

# EMC VERIFICATION SUMMARY

Report No.: SZHH01168200-003

Toy

ITE

Others

Model: 0703  Additional Models: 0701 to 0799 INCLUSIVE, 0703C, 0704,0704W, 0705, 0705C, 0706, 0706C, 0707, 0708, 0708C,0711, 0711W, 0712, 0712C, 0715, 0715C, 0717, 0718, 0718C, 0720, 0720C, 0721, 0731	Applicant: HOBBY ENGINE MODEL LTD. ROOM 619, 6/F. PENINSULA CENTER, 67 MODY ROAD, TSIM SHA TSUI, HONG KONG  Sample Receipt Date: 24 June 2017  Test Conducted Date: 24 June 2017 to 28 July 2017		
Product Description: Excavator  <input checked="" type="checkbox"/> 1 <sup>st</sup> TEST <input type="checkbox"/> 2 <sup>nd</sup> TEST	ALL TESTS WERE CONDUCTED IN ACCORDANCE WITH:  *EN 55014-1: 2006 + A1: 2009 + A2: 2011 *EN 55014-2: 1997 + A1: 2001 + A2: 2008 *EN 61000-3-2: 2014 *EN 61000-3-3: 2013		
Test Site and Location:	Intertek Testing Services Shenzhen Ltd. Longhua Branch 1F/2F, Building B, QiaoAn Scientific Technology Park, ShangKeng Community, GuanHu Subdistrict, LongHua District, ShenZhen. P.R. China, 518110		
Test Result	OK	Not OK	Remark(See page 2)
*EN 55014-1: 2006 + A1: 2009 + A2: 2011	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
*EN 55014-2: 1997 + A1: 2001 + A2: 2008	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
*EN 61000-3-2: 2014	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
*EN 61000-3-3: 2013	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remark: When determining the test conclusion, the Measurement Uncertainty of test has been considered.			

**Prepared and checked by:**

**Approved By:**

**Sign On File**

**Abel Zhou**  
**Senior Engineer**  
**Intertek**

\_\_\_\_\_  
**Jimmy Wen**  
**Assistant Supervisor**  
**Intertek**  
**Date: 28 July 2017**

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- The test report only allows to be revised only within the report defined retention period unless further standard or the requirement was noticed

TRF No.: EN55014-1/-2\_b

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## EMC Results Conclusion (with Justification)

RE: EMC Testing Pursuant to EMC Directive 2014/30/EU, Performed On the  
Excavator,  
Model: 0703

We tested the Excavator, Model: 0703, to determine if it was in compliance with the relevant EN standards as marked on the EMC Verification Summary. We found that the unit met the requirement of EN 55014-1, EN55014-2, EN 61000-3-2, EN 61000-3-3 standards when tested as received.

The additional models: 0701 to 0799 INCLUSIVE, 0703C, 0704,0704W, 0705, 0705C, 0706, 0706C, 0707, 0708, 0708C, 0711, 0711W, 0712, 0712C, 0715, 0715C, 0717, 0718, 0718C, 0720, 0720C, 0721, 0731 are the same as the Model: 0703 in hardware aspect. The difference in model number and appearance serves as marketing strategy.

The production units are required to conform to the initial sample as received when the units are placed on the market.

Remark: Standards against which no testing has been conducted of the captioned model and the engineering judgement is stated as follows:

EN61000-3-2: This product has power consumption 75W or less under normal operating conditions. It is therefore not likely to produce harmonics above the limits of the standard. The product is deemed to comply with the standard without any measurements.

**LABORATORY MEASUREMENTS****Configuration Information**

<b>Equipment Under Test (EUT):</b>	Excavator
<b>Model:</b>	0703
<b>Serial No.:</b>	N/A
<b>Support Equipment:</b>	N/A
<b>Cables:</b>	N/A
<b>Adaptor:</b>	Model: GQ07-090020-AG Input: AC 100-240V 50-60Hz 0.3A Output: DC 9.0V 0.2A (Provided by Client)
<b>Rated Voltage:</b>	DC 7.2V (1 x 7.2V Rechargeable Battery)

TRF No.: EN55014-1/2\_b

## Performance Criteria for Immunity

The performance criteria are referred to the test standard: EN 55014-2

### Performance criteria A

During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. 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 by what the user may reasonably expect from the EUT if used as intended.

### Performance criteria B

After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of 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 by what the user may reasonably expect from the EUT if used as intended.

### Performance criteria C

During and after testing, a temporary loss of function is allowed, provided the function is selfrecoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions.

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Applicant: HOBBY ENGINE MODEL LTD.

Model: 0703

Worst Case Operating Mode: Charging

## EN 55014-1 Radiated Scan

### Used Test Equipment

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ185-01	EMI Receiver	R & S	ESCI	9-Feb-17	9-Feb-18
SZ061-03	Biconilog Antenna	ETS	3142C	12-Oct-16	12-Oct-17
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	16-Jan-17	16-Jan-19

- Notes:
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
  2. Frequency range scanned: 30MHz to 1000MHz.
  3. Only emissions significantly above equipment noise floor are reported.
  4. Uncertainty:  $\pm 4.8$ dB at a level of confidence of 95%.
  5. Negative sign (-) in the margin column signify levels below the limit.

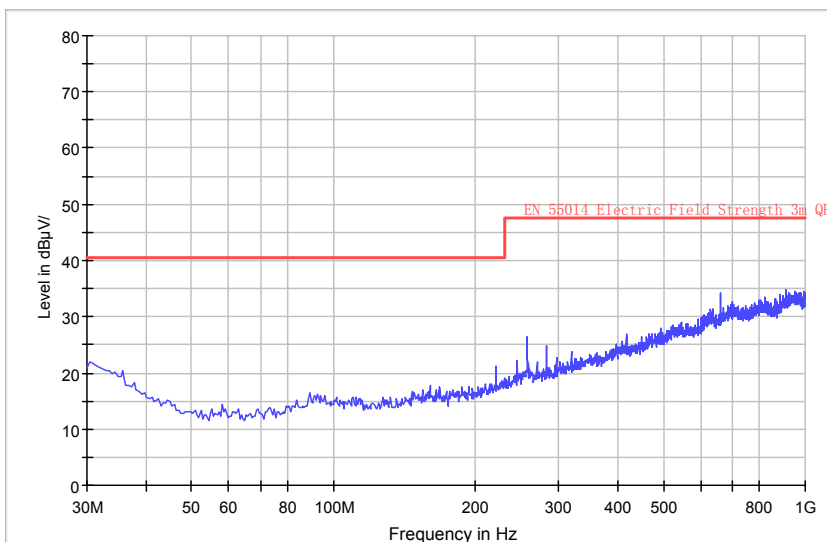
TRF No.: EN55014-1/2\_b

Applicant: HOBBY ENGINE MODEL LTD.

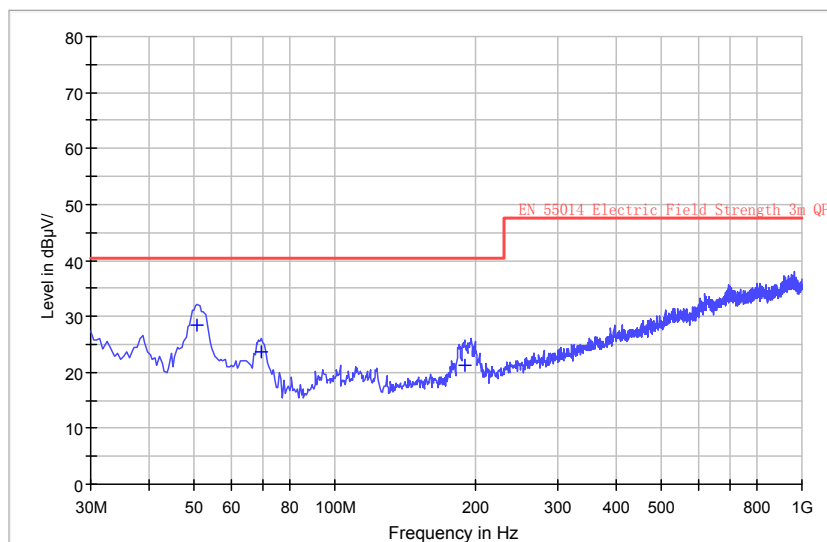
Model: 0703

Worst Case Operating Mode: Charging

## Graphic Radiated Emissions Pursuant to EN55014-1: Emissions Requirement Horizontal



## Vertical



TRF No.: EN55014-1/2\_b

Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703  
Worst Case Operating Mode: Charging

### Data Table

#### Radiated Emissions Pursuant to EN55014-1: Emissions Requirement

Polarization	Frequency (MHz)	Net at 3m (dB $\mu$ V/m)	Calculated Net at 10m (dB $\mu$ V/m)	Limit at 10m (dB $\mu$ V/m)	Margin (dB)
V	50.850	28.5	18.0	30.0	-12.0
V	69.770	23.6	13.1	30.0	-16.9
V	189.565	21.3	10.8	30.0	-19.2

No emissions significantly above equipment noise floor.



Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703  
Worst Case Operating Mode: Charging

## EN55014-1 RFI Voltage Test

### Used Test Equipment

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ187-01	LISN	R & S	ENV216	1-Nov-16	1-Nov-17
SZ187-02	LISN	R & S	ENV216	1-Jul-17	1-Jul-18
SZ185-02	EMI Test Receiver	R&S	ESCI	1-Nov-16	1-Nov-17
SZ188-03	Shielding Room	ETS	RFD-100	16-Jan-17	16-Jan-19

- Notes:
1. Peak and average detector quick scan are showed on the graph and final quasi-peak and average detector data are measured, the worst-case is recorded in the following graph and table.
  2. Frequency range scanned: 150kHz to 30MHz.
  3. Only emissions significantly above equipment noise floor are reported.
  4. Uncertainty:  $\pm 3.6$ dB at a level of confidence of 95%.

TRF No.: EN55014-1/2\_b



Applicant: HOBBY ENGINE MODEL LTD.

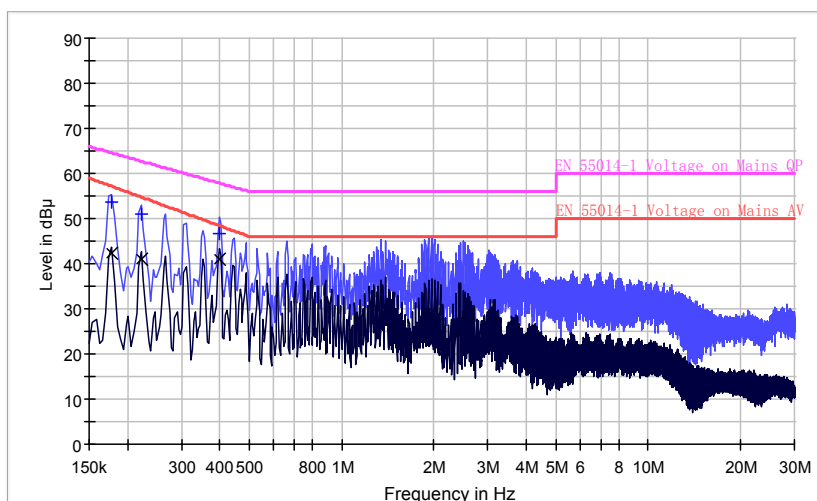
Model: 0703

Worst Case Operating Mode: Charging

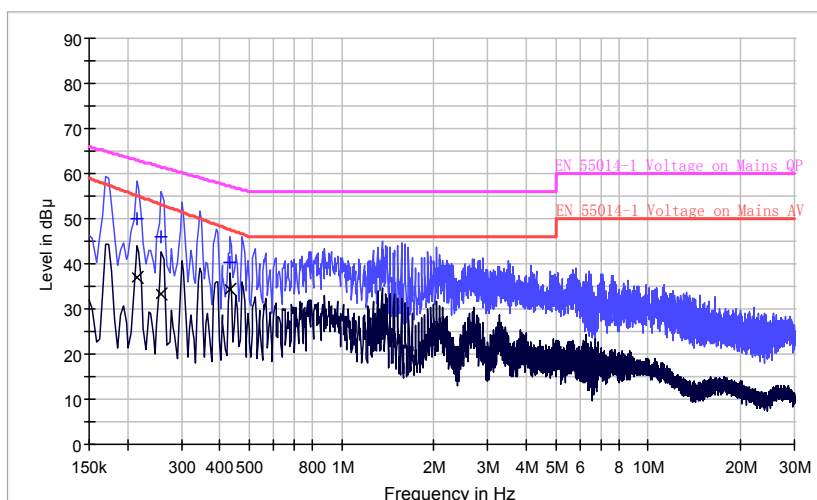
Phase: Live / Neutral

## Graphic RFI Voltage Test Pursuant to EN 55014-1: Emissions Requirement

### Live Line



### Neutral Line



TRF No.: EN55014-1/2\_b

Applicant: HOBBY ENGINE MODEL LTD.  
 Model: 0703  
 Worst Case Operating Mode: Charging  
 Phase: Live / Neutral

### Data Table

#### RFI Voltage Test Pursuant to EN 55014-1: Emissions Requirement

Live Line

Frequency (MHz)	Quasi-Peak		Average	
	Disturbance level dB(μV)	Permitted limit dB(μV)	Disturbance level dB(μV)	Permitted limit dB(μV)
0.178000	53.6	64.6	42.2	57.2
0.222000	50.9	62.7	41.1	54.8
0.398000	46.8	57.9	41.0	48.5

No emissions significantly above equipment noise floor.

Neutral Line

Frequency (MHz)	Quasi-Peak		Average	
	Disturbance level dB(μV)	Permitted limit dB(μV)	Disturbance level dB(μV)	Permitted limit dB(μV)
0.214000	49.9	63.0	37.0	55.2
0.258000	46.0	61.5	33.5	53.1
0.434000	40.4	57.2	34.2	47.5

No emissions significantly above equipment noise floor.



Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703  
Worst Case Operating Mode: Charging

## EN61000-3-3 Voltage Fluctuations

### Used Test Equipment

Equip No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ064-01	Compliance Test System	California Instruments	5001iX-CTS-400	9-Feb-17	9-Feb-18
SZ064-01-01	Power Analyzer and Conditioning System	California Instruments	PACS-1	9-Feb-17	9-Feb-18

- Notes: 1. The test result consisting of worst-case was attached in the following pages.  
2. Uncertainty: 0.25% at a level of confidence of 95%.



Applicant: HOBBY ENGINE MODEL LTD.

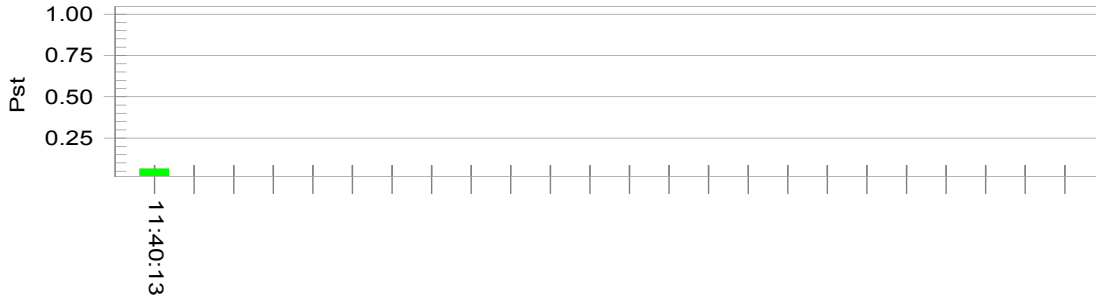
Model: 0703

Worst Case Operating Mode: Charging

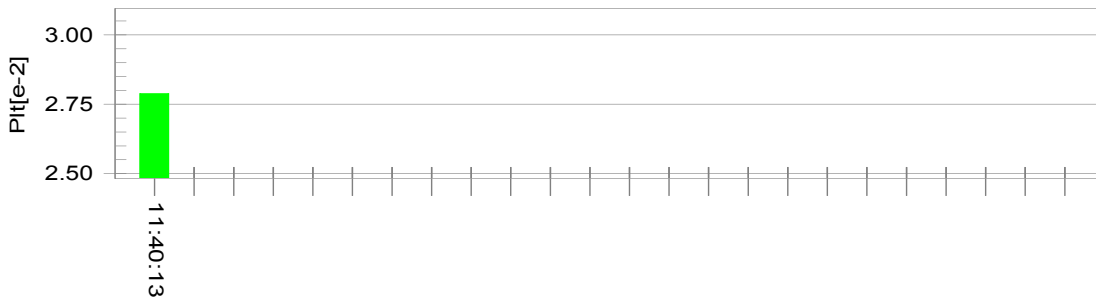
## Flicker Test Summary per EN/IEC61000-3-3 (Run time)

Pst<sub>i</sub> and limit line

European Limits



Plt and limit line



### Parameter values recorded during the test:

<b>Vrms at the end of test (Volt):</b>	<b>230.26</b>		
<b>Highest dt (%):</b>	<b>0.00</b>	<b>Test limit (%):</b>	<b>3.30 Pass</b>
<b>Time(mS) &gt; dt:</b>	<b>0.0</b>	<b>Test limit (mS):</b>	<b>500.0 Pass</b>
<b>Highest dc (%):</b>	<b>0.00</b>	<b>Test limit (%):</b>	<b>3.30 Pass</b>
<b>Highest dmax (%):</b>	<b>0.00</b>	<b>Test limit (%):</b>	<b>4.00 Pass</b>
<b>Highest Pst (10 min. period):</b>	<b>0.064</b>	<b>Test limit:</b>	<b>1.000 Pass</b>

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**EN61000-4-2  
Electrostatic Discharge**

**Test Summary (Pursuant to EN55014-2)**

Basic Standard:	IEC 61000-4-2: 1995 + A1: 1998 + A2: 2000
Port:	Enclosure
Required Performance Criterion:	B
Limit:	±8.0kV (Air Discharge)
	±4.0kV (Contact Discharge)
	±4.0kV (Indirect Contact Discharge)
Time Between Each Discharge:	1 second
Temperature:	27.3°C
Relative Humidity:	54.6%
Test Mode:	Charging
Test Setup:	Table Top
Test of Post-Installation:	N/A

**Used Test Equipment**

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ189-03	ESD Simulator	Teseq	NSG 435	17-Nov-16	17-Nov-17

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

**Test Results****EN61000-4-2  
Electrostatic Discharge**

Discharge Type	No. of Discharge	Applied Voltage	Result (Pursuant to EN55014-2, Criterion B)
Contact Discharge	20	±4kV	OK
Air Discharge	20	±8kV	OK
Indirect HCP Discharge	20	±4kV	OK
Indirect VCP Discharge	20	±4kV	OK

Additional Information

No observable change

TRF No.: EN55014-1/2\_b

Applicant: HOBBY ENGINE MODEL LTD.

Model: 0703

**EN61000-4-6  
Injected Current (0.15MHz to 230MHz)**

**Test Summary (Pursuant to EN55014-2)**

Basic Standard:	IEC 61000-4-6: 2003 + A1: 2004 + A2: 2006
Port:	AC Power Lines, DC Power Lines, Signal Lines and Control Lines
Required Performance Criterion:	A
Limit:	3.0V (rms)
Test Modulation:	1kHz, 80% AM
Frequency:	0.15MHz to 230MHz
Dwell Time:	1s
Frequency Step:	1%
Temperature:	25°C
Relative Humidity:	48%
Coupling Factor of CDN:	-1.0dB ~ -1.7dB
Test Mode:	Charging
Test Setup:	Table-Top
Equipment Under Test (EUT):	Single Unit

**Used Test Equipment**

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ180-02	Signal Generator	Aeroflex	2023A	31-Jan-16	31-Jul-17
SZ181-03	Amplifier	AR-WORLDWIDE	75A250	31-Jan-16	31-Jul-17
SZ181-03-01	Attenuator	AR-WORLDWIDE	6dB/50FH-006-100	31-Jan-16	31-Jul-17
SZ184-03	Coupling-Decoupling Network	Luthi	CDN L-801 M2/M3	31-Jan-16	31-Jul-17
SZ183-01	RF CURRENT-INJECTION CLAMP	LUTHI	EYW85820 001	31-Jan-16	31-Jul-17

TRF No.: EN55014-1/2\_b

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## Test Results

### EN61000-4-6 Injected Current (0.15MHz to 230MHz)

Port	Frequency (MHz)	Level	Result (Pursuant to EN55014-2, Criterion A)
AC Power Lines	0.15 to 230	3V (rms)	OK
DC Power Lines	0.15 to 230	1V (rms)	N/A
Signal Lines	0.15 to 230	1V (rms)	N/A
Control Lines	0.15 to 230	1V (rms)	N/A

Additional Information

No observable change

TRF No.: EN55014-1/2\_b



Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## EN61000-4-4 Electrical Fast Transient / Burst

### Test Summary (Pursuant to EN55014-2)

Basic Standard:	IEC 61000-4-4: 2004
Port:	AC Power Lines
Required Performance Criterion:	B
Limit:	±1.0kV
Temperature:	24°C
Relative Humidity:	53%
Test Duration:	1 minute
Test Mode:	Charging
Test Setup:	Table Top
Generator Drive:	Internal
Sequence of Application:	Multiple

### Used Test Equipment

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ063-01	Compact Immunity Tester	Haefely	ECOMPACT 4	9-Feb-17	9-Feb-18

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Applicant: HOBBY ENGINE MODEL LTD.  
 Model: 0703

### Test Results

#### EN61000-4-4 Electrical Fast Transient / Burst

Port	Level	Polarity	Result (Pursuant to EN55014-2, Criterion B)
AC Power Lines	1kV	+	OK
	1kV	-	OK
DC Power Lines	0.5kV	+	N/A
	0.5kV	-	N/A
Signal Lines	0.5kV	+	N/A
	0.5kV	-	N/A
Control Lines	0.5kV	+	N/A
	0.5kV	-	N/A

Additional Information

No observable change

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## EN61000-4-5 Surge Immunity

### Test Summary (Pursuant to EN55014-2)

Basic Standard:	IEC 61000-4-5: 2005		
Port:	AC Power Lines		
	Phase and Neutral	Phase and Earth	Neutral and Earth
Limit:	5 Positive and 5 Negative Surges		
	±1kV	±2kV	±2kV
Generator Impedance:	2ohm	12ohm	12ohm
Required Performance Criterion:	B		
Repetition Rate:	1 minute		
Temperature:	24°C		
Relative Humidity:	53%		
Test Mode:	Charging		
Test Setup:	Table Top		
Surge Generator Trigger:	Internal		
Installation Condition:	Class 3: Electrical environment where cables run in parallel.		
Phase Angle:	90°, 270°		

### Used Test Equipment

Equip No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ063-01	Compact Immunity Tester	Haefely	ECOMPACT 4	9-Feb-17	9-Feb-18

TRF No.: EN55014-1/2\_b

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## Test Results

### EN61000-4-5 Surge Immunity

Level	Result (Pursuant to EN55014-2, Criterion B)
Between Phase and Neutral: $\pm 1\text{kV}$	OK
Between Phase and Earth: $\pm 2\text{kV}$	N/A
Between Neutral and Earth: $\pm 2\text{kV}$	N/A

Additional Information

No observable change

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## EN61000-4-11 Voltage Dips and Interruptions

### Test Summary (Pursuant to EN55014-2)

Basic Standard	EN 61000-4-11: 2004			
Port:	A.C. Power Lines			
Limit:	Test level in %UT	Duration (Periods)		Required Performance Criterion
		50Hz	60Hz	
	0	0.5	0.5	C
	40	10	12	C
	70	25	30	C
No. of dips/interruptions:	3			
Test Mode:	Charging			
Test Setup:	Test generator causes the interference of the EUT AC mains			

$U_T$  is the rated voltage for the equipment.

### Used Test Equipment

Equip No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ063-01	Compact Immunity Tester	Haefely	ECOMPACT 4	9-Feb-17	9-Feb-18

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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## Test Results

### EN61000-4-11 Voltage Dips and Interruptions

Test condition			Result  (Pursuant to EN55014-2, Criterion C)
Test Level in %UT	Duration (Periods)		
	50Hz	60Hz	
0	0.5	0.5	OK
40	10	12	OK
70	25	30	OK

Additional Information

No observable change

TRF No.: EN55014-1/2\_b

Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

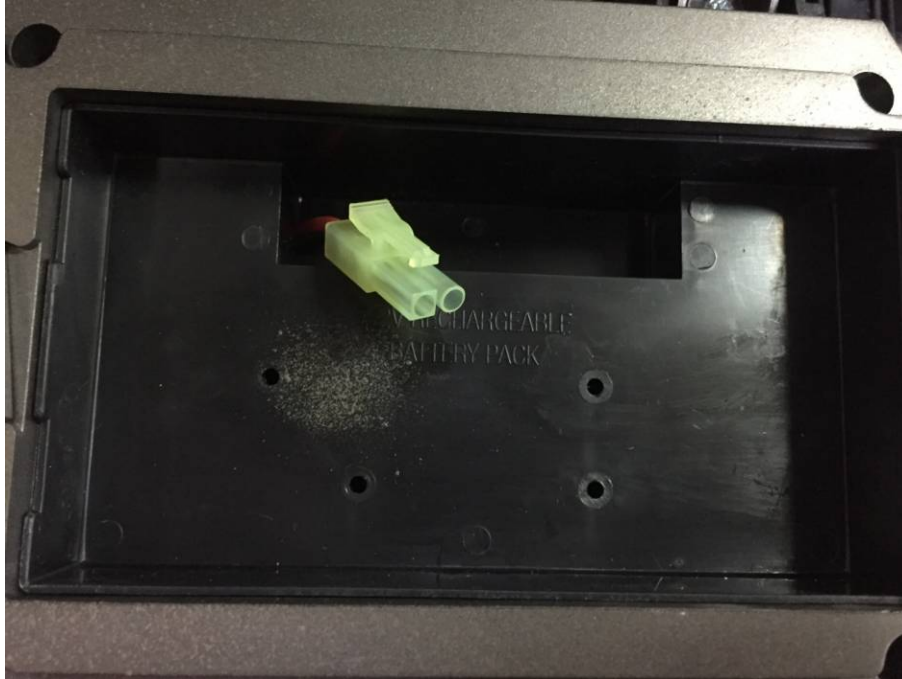
## External Photo



TRF No.: EN55014-1/2\_b

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Model: 0703

## Internal Photo

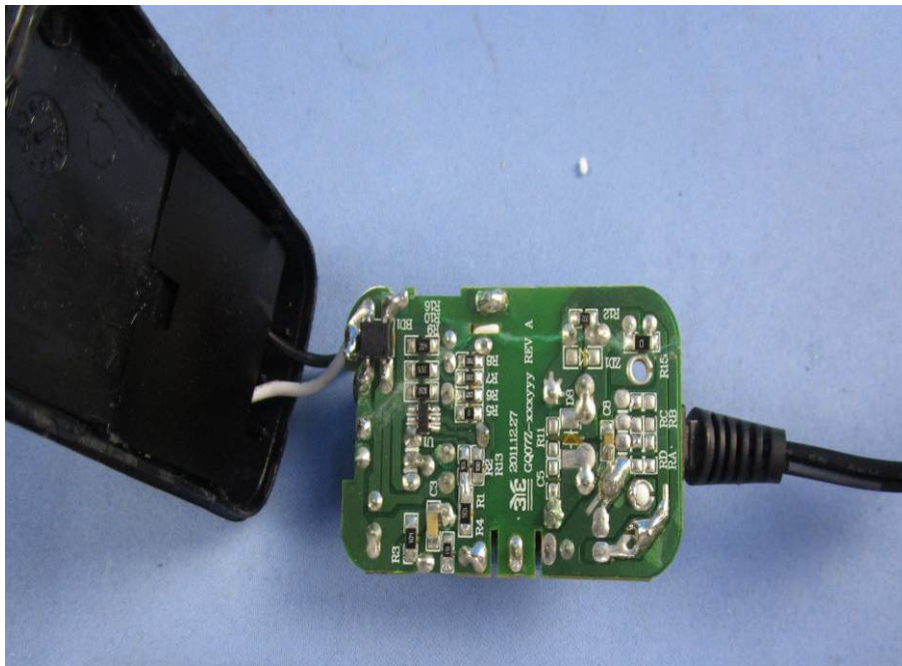
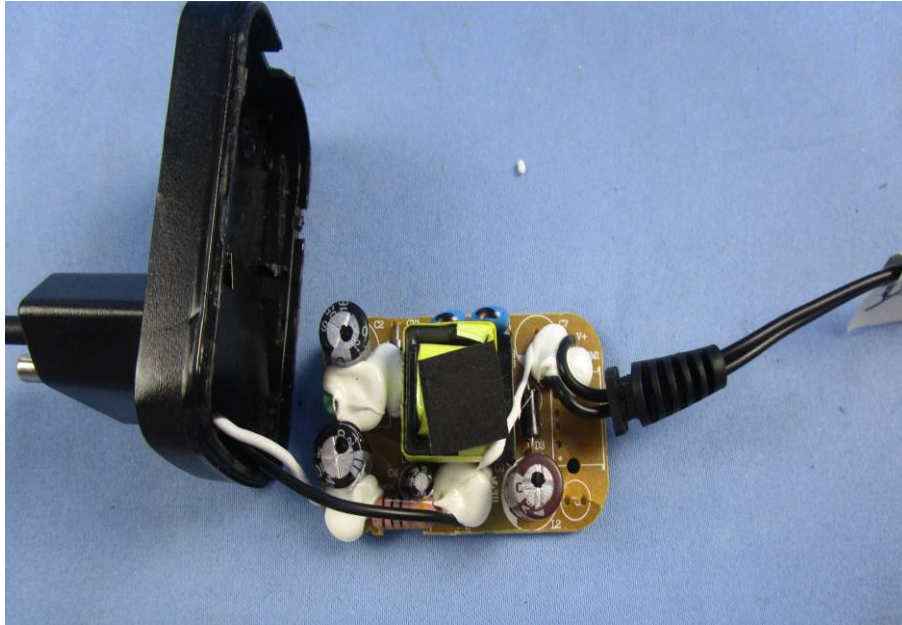


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Applicant: HOBBY ENGINE MODEL LTD.  
Model: 0703

## Internal Photo



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TRF No.: EN55014-1/2\_b