

EMC TEST REPORT

According to

EN 55014-1 : 2006+A1:2009+A2:2010

EN 61000-3-2 : 2006+A1:2009+A2:2009

EN 61000-3-3 : 2008

EN 55014-2 : 1997+A1:2001+A2:2008, Category II

*Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus
Part 1: Emission*

*Limits - Limits for harmonic current emissions (equipment input current up to and including 16A per phase);
Electromagnetic compatibility(EMC) Part 1 : Limits, section 1.*

Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current I_{N16}

*Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus
Part 1: Immunity - Product family standard.*

Test Report No.	:	CSTS-CE13/EMC007 (Rev. 0)
Test Date	:	Jan. 11, 2013 ~ Jan. 17, 2013
Issue Date	:	Jan. 21, 2013
Equipment	:	Heating Film
Model Name	:	GH800
Alt. Model Name	:	GH300, GH500, GH1000, EF300, EF500, EF800, EF1000
Applicant	:	GH CO., LTD. 87-25, Aegibong-ro 681beong-gil, Tongjin-eup Gimpo-si, Gyeonggi-do, Korea

This report applies only to the product named in the title of this report manufactured at the location indicated. Test results apply only to the particular equipment and functionality described in this test report.

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1. General Description of EUT

1.1 Applicant

Company Name	GH CO., LTD.	
Address	87-25, Aegibong-ro 681beong-gil, Tongjin-eup Gimpo-si, Gyeonggi-do, Korea	
Contact Person	SUNG GYEUM KIM / Manager	
Tel. / Fax.	Tel.) +82-31-949-8348	Fax.) +82-31-949-8349
E-Mail	ks0789@hanmail.net	

1.2 Manufacturer

Company Name	GH CO., LTD.	
Address	87-25, Aegibong-ro 681beong-gil, Tongjin-eup Gimpo-si, Gyeonggi-do, Korea	
Contact Person	SUNG GYEUM KIM / Manager	
Tel. / Fax.	Tel.) +82-31-949-8348	Fax.) +82-31-949-8349
E-Mail	ks0789@hanmail.net	

1.3 Test Condition of EUT

Trade Name	-
Product Name	Heating Film
Model Name	GH800
Serial Number	N/A
Input rating	230 V~, 50 Hz

1.4 Technical Description of EUT

Section		Specification
Heating Film Temperature Controller	Input Voltage	100 VAC - 250 VAC, 50-60 Hz
	Allowable Current	18 A (Max.)
	Peak Load	4 kW
	Dimension	70(W) x 120(H) x 27(D) mm
Film	Width	803 mm
	Thickness	0.338 mm
	Input Voltage	230 VAC, 50 Hz
	Power Consumption	196 W/M

2. General Information of Test

2.1 Test Facility

This test was carried out by Certification Service Technology, Inc.	
Test Site Location	4f, 181 Manhaero, Danwon-Gu, Ansan-City, Gyeonggi-Do, 425-839, Korea Tel.) +82-31-493-2001 Fax.) +82-31-493-2015

2.2 Standard Applicable for Testing

Standards	Status
EN 55014-1 : 2006+A1:2009+A2:2010	Applicable
EN 61000-3-2 : 2006+A1:2009+A2:2009	Applicable
EN 61000-3-3 : 2008	Applicable
EN 55014-2 : 1997+A1:2001+A2:2008, Category II	Applicable

Note : Table of tests are performed out under each category of equipment.

2.3 Deviation from The Standards

Standards	Deviation
EN 61000-4-2 : 2009	Applicable
EN 61000-4-3 : 2006+A1:2008+A2:2010	Not Applicable
EN 61000-4-4 : 2012	Applicable
EN 61000-4-5 : 2006	Applicable
EN 61000-4-6 : 2009	Applicable
EN 61000-4-8 : 2010	Not Applicable
EN 61000-4-11 : 2004	Applicable

2.4 Summary of Test Results

Standard	Description	Test Result
EN 55014-1	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission;	■ Pass □ Fail
EN 61000-3-2	Limits for harmonic current emissions (equipment input current ≤16 A per phase)	■ Pass □ Fail
EN 61000-3-3	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection	■ Pass □ Fail
IEC 61000-4-2	Testing and measurement techniques - Electrostatic discharge immunity test	■ Pass □ Fail
IEC 61000-4-3	Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	□ Pass □ Fail
IEC 61000-4-4	Testing and measurement techniques - Electrical fast transient/burst immunity test	■ Pass □ Fail
IEC 61000-4-5	Testing and measurement techniques - Surge immunity test	■ Pass □ Fail
IEC 61000-4-6	Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	■ Pass □ Fail
IEC 61000-4-8	Testing and measurement techniques - Power frequency magnetic field immunity test	□ Pass □ Fail
IEC 61000-4-11	Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	■ Pass □ Fail

2.5 Description of EUT modification

The EUT was tested by executing 'heating mode' and observing temperature of the EUT during the test.

2.6 Operation of EUT

Operating Voltage : AC 230 V, 50 Hz

Operating condition : The EUT was operated by "Heating Mode"

And the test engineer observed whether the EUT was operated normally during the test.

2.7 Description of Test System (EMI and EMS)

2.7.1 Internal Board of EUT

Description	Model	Serial No.	Manufacturer
Film	N/A	N/A	N/A
Controller (EUT)	UTH-170	N/A	URIEL ELECTRONICS
Controller_Main Board (EUT)	N/A	N/A	N/A
Controller_Sub Board (EUT)	N/A	N/A	N/A

2.7.2 Configuration of Test Setup

Description	Model	Serial No.	Manufacturer
Heating Film (EUT)	GH800	N/A	GH CO., LTD.
Controller (EUT)	UTH-170	N/A	URIEL ELECTRONICS

2.8 Type of Cables Used

Device From		Device To		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length(m)	Shield
EUT	DC In	Controller	DC Out	0.8	Unshielded
Controller (EUT)	AC In	AC Line	AC Power	1.0	Unshielded

3. Test Data

3.1 Conducted Emission Test

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the 230 VAC power and return leads of the EUT according to the methods defined in European Standard EN55014-1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

3.1.1 Test Condition

Frequency Range of Test	: 150 kHz to 30 MHz
Test Standard	: EN 55014-1 : 2006+A1:2009+A2:2010
Test Date	: Jan. 16, 2013
Item	: At main terminals
Temperature/Humidity	: 20.5 °C / 47 % R.H.

3.1.2 Limits of Conducted Emission

Item	Frequency Range (MHz)	Limits(dBµV)	
		Quasi-Peak	Average-Peak
At main terminals	0.15 – 0.5	66 – 56	59 – 46
	0.5 – 5	56	46
	5 – 30	60	50

3.1.3 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
Test Receiver	ER-265	LIG NEX1	L0804B002	Jul. 05, 2013	■
Conducted Cable	N/A	N/A	N/A	N/A	■
LISN	LN2-16	EMCIS	LN10010	Mar. 06, 2013	■
Artificial Mains Network	1.2-16B	NARDA Safety Test Solutions	000WXC20812	Nov. 19, 2013	■
Transient Limiter	11947A	HP	3107A00640	Sep. 04, 2013	■
Shielded Room	N/A	BRADEN	DAC-60-005	N/A	■
AC Power Source	6205	EXTECH ELECTRONIC	1140044	Sep. 04, 2013	■

3.1.4 Test Result of Conducted Emission

EUT : **GE000**
 Input Voltage : AC 230 V, 50 Hz

Conducted Emission Test Results: PASS

Test data

Freq. (MHz)	Loss (dB)		Pol. (L/N)	Quasi-Peak Mode			Average Mode		
	LISN	Cable		Limit (dB μ V)	Measure (dB μ V)	Result (dB μ V)	Limit (dB μ V)	Measure (dB μ V)	Result (dB μ V)
0.160	0.08	0.04	L	65.46	25.55	25.7	58.30	17.48	17.6
0.240	0.08	0.04	L	62.10	25.22	25.3	53.93	10.69	10.8
0.429	0.13	0.05	N	57.27	47.53	47.7	47.65	39.20	39.4
0.456	0.13	0.06	N	56.77	48.17	48.4	46.99	39.02	39.2
0.550	0.09	0.06	L	56.00	32.27	32.4	46.00	24.41	24.6
0.942	0.09	0.08	L	56.00	45.20	45.4	46.00	42.24	42.4
1.000	0.14	0.09	N	56.00	47.04	47.3	46.00	38.21	38.4
1.400	0.15	0.10	N	56.00	44.93	45.2	46.00	35.93	36.2
2.000	0.16	0.12	N	56.00	42.97	43.3	46.00	33.50	33.8
3.500	0.18	0.16	N	56.00	38.71	39.1	46.00	28.48	28.8
6.000	0.20	0.22	N	60.00	36.34	36.8	50.00	26.23	26.7
10.000	0.19	0.29	N	60.00	31.05	31.3	50.00	17.01	17.5
22.000	0.26	0.45	L	60.00	19.05	19.8	50.00	8.42	9.1
30.000	0.25	0.53	L	60.00	24.23	25.0	50.00	7.86	8.6

Notes:

All modes of operation were investigated and the worst-case emissions are reported. See the plots in next pages.
 Measurement uncertainty estimated at 2.3 dB.

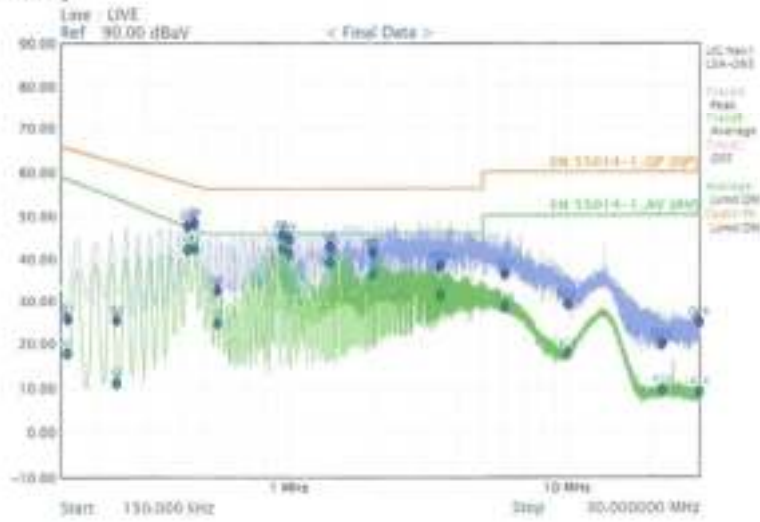
However, influenced by the sample and the environmental impact is not taken into account.

The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k=2$.

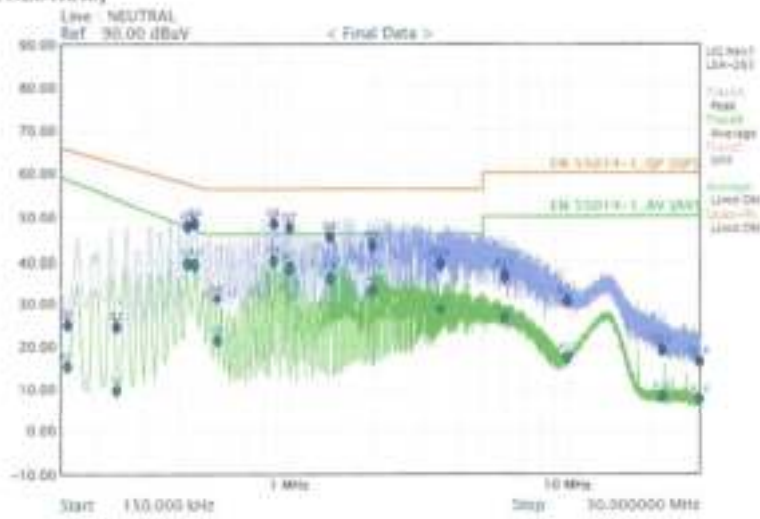

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PLOTS OF EMISSIONS

[LINE: LIVE]



[LINE: NEUTRAL]



3.1.5 Photographs of Conducted Emission Test Configuration

[Front]



[Rear]



3.2 Main terminal discontinuous disturbance (Click) test

The EUT was placed on a wooden table, 40 centimeters height above the floor. Power was fed to the EUT through a 50 ohm/ 50 uH + 5 ohm Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

3.2.1 Test Condition

Frequency Range of Test : 150 kHz, 500 kHz, 1.4 MHz, 30 MHz
 Test Standard : EN 55014-1 : 2006+A1:2009+A:2010
 Test Date : Jan. 16, 2013
 Run Duration : 120 min
 Temperature/Humidity : 20.5 °C / 47 % R.H.

3.2.2 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
EMI Test Receiver	9010	NARDA Safety Test Solutions	696WX20805	Nov. 19, 2013	■
Four-channel simultaneous click measurement	Click-4E	NARDA Safety Test Solutions	030WX20112	N/A	■
Click Analyzer	9010-CLICK	NARDA Safety Test Solutions	010WX10204	N/A	■
Artificial Mains Network	1.2-16B	NARDA Safety Test Solutions	000WX20812	Nov. 19, 2013	■
Shielded Room	N/A	BRADEN	DAC-60-005	N/A	■
AC Power Source	6205	EXTECH ELECTRONIC	1140044	Sep. 04, 2013	■

3.2.3 Test Result of Main Terminal Discontinuous Disturbance (Click) Test

EUT : GH800
 Input Voltage : AC 230 V, 50 Hz

Main Terminal discontinuous Disturbance (Click) Test Results: PASS

Test data

Frequency (MHz)	Limit (dB μ V)	≤ 10 ms	≤ 20 ms	≤ 0.2 s	From Exception E4	Other than click (ms)	Total Clicks	Time min.	N Rate	+Lq (dB)
0.15	75	0	0	0	0	0	0	120	0	PASS
0.5	75	0	0	0	0	0	0	120	0	PASS



Tested by Park, Kang Uk

3.2.4 Photograph of Main Terminal Discontinuous Disturbance (Click) Test



3.3 Disturbance Power Test

The EUT was placed on a non-metallic table approximately 0.8 meters above the ground plane. At the rear side of the EUT, a non-metallic table of length 6 m was placed to provide for movement of the absorbing clamp. The absorbing clamp was applied successively to all leads whose length was 25 cm or longer, unshielded and screened. The frequency spectrum from 30 MHz to 300 MHz was scanned and emission levels maximized at each frequency recorded. The AC main cable was varied in length to 6.0 meters in order to determine the maximum emission levels.

3.3.1 Test Condition

Frequency Range of Test : 30 MHz to 300 MHz
 Test Standard : EN 55014-1 : 2006+A1:2009+A2:2010
 Test Date : Jan. 16, 2013
 Temperature/Humidity : 20.5 °C / 47 % R.H.

3.3.2 Limits of Disturbance Power

Item	Frequency Range (MHz)	Limits(dB μ V)	
		Quasi-Peak	Average-Peak
Household and similar appliances	30 - 300	45 - 55	35 - 45

3.3.3 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
Test Receiver	ER-265	LIG NEX1	L0804B002	Jul. 05, 2013	■
Absorbing Clamp	MDS-21	Luthi Elektronik	3813	Oct. 09, 2013	■
3 m SAC	N/A	BRANEN	N/A	-	■
CVCF	DFTT-80	Dae Young Electric Technology Co., Ltd.	1007104-2	N/A	■

3.3.4 Test Result of Disturbance Power Test

EUT : **G1000**
 Test distance : 6 m

Radiated Emission Test Results: PASS

Test data

FREQ. [MHz]	Total[dBpW]		Insertion Loss	Cable Loss	Limit[dBpW]		Margin[dBpW]	
	[QP]	[AV]			[QP]	[AV]	[QP]	[AV]
30.00	36.2	18.8	20.20	0.80	45.00	35.00	-8.77	-16.23
31.14	38.9	26.8	20.09	0.83	45.16	35.16	-6.26	-8.40
45.00	35.8	22.2	18.78	1.16	46.76	36.76	-10.92	-14.61
55.98	42.0	25.8	17.88	1.35	47.71	37.71	-5.70	-11.89
65.00	36.8	23.4	17.25	1.45	48.36	38.36	-11.61	-15.01
90.00	26.7	14.4	16.50	1.74	49.77	39.77	-23.12	-25.41
150.00	28.3	16.4	17.00	2.30	51.99	41.99	-23.67	-25.63
180.00	18.2	10.7	13.70	2.57	52.78	42.78	-34.62	-32.09
220.00	19.2	11.9	15.93	2.89	53.65	43.65	-34.47	-31.77
300.00	19.9	12.6	16.10	3.45	55.00	45.00	-35.15	-32.41

Notes :

Result = Reading + Absorbing Clamp factor + Cable loss

Measurement uncertainty estimated at 4.5 dB.

However, influenced by the sample and the environmental impact is not taken into account.

The measurement uncertainty is given with a confidence of 95 % with the coverage factor, k=2.

Tested by Park, King C.S.

3.3.5 Photograph of Disturbance Power Test



3.4 Radiated Emission Test

Radiated emission from 30 MHz to 1 000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in EN55014-1. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 3.2.5 The interface cables and equipment positions were varied within limits of reasonable application to determine the positions production maximum radiated emissions.

3.4.1 Test Condition

Frequency Range of Test : 30 MHz to 1 000 MHz
 Test Standard
 Test Date
 Class
 Temperature/Humidity

3.4.2 Limits of Radiated Emission

Item	Frequency Range (MHz)	Limits (dB μ V)	
		Quasi-Peak	Average-Peak
<input type="checkbox"/> Class A	30-230	40	N/A
	230-1 000	47	N/A
<input type="checkbox"/> Class B	30-230	30	N/A
	230-1 000	37	N/A

3.4.3 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
EMI Test Receiver	ESVS10	R&S	833206/010	Mar. 13, 2013	<input type="checkbox"/>
Open Site	N/A	CSTech	N/A	-	<input type="checkbox"/>
Turn Table	D-TT 09	Daifl EMC	N/A	-	<input type="checkbox"/>
Ant. Mast	D-AM 06	Daifl EMC	N/A	-	<input type="checkbox"/>
Controller	C84135	Daifl EMC	N/A	-	<input type="checkbox"/>
CVCF	TFC-10	TJ Tech	11F0928	-	<input type="checkbox"/>
Biconical Antenna	3104C	EMCO	9012-4380	Mar. 13, 2014	<input type="checkbox"/>
Log Periodic Antenna	3146	EMCO	9008-2863	Mar. 13, 2014	<input type="checkbox"/>

3.4.4 Test Result of Radiated Emission

EUT :
 Test distance :

Radiated Emission Test Results: N/A
 Test data

Freq. (MHz)	Reading (dB μ V/m)	Pol. (H/V)	ANT. (m)	Correction		Emission Level (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
				A.F. (dB)	C.L. (dB)			

Notes :

*H : Horizontal polarization, **V: Vertical polarization

Result = Reading + Antenna factor + Cable loss

Margin Value = Emission Level - Result

All modes of operation were investigated and the worst-case emissions are reported. See the plots in next pages.

Measurement uncertainty estimated at Horizontal polarization : 3,5 dB, Vertical polarization : 3,7 dB.

However, influenced by the sample and the environmental impact is not taken into account.

The measurement uncertainty is given with a confidence of 95 % with the coverage factor, k=2.

3.4.5 Photographs of Radiated Emission Configuration

[Front]

N/A

[Rear]

N/A

3.5 Power Frequency Harmonics and Flicker Emission Test

Power Frequency Harmonics Tests:

The measured values of the harmonics components of the input current, including line current and neutral and neutral current, shall be compared with the limits given in Clause 7 of EN 61000-3-2.

Flicker Emission Tests:

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 $\pm 8\%$ is achieved during the whole assessment procedure.(EN 61000-3-3)

3.5.1 Test Condition

EUT : **G11800**
 Test Standard : EN 61000-3-2 : 2006+A1:2009+A2:2009
 EN 61000-3-3 : 2008
 Test Date : Jan. 17, 2013
 Device Class : A
 Temperature/Humidity/Pressure : 21.6 °C / 50 % R.H.

3.5.2 Test Equipment List

Equipment Type	Model	Manufacturer	Serial No.	Cal. Due Date	Use
Universal Power Analyzer	PM6000	VOLTECH INSTRUMENTS Ltd	200006700499	Aug. 10, 2013	■
Impedance Network	IEC535 Reference Impedance Network	VOLTECH INSTRUMENTS Ltd	3063	Jun. 01, 2013	■
AC Power Source/ PROGRAMMABLE CONTROLLERS	395AMXT-UPC32/M5283	Pacific	1279	Jul. 05, 2013	■

3.5.3 Test Result of Power Frequency Harmonics and Flicker Emission Tests

Power Frequency Harmonics : PASS
 Flicker Emission Tests : PASS

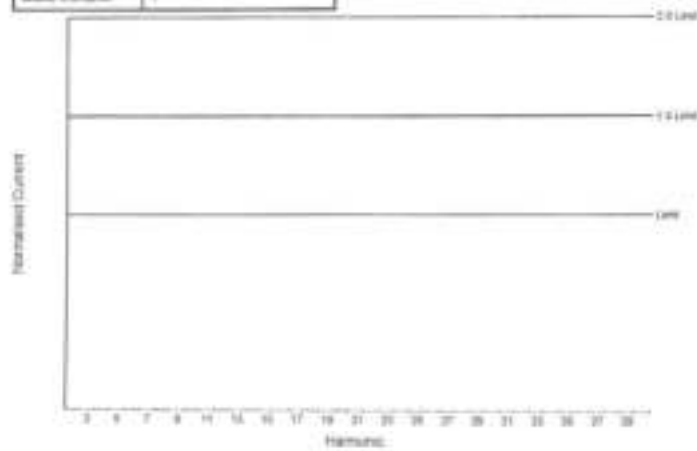
[Harmonics]

Product: QH-CG (LTD)		2013 Jan-17 0:21pm					
Serial no:		Page 1 of 1					
Description:							
Result Name: QH-002							
Voltage: E081000-3 Windows Software 1.24.12		Test Date: 2013 Jan-17 3:20pm					
Type of Test: Fluctuating Harmonics Test - Source Quantization (2008)							
Power Analyzer: Voltech PMS200 S/N: 200000100400 Firmware version: v1.22.0TRC0							
Channel 1: 100 Vrms 50 Hz 20 Adjusted Date: 28 Jul 2012 2.20 Hz Adjusted Date None Channel 2: 200 Vrms Adjusted Date None 4.20 Hz Adjusted Date None Channel 3: 200 Vrms Adjusted Date None 6.20 Hz Adjusted Date None Channel 4: 200 Vrms Adjusted Date None 8.20 Hz Adjusted Date None Channel 5: 200 Vrms Adjusted Date None 10.20 Hz Adjusted Date None Channel 6: 200 Vrms Adjusted Date None 12.20 Hz Adjusted Date None Channel 7: 200 Vrms Adjusted Date None 14.20 Hz Adjusted Date None Channel 8: 200 Vrms Adjusted Date None 16.20 Hz Adjusted Date None Channel 9: 200 Vrms Adjusted Date None 18.20 Hz Adjusted Date None Channel 10: 200 Vrms Adjusted Date None 20.20 Hz Adjusted Date None Channel 11: 200 Vrms Adjusted Date None 22.20 Hz Adjusted Date None Channel 12: 200 Vrms Adjusted Date None 24.20 Hz Adjusted Date None Channel 13: 200 Vrms Adjusted Date None 26.20 Hz Adjusted Date None Channel 14: 200 Vrms Adjusted Date None 28.20 Hz Adjusted Date None Channel 15: 200 Vrms Adjusted Date None 30.20 Hz Adjusted Date None Channel 16: 200 Vrms Adjusted Date None 32.20 Hz Adjusted Date None Channel 17: 200 Vrms Adjusted Date None 34.20 Hz Adjusted Date None Channel 18: 200 Vrms Adjusted Date None 36.20 Hz Adjusted Date None Channel 19: 200 Vrms Adjusted Date None 38.20 Hz Adjusted Date None Channel 20: 200 Vrms Adjusted Date None 40.20 Hz Adjusted Date None Channel 21: 200 Vrms Adjusted Date None 42.20 Hz Adjusted Date None Channel 22: 200 Vrms Adjusted Date None 44.20 Hz Adjusted Date None Channel 23: 200 Vrms Adjusted Date None 46.20 Hz Adjusted Date None Channel 24: 200 Vrms Adjusted Date None 48.20 Hz Adjusted Date None Channel 25: 200 Vrms Adjusted Date None 50.20 Hz Adjusted Date None Channel 26: 200 Vrms Adjusted Date None 52.20 Hz Adjusted Date None Channel 27: 200 Vrms Adjusted Date None 54.20 Hz Adjusted Date None Channel 28: 200 Vrms Adjusted Date None 56.20 Hz Adjusted Date None Channel 29: 200 Vrms Adjusted Date None 58.20 Hz Adjusted Date None Channel 30: 200 Vrms Adjusted Date None 60.20 Hz Adjusted Date None Channel 31: 200 Vrms Adjusted Date None 62.20 Hz Adjusted Date None Channel 32: 200 Vrms Adjusted Date None 64.20 Hz Adjusted Date None Channel 33: 200 Vrms Adjusted Date None 66.20 Hz Adjusted Date None Channel 34: 200 Vrms Adjusted Date None 68.20 Hz Adjusted Date None Channel 35: 200 Vrms Adjusted Date None 70.20 Hz Adjusted Date None Channel 36: 200 Vrms Adjusted Date None 72.20 Hz Adjusted Date None Channel 37: 200 Vrms Adjusted Date None 74.20 Hz Adjusted Date None Channel 38: 200 Vrms Adjusted Date None 76.20 Hz Adjusted Date None Channel 39: 200 Vrms Adjusted Date None 78.20 Hz Adjusted Date None Channel 40: 200 Vrms Adjusted Date None 80.20 Hz Adjusted Date None							
AC Source: Mains / Manual Source							
Overall Result:							
PASS							
	Normal	Measured	Deviation	Allowed Deviation	Result		
Supply Voltage	230.00V	229.98V	0.02V	4.00V	Pass		
Supply Frequency	50.00Hz	49.99Hz	0.01Hz	0.25Hz	Pass		
Power Factor	1.4700	1.4207	0.0493	wt. 0.01	Fail		
Harmonics	Reference	Limit	Result	Harmonics	Reference	Limit	Result
2	0.05%	0.20%	Pass	3	0.05%	0.20%	Pass
4	0.03%	0.20%	Pass	5	0.03%	0.20%	Pass
6	0.02%	0.20%	Pass	7	0.02%	0.20%	Pass
8	0.02%	0.20%	Pass	9	0.02%	0.20%	Pass
10	0.02%	0.20%	Pass	11	0.02%	0.10%	Pass
12	0.02%	0.20%	Pass	13	0.02%	0.10%	Pass
14	0.02%	0.20%	Pass	15	0.02%	0.10%	Pass
16	0.02%	0.20%	Pass	17	0.02%	0.10%	Pass
18	0.02%	0.20%	Pass	19	0.02%	0.10%	Pass
20	0.02%	0.20%	Pass	21	0.02%	0.10%	Pass
22	0.02%	0.20%	Pass	23	0.02%	0.10%	Pass
24	0.02%	0.20%	Pass	25	0.02%	0.10%	Pass
26	0.02%	0.20%	Pass	27	0.02%	0.10%	Pass
28	0.02%	0.20%	Pass	29	0.02%	0.10%	Pass
30	0.02%	0.20%	Pass	31	0.02%	0.10%	Pass
32	0.02%	0.10%	Pass	33	0.02%	0.10%	Pass
34	0.02%	0.10%	Pass	35	0.02%	0.10%	Pass
36	0.02%	0.10%	Pass	37	0.02%	0.10%	Pass
38	0.02%	0.10%	Pass	39	0.02%	0.10%	Pass
40	0.02%	0.10%	Pass				

[Harmonics]

Product	GH-CD, LTD.	2013 Jan 17 5:21pm Page 1 of 1
Serial No.		
Description		
Result Name	GH000	
Voltech IEC61000-3 Harmonic Software: 1.24.12	Test Date:	2013 Jan 17 5:25pm
Type of Test	Fluctuating Harmonics Test - Normalized Voltage Case Bar Chart (C000)	
Power Analyzer	Voltech PA6000 Rev. 20000700469 Firmware version: v1.22 DTRC5 Overview: 1. 30 min (20130116 24 Adjusted Date: 28 Jul 2013) 0. 30 Hours Adjusted Date None 2. 30 Hours Adjusted Date None 4. 30 Hours Adjusted Date None 3. 30 Hours Adjusted Date None 5. 30 Hours Adjusted Date None Details: 1. 30 min (20130116 24 Adjusted Date: 28 Jul 2013) 0. 30 Hours Adjusted Date None 2. 30 Hours Adjusted Date None 4. 30 Hours Adjusted Date None 3. 30 Hours Adjusted Date None 5. 30 Hours Adjusted Date None	
AC Source	Mains / Manual Source	
Overall Result	PASS	

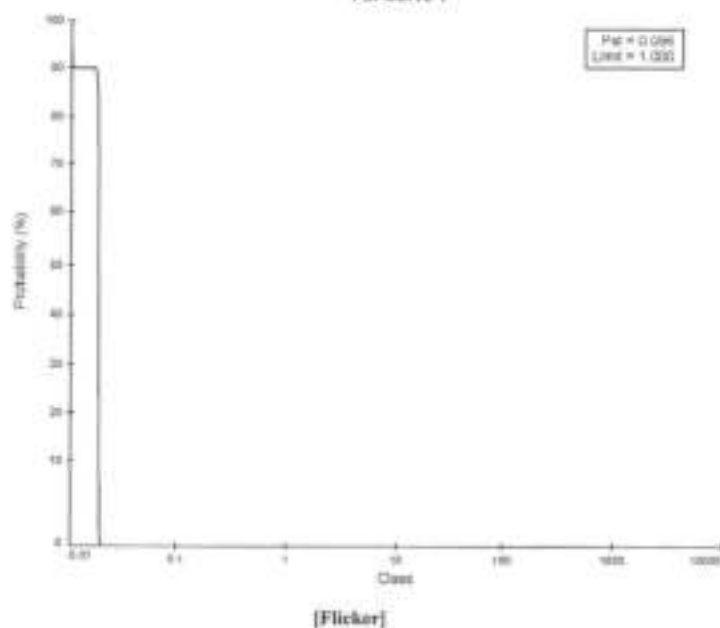
Class	Class A
Class Multiplier	1



[Flicker]

Product	GH-00 - LTD	2013 Jan 17 9:22am
Serial no:		Page 1 of 1
Description		
Result Name	GH-000	
Voltage	IEC61000-3 Windows Software - 1.34.12	Test Date: 2013 Jan 17 9:22am
Type of Test	Flickermeter Test - Pst Curve	
Power Analyser	Votech 754000 SA 300000700499 Firmware Version: v1.22 GTR05	
Channels:		
	1 SA 00180000 2R Adjust Date: 28.01.2013 2 SA None Adjust Date None	
	3 SA None Adjust Date None 4 SA None Adjust Date None	
	5 SA None Adjust Date None 6 SA None Adjust Date None	
Shunts:		
	1 SA 00120000 4 Adjust Date: 20.01.2013 2 SA None Adjust Date None	
	3 SA None Adjust Date None 4 SA None Adjust Date None	
	5 SA None Adjust Date None 6 SA None Adjust Date None	
AC Source	Main / Manual Source	
Overall Result	Notes: Measurement method - Voltage	
PASS		

Pst Curve 1



Product: OH CO., LTD.		2013 Jan 17 9:20pm		
Serial no:		Page 1 of 1		
Description:				
Result Name: OH900				
Vultech ICC1000-3 Windows Software 1.24.12		Test Date: 2013 Jan 17 9:20pm		
Type of Test: Flickermeter Test - Table				
Power Analyzer: Vultech PM6000 SN: 200006750499 Firmware Version: v1.22.07RC5				
Channel:				
1. SN: 09011001976, 20 Adjusted Date: 28 JUL 2012, 2. SN: None Adjusted Date: None				
3. SN: None Adjusted Date: None, 4. SN: None Adjusted Date: None				
5. SN: None Adjusted Date: None, 6. SN: None Adjusted Date: None				
Shunt:				
1. SN: 0112102160, Adjusted Date: 30 JUL 2012, 2. SN: None Adjusted Date: None				
3. SN: None Adjusted Date: None, 4. SN: None Adjusted Date: None				
5. SN: None Adjusted Date: None, 6. SN: None Adjusted Date: None				
AC Source: Mains / Manual Source				
Overall Result:		Notes:		
PASS		Measurement method - Voltage		
	Pat	dc (%)	distar (%)	dist1 + 3.3%(rms)
Limit	1.000	3.300	4.000	600
Reading 1	0.006	0.000	0.636	0

Tested by: Park Kiang Li

3.5.5 Photograph of Harmonics and Flicker Emission Tests Configuration.

[Harmonics and Flicker Emission]



3.6 Electrostatic Discharge Immunity Test

In order to minimize the impact of environmental parameters on test results, the tests shall be carried out in climatic and electromagnetic reference conditions as specified in EN 61000-4-2of 8.1.1 and 8.1.2. The 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. The testing shall be performed by direct and indirect application of discharges to the EUT according to a test plan.

3.6.1 Test Condition

EUT: **GH800**
Test Method: EN 61000-4-2 : 2009
Test Date: Jan. 11, 2013
Performance criterion: B
Temperature/Humidity/Pressure: 21.7 °C / 48 % R.H. / 98.1 kPa.

3.6.2 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
ESD Simulator	ESS-2000	Noiseken	6000C03060	Sep. 23, 2013	■
ESD GUN	TC-815P	Noiseken	600003073	Sep. 23, 2013	■
HCP	N/A	CSTECH	01	-	■
VCP	N/A	CSTECH	02	-	■

3.6.3 Test Result of Electrostatic Discharge Immunity Test

Electrostatic Discharge Immunity Test : PASS


Test data

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
8	+/-	Enclosure(Front), Controller, LED, Button	-	A
8	+/-	Enclosure(Rear)	-	A
4	+/-	Screw	A	-

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	
4	+/-	HCP/VCP	A	



Tested by Park, Kang Uk

[Test Point] Air Discharge (A) 
 Contact Discharge (C) 

[Front]



[Rear]



3.6.4 Photograph of Electrostatic Discharge Immunity Test Configuration

[Electrostatic Discharge Immunity Test]



3.7 Radio Frequency Electromagnetic Field Immunity Test

Tests were conducted in accordance with EN 61000-4-3 over the frequency range of 80 MHz to 1 GHz. The transmitting antenna was located 3 meters from the EUT at a height. Front, sides and back of the EUT were exposed to a uniform field of 3 V/m using both horizontal and vertical antenna polarizations.

3.7.1 Test Condition

EUT :
 Test Standard : EN 61000-4-3 : 2006+A1:2008+A2:2010
 Test Date :
 Test field strength (V/m) :
 Performance criterion :
 Temperature/Humidity/Pressure :

3.7.2 Test Equipment List

Equipment Type	Model	Manufacturer	Serial No.	Cal. Due Date	USE
Integrated measurement system for EMS	IMS	ROHDE & SCHWARZ	100006	Jul. 05, 2013	□
USB adapter(passive)	GP1B-USB-11S	NATIONAL INSTRUMENTS	11B6EP8	-	□
Average Power Sensor	NRP-Z91	ROHDE & SCHWARZ	100435	Jul. 05, 2013	□
Power Amplifier	BLWA 0R30-160/100/40D	BONN	076680B	Jul. 05, 2013	□
Fiber Optic Modem	HD-4413P	ETS	N/A	-	□
High Gain Log-Periodic Ant	HL046Z1	ROHDE & SCHWARZ	100056	-	□

3.7.3 Test Result of Radio Frequency Electromagnetic Field Immunity Test

Electromagnetic Field Immunity Test : N/A

Test data

Frequency Range (MHz)	Position (Angle)	Antenna Polarity	Field Strength (V/m)	Modulation	Result (Criteria)
80-1 000	Front, Rear, Left, Right	Vertical, Horizontal	3	80 %AM(1 kHz)	N/A

3.7.4 Photograph of Radiated Electromagnetic Field Immunity Test Configuration

[Radio-Frequency Electromagnetic Field Immunity Test]

N/A

3.8 Electrical Fast Transient/Burst Immunity Test

Tests were conducted in accordance with EN 61000-4-4. Tests were performed to 1 kV to AC Power lines and 0.5 kV to signal. Connected directly to power supply network cables.

3.8.1 Test Condition

EUT : **GH000**
 Test Standard : EN 61000-4-4 : 2012
 Test Date : Jun. 14, 2013
 Test Voltage : ±1 kV (AC Power Port)
 Performance criterion : B
 Temperature/Humidity/Pressure : 22.0 °C / 49 % R.H. / 98.3 kPa

3.8.2 Test Equipment List

Equipment Type	Model	Manufacturer	Serial No.	Cal. Due Date	Use
NOISE SIMULATOR(EFT)	FNS-AXII A16	NOISEKEN	3000B01366	Sep. 04, 2013	■
Pulse Coupling Network	15-00001A	NOISEKEN	N/A	-	□

3.8.3 Test Result of Electrical Fast Transient / Burst Immunity Test

Electromagnetic field immunity test : PASS

Test data

Line or Port	Voltage	Coupling	Inject Time (sec)	Result (performance criteria)
L	±1 kV	Direct	60	PASS(A)
N	±1 kV	Direct	60	PASS(A)
L - N	±1 kV	Direct	60	PASS(A)



Tested by Park, Kang-Geun

3.8.4 Photograph of Electrical Fast Transient/Burst Immunity Test Configuration

[Electrical Fast Transient/Burst Immunity Test]



3.9 Surge Immunity Test

Tests were conducted in accordance with EN 61000-4-5. Tests were performed to 1.0 kV to AC Line to Line and 2.0 kV Line to Ground.

3.9.1 Test Condition

EUT : **GH800**
 Test Standard : EN 61000-4-5; 2006
 Test Date : Jan. 14, 2013
 Test Voltage : ±1 kV(Line to Line)
 : ±2 kV(Line to Ground)
 Performance criterion : B
 Temperature/Humidity/Pressure : 22.0 °C / 49 % R.H. / 98.3 kPa

3.9.2 Test Equipment List

Equipment Type	Model	Manufacture	Serial No.	Cal. Due Date	Use
Lightning Surge Simulator	LSS-6030	NOISEKEN	1000E00401	Sep. 04, 2013	■
Inter Connection Line Unit	LSS- INJ6400SIG	NOISEKEN	LSS0310165	-	□
Telecom Line Injection Unit	LSS- INJ6401TEL	NOISEKEN	LSS0310163	Sep. 04, 2013	□

3.9.3 Test Result of Surge Immunity Test

Surge Immunity Test : **PASS**

Test data

Line or Port	Voltage	Coupling	Phase(Degree)	Inject (count-min)	Result (performance criteria)
L - N	±1.0 kV	Direct	0,90,180,270	5 times-5 min	PASS(A)


 Tested by Park, King LA

3.9.4 Photograph of Surge Immunity Test Configuration

[Surge Immunity Test]

