CE TEST REPORT

Report Number	:	ETLE070516.321	Report issue date :	June 27, 2007

Model / Serial No.	:	ROMEO I / NONE
Multiple Model Name	:	ROMEO II, W2-360, W2-360E, W2-340, W2-340S, W2-340E, W2-300P, W2-310P, W2-310L
Product Type	:	POU Water Cooler
Applicant	:	HYUNDAI Wacor Tec Co., Ltd.
Address	:	684-49, Gongreung-dong, Nowon-gu, Seoul, Korea
Manufacturer	:	HYUNDAI Wacor Tec Co., Ltd.
Address	:	684-49, Gongreung-dong, Nowon-gu, Seoul, Korea
Test Standard(s)	:	EN 55014-1: 2000 + A1: 2001 + A2: 2002 EN 55014-2: 1997 + A1: 2001 EN 61000-3-2: 2000 EN 61000-3-3: 1995 + A1: 2001
Test Result	:	■ **Positive**
Total pages including Attachments	:	36

Prepared by:	Reviewed by:
Jae Young, Kwon (Test Engineer)	Chon Sik, Kim (Chief Engineer)
	
June 27, 2007	June 27, 2007

ETL Inc.
371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
Tel : 82-2-858-0786 Fax : 82-2-858-0788

Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyeonggi-do, 469-885, Korea

DIRECTORY

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EMC TEST STANDARD(S)

The emc tests were performed according to the following standards:

■ EMC - Directive 89/336/EEC and its amendments

■ EN 55014-1: 2000 + A1: 2001+ A2: 2002

■ Household appliances and similar
☐ Portable tools
☐ Section 7.3.6 Electric and electronic toys
Category B

■ EN 61000-3-2: 2000
■ EN 61000-3-3: 1995 + A1: 2001

■ EN 55014-2: 1997 + A1: 2001

■ Category - I ☐ Category – II

☐ Category – lll ☐ Category - IV

☐ IEC 61000-4-2: 1995 + A1: 1998 + A2: 2000
☐ IEC 61000-4-3: 2002 + A1: 2002
☐ IEC 61000-4-4: 2004
☐ IEC 61000-4-5: 1995 + A1: 2000
☐ IEC 61000-4-6: 1996 + A1: 2000
☐ IEC 61000-4-8: 1993 + A1: 2000
☐ IEC 61000-4-11: 1994 + A1: 2000

Note: *For undated references, the latest edition of the publication at the time of testing (including amendments) was applied.*

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ADDRESS OF THE TEST LABORATORY

■ **ETL Inc. (Seoul office and EMC Laboratory)**

#371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea

■ **ETL Inc. (Yoju EMC Laboratory)**

#584, Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyeonggi-do, 469-885, Korea

ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature	:	15 °C - 35 °C
Humidity	:	30 %R.H. - 60 %R.H.
Atmospheric Pressure	:	86 kPa - 106 kPa

POWER SUPPLY SYSTEM UTILIZED

Power supply system ■ AC 220 V – 240 V, 50 Hz/ 60 Hz; 750 W – 800 W

Voltage Range Test

Preliminary test has been performed with two voltage conditions of 220 V and 240V at the frequencies of 160 kHz and 50 MHz to determine maximum disturbance voltage condition. The measurement result is no maximum disturbance voltage condition. So the test condition is normal AC 230 V, 50 Hz.

SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)

Number of received / tested samples: **1 / 1**

Serial Number: none

DEFINITIONS FOR SYMBOLS USED IN THIS TEST REPORT

■ The black square indicates that the listed condition, standard or equipment is applicable for this report.

☐ Blank box indicates that the listed condition, standard or equipment was not applicable for this report.

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Conducted Emission (Interference Voltage) Test

Conducted emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the 230 V AC power and return leads of the EUT according to the methods defined in EN 55014-1.
The EUT was placed upon a non-metallic table 0,8 m above the horizontal metal reference plane and placed 40 cm from a vertical ground plane which is connected to the horizontal metal ground plane.

☐ **Test not applicable**

■ Test area - shielded room
☐ Anechoic chamber
☐ Full compact chamber

Used test instruments and test accessories please see Attachment B.

Type	Frequency Range (MHz)	Quasi-Peak limit (dBuV)	Average limit (dBuV)
Mains terminals	0,15 to 0,5	66 to 56	59 to 46
	0,5 to 5	56	46
	5 to 30	60	50

■ **Pass** ☐ **Fail**

Minimum limit margin	9,9	dB	at	0,775	MHz
Maximum limit exceeding		dB	at		MHz

Remarks: Please refer to the test data and graph in Attachment A.

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Disturbance Power Emissions Test

Disturbance power emissions form 30 MHz to 300 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 a shielded room, 0.8 m above the ground plane.

☐ **Test not applicable**

■ Test area - Anechoic ferrite lined shielded room

Used test instruments and test accessories please see Attachment B.

Type	Frequency Range (MHz)	Quasi-Peak limit (dBpW)	Average limit (dBpW)
Household	30 - 300	45 - 55	35 - 45

Result:

■ **Pass** ☐ **Fail**

Minimum limit margin	29,2	dB	at	31,929	MHz
Maximum limit exceeding		dB	at		MHz

Remarks: Please refer to the test data and graph in Attachment A.

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Discontinuous Disturbance Emissions Test

Discontinuous disturbance emissions form 148,5 kHz to 30 MHz were measured with a bandwidth of 9 kHz according to the methods defines in EN55014-1. The EUT was placed on a nonmetallic stand in a shielded room, 0,8 m above the ground plane.

☐ **Test not applicable**

■ Test area - Anechoic ferrite lined shielded room

Used test instruments and test accessories please see Attachment B.

Result:

■ **Pass** ☐ **Fail**

Remarks: Please refer to the test data in Attachment A.

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Harmonic Current Emissions and Flicker

Power Frequency Harmonics Tests: The measured values of the harmonics components of the input current, including line current and neutral current, shall be compared with the limits given in 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.

☐ **Test not applicable**

■ Test area - ETL Harmonics test room
☐ Anechoic chamber
☐ Full compact chamber

Used test instruments and test accessories please see Attachment B.

■ **Pass** ☐ **Fail**

Remarks: Please refer to the test data and graph in Attachment A.

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Equipment Under Test (EUT) Test Operation Mode:

The equipment under test was operated under the following conditions during emissions testing:

☐ Standby

■ During the test, EUT was the continuous cooling & heating mode hold down that the discharge water periodically

Configuration of the equipment under test:

■ See constructional data form in Attachment D - Page D2

☐ See product information form(s) in Attachment D - Page D3

The following devices and interface cables were connected during the testing:

	Type	Model	Serial No.	Manufacturer

■ Unshielded power cable : 1,5 m

☐ Shielded cables

☐ Unshielded cables:

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GENERAL REMARKS:

SUMMARY:

All tests according to the regulations cited on page 3 were

■ Performed

☐ **Not** Performed

The Equipment Under Test

■ **Fulfills** the general approval requirements cited on page 3.

☐ **Does not** fulfill the general approval requirements cited on page 3.

Date of receipt of test sample:	May 16, 2007
Test start date:	June 20, 2007
Test end date:	June 22, 2007

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Photograph of test setup: Conducted emissions

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Photograph of test setup: Disturbance Power emissions

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Photograph of test setup: Discontinuous Disturbance Emissions

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Photograph of test setup: Harmonic current/ flicker

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Attachment A

Test Data

and

Test Setup Drawing(s)

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Conducted Emissions Measurement

EUT	POU Water Cooler/ ROMEO I(SN:N/A)
Limit apply to	EN 55014-1
Test Date	June 20, 2007
Operating Condition	Water is continuous cooling & heating mode
Result	Passed by 9,90 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarizations of hot and neutral line.
Detector mode: CISPR Quasi – Peak mode (6 dB Bandwidth: 9 kHz)

Frequency [MHz]	Result [dBuV]		Phase (*H/**N)	Limit [dBuV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Quasi-peak	Average
0,222	38,3	33,3	N	62,8	54,8	24,5	21,5
0,280	38,2	33,0	H	60,8	52,2	22,6	19,2
0,464	37,0	32,2	N	56,6	46,8	19,6	14,6
0,520	37,9	32,9	N	56,0	46,0	18,1	13,1
0,775	40,4	36,1	N	56,0	46,0	15,6	9,9
0,944	37,4	32,0	N	56,0	46,0	18,6	14,0
1,027	37,5	32,0	N	56,0	46,0	18,5	14,0
1,187	37,5	32,0	N	56,0	46,0	18,5	14,0
1,256	37,5	32,0	N	56,0	46,0	18,5	14,0

NOTES :

1. **H : HOT Line , **N : Neutral Line**
2. **Margin value = Limit – Result**
3. **All conditions were investigated and the worst-case emissions are reported.**

Jae Young, Kwon
Test Engineer

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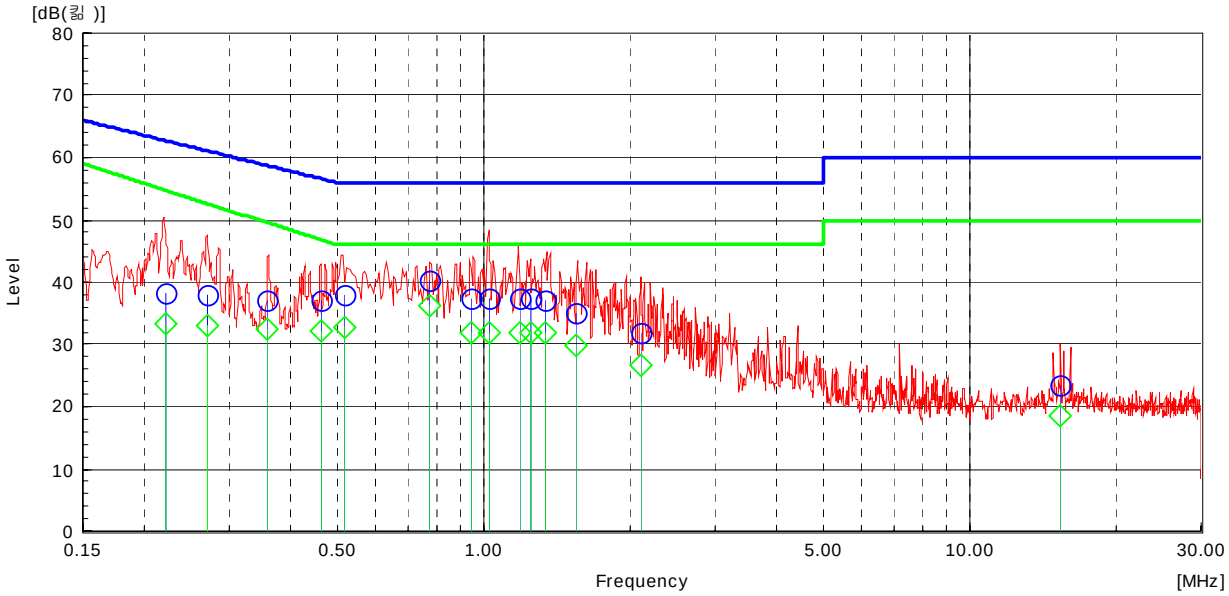
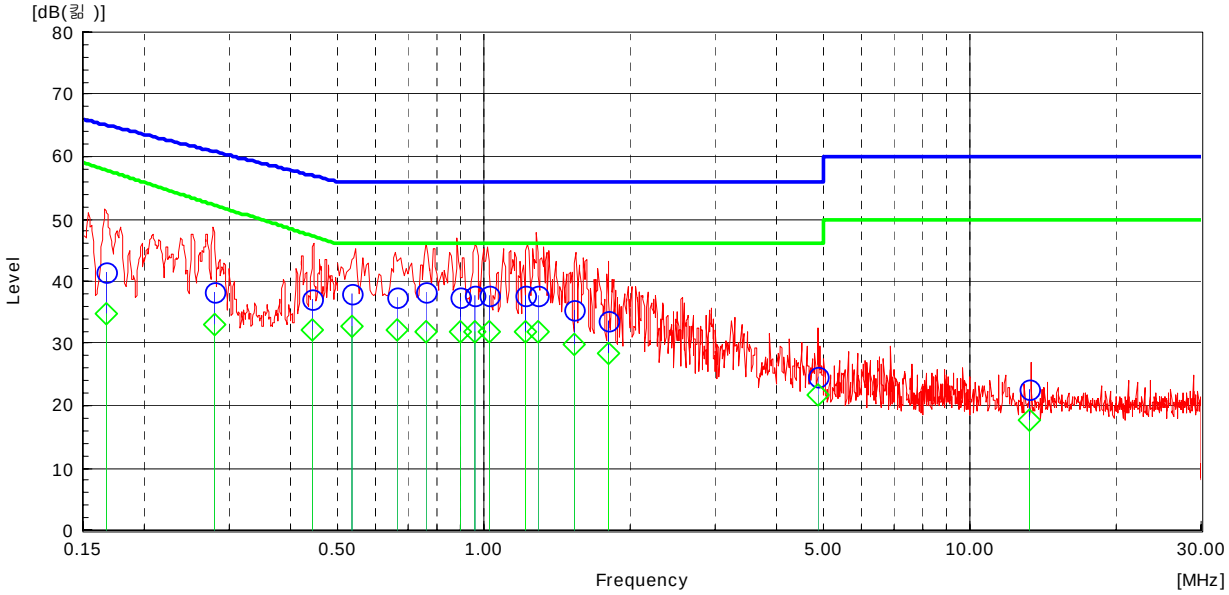
Conducted Emission

Limit : Quasi-peak
Average

Line : Neutral



Line : Hot



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Disturbance Power Measurement

EUT	POU Water Cooler/ ROMEO I (SN:N/A)
Limit apply to	EN 55014-1
Test Date	June 21, 2007
Operating Condition	Water is continuous cooling & heating mode
Result	Passed by 29,2 dB

Disturbance Power Test Data

Frequency [MHz]	Result [dBuV]		Limit [dBuV]		Margin [dB]	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
31,929	15,9	-	45,1	35,1	29,2	-
61,243	14,2	-	46,2	36,2	32,0	-
103,671	13,4	-	47,8	37,8	34,4	-

Jae Young, Kwon
Test Engineer

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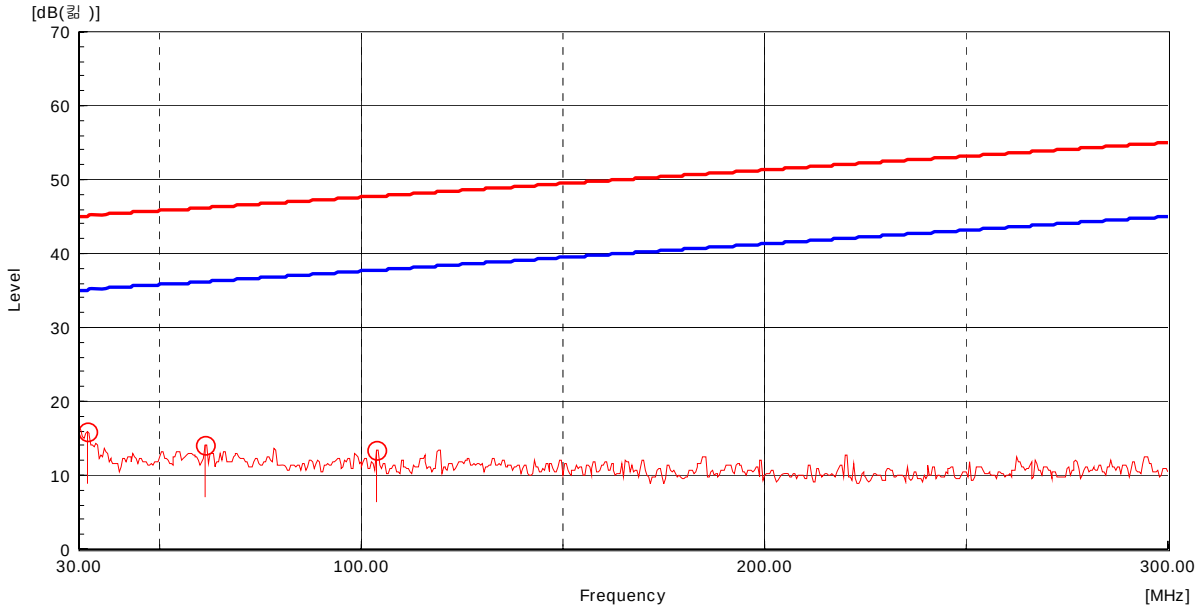

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Discontinuous Disturbance Measurement

EUT	POU Water Cooler/ ROMEO I (SN:N/A)
Limit apply to	EN 55014-1
Test Date	June 22, 2007
Operating Condition	Water is continuous cooling & heating mode
Result	Passed

Phase : Hot(dB㎶)

Click	150 kHz	500 kHz	1,4 MHz	30 MHz
1	O	71,12	O	O
2	O	O	O	O
3	O	O	O	O
4	86,99	O	O	O
5	O	O	O	O
6	O	O	O	O
7	O	O	O	O
8	O	78,29	O	O
9	O	O	O	O
10	O	O	O	O
11	O	O	60,76	O
12	O	O	O	O
13	O	O	O	O
14	O	O	O	O
15	O	73,18	O	O
16	O	O	O	O
17	O	O	O	O
18	O	O	O	O
19	O	O	43,02	O
20	O	O	O	O

Click	150 kHz	500 kHz	1,4 MHz	30 MHz
21	O	O	O	O
22	O	O	O	O
23	O	79,56	O	O
24	O	O	O	O
25	O	O	O	O
26	O	O	61,14	O
27	O	O	O	O
28	O	O	O	O
29	O	O	O	O
30	O	O	O	O
31	O	O	O	O
32	53,47	O	O	O
33	O	O	O	O
34	O	O	O	O
35	O	O	65,88	O
36	O	O	O	O
37	O	O	O	O
38	O	O	O	O
39	O	O	62,30	O
40	O	O	O	O

Lc = 20 log (30/N) =
N = Click / min
Click = 10 ms < C time < 200 ms
(Industry machine + 10 dB)
Measurement Relay Time; 5 min

N < 0.2 (5min) + 44 dB
0.2 < N < 30 + Lc
N > 30 (2sec) + 0 dB

Click Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz
Contin.Limit L st	66	56	56	60
Click Rate	1	4	4	O
Click level Lc	43.52	31.48	31.48	44
L = Lc + Lst	103.52	87.48	87.48	104
Number of Click	O	O	O	O
Numer over limit	O	O	O	O
Passed	PASS	PASS	PASS	PASS

REMARKS:

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Phase : Neutral(dBμV)

Click	150 kHz	500 kHz	1.4 MHz	30 MHz
1	O	O	O	O
2	O	O	O	O
3	O	74,28	O	O
4	O	O	O	O
5	82,84	O	O	O
6	O	O	O	O
7	O	O	O	O
8	O	O	O	O
9	O	81,02	O	O
10	O	O	O	O
11	O	O	O	O
12	O	O	70,65	O
13	O	O	O	O
14	O	O	O	O
15	O	79,69	O	O
16	O	O	O	O
17	O	O	O	O
18	O	O	O	O
19	O	O	37,04	O
20	O	O	O	O

Click	150 kHz	500 kHz	1.4 MHz	30 MHz
21	O	O	O	O
22	O	O	O	O
23	O	78,15	O	O
24	O	O	O	O
25	O	O	O	O
26	O	O	69,48	O
27	O	O	O	O
28	O	O	O	O
29	O	O	O	O
30	O	O	63,18	O
31	O	O	O	O
32	O	O	O	O
33	O	O	66,10	O
34	O	O	O	O
35	O	O	O	O
36	44,49	O	O	O
37	O	O	O	O
38	O	O	O	O
39	O	O	O	O
40	O	O	O	O

Lc = 20log (30/N) =
N = Click / min
Click = 10ms < C time < 200ms
(Industry machine + 10dB)
Measurement Relay Time; 5 min

N < 0.2 (5min) + 44dB
0.2 < N < 30 + Lc
N > 30 (2sec) + 0dB

Click Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz
Contin.Limit L st	66	56	56	60
Click Rate	1	4	4	O
Click level Lc	43.52	31.48	31.48	44
L = Lc + Lst	103.52	87.48	87.48	104
Number of Click	O	O	O	O
Numer over limit	O	O	O	O
Passed	PASS	PASS	PASS	PASS

REMARKS:

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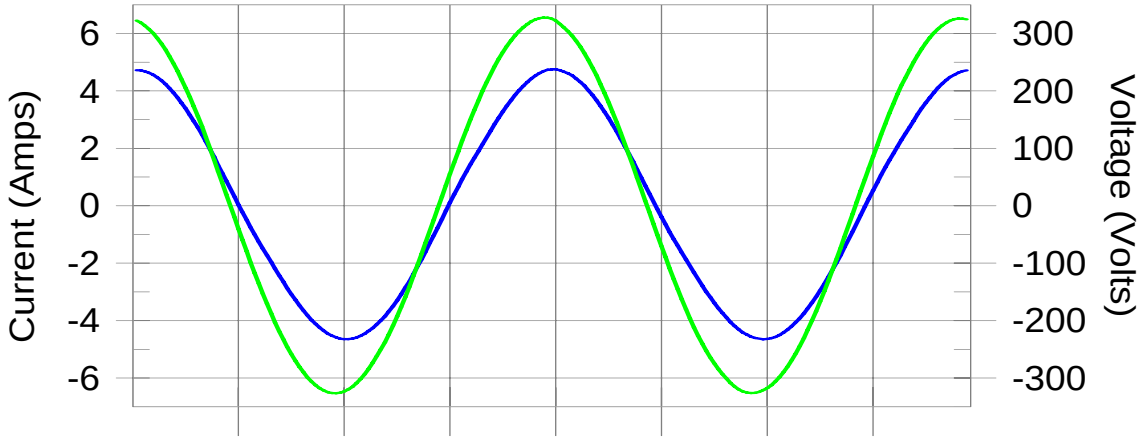
Harmonics – Class-A

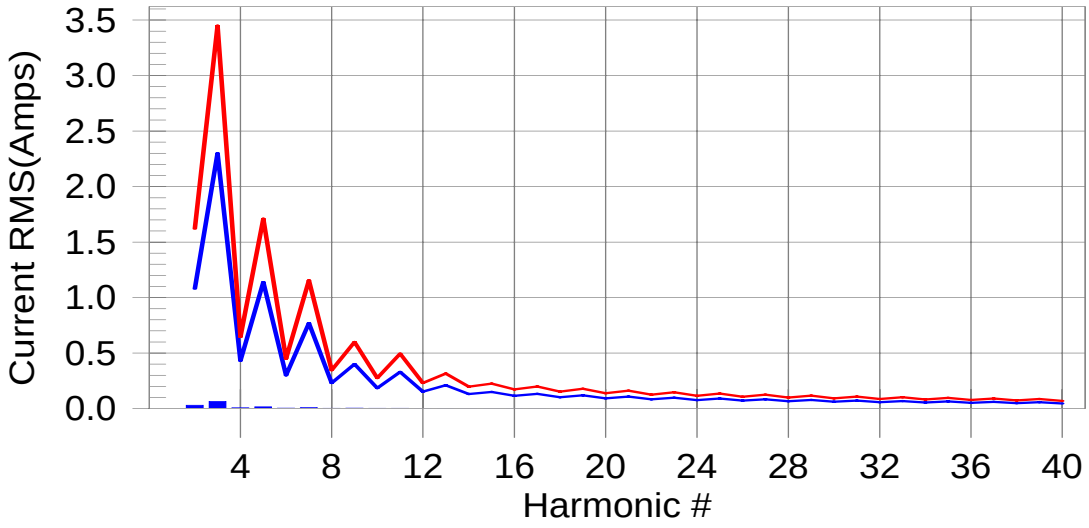
EUT: ROMEO I **Tested by: Jae Young, Kwon**
Test category: Class-A **Test Margin: 100**
Test date: 2007-06-20 **Start time: 13:49:40** **End time: 13:54:50**
Test duration (min): 5 **Data file name: H-000045.cts_data**
Comment:
Customer: HYUNDAI Wacor Tec Co., Ltd.

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass Worst harmonic was #2 with 1.89% of the limit.

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Current Test Result Summary (Run time)

EUT: ROMEO I **Tested by: Jae Young, Kwon**
Test category: Class-A **Test Margin: 100**
Test date: 2007-06-20 **Start time: 13:49:40** **End time: 13:54:50**
Test duration (min): 5 **Data file name: H-000045.cts_data**
Comment:
Customer: HYUNDAI Wacor Tec Co., Ltd.

Test Result: Pass **Source qualification: Normal**
THC(A): 0.07 **I-THD(%): 2.21** **POHC(A): 0.002** **POHC Limit(A): 0.251**
Highest parameter values during test:

V_RMS (Volts):	230.77	Frequency(Hz):	50.00
I_Peak (Amps):	4.775	I_RMS (Amps):	3.272
I_Fund (Amps):	3.269	Crest Factor:	1.461
Power (Watts):	744.3	Power Factor:	0.986

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.030	1.080	2.8	0.031	1.620	1.89	Pass
3	0.063	2.300	2.7	0.064	3.450	1.85	Pass
4	0.006	0.430	1.4	0.006	0.645	1.01	Pass
5	0.014	1.140	1.2	0.015	1.710	0.85	Pass
6	0.003	0.300	1.0	0.003	0.450	0.75	Pass
7	0.007	0.770	0.9	0.008	1.155	0.67	Pass
8	0.002	0.230	0.7	0.002	0.345	0.62	Pass
9	0.003	0.400	0.7	0.003	0.600	0.52	Pass
10	0.002	0.184	1.2	0.003	0.276	0.99	Pass
11	0.002	0.330	0.5	0.002	0.495	0.42	Pass
12	0.002	0.153	1.1	0.002	0.230	0.86	Pass
13	0.001	0.210	0.5	0.002	0.315	0.49	Pass
14	0.001	0.131	0.9	0.001	0.197	0.73	Pass
15	0.001	0.150	0.6	0.001	0.225	0.51	Pass
16	0.001	0.115	0.7	0.001	0.173	0.62	Pass
17	0.001	0.132	0.7	0.001	0.199	0.57	Pass
18	0.001	0.102	0.7	0.001	0.153	0.64	Pass
19	0.001	0.118	0.7	0.001	0.178	0.58	Pass
20	0.001	0.092	0.7	0.001	0.138	0.70	Pass
21	0.001	0.107	0.6	0.001	0.161	0.55	Pass
22	0.001	0.084	0.9	0.001	0.125	0.80	Pass
23	0.001	0.098	0.6	0.001	0.147	0.55	Pass
24	0.001	0.077	0.9	0.001	0.115	0.76	Pass
25	0.001	0.090	0.6	0.001	0.135	0.55	Pass
26	0.001	0.071	1.0	0.001	0.106	0.85	Pass
27	0.001	0.083	0.7	0.001	0.125	0.56	Pass
28	0.001	0.066	1.0	0.001	0.099	0.82	Pass
29	0.001	0.078	0.8	0.001	0.116	0.62	Pass
30	0.001	0.061	1.4	0.001	0.092	1.06	Pass
31	0.001	0.073	0.8	0.001	0.109	0.62	Pass
32	0.001	0.058	1.1	0.001	0.086	0.89	Pass
33	0.001	0.068	0.8	0.001	0.102	0.63	Pass
34	0.001	0.054	1.4	0.001	0.081	1.09	Pass
35	0.001	0.064	0.8	0.001	0.096	0.65	Pass
36	0.001	0.051	1.2	0.001	0.077	0.94	Pass
37	0.000	0.061	0.8	0.001	0.091	0.68	Pass
38	0.001	0.048	1.1	0.001	0.073	0.89	Pass
39	0.000	0.058	0.8	0.001	0.087	0.68	Pass
40	0.000	0.046	1.0	0.001	0.069	0.79	Pass

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EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyeonggi-do, 469-885, Korea

Voltage Source Verification Data

EUT: ROMEO I **Tested by: Jae Young, Kwon**
Test category: Class-A **Test Margin: 100**
Test date: 2007-06-20 **Start time: 13:49:40** **End time: 13:54:50**
Test duration (min): 5 **Data file name: H-000045.cts_data**
Comment:
Customer: HYUNDAI Wacor Tec Co., Ltd.

Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	**230.77**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**4.775**	**I_RMS (Amps):**	**3.272**
I_Fund (Amps):	**3.269**	**Crest Factor:**	**1.461**
Power (Watts):	**744.3**	**Power Factor:**	**0.986**

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.160	0.462	34.67	OK
3	0.714	2.077	34.37	OK
4	0.098	0.462	21.18	OK
5	0.075	0.923	8.14	OK
6	0.056	0.462	12.17	OK
7	0.055	0.692	7.95	OK
8	0.052	0.462	11.32	OK
9	0.057	0.462	12.38	OK
10	0.044	0.462	9.56	OK
11	0.039	0.231	16.95	OK
12	0.134	0.231	57.96	OK
13	0.033	0.231	14.32	OK
14	0.030	0.231	13.01	OK
15	0.026	0.231	11.42	OK
16	0.043	0.231	18.46	OK
17	0.028	0.231	12.24	OK
18	0.031	0.231	13.45	OK
19	0.024	0.231	10.19	OK
20	0.036	0.231	15.46	OK
21	0.021	0.231	8.98	OK
22	0.021	0.231	9.28	OK
23	0.019	0.231	8.14	OK
24	0.039	0.231	16.97	OK
25	0.020	0.231	8.46	OK
26	0.020	0.231	8.65	OK
27	0.015	0.231	6.58	OK
28	0.019	0.231	8.07	OK
29	0.014	0.231	6.26	OK
30	0.014	0.231	6.28	OK
31	0.012	0.231	5.38	OK
32	0.014	0.231	6.11	OK
33	0.013	0.231	5.60	OK
34	0.011	0.231	4.86	OK
35	0.011	0.231	4.70	OK
36	0.016	0.231	7.05	OK
37	0.011	0.231	4.82	OK
38	0.010	0.231	4.39	OK
39	0.010	0.231	4.16	OK
40	0.023	0.231	9.78	OK

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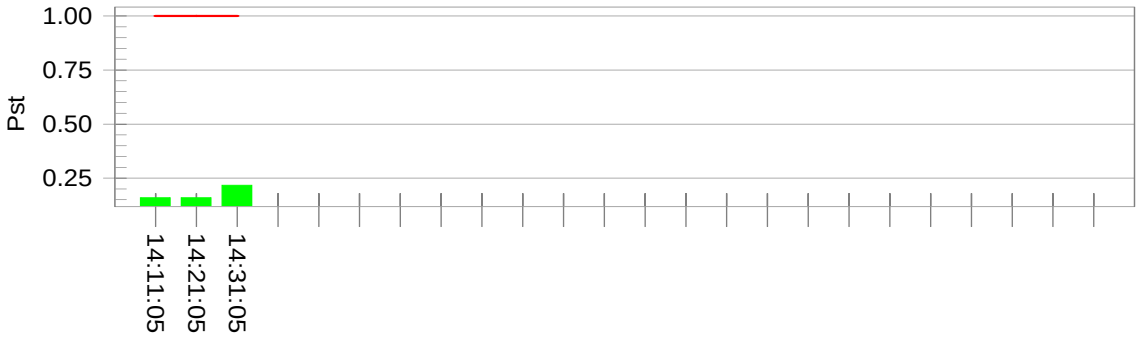
Flicker Test Summary

EUT: ROMEO I **Tested by: Jae Young, Kwon**
Test category: All parameters **Test Margin: 100**
Test date: 2007-06-20 **Start time: 14:00:45** **End time: 14:31:06**
Test duration (min): 30 **Data file name: F-000046.cts_data**
Comment:
Customer: HYUNDAI Wacor Tec Co., Ltd.

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

Pst_i and limit line **European Limits**



Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt):	**230.53**			
Highest dt (%):	**0.25**	**Test limit (%):**	**3.30**	**Pass**
Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.45**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.42**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.217**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.115**	**Test limit:**	**0.650**	**Pass**

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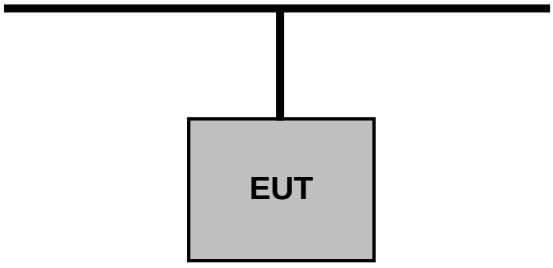
The setup drawing(s)



: DATA LINE

: POWER LINE

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Attachment B

List of Test Equipment

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Emission Test Equipments

	Description	Model Number	Manufacturer	Serial Number	Cal Due Date
■	EMI Test Receiver	ESPI3	R & S	100478	07.10.17
■	EMI TEST RECEIVER	ESVS 10	R&S	835165/001	08.05.03
■	LISN	3816/2	EMCO	1002	07.10.17
■	Filcker Meter	CCN1000-1LR1	Schaffner	X71836	N/A
■	AC Power Source	ProfLine 2105-400	Schaffner	HK53887	07.10.18
■	ABSORBING CLAMP	MDS-21	R&S	831676/013	08-03-21

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Attachment C

Constructional Photographs

of

Equipment Under Test (EUT)

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View of front

View of rear

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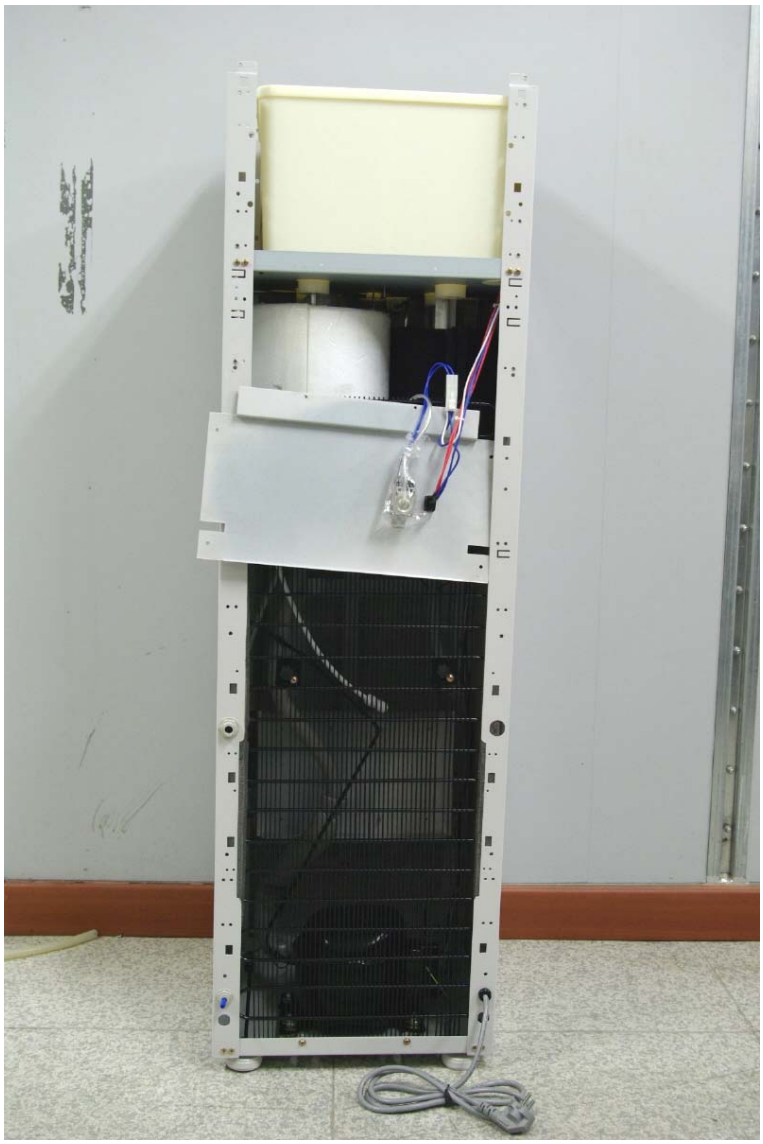
Internal view of EUT



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Top side view LED board

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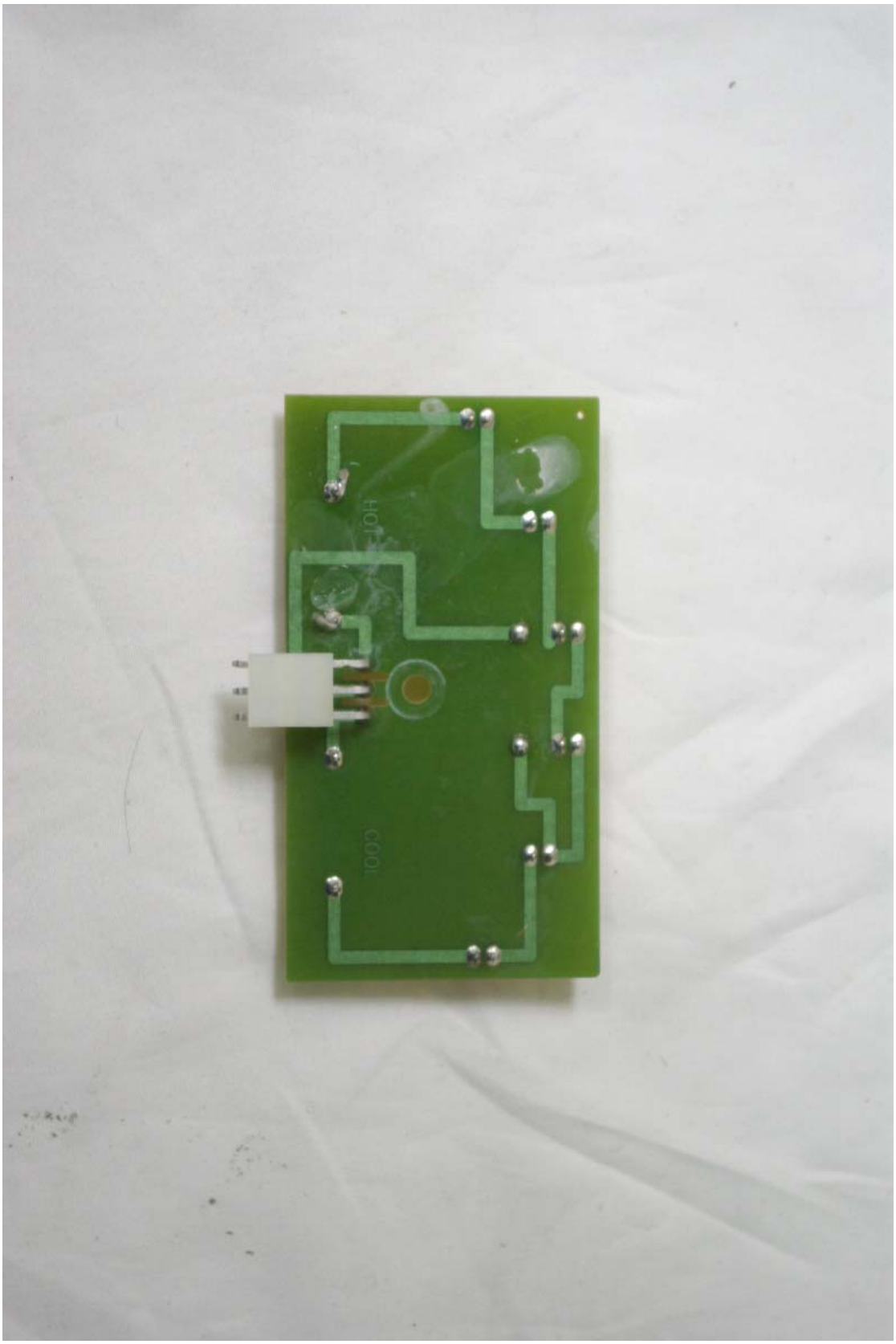
Bottom side view LED board



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Attachment D

Constructional Data Form

and

Product Information Form(s)

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CONSTRTUCTION DATAFORM FOR EMC – TESTING

Applicant	: HYUNDAI Wacor Tec Co., Ltd.		
Address	: 684-49, Gongreung-dong, Nowon-gu, Seoul, Korea		
Factory	: HYUNDAI Wacor Tec Co., Ltd.		
Address	: 684-49, Gongreung-dong, Nowon-gu, Seoul, Korea		
Type	: POU Water Cooler	Rated voltage	: AC 220 V – 240 V, 50 Hz/ 60 Hz;
			750 W – 800 W
Serial No.	: N/A	Rated input power	:
Protection type	:	Protection class	:

Configuration of equipment:

	Rev.	:
	Rev.	:
	Rev.	:

Source of interference	:
Internal frequency	:
Noise suppression components	:
Measures for electromagnetic shielding	:

Place of issue	date	Seal and signature of applicant

If applicable, if necessary complete overleaf

End of test report

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