



Korea Standard Testlab
#107-25, Jangdeokdong-gil, Namyang-cup, Hwasong-si, Gyeonggi-do, Korea
Tel : +82-31-356-7333 FAX : +82-31-356-7303



CE CONFORMANCE TEST REPORT

Report No. : KST-CEM-240045
Date of Issue : December 31, 2024
Model : ROMEO 1
Variant Model : ROMEO 2, ROMEO 3, JULIT, JULIT 3, W2-340, W2-340E, W2-340S, W2-340H, W2-360, W2-360H
Kind of Product : Hot & Cold water purifier system
Applicant : WACO.Corp
Applicant's Address : A-301, 10, Nowon-ro 15-gil, Nowon-gu, Seoul, Republic of Korea
Manufacturer : Same as above
Test Period : Start : November 14, 2024 End : November 14, 2024
Test Result : ☒ In Compliance ☐ Not in Compliance
Applicable Standard : EN IEC 55014-1:2021
EN IEC 55014-2:2021
EN IEC 61000-3-2:2019/A1:2021
EN 61000-3-3:2013/A2:2021

Tested by

Seung-Yeop, Lee
EMC Test Engineer

Reviewed by

Jae-Beom, Cho
EMC Technical Manager

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Report Number : KST-CEM-240045

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KSTFR-P30-14(Rev.3.0)

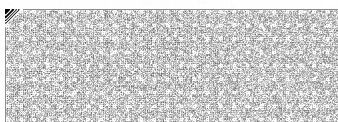
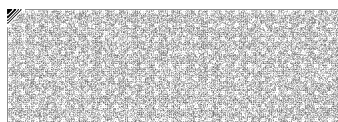


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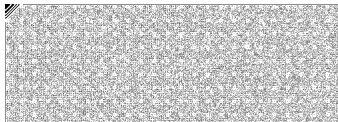




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1. General Product Description

EUT Name	Hot & Cold water purifier system
Model	ROMEO 1
Variant Model	ROMEO 2, ROMEO 3, JULIT, JULIT 3, W2-340, W2-340E, W2-340S, W2-340H, W2-360, W2-360H
Dimension (mm)	Width : 370 Depth : 400 Height : 1 290
Rated Voltage	AC 230 V, 50 Hz
Test Voltage	AC 230 V, 50 Hz
Maximum Operating Frequency	12 MHz





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2. Device Modification

- Not applicable.

3. Model Difference

- Differences in product design and water tank capacity.



4. EUT / Support Equipment / External I/O Cabling

■ EUT

Description	Model Number	Serial Number	Manufacturer
Hot & Cold water purifier system	ROMEO 1	-	WACO.Corp

☐ Peripheral Devices

Description	Model Number	Serial Number	Manufacturer

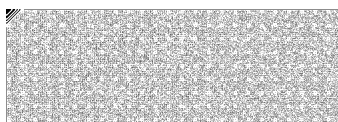
For more details, please refer to the Appendix A for individual test set-up configuration(s).

☐ System Configuration

Description	Model Number	Serial Number	Manufacturer

■ Cable Description

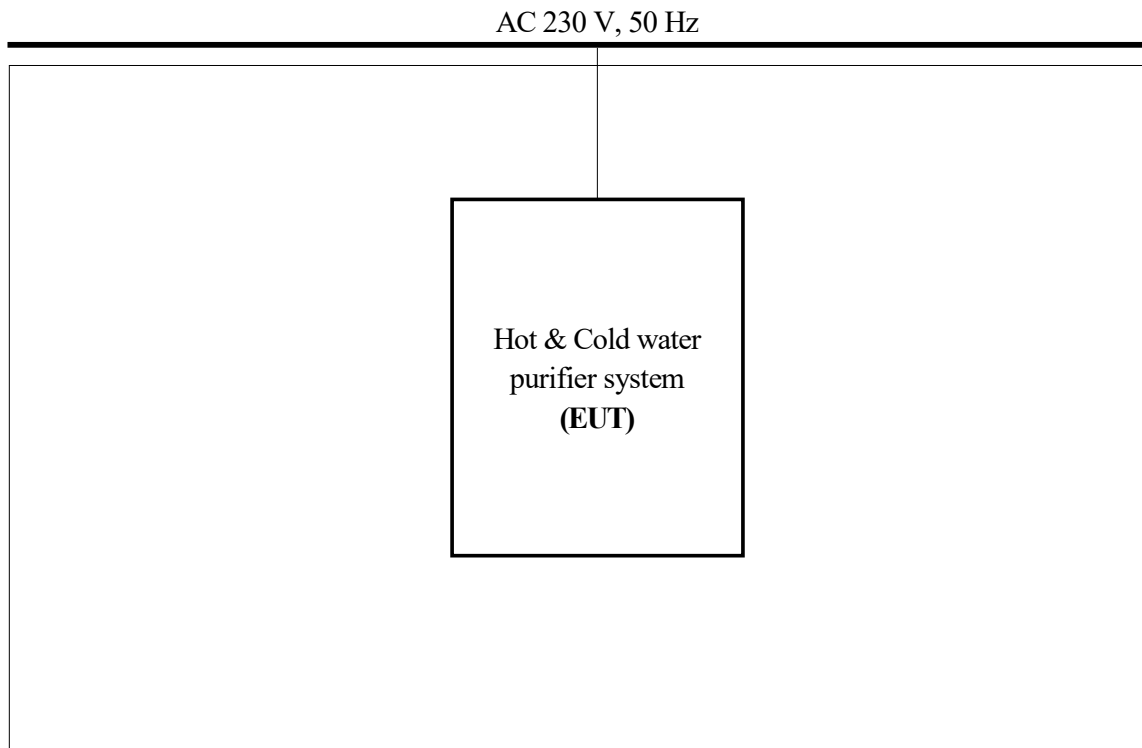
Description	I/O Port	Description	I/O Port	Length (m)	Shielded
Hot & Cold water purifier system	AC IN	AC SOURCE	AC OUT	1.0	Unshielded



5. EUT Operating Mode

- After placing the EUT as shown in the layout diagram below, tested while operating hot water mode and cold water mode simultaneously.

6. Configuration of Test System





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7. Calibration Detail of Equipments Used for Measurement

The test and measurement equipments including accessories are periodically calibrated to ensure its operating within its specified parameters by a calibration institution as accredited according to ISO/IEC 17025.

8. Laboratory Information

8.1 Address of the test laboratory

- ☒ (Branch site) 107-25 Jangdeokdong-gil Namyang-eup Hwaseong-si Gyonggi-do Korea
☐ (Satellite facilities-1) 107-27 Jangdeokdong-gil Namyang-eup Hwaseong-si Gyonggi-do Korea

8.2 Laboratory Accreditation

Korea Standard Testlab has been accredited as a designated testing laboratory by National Radio Research Agency in Korea under ISO/IEC 17025. Its Lab Code is KR0155



9. Test Regulations

The emissions and immunity tests were performed according to following regulations :

☒ EMC - Directive 2014/30/EU

☐ Radio Equipment - Directive 2014/53/EU

☐ EN IEC 61000-6-1:2019

☐ EN IEC 61000-6-2:2019

☐ EN IEC 61000-6-3:2021

☐ EN IEC 61000-6-4:2019

☐ EN 55011:2016/A11:2020

☐ Group 1

☐ Group 2

☐ Class A

☐ Class B

☐ EN 50130-4:2011/A1:2014

☒ EN IEC 55014-1:2021

☒ EN IEC 55014-2:2021

☐ Category C1

☒ Category C2

☐ Category C3

☐ Category C4

☐ Category C5

☐ EN 60034-1:2010

☐ EN IEC 55015:2019/A11:2020

☐ EN 55024:2010/A1:2015

☐ EN IEC 61326-2-1:2021

☐ EN IEC 61326-1:2021

☐ EN IEC 61547:2023

☐ EN 50415:2003

☐ EN 55032:2015/A11:2020

☐ Class A

☐ Class B

☐ EN 55035:2017/A11:2020

☒ EN IEC 61000-3-2:2019/A1:2021

☒ EN 61000-3-3:2013/A2:2021

☐ EN 301 489-1 V2.2.3

☐ Class A

☐ Class B

☐ EN 301 489-3 V2.1.2

☐ EN 301 489-17 V3.2.4

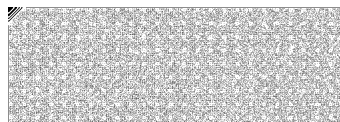
☐ EN IEC 61800-3:2018

☐ Category C1

☐ Category C2

☐ Category C3

☐ Category C4





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☐ FCC Part 15 Subpart B

☐ Class A

☐ Class B

☐ CISPR 11:2024

☐ Group 1

☐ Group 2

☐ Class A

☐ Class B

☐ CISPR 14-1:2020

☐ CISPR 15:2018

☐ J 55014-1(H27)

☒ EN 61000-4-2:2009

☐ EN 61000-4-3:2006+A2:2010

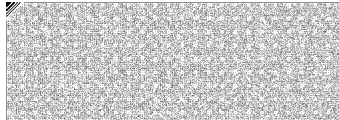
☒ EN 61000-4-4:2012

☒ EN 61000-4-5:2014+A1:2017

☒ EN 61000-4-6:2014

☐ EN 61000-4-8:2010

☒ EN IEC 61000-4-11:2020





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9.1. Conducted Disturbance Voltages

Test Date and Condition

Date	November 14, 2024	Temperature	17.3 °C	Humidity	58.0 %
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Test Location

Shield Room

Test Equipment

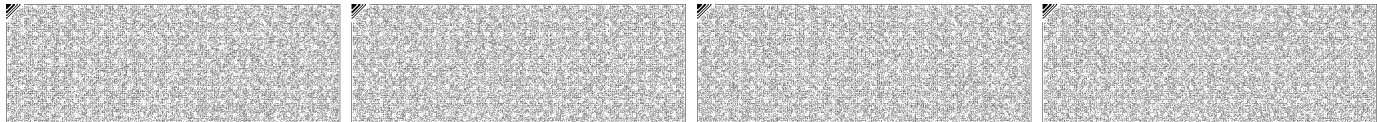
	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	TEST Receiver	ROHDE & SCHWARZ	ESPI	101014	2025.02.21
□	LISN	HAMEG	HM6050-2	043810114	2025.02.21
■	LISN	ROHDE & SCHWARZ	ENV216	101732	2025.02.21

Frequency Range of Measurement

150 kHz to 30 MHz

Test Results

The requirements are : ■ MET □ NOT MET □ NOT APPLICABLE

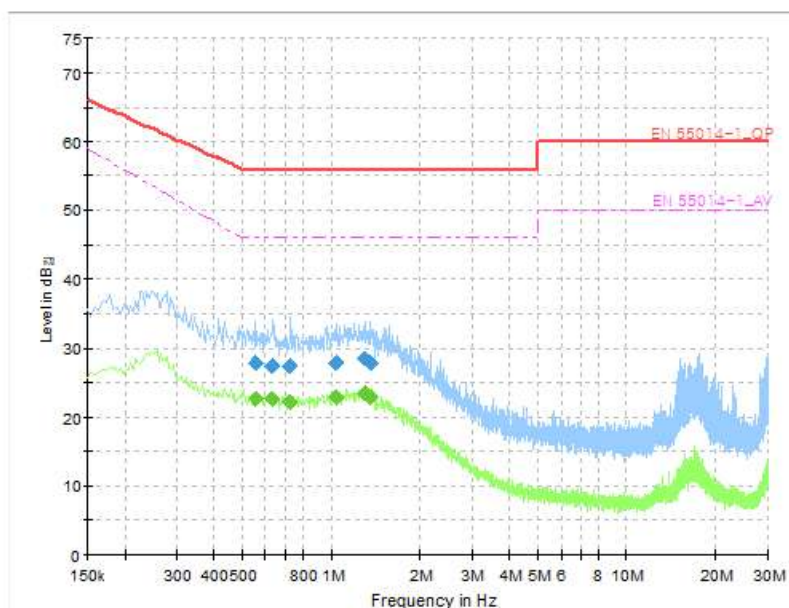


Conducted Disturbance Voltage [0.15 MHz -30 MHz] : AC Power Ports

[Line]

Common Information

Test Description:	N-240172-WACO-ROMEO 1-CE-L
Test Site:	Shield room
Test Standard:	EN 55014-1
Environment Conditions:	AC 230 V, 50 Hz
Operator Name:	ESY
Comment:	



Final Result

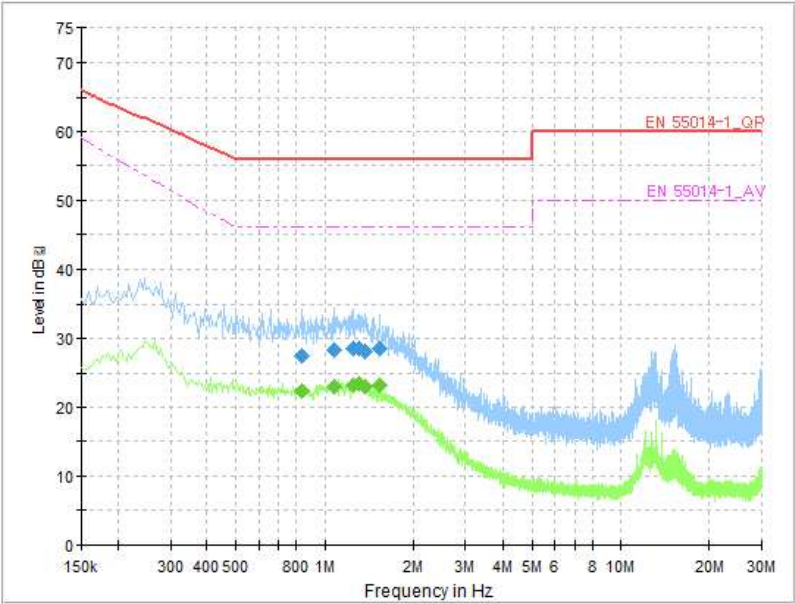
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.550000	---	22.72	46.00	23.28	L1	9.9
0.550000	27.80	---	56.00	28.20	L1	9.9
0.634000	---	22.56	46.00	23.44	L1	9.9
0.634000	27.51	---	56.00	28.49	L1	9.9
0.726000	---	22.29	46.00	23.71	L1	9.9
0.726000	27.36	---	56.00	28.64	L1	9.9
1.034000	---	22.90	46.00	23.10	L1	9.8
1.034000	27.88	---	56.00	28.12	L1	9.8
1.294000	---	23.38	46.00	22.62	L1	9.8
1.294000	28.44	---	56.00	27.56	L1	9.8
1.362000	---	22.87	46.00	23.13	L1	9.8
1.362000	27.91	---	56.00	28.09	L1	9.8



[Neutral]

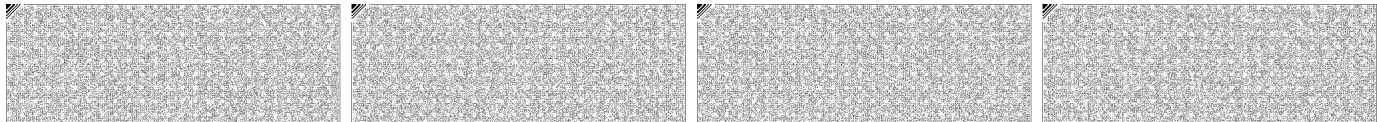
Common Information

Test Description: N-240172-WACO-ROMEO 1-CE-N
Test Site: Shield room
Test Standard: EN 55014-1
Environment Conditions: AC 230 V, 50 Hz
Operator Name: ESY
Comment:



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.842000	---	22.44	46.00	23.56	N	9.9
0.842000	27.43	---	56.00	28.57	N	9.9
1.078000	---	23.10	46.00	22.90	N	9.8
1.078000	28.25	---	56.00	27.75	N	9.8
1.242000	---	23.33	46.00	22.67	N	9.8
1.242000	28.44	---	56.00	27.56	N	9.8
1.306000	---	23.37	46.00	22.63	N	9.8
1.306000	28.45	---	56.00	27.55	N	9.8
1.382000	---	23.04	46.00	22.96	N	9.8
1.382000	28.07	---	56.00	27.93	N	9.8
1.538000	---	23.32	46.00	22.68	N	9.8
1.538000	28.52	---	56.00	27.48	N	9.8



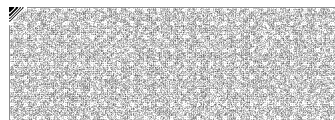
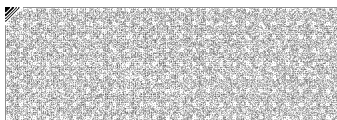


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☐ Conducted Disturbance Voltage [0.15-30 MHz] : Telecommunication Ports

N/A





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9.2. Discontinuous disturbance

Test Date and Condition

Date	November 14, 2024	Temperature	17.4 °C	Humidity	57.0 %
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Test Location

Shield Room

Test Equipment

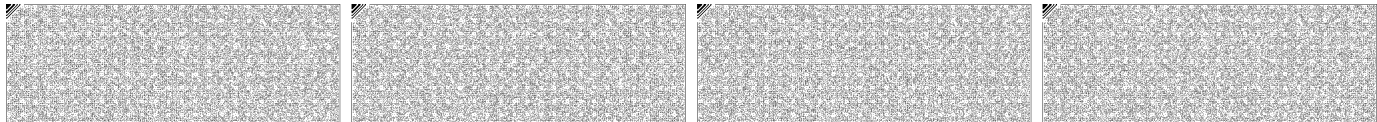
	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Click Meter	AFJ	CL55C	55041245206	2025.05.16
■	LISN	ROHDE & SCHWARZ	ENV216	101732	2025.02.21

Frequency Range of Measurement

150 kHz, 500 kHz, 1.4 MHz, 30 MHz

Test Results

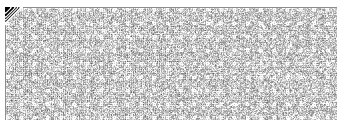
The requirements are : ☒ MET ☐ NOT MET ☐ NOT APPLICABLE



■ Discontinuous disturbance

Observation time : 120 min.

Frequency (MHz)	150 kHz	500 kHz	1.4 MHz	30 MHz
Continuous disturbance Limit(L)	66 dB(uV)	56 dB(uV)	56 dB(uV)	60 dB(uV)
Click number(1st)	0	0	0	0
Click rate(N)	0	0	0	0
Allow click number (upper quartile)	0	0	0	0
Margin(ΔL)	44	44	44	44
Click limit(Lq)	110	100	100	104
Click number(2nd)	0	0	0	0
Tested result	Pass	Pass	Pass	Pass



9.3. Disturbance power

Test Date and Condition

Date		Temperature:	℃	Humidity	%
------	--	--------------	---	----------	---

Test Location

Anechoic chamber

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
☐	Absorbing clamp	ROHDE & SCHWARZ	MDS21	4195	2025.05.21
☐	TEST Receiver	ROHDE & SCHWARZ	ESPI	101014	2025.02.21

Frequency Range of Measurement

30 MHz to 300 MHz

Test Results

 The requirements are : ☐ MET ☐ NOT MET ☒ NOT APPLICABLE


☐ **Disturbance power (30 MHz - 300 MHz)**

Freq. (MHz)	Correction Factor	QP / AV			
			Limit (dBuV)	Corrected Amplitude (dBuV)	Margin

* Correction Factor = Clamp Factor[dB] + Cable Loss[dB]
* Result value and Reading value are same because Reading values are included correction factor.

Worst case for frequency range

Frequency (MHz)	Corrected Amplitude(dBuV)	Margin(dB)	QP / AV	Remark



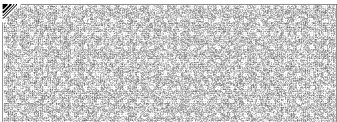


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☐ **Measurement Graph**

N/A



9.4. Radiated Electric Field Emission

Test Date and Condition

Date	November 14, 2024	Temperature	16.8 °C	Humidity	58.0 %
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Test Location

Semi-Anechoic Chamber (3 m)

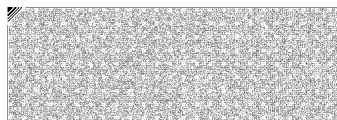
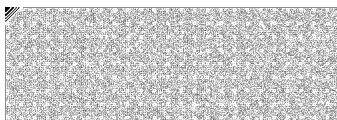
Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Bi-log Antenna	Schwarzbeck	VULB9163	760	2025.05.24
■	TEST Receiver	ROHDE & SCHWARZ	ESR7	102112	2025.02.21
■	Low Noise Amplifier	Testek	TK-PA06S	190018-L	2025.05.16
■	Common Mode Absorption Device	Schwarzbeck	CMAD1614	00170	2025.02.14

Frequency Range of Measurement

30 MHz to 1 000 MHz

Test Results

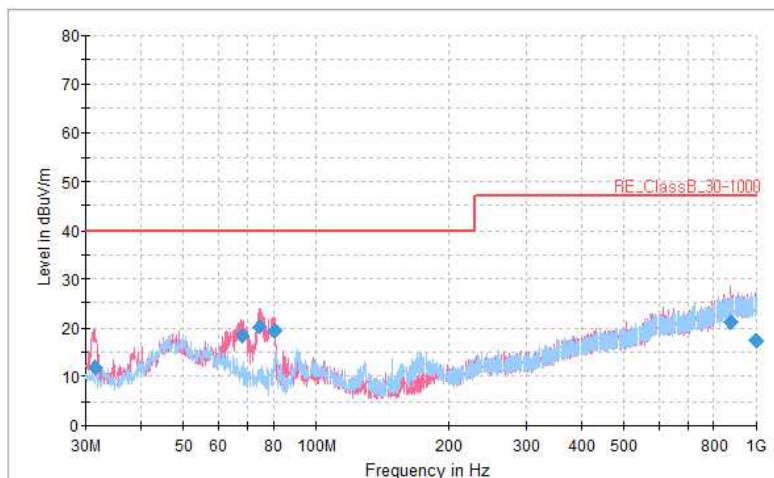
 The requirements are : ☒ MET ☐ NOT MET ☐ NOT APPLICABLE


■ Radiated Electric Field Emissions (30 MHz - 1 000 MHz)

Common Information

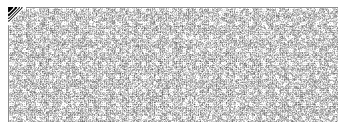
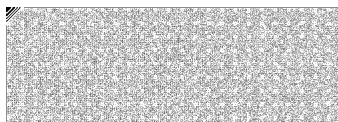
Test Description:	N-240172-WACO-ROMEO 1-RE-1
Test Site:	3m Full Chamber_B
Test Standard:	EN 55014-1
Environment Conditions:	AC 230 V, 50 Hz
Operator Name:	ESY
Comment:	

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.508889	11.90	40.00	28.10	125.0	V	190.0	-31.8
67.922222	18.46	40.00	21.54	100.0	V	10.0	-31.8
74.366111	20.33	40.00	19.67	210.0	V	-21.0	-34.1
80.866111	19.41	40.00	20.59	105.0	V	-15.0	-34.6
874.751667	21.17	47.00	25.83	125.0	V	174.0	-16.0
998.416111	17.19	47.00	29.81	125.0	H	-9.0	-15.6





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Test Date and Condition

Date		Temperature	℃	Humidity	%
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Test Location
Anechoic chamber

Test Equipment

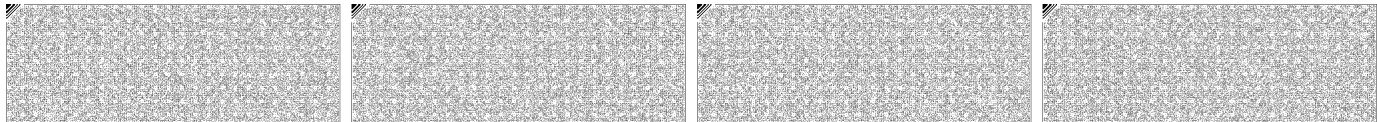
	Description	Manufacturer	Model Number	Serial Number	Cal. Due
☐	Bi-log Antenna	Schwarzbeck	VULB9163	760	2025.05.24
☐	TEST Receiver	ROHDE & SCHWARZ	ESR7	102112	2025.02.21
☐	Low Noise Amplifier	Testek	TK-PA06S	190018-L	2025.05.16

Frequency Range of Measurement

1 000 MHz to 6 000 MHz

Test Results

The requirements are : ☐ MET ☐ NOT MET ☒ NOT APPLICABLE





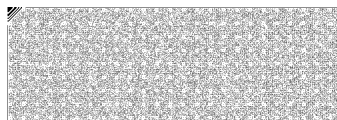
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☐ Radiated Electric Field Emissions (1 000 MHz - 6 000 MHz)

[Peak]

N/A



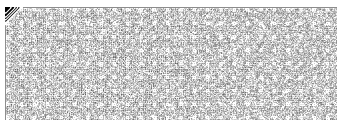


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[C-Average]

N/A



9.5. Harmonic Current Emissions

Test Date and Condition

Date	November 14, 2024	Temperature	17.1 °C	Humidity	58.0 %
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Test Location

Harmonic & Flicker Section

Test Equipment

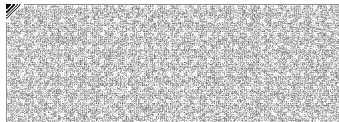
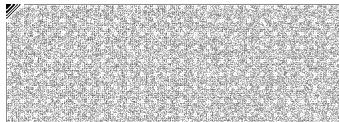
	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Harmonic & Flicker Tester (Signal conditioning unit)	Schaffner	CCN 1000-1-LR1	X71715	2025.05.19
■	Harmonic & Flicker Tester (Power Source)	Schaffner	NSG 1007	HK53453	2025.05.18

Classification of Equipment for Harmonic Current Emissions

- ☒ Class A
☐ Class B
☐ Class C
☐ Class D

Test Results

The requirements are : ☒ MET ☐ NOT MET ☐ NOT APPLICABLE



■ Measurement graphs

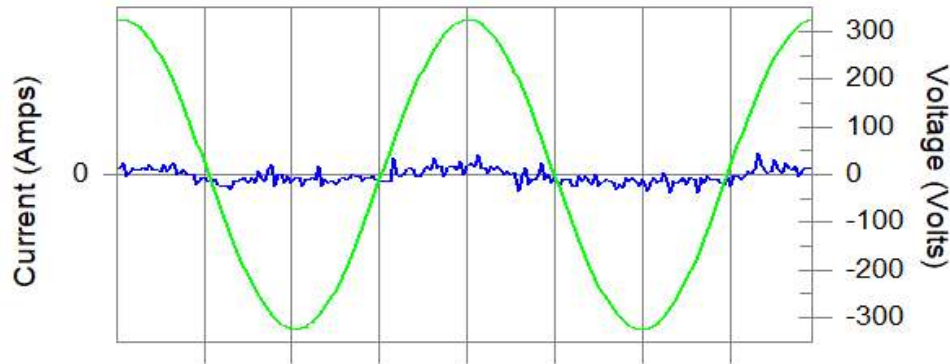
Harmonics – Class-A per Ed. 4.0 (2019)(Run time)

EUT: Equipment under test
Test category: Class-A per Ed. 4.0 (2019) (European limits)
Test date: 2024-11-29
Test duration (min): 5
Comment: Comment
Customer: Customer information

Tested by: Tested by
Test Margin: 100
Start time: 오전 11:23:39
End time: 오전 11:29:01
Data file name: H-000510.cts_data

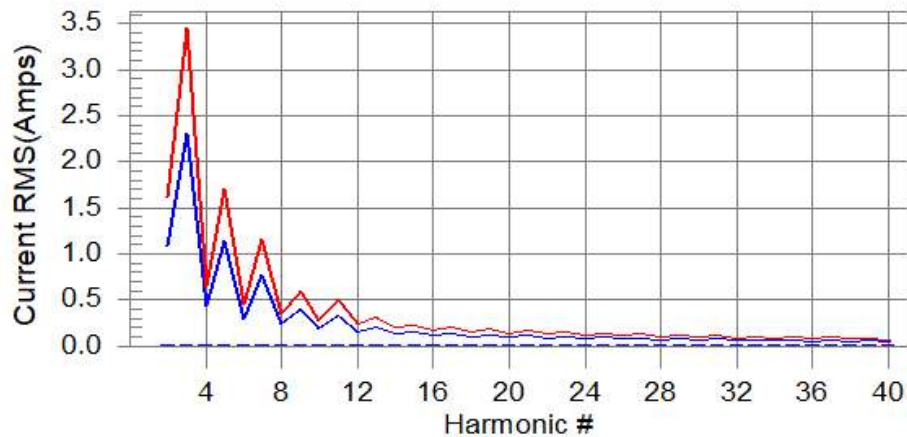
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass Worst harmonic was #0 with 0.0% of the limit.





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Current Test Result Summary (Run time)

EUT: Equipment under test
Test category: Class-A per Ed. 4.0 (2019) (European limits)
Test date: 2024-11-29
Test duration (min): 5
Comment: Comment
Customer: Customer information

Tested by: Tested by
Test Margin: 100
Start time: 오전 11:23:39
End time: 오전 11:29:01
Data file name: H-000510.cts_data

Test Result: Pass Source qualification: Normal
THC(A): 0.003 I-THD(%): 48.0 POHC(A): 0.000 POHC Limit(A): 0.251

Highest parameter values during test:

V RMS (Volts):	229.45	Frequency(Hz):	50.00
I Peak (Amps):	0.073	I RMS (Amps):	0.009
I Fund (Amps):	0.006	Crest Factor:	7.915
Power (Watts):	1.3	Power Factor:	0.655

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





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Voltage Source Verification Data (Run time)

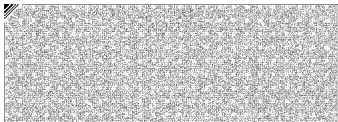
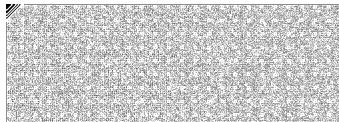
EUT: Equipment under test Tested by: Tested by
Test category: Class-A per Ed. 4.0 (2019) (European limits) Test Margin: 100
Test date: 2024-11-29 Start time: 오전 11:23:39 End time: 오전 11:29:01
Test duration (min): Data file name: H-000510.cts_data
Comment: Comment
Customer: Customer information

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms):	229.45	Frequency(Hz):	50.00
I Peak (Amps):	0.073	I RMS (Amps):	0.009
I Fund (Amps):	0.006	Crest Factor:	7.915
Power (Watts):	1.3	Power Factor:	0.655

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.057	0.459	12.43	OK
3	0.989	2.065	47.89	OK
4	0.029	0.459	6.31	OK
5	0.087	0.918	9.47	OK
6	0.107	0.459	23.29	OK
7	0.078	0.688	11.31	OK
8	0.095	0.459	20.74	OK
9	0.027	0.459	5.95	OK
10	0.050	0.459	10.87	OK
11	0.022	0.229	9.61	OK
12	0.022	0.229	9.40	OK
13	0.016	0.229	7.09	OK
14	0.010	0.229	4.33	OK
15	0.009	0.229	3.76	OK
16	0.012	0.229	5.20	OK
17	0.014	0.229	5.91	OK
18	0.014	0.229	6.27	OK
19	0.007	0.229	2.98	OK
20	0.015	0.229	6.41	OK
21	0.008	0.229	3.67	OK
22	0.009	0.229	3.89	OK
23	0.007	0.229	2.99	OK
24	0.007	0.229	2.84	OK
25	0.007	0.229	3.06	OK
26	0.009	0.229	3.97	OK
27	0.006	0.229	2.52	OK
28	0.007	0.229	3.00	OK
29	0.007	0.229	3.08	OK
30	0.007	0.229	3.02	OK
31	0.004	0.229	1.81	OK
32	0.005	0.229	2.33	OK
33	0.006	0.229	2.61	OK
34	0.004	0.229	1.87	OK
35	0.004	0.229	1.82	OK
36	0.005	0.229	1.98	OK
37	0.006	0.229	2.61	OK
38	0.004	0.229	1.81	OK
39	0.004	0.229	1.88	OK
40	0.011	0.229	4.66	OK





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9.6. Voltage Fluctuations and Flicker

Test Date and Condition

Date	November 14, 2024	Temperature	17.1 °C	Humidity	58.0 %
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Test Location

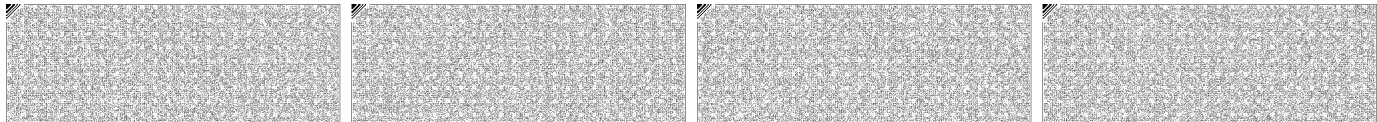
Harmonic & Flicker Section

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Harmonic & Flicker Tester (Signal conditioning unit)	Schaffner	CCN 1000-1-LR1	X71715	2025.05.19
■	Harmonic & Flicker Tester (Power Source)	Schaffner	NSG 1007	HK53453	2025.05.18

Test Results

The requirements are : ☒ MET ☐ NOT MET ☐ NOT APPLICABLE





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■ Measurement graphs

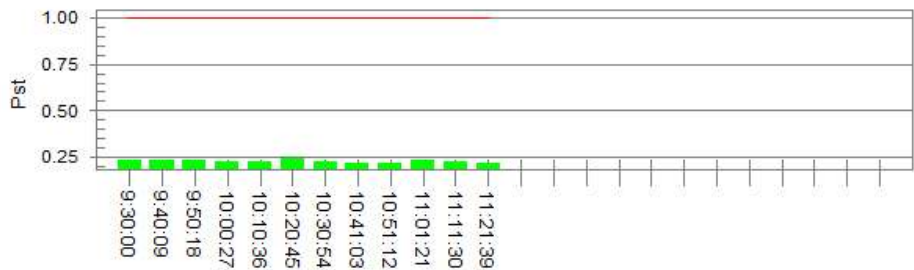
Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2019) (Run time)

EUT: Equipment under test
Test category: All parameters (European limits)
Test date: 2024-11-29
Test duration (min): 120
Comment: Comment
Customer: Customer information

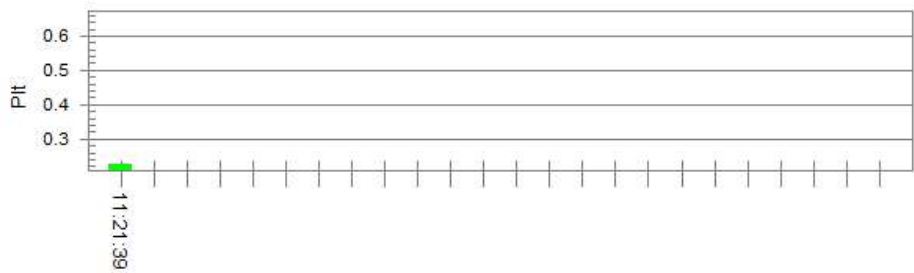
Tested by: Tested by
Test Margin: 100
Start time: 오전 9:19:30
End time: 오전 11:21:41
Data file name: F-000509.cts_data

Test Result: Pass Status: Test Completed

Pst and limit line European Limits

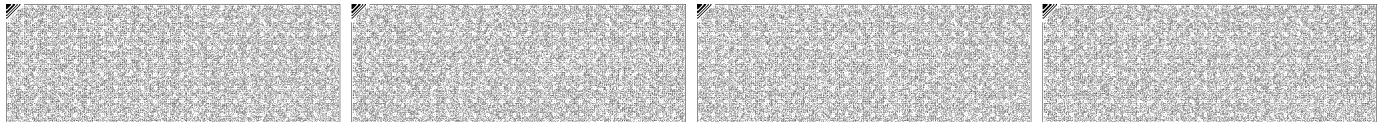


Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.43		
Highest dt (%):	0.00	Test limit (%):	N/A
T-max (mS):	0	Test limit (mS):	500.0
Highest dc (%):	0.00	Test limit (%):	3.30
Highest dmax (%):	0.09	Test limit (%):	4.00
Highest Pst (10 min. period):	0.244	Test limit:	1.000
Highest Plt (2 hr. period):	0.228	Test limit:	0.650
			Pass



9.7. Performance Criteria (PC)

A Functional description of the performance criteria, during or as consequence of the immunity testing, shall be provided by the manufacturer and noted in the test report.

Performance criterion A :

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment 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 equipment if used as intended.

Performance criterion B :

the equipment 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 apparatus 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.

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 equipment if used as intended.

EXAMPLE 1 A data transfer is controlled/checked by parity check or by other means. In the case of malfunctioning, such as caused by a lightning strike, the data transfer will be repeated automatically. The reduced data transfer rate at this time is acceptable.

EXAMPLE 2 During testing, an analogue function value may deviate. After the test, the deviation vanishes.

EXAMPLE 3 In the case of a monitor used only for man-machine monitoring, it is acceptable that some degradation takes place for a short time, such as flashes during the burst application.

EXAMPLE 4 An intended change of the operating state is allowed if self-recoverable.

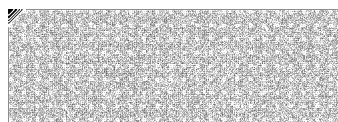
Performance criterion C :

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

EXAMPLE 1 In the case of an interruption in the mains longer than the specified buffer time, the power supply stops at a defined position and is not left in a “crashed state.” The operator’s decision prompts may be necessary.

EXAMPLE 2 After a programme interruption caused by a disturbance, the processor functions of the equipment stops at a defined position and is not left in a “crashed state.” The operator’s decision prompts may be necessary.

EXAMPLE 3 The test result in an opening of an over-current protection device that is replaced or reset by the operator.





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9.8. Electrostatic Discharge

Reference Standard
EN 61000-4-2

Test Date and Condition

Date	November 14, 2024	Temperature	17.8 °C	Humidity	57.0 %	Pressure	101.7 kPa
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Test Location
Electrostatic Discharge Section

Test Equipment

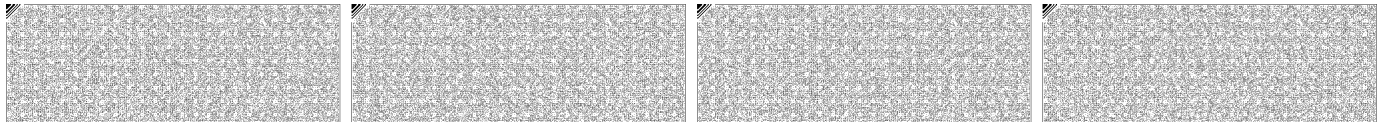
	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	ESD SIMULATOR	EM TEST	DITO	-	2025.05.23

Test Specifications

Discharge Factor : ≥ 1 s
Discharge Impedance : 330 Ω / 150 pF
Kind of Discharge : Air, Contact (direct and indirect)
Polarity : Positive and Negative
Number of Discharge : ≥ 10 at all locations

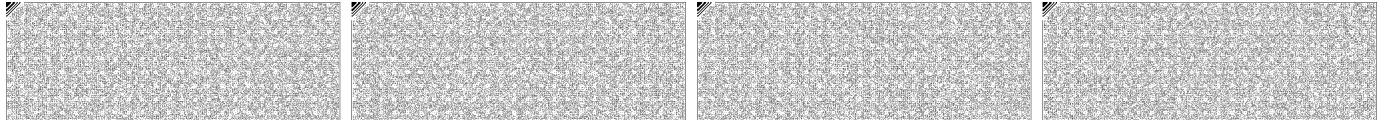
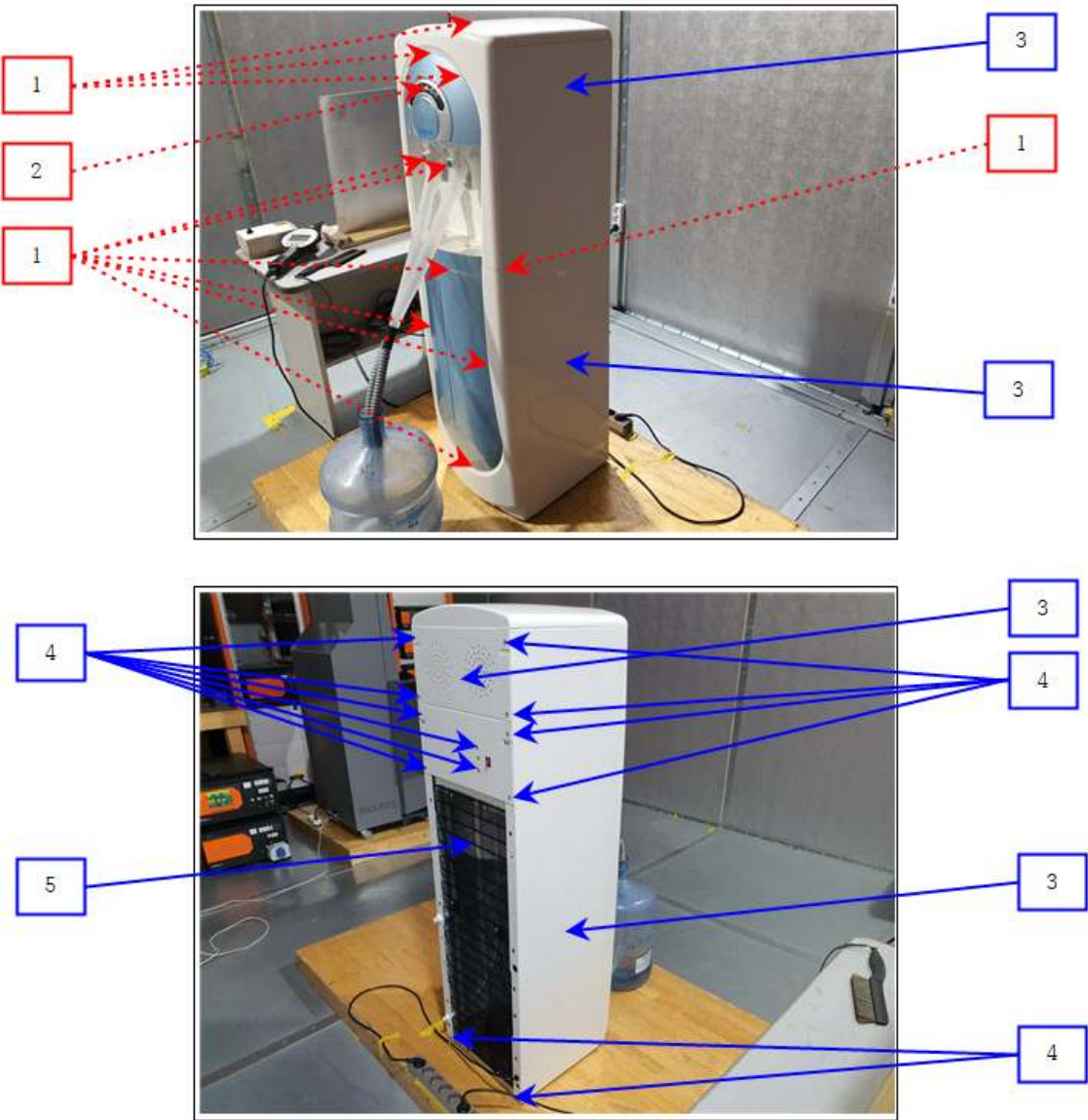
Discharge Voltage	Contact	Air	HCP	VCP
	☐ 2 kV	☐ 2 kV	☐ 2 kV	☐ 2 kV
	☒ 4 kV	☐ 4 kV	☐ 4 kV	☒ 4 kV
	☐ 6 kV	☐ 6 kV	☐ 6 kV	☐ 6 kV
	☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV

Required Performance Criteria : B



Location of Discharge :

Contact:		Air :	
----------	---	-------	---

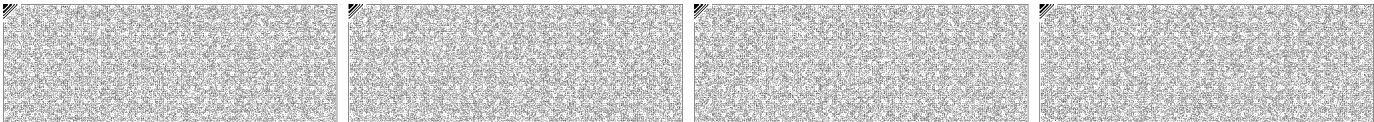
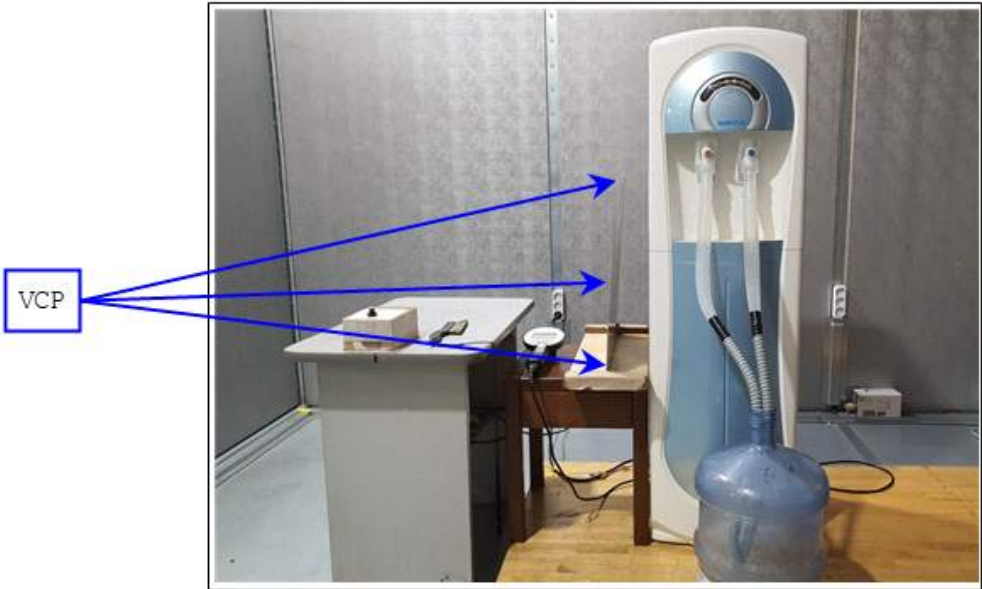




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Location of Discharge :



Test Data

Test method	Test Point	Discharge method	Performance Criteria	Performance Results	Remarks
Indirect	HCP	Contact	-	-	
	VCP		B	A	

Test method	Test Point		Discharge method	Performance Criteria	Performance Results	Remarks
Direct	1	Surface (non-metal)	Air	B	A	
	2	LED	Air	B	A	
	3	Surface (metal)	Contact	B	A	
	4	Screw	Contact	B	A	
	5	Heat sink	Contact	B	A	

Performance Results

A: Normal performance within the specification limits.

B: Temporary degradation or loss of function or performance which is self-recoverable.

C: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

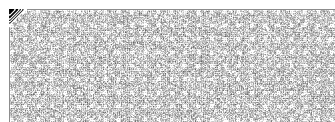
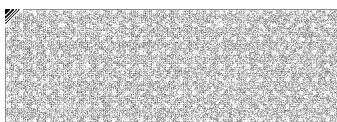
Test Results

☒ MET Required Performance Criteria

☐ NOT MET Required Performance Criteria

Remark

No degradation of performance or loss of function was observed during and after the test.



9.9. Radiated Electric Field Immunity

Reference Standard

EN 61000-4-3

Test Date and Condition

Date	Temperature	Humidity
------	-------------	----------

Test Location

Anechoic chamber

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
☐	Signal Generator	HP	E4432A	US37231205	2025.05.20
☐	Power Amplifier	Schaffner	CBA9413A	4008	-
☐	Power Amplifier	INFINITECH	ITA1500-100	2011 02 00001	-
☐	Power Amplifier	INFINITECH	ITA2500-100	2011 02 00001	-
☐	Power Amplifier	INFINITECH	ITA4500KL-50	2015090001	-
☐	Power Meter	Boonton Electronic Corp	4232A	56101	2025.05.23
☐	Power Sensor	Boonton Electronic Corp	51011-EMC	31978	2025.05.23
☐	Bi-log Antenna	Schaffner	CBL6140A	1163	-
☐	Bi-log Antenna	Schwatzbeck	VULB9160	3311	2026.02.28
☐	Horn Antenna	Schwatzbeck	BBHA 9120D	1281	-

Test Specifications

Antenna Distance : 3 m

	Frequency Range	Field Strength
☐	80 MHz to 1 000 MHz	3 V/m

Modulation : AM, 80 %, 1 kHz sine wave

Frequency step : 1 % step

 Sweep : 1.5×10^{-3} decades/s

Dwell time : 1 s

Required Performance Criteria : A



Test Data

No.	Test Point	Performance Criteria	Performance Results		Remarks
			Horizontal	Vertical	

Performance Results

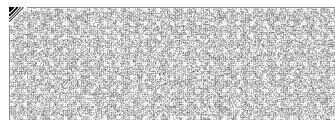
- A: Normal performance within the specification limits.
 B: Temporary degradation or loss of function or performance which is self-recoverable.
 C: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

Test Results

- ☐ MET Required Performance Criteria
☐ NOT MET Required Performance Criteria

Remark

Not applicable.



9.10. Electrical Fast Transients / Bursts

Reference Standard

EN 61000-4-4

Test Date and Condition

Date	November 14, 2024	Temperature	17.8 °C	Humidity	57.0 %
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Test Location

Bust/Surge/Voltage Dip and Short Interrupts section

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Compact Immunity Test System	3ctest	CCS600	ES0801921	2025.05.17
■	Coupling/Decoupling Network	3ctest	SEPN 4532T	ES3741901	2025.05.17

Test Specifications

Pulse Amplitude & Polarity(Power Line) : ☒ ± 1.0 kV ☐ ± 2.0 kV ☐ ± 4.0 kV
 Pulse Amplitude & Polarity(Signal Line) : ☐ ± 0.5 kV ☐ ± 1.0 kV ☐ ± 2.0 kV
 Burst Period : 300 ms ± 20 %
 Repetition Rate : 5 kHz
 Coupling Time : 120 s
 Rise time : 5 ns ± 30 %
 Impulse duration : 50 ns ± 30 %
 Burst duration : 15 ms ± 20 %
 Required Performance Criteria : B



Test Data
☒ Power Port

Test Point	Performance Criteria	Performance Results		Remarks
		+Burst	-Burst	
L - N - PE	B	A	A	

☐ Signal Port

Test Point	Performance Criteria	Performance Results		Remarks
		+Burst	-Burst	

Performance Results

A: Normal performance within the specification limits.

B: Temporary degradation or loss of function or performance which is self-recoverable.

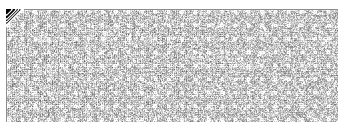
C: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

Test Results
☒ MET Required Performance Criteria

☐ NOT MET Required Performance Criteria

Remark

No degradation of performance or loss of function was observed during and after the test.



9.11. Surge Transients

Reference Standard
EN 61000-4-5

Test Date and Condition

Date	November 14, 2024	Temperature	17.8 °C	Humidity	57.0 %
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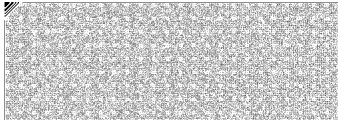
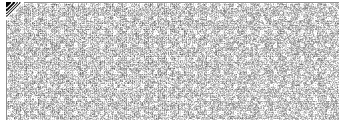
Test Location
Bust/Surge/Voltage Dip and Short Interrupts section

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	Compact Immunity Test System	3ctest	CCS600	ES0801921	2025.05.17
■	Coupling/Decoupling Network	3ctest	SEPN 4532T	ES3741901	2025.05.17

Test Specifications

Source Impedance	: 2 Ω for line to line and 12 Ω for line to earth
Surge Amplitude	: Line to Line ☐ ± 0.5 kV ☒ ± 1.0 kV Line to Earth ☐ ± 0.5 kV ☐ ± 1.0 kV ☒ ± 2.0 kV Signal Line ☐ ± 0.5 kV ☐ ± 1.0 kV
Number of Surges	: 5 surge per polarity
Angle	: 90°, 270°
Repetition Rate	: 1surge per 20s
Open-circuit voltage	: 1.2/50 μs
Short-circuit current time	: 8/20 μs
Required Performance Criteria	: B





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Test Data

☒ Power Port

Test Point	Performance Criteria	Performance Results		Remarks
		+Surge	-Surge	
L - N	B	A	A	
L - PE	B	A	A	
N - PE	B	A	A	

☐ Signal Port

Test Point	Performance Criteria	Performance Results		Remarks
		+Surge	-Surge	

Performance Results

- A: Normal performance within the specification limits.
B: Temporary degradation or loss of function or performance which is self-recoverable.
C: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

Test Results

- ☒ MET Required Performance Criteria
☐ NOT MET Required Performance Criteria

Remark

No degradation of performance or loss of function was observed during and after the test.



9.12. Conducted Disturbance Immunity

Reference Standard
EN 61000-4-6

Test Date and Condition

Date	November 14, 2024	Temperature	17.8 °C	Humidity	57.0 %
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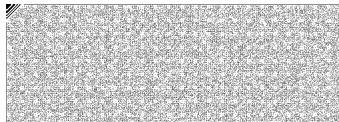
Test Location
Shield Room

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
☒	Continuous Wave Simulator	EM Test	CWS 500N1	V1143110967	2025.05.16
☒	CDN	EM Test	CDN M2/M3	P1509150897	2025.05.16
☒	Attenuator	ETI	RFA100NFF6	N/A	2025.05.16
☐	EM Clamp	Schaffner	KEMZ801	14302	2025.05.20

Test Specifications

Frequency range : 150 kHz to 230 MHz
Voltage level : ☐ 1 Vrms ☒ 3 Vrms ☐ 10 Vrms
Modulation : AM, 80 %, 1 kHz sine wave
Frequency step : 1 % step
Sweep : 1.5×10^{-3} decades/s
Dwell time : 1 s
Required Performance Criteria : A



Test Data

☒ Power Port

Coupling location	Coupling Method	Performance Criteria	Performance Results	Remarks
Main power port	CDN (M3)	A	A	

☐ Signal Port

Coupling location	Coupling Method	Performance Criteria	Performance Results	Remarks

Performance Results

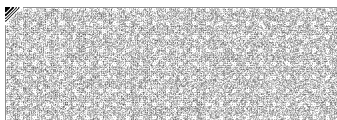
- A: Normal performance within the specification limits.
 B: Temporary degradation or loss of function or performance which is self-recoverable.
 C: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

Test Results

- ☒ MET Required Performance Criteria
☐ NOT MET Required Performance Criteria

Remark

No degradation of performance or loss of function was observed during and after the test.





Korea Standard Testlab

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9.13. Voltage Dips and Short Interrupts

Reference Standard

EN IEC 61000-4-11

Test Date and Condition

Date	November 14, 2024	Temperature	17.8 °C	Humidity	57.0 %
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Test Location

Bust/Surge/Voltage Dip and Short Interrupts section

Test Equipment

	Description	Manufacturer	Model Number	Serial Number	Cal. Due
■	PFS Single Phase Power Fail Simulator	3ctest	PFS4530T1	ES3481901	2025.05.17

Test Specifications & Performance Results

	Test level [Reduction]	Duration [in Period/ms (50 Hz)]	Performance Criteria	Performance Result
■	60 %	■ 10	C	B
■	30 %	■ 25	C	B
■	100%	■ 0.5	C	B

Performance Results

- A: Normal performance within the specification limits.
B: Temporary degradation which is self-recoverable.
C: Loss of function or performance which required operator intervention or system reset.

Test Results

- MET Required Performance Criteria
□ NOT MET Required Performance Criteria

Remark

- a. No degradation of performance or loss of function was observed during and after the test.
b. When the EUT was tested for voltage dips and short interrupts, the EUT shutdown but returned to normal status by itself.

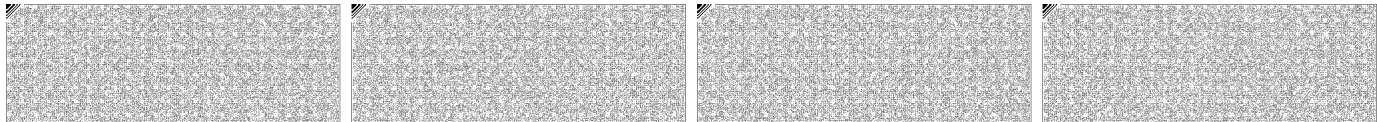
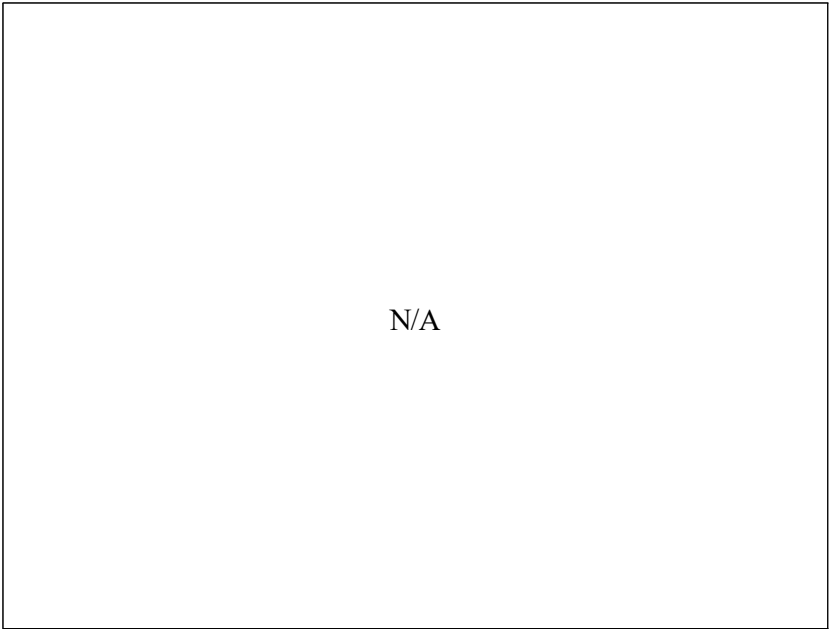


APPENDIX A - Test Setup Photographs

Conducted Disturbance Voltage (Main Port)



Conducted Disturbance Voltage (Communication Port)

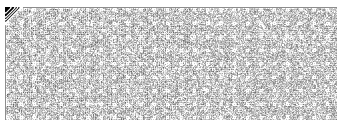


Discontinuous disturbance (150 kHz, 500 kHz, 1.4 MHz, 30 MHz)



Disturbance Power

N/A

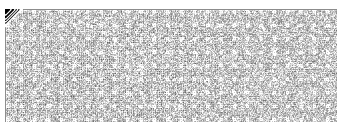


Radiated Electric Field Emissions (30 MHz - 1 000 MHz)



Radiated Electric Field Emissions (1 000 MHz - 6 000 MHz)

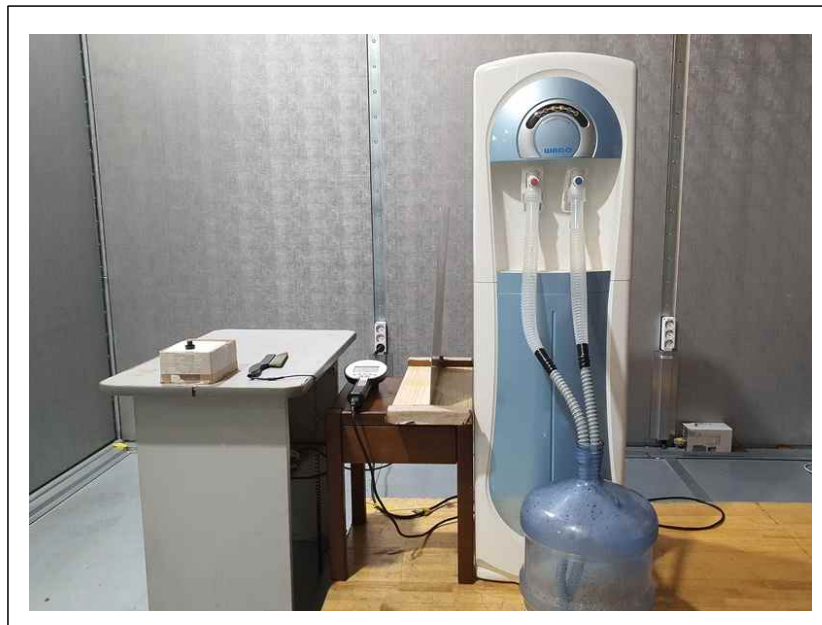
N/A



Harmonic & Flicker



Electrostatic Discharge

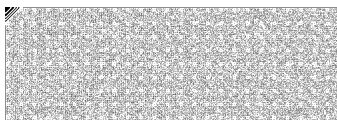


Radiated Electric Field Immunity [Below 1 000 MHz]

N/A

Radiated Electric Field Immunity [Above 1 000 MHz]

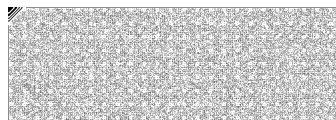
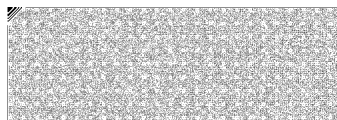
N/A



Electrical Fast Transients / Bursts



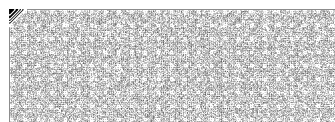
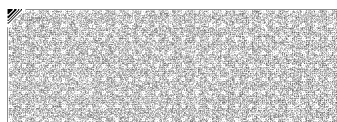
Surge Transients



Conducted Disturbance Immunity

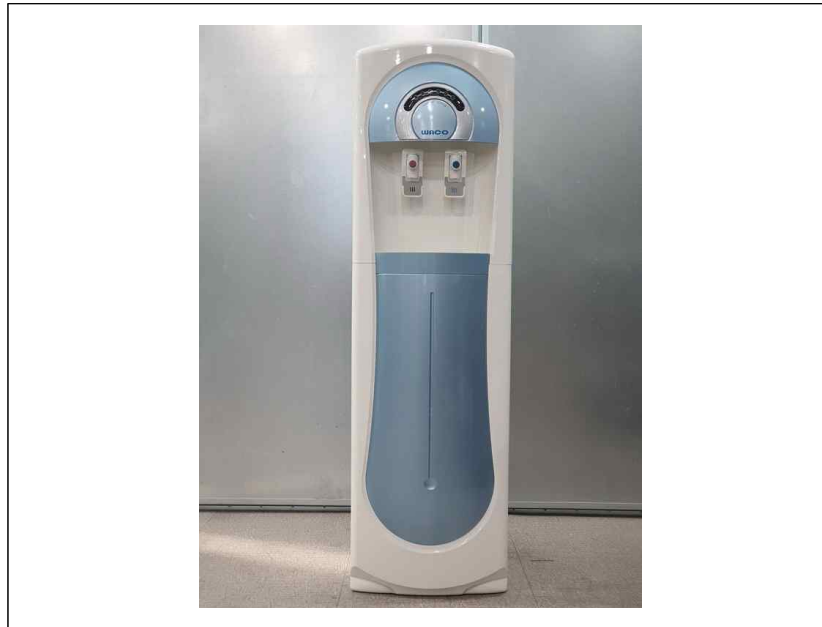


Voltage Dips and Short Interrupts

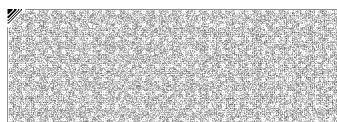


APPENDIX B - EUT Photographs

EUT : Front View



EUT : Rear View



EUT : Internal View

