6000	-2.63	22.53	19.90	51.83	-31.93	QP		
10		240.0000	-7.36	23.05	15.69	44.03	-28.34	AVG		
11		274.9800	-5.26	25.26	20.00	54.62	-34.62	QP		
12		280.0200	-11.25	24.88	13.63	44.70	-31.07	AVG		

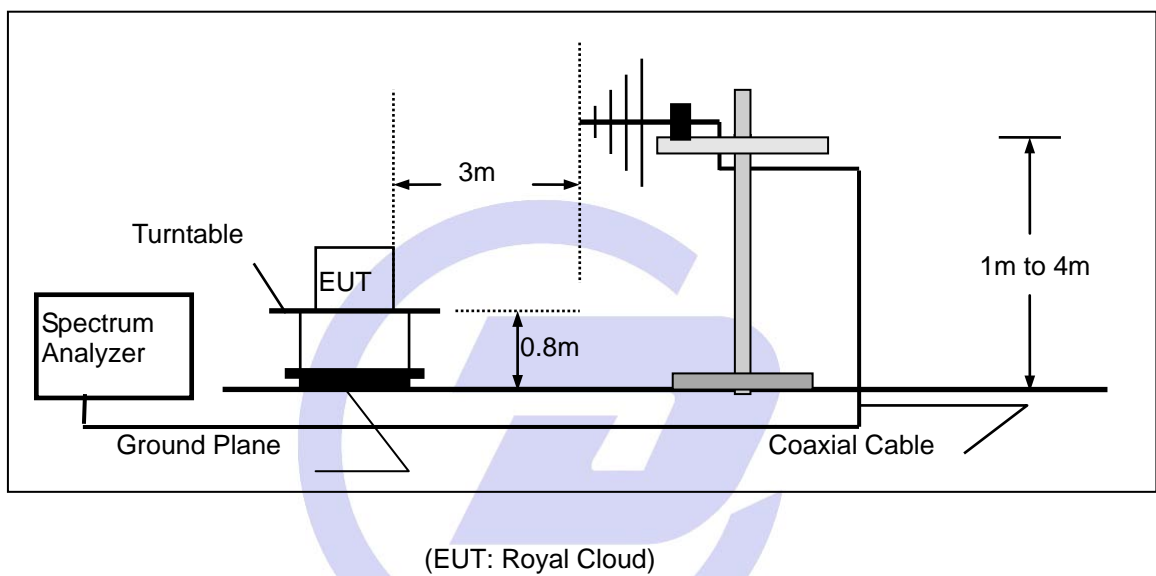
7. RADIATED EMISSION MEASUREMENT

7.1. Block Diagram of Test Setup

7.1.1. Block diagram of connection between the EUT and simulators



7.1.2. Block diagram of test setup (In chamber)



7.2. Measuring Standard

EN 55014-1:2017

7.3. Radiated Emission Limits

All emanations from a device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB μ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

7.4. EUT Configuration on Test

The EN 55014-1 regulations test method must be used to find the maximum emission during radiated emission measurement.

7.5. Operating Condition of EUT

7.5.1. Turn on the power.

7.5.2. After that, let the EUT work in test mode (ON) and measure it.

7.6. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver is set at 120kHz.

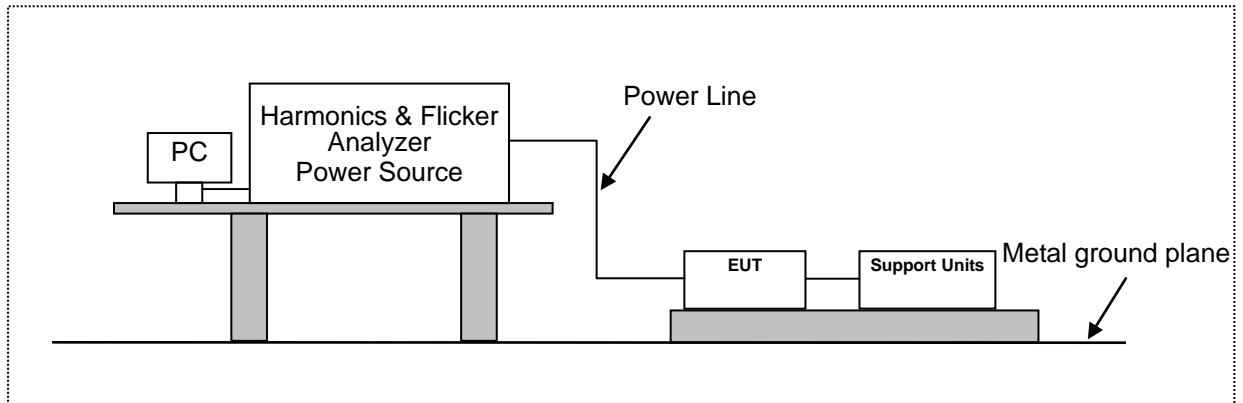
7.7. Measuring Results

N/A.



8. HARMONIC CURRENT EMISSION MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Measuring Standard

EN 61000-3-2:2014, Class A

8.3. Measurement Limits

Table 1 - Limits for Class A equipment

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
$15 \leq n \leq 39$	$0.15 \frac{0.15}{n}$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \frac{8}{n}$

8.4. Test Procedure

The measurement of harmonic currents shall be performed as follows: i. For each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in EN / IEC 61000-4-7:2009. ii. Calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic (T cycles ≤ 2.5 min). Because of synchronisation to meet the requirements for repeatability in 5%.

8.5. Test Results

PASS.

Please refer to the following pages.

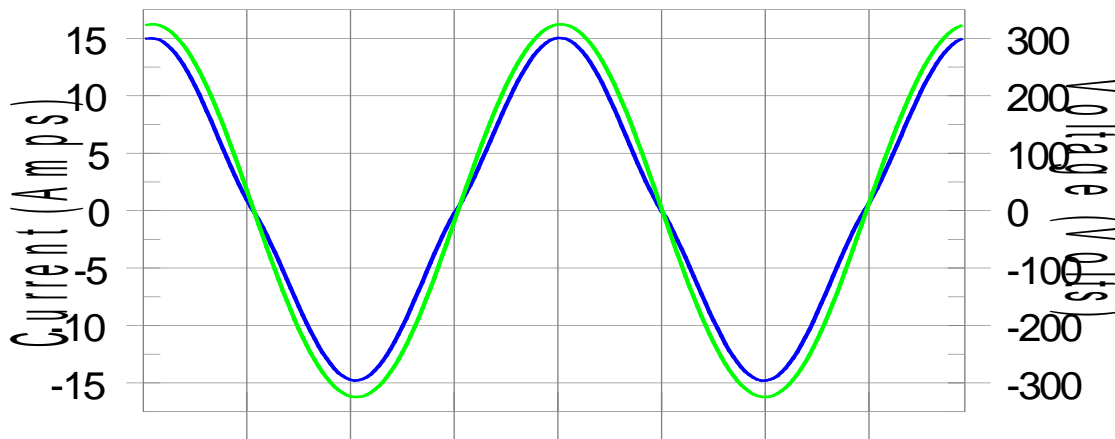


Harmonics – Class-A per Ed. 4.0 (2014)(Run time)

EUT: Royal Cloud M/N: H04-A Tested by: Jean
 Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
 Test date: 2019/12/12 Start time: 9:53:43 End time: 9:56:24
 Test duration (min): 2.5 Data file name: H-001024.cts_data
 Comment: ON Ambient Condition: 22°C,55% RH,96kPa
 Customer: HG

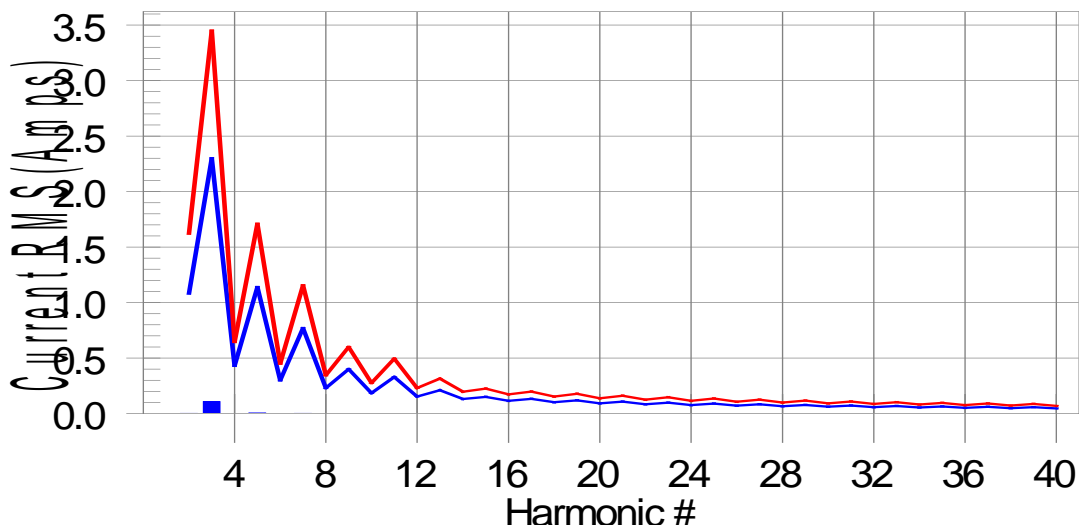
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass Worst harmonic was #3 with 7.4% of the limit.

Current Test Result Summary (Run time)

Test Result: Pass **Source qualification: Normal**
THC(A): 0.109 **I-THD(%): 21.2** **POHC(A): 0.000** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts): 229.77	Frequency(Hz): 50.00
I_Peak (Amps): 15.051	I_RMS (Amps): 9.470
I_Fund (Amps): 2.856	Crest Factor: 4.596
Power (Watts): 659.8	Power Factor: 0.986

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.002	1.080	N/A	0.043	1.620	N/A	Pass
3	0.108	2.300	4.7	0.254	3.450	7.4	Pass
4	0.001	0.430	N/A	0.015	0.645	N/A	Pass
5	0.007	1.140	0.6	0.035	1.710	2.0	Pass
6	0.001	0.300	N/A	0.011	0.450	N/A	Pass
7	0.002	0.770	N/A	0.013	1.155	N/A	Pass
8	0.000	0.230	N/A	0.007	0.345	N/A	Pass
9	0.001	0.400	N/A	0.009	0.600	N/A	Pass
10	0.000	0.184	N/A	0.006	0.276	N/A	Pass
11	0.001	0.330	N/A	0.006	0.495	N/A	Pass
12	0.000	0.153	N/A	0.005	0.230	N/A	Pass
13	0.001	0.210	N/A	0.005	0.315	N/A	Pass
14	0.000	0.131	N/A	0.004	0.197	N/A	Pass
15	0.000	0.150	N/A	0.004	0.225	N/A	Pass
16	0.000	0.115	N/A	0.004	0.173	N/A	Pass
17	0.001	0.132	N/A	0.003	0.198	N/A	Pass
18	0.000	0.102	N/A	0.003	0.153	N/A	Pass
19	0.000	0.118	N/A	0.004	0.178	N/A	Pass
20	0.000	0.092	N/A	0.003	0.138	N/A	Pass
21	0.000	0.107	N/A	0.003	0.161	N/A	Pass
22	0.000	0.084	N/A	0.003	0.125	N/A	Pass
23	0.000	0.098	N/A	0.003	0.147	N/A	Pass
24	0.000	0.077	N/A	0.002	0.115	N/A	Pass
25	0.000	0.090	N/A	0.003	0.135	N/A	Pass
26	0.000	0.071	N/A	0.002	0.107	N/A	Pass
27	0.000	0.083	N/A	0.002	0.125	N/A	Pass
28	0.000	0.066	N/A	0.002	0.099	N/A	Pass
29	0.000	0.078	N/A	0.002	0.116	N/A	Pass
30	0.000	0.061	N/A	0.002	0.092	N/A	Pass
31	0.000	0.073	N/A	0.002	0.109	N/A	Pass
32	0.000	0.058	N/A	0.002	0.086	N/A	Pass
33	0.000	0.068	N/A	0.002	0.102	N/A	Pass
34	0.000	0.054	N/A	0.002	0.081	N/A	Pass
35	0.000	0.064	N/A	0.002	0.096	N/A	Pass
36	0.000	0.051	N/A	0.002	0.077	N/A	Pass
37	0.000	0.061	N/A	0.002	0.091	N/A	Pass
38	0.000	0.048	N/A	0.002	0.073	N/A	Pass
39	0.000	0.058	N/A	0.002	0.087	N/A	Pass
40	0.000	0.046	N/A	0.002	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

Test Result: Pass

Source qualification: Normal

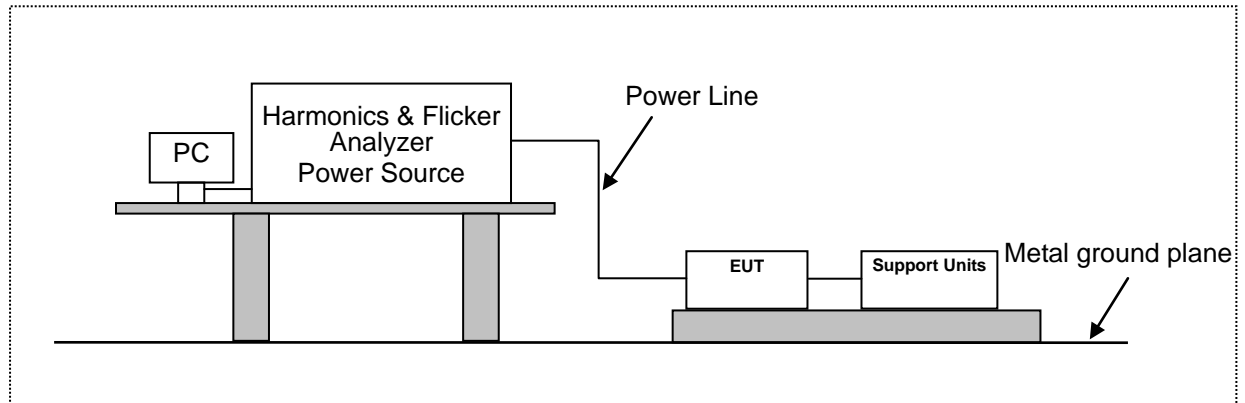
Highest parameter values during test:

V_RMS (Volts):	229.77	Frequency(Hz):	50.00
I_Peak (Amps):	15.051	I_RMS (Amps):	9.470
I_Fund (Amps):	2.856	Crest Factor:	4.596
Power (Watts):	659.8	Power Factor:	0.986

Harm#	Harmonics	V-rms	Limit V-rms	% of Limit	Status
2		0.043	0.459	9.43	OK
3		0.577	2.068	27.92	OK
4		0.051	0.459	11.15	OK
5		0.072	0.919	7.87	OK
6		0.039	0.459	8.42	OK
7		0.014	0.689	2.02	OK
8		0.014	0.459	3.14	OK
9		0.042	0.459	9.13	OK
10		0.007	0.459	1.45	OK
11		0.015	0.230	6.38	OK
12		0.011	0.230	4.86	OK
13		0.005	0.230	2.29	OK
14		0.006	0.230	2.64	OK
15		0.009	0.230	4.13	OK
16		0.008	0.230	3.47	OK
17		0.006	0.230	2.55	OK
18		0.010	0.230	4.49	OK
19		0.005	0.230	2.39	OK
20		0.013	0.230	5.80	OK
21		0.006	0.230	2.62	OK
22		0.006	0.230	2.75	OK
23		0.004	0.230	1.63	OK
24		0.004	0.230	1.57	OK
25		0.005	0.230	2.08	OK
26		0.003	0.230	1.39	OK
27		0.006	0.230	2.65	OK
28		0.003	0.230	1.51	OK
29		0.005	0.230	2.24	OK
30		0.003	0.230	1.50	OK
31		0.003	0.230	1.29	OK
32		0.003	0.230	1.49	OK
33		0.003	0.230	1.52	OK
34		0.003	0.230	1.33	OK
35		0.003	0.230	1.40	OK
36		0.002	0.230	1.04	OK
37		0.004	0.230	1.75	OK
38		0.003	0.230	1.15	OK
39		0.004	0.230	1.68	OK
40		0.005	0.230	2.20	OK

9. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

9.1. Block Diagram of Test Setup



9.2. Measuring Standard

EN 61000-3-3:2013

9.3. Measurement Limits

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current ≤ 16 A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

Voltage Fluctuation and Flicker Limits:

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- the value of $d(t)$ during a voltage change shall not exceed 3.3 % for more than 500 ms;
- the relative steady-state voltage change, d_c , shall not exceed 3.3 %;
- the maximum relative voltage change, d_{max} , shall not exceed 4.0 %;

9.4. Test Procedure

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of 8% is achieved during the whole assessment procedure.

9.5. Test Results

PASS.

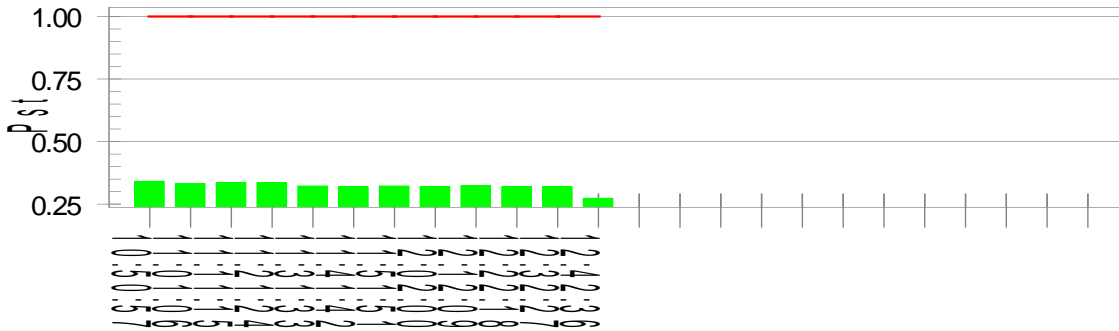
Please refer to the following pages.

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

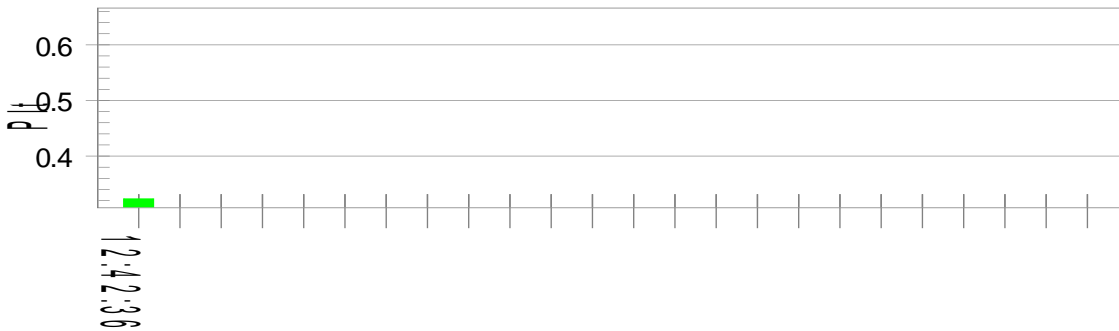
EUT: Royal Cloud **M/N:** H04-A **Tested by:** Jean
Test category: All parameters (European limits) **Test Margin:** 100
Test date: 2019/12/12 **Start time:** 9:58:46 **End time:** 10:09:13
Test duration (min): 10 **Data file name:** F-001025.cts_data
Comment: ON
Customer: HG

Test Result: Pass **Status:** Test Completed

Pst_t and limit line European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.76		
Highest dt (%):	0.72	Test limit (%):	N/A N/A
T-max (mS):	0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.76	Test limit (%):	3.30 Pass
Highest dmax (%):	0.85	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.342	Test limit:	1.000 Pass
Highest Plt (2 hr. period):	0.323	Test limit:	0.650 Pass

10. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria.

Performance 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.

Performance 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. 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.

Performance 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.

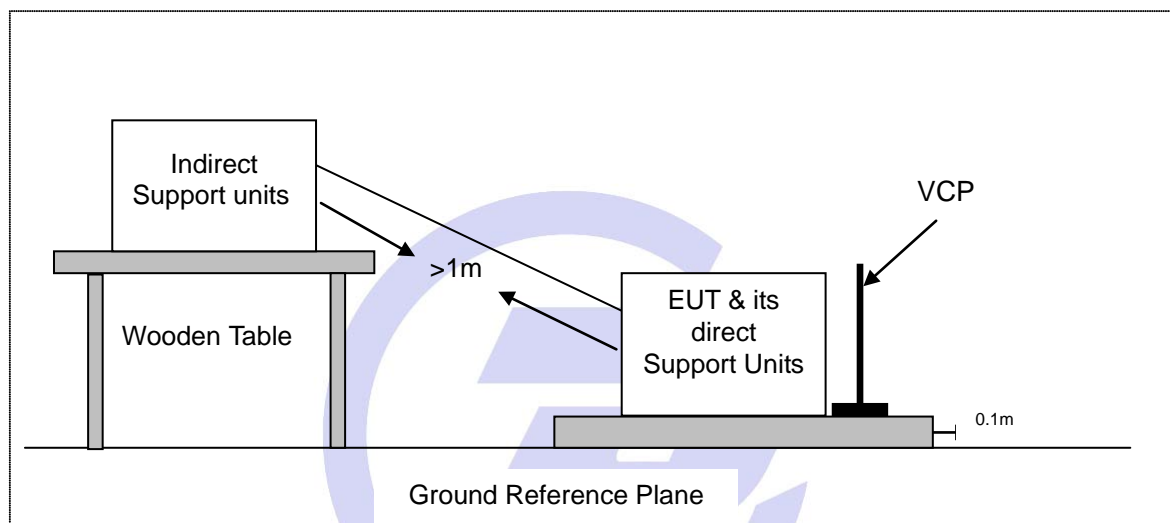


11. ELECTROSTATIC DISCHARGE IMMUNITY TEST

11.1. Test Specification

Test standard	: EN 55014-2
Basic standard	: IEC 61000-4-2
Performance criterion	: B
Test level	: $\pm 8.0\text{kV}$ (Air discharge) $\pm 4.0\text{kV}$ (Contact discharge)

11.2. Block Diagram of Test Setup



11.3. Test Procedure

- In the case of air discharge testing, the climatic conditions shall be within the following ranges:
 - ambient temperature: 15°C to 35°C;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)
- Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
- In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.
- The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.
- The test shall be performed with both air discharge and contact discharge. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive

polarity) shall be applied. For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

h. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

11.4. Test Results

PASS

Temperature : 24 °C
 Humidity : 55 %
 Atmospheric Pressure : 101kpa
 Test Engineer : Jean
 Test Date : 2019-12-12

Contact Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4kV	/	/		/
±2; 4kV	/	/		/

Indirect Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4kV	HCP	A	B	Pass
±2; 4kV	VCP	A	B	Pass

Air Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4; 8kV	Nonmetal Enclosure	A	B	Pass
±2; 4; 8kV	Switch	A	B	Pass
±2; 4; 8kV	Button	A	B	Pass

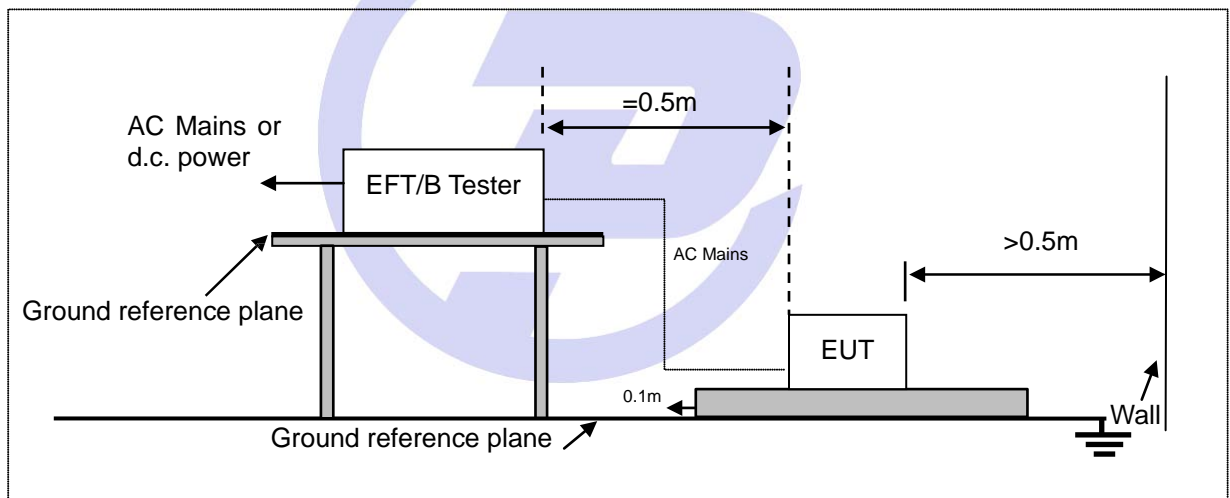
12. ELECTRICAL FAST TRANSIENTS/BURST IMMUNITY TEST

12.1. Test Specification

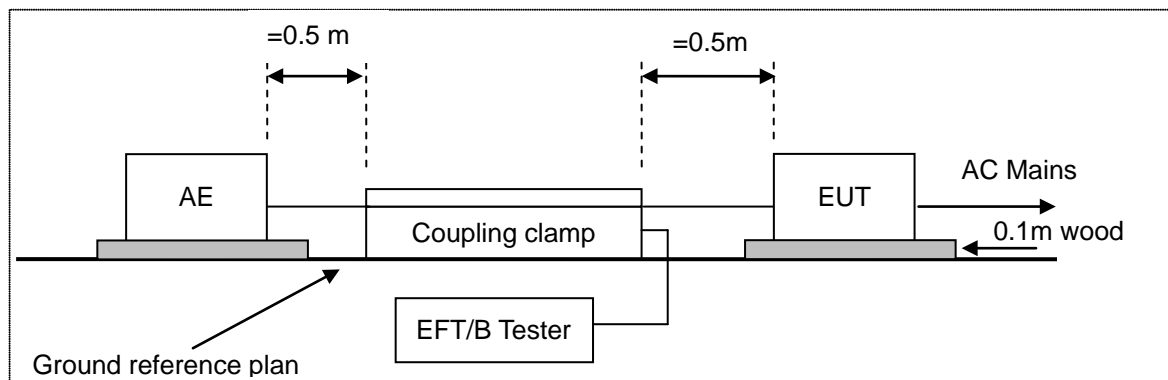
Test standard	: EN 55014-2
Basic standard	: IEC 61000-4-4
Performance criterion	: B
Test level	: <input checked="" type="checkbox"/> 1kV, Input a.c. power ports <input type="checkbox"/> 1kV, Output a.c. power ports <input type="checkbox"/> 0.5kV, Signal lines and control lines <input type="checkbox"/> 0.5kV, Input and output d.c. power ports
Repetition frequency	: 5kHz
Tr/Th:	: 5/50ns
Burst period	: 300ms
Test time :	: 120s

12.2. Block Diagram of Test Setup

AC Lines and d.c. power ports:



Signal lines:



12.3. Test Procedure

The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

12.4. Test Results

PASS

Temperature : 24 °C
 Humidity : 55 %
 Atmospheric Pressure : 101kpa
 Test Engineer : Jean
 Test Date : 2019-12-12

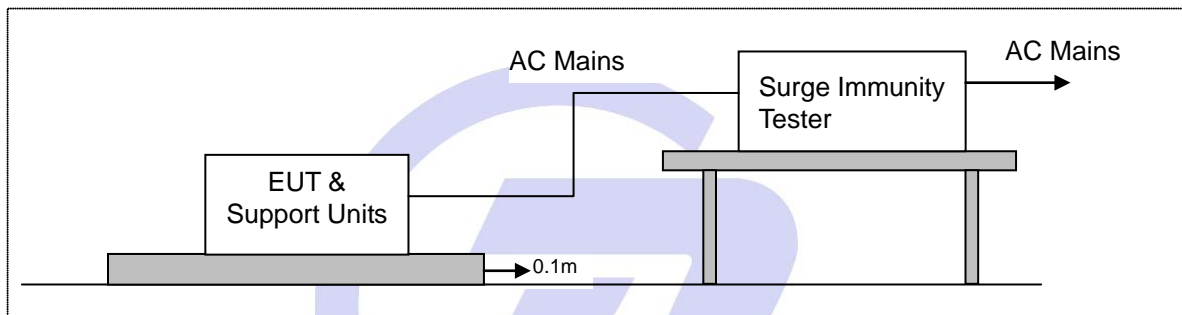
Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> AC mains power ports	± 1	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input type="checkbox"/> Input and output d.c. power ports	± 0.5	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	N/A	B	N/A
<input type="checkbox"/> signal lines and control lines	± 0.5	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	N/A	B	N/A

13. SURGE IMMUNITY TEST

13.1. Test Specification

Test standard	: EN 55014-2
Basic standard	: IEC 61000-4-5
Performance criterion	: B
Test level	: <input checked="" type="checkbox"/> 1kV, Line to Line, AC mains power ports, Criterion B <input type="checkbox"/> 2kV, Line to Earth, AC mains power ports, Criterion B
Number of surges	: 5 (for each combination of parameters)
Repetition rate	: 1 minute / time
Polarity:	: Positive / Negative
Phase angle:	: 90°, 270°

13.2. Block Diagram of Test Setup



13.3. Test Procedure

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10ohm and Neutral to Protective Earth with 9uF and 10ohm, common mode, generator earthed.

Line to Line (L-L): Combination Wave,

Line to Neutral with 18uF, differential mode, generator floated.

2 ohm : the source impedance of the low-voltage power supply network.

12 ohm : the source impedance of the low-voltage power supply network and ground.

The positive pulses are applied 90° relative to the phase angle of the a.c. line voltage to the equipment under test, and the negative pulses are applied 270° relative to the phase angle of the a.c. line voltage to the equipment under test. Tests with other (lower) voltages than those given in Table 12 are not required.

- If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
- The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.
- For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
- Testing shall be performed according to a Test Plan, which shall be included in the test report.
- To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

13.4. Test results

PASS

Temperature : 24 °C
 Humidity : 55 %
 Atmospheric Pressure : 101kpa
 Test Engineer : Jean
 Test Date : 2019-12-12

AC mains power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to line	1	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input checked="" type="checkbox"/> Line to earth	2	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass

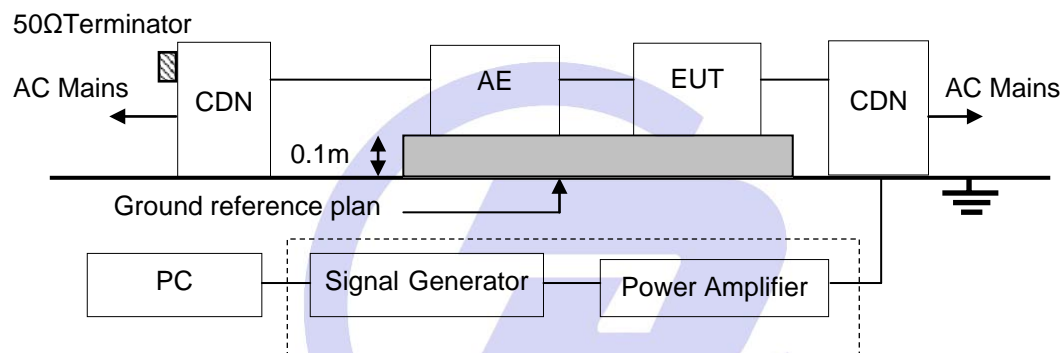


14. INJECTED CURRENTS SUSCEPTIBILITY IMMUNITY TEST

14.1. Test Specification

Test standard	: EN 55014-2
Basic standard	: IEC 61000-4-6
Performance criterion	: A
Test level	: <input checked="" type="checkbox"/> AC mains power ports, 0.15M to 230MHz, 3V <input type="checkbox"/> signal lines and control lines, 0.15M to 230MHz, 1V <input type="checkbox"/> Input and output d.c. power ports, 0.15M to 230MHz, 1V
Modulation	: AM 80%, 1kHz sine-wave
Frequency Step	: 1% of fundamental

14.2. Block Diagram of Test Setup



14.3. Test Procedure

- The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- The EUT is placed on a 0.1m high test table, and a well grounded cable is connected to metallic plane above the test table.
- All cables/wires must be laid out on test plate (3cm in thickness), and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo, and the cables/wires must not be in mid-air, they should be touching the surface of test plate. Ensure that the EUT is properly connected to the accessory equipment.
- The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- The frequency range is swept from 150 kHz to 230 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility
- Testing shall be performed according to a Test Plan, which shall be included in the test report.

14.4. Test results

PASS

Temperature : 24 °C
 Humidity : 55 %
 Atmospheric Pressure : 101kpa
 Test Engineer : Jean
 Test Date : 2019-12-12

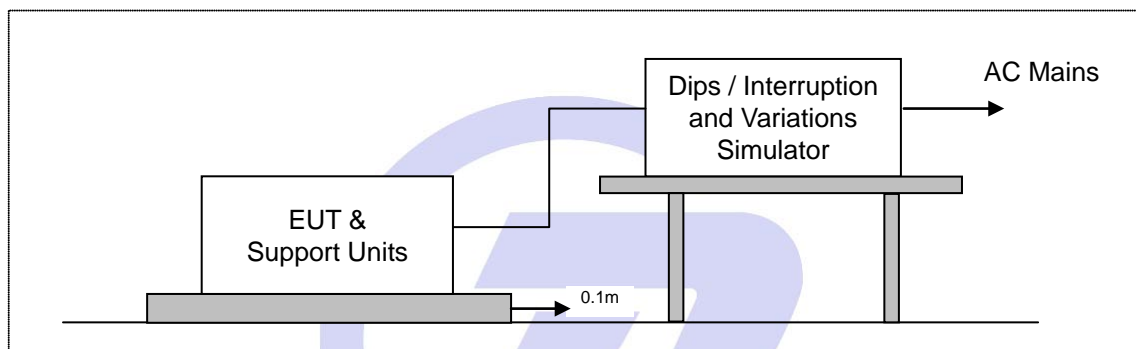
Range (MHz)	Levers (V)	Injection port	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
0.15-230	3	<input checked="" type="checkbox"/> AC mains power ports	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	A	A	Pass
0.15-230	1	<input type="checkbox"/> signal lines and control lines	<input type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	N/A	A	N/A
0.15-230	1	<input type="checkbox"/> Input and output d.c. power	<input type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	N/A	A	N/A

15. VOLTAGE DIPS IMMUNITY TEST

15.1. Test Specification

Test standard	: EN 55014-2
Basic standard	: IEC 61000-4-11
Test level	: <input checked="" type="checkbox"/> 0%, 0.5 periods, Criterion C
	<input checked="" type="checkbox"/> 40%, 10 periods for 50Hz, Criterion C
	<input checked="" type="checkbox"/> 40%, 12 periods for 60Hz, Criterion C
	<input checked="" type="checkbox"/> 70%, 25 periods for 50Hz, Criterion C
	<input checked="" type="checkbox"/> 70%, 30 periods for 60Hz, Criterion C

15.2. Block Diagram of Test Setup



15.3. Test Procedure

- a. Where the equipment has a rated voltage the following shall apply - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
 - In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.
- b. Test Conditions
 - Select operated voltage and frequency of EUT - Test of interval : 10 sec.
 - Level and duration : Sequence of 3 dips/interrupts.
 - Voltage rise (and fall) time : 1.5 μ s.

15.4. Test results

PASS

Temperature : 24 °C
 Humidity : 55 %
 Atmospheric Pressure : 101kpa
 Test Engineer : Jean
 Test Date : 2019-12-12

	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	0.5	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	60	0.5	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	40%	0°, 180°	AC 230V	50	10	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	40%	0°, 180°	AC 230V	60	12	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	50	25	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	60	30	B	C	Pass

16. PHOTOGRAPH

16.1. Photo of Conducted Emission Measurement



16.2. Photo of disturbance power measurement



16.3. Photo of Electrostatic Discharge Test



16.4. Photo of Harmonic Current/Flicker Test



16.5.Photo of Electrical Fast Transient /Burst Test



16.6.Photo of Surge Test



16.7.Photo of Injected Currents Susceptibility Test



16.8.Photo of Voltage Dips and Interruption Immunity Test



APPENDIX I (Photos of EUT)





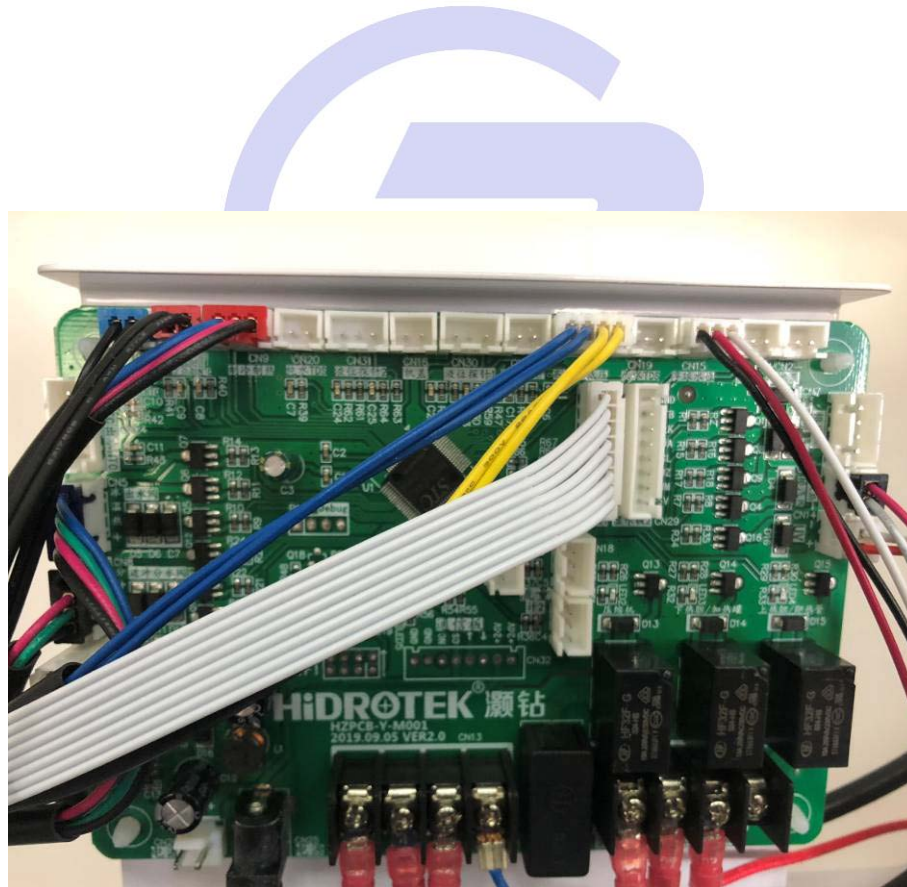


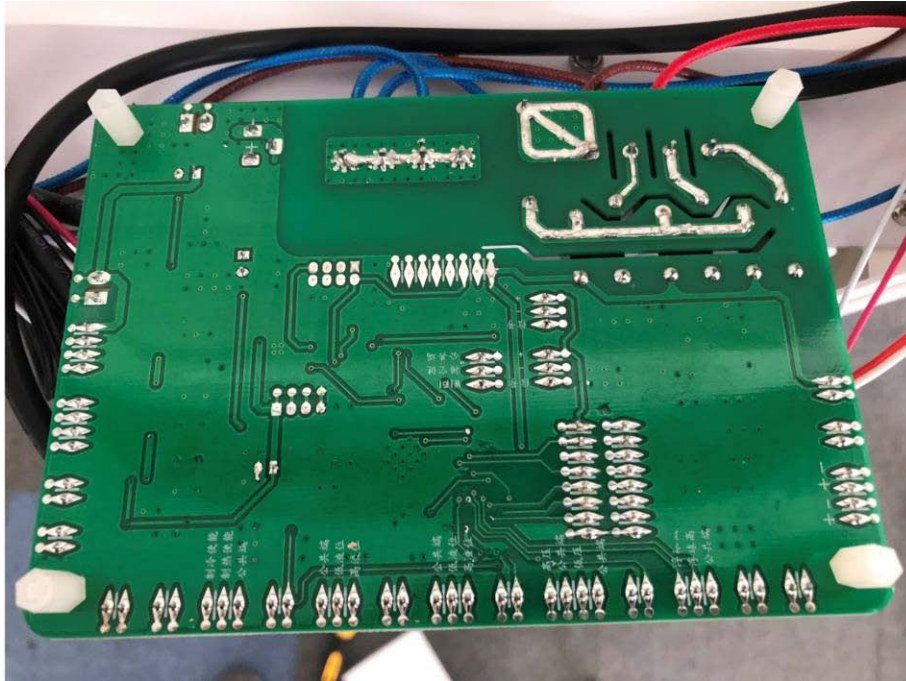


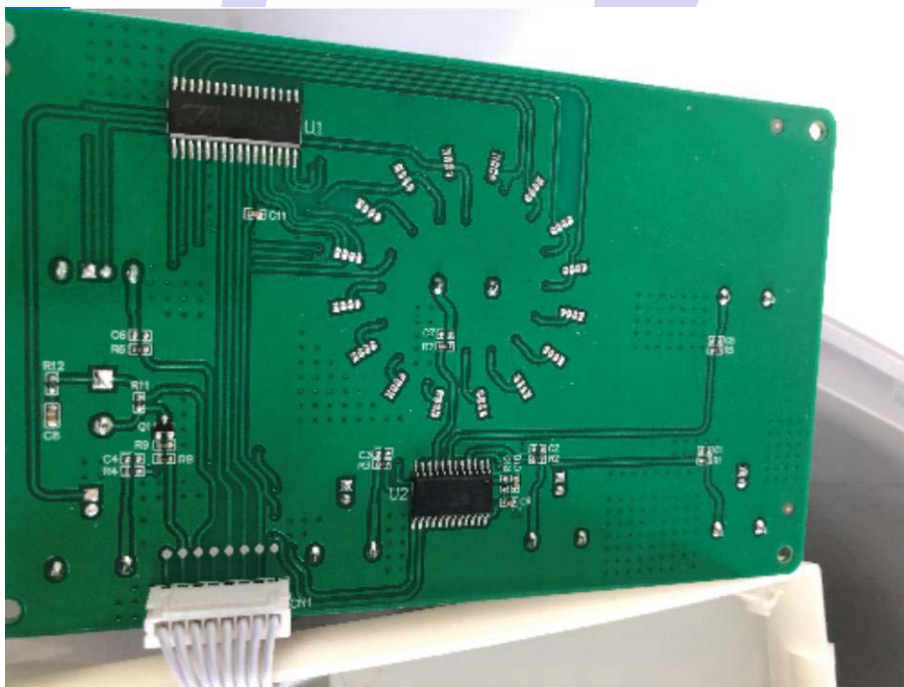
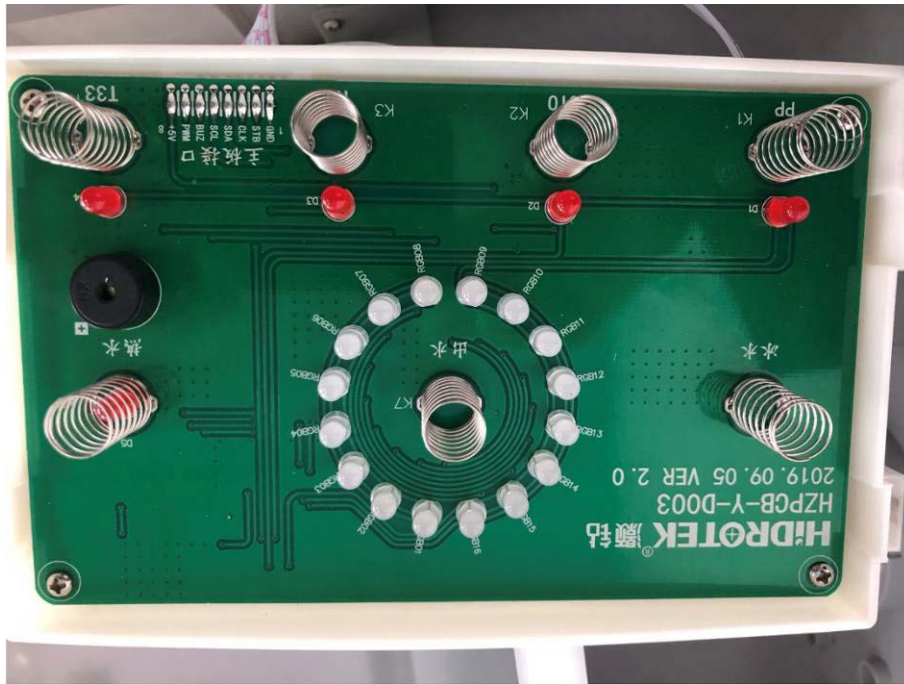












---The End---