

ELECTROMAGNETIC COMPATIBILITY TEST REPORT

Test Report No.		RAPA14-O-028
Applicant	Name	Comfile Technology Inc.
	Address	104-5, Guro5-dong, Guro-gu, Seou, Korea
Manufacturer	Name	Comfile Technology Inc.
	Address	104-5, Guro5-dong, Guro-gu, Seoul, Korea
Type of Equipment		Controller for Industry
Model Name		MSB630TA-DC
Multi Model Name		N/A
Serial number		N/A
Total page of Report		30 pages (including this page)
Test period		May 22, 2018 - June 01, 2018
Issuing date of report		June 12, 2018

SUMMARY

The equipment complies with the standards; EN 61000-6-1:2007, EN 61000-6-3:2007, EN 6100-3-2:2014 and EN 6100-3-3:2013.

This test report contains only the result of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

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1. APPLICANT AND MANUFACTURER INFORMATION

Applicant	Name	Comfile Technology Inc.
	Address	104-5, Guro5-dong, Guro-gu, Seoul, Korea
Manufacturer	Name	Comfile Technology Inc.
	Address	104-5, Guro5-dong, Guro-gu, Seoul, Korea
Name of contact		Hwang young / Engineer / comfile@nate.com
Telephone No.		+82-2-711-2592
Fax No.		+82-2-856-2611

2. TEST SUMMARY

2.1 Test standards and results

STANDARDS		RESULTS
EN 61000-6-3:2007 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Main Terminal Continuous Disturbance Voltage	PASS
	Conducted common mode disturbance at TEL ports	N/A(See Note 1)
	Mains terminal discontinuous disturbance voltage	N/A(See Note 3)
	Radiated Emission (Below 1 GHz)	PASS
	Radiated Emission (Above 1 GHz)	N/A(See Note 2)
EN 61000-3-2:2014	Harmonic Current Emission	N/A(See Note 3)
EN 61000-3-3:2013	Voltage Change, Voltage fluctuations and Flicker	N/A(See Note 3)
EN 61000-6-1:2007 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	Electrostatic discharge immunity	PASS
	Radio frequency electromagnetic fields	PASS
	Electrical fast transient/burst immunity	PASS
	Surge immunity	PASS
	Conducted disturbance induced by RF fields immunity	PASS
	Power frequency magnetic field immunity	N/A(See Note 4)
	Voltage Dips and Short interruptions	N/A(See Note 3)

NOTE 1: The equipment has not communication ports, so this test was not executed.

NOTE 2: The equipment operates at frequency 108 MHz, so this test was not executed.

NOTE 3: This test is not performed because the EUT is operated by DC voltage.

NOTE 4: The equipment under test was not susceptible to magnetic fields, so this test was not executed.

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standards.

2.3 Purpose of the test

To determine whether the equipment under test fulfills the EMC requirements of the standards stated in section 2.1.

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CE-EMCD (Rev.0)

HEAD OFFICE & EMC Testing Dept:

824 & B104 268, Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea (TEL: +82-31-427-9100, FAX: +82-31-427-2323)

2.4 Test facilities

- Place of test :
 - Head office
101 & B104, Anyang Megavalley, 268, Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
 - Open Area Test Site
103, Anseok-dong, 138beon-gil, Hwaseong-si, Gyeonggi-do, Korea
(FCC OATS Registration Number : 931589)
(FCC Conformity Assessment Body, Registration Number : 608365)
(IC Company address code : 9355B)
(RRA Designation Number : KR0027)

2.5 Criterion description

Criterion	Descriptions
A	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed 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. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level 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 however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

3. EUT (Equipment Under Test)

3.1 Identification of the EUT

- Equipment : Controller for Industry
- Model name : MSB630TA-DC
- Multi model name : N/A
- Brand name : Comfile Technology Inc.
- Serial number : N/A
- Manufacturer : Comfile Technology Inc.

3.2 Additional information about the EUT

The model MSB630TA-DC (referred to as the EUT in this report) of Comfile Technology Inc. is an industrial controller. Product specification described herein was obtained from product data sheet or user's manual.

Item	Description
Program Memory	200 KB
BASIC Data Memory	6 KB
Ladder Logic Data Memory	1 KB
Power	DC 240 V
Temperature	-30 °C ~ 70 °C
Humidity	10 % ~ 90 %

3.3 Peripheral equipment

It is defined as peripheral equipment needed for correct operation of the EUT but not considered as tested.

Model	Manufacturer	Description	Connected to
MSB630TA-DC	Comfile Technology Inc.	Controller for Industry (EUT)	-
HP ProBook 650 G1	HP	Notebook 1	EUT
PPP012D-S	Delta Electronics (Jiangsu) Ltd.	Notebook Adapter 1	Notebook 1
HSTNN-F12C	HP	Notebook 2	EUT
PPP012SD-2	HP	Notebook Adapter 2	Notebook 2
CN-RS232485	Comfile Technology Inc.	RS-232/485 Device	EUT
N/A	Comfile Technology Inc.	Switch 1	EUT
N/A	Comfile Technology Inc.	Switch 2	EUT
N/A	Comfile Technology Inc.	JIG 1	EUT
N/A	Comfile Technology Inc.	JIG 2	EUT
GP-4303P	LG	DC Power Supply	EUT

3.4 Mode of operation during the test

The EUT has maintained normal operation and full loaded mode and EUT Input power was 24 VDC (through DC Power Supply) during the test.

3.5 Alternative type(s)/model(s); also covered by this test report

The followings are added model names and their differences.

Model Name	Differences	Tested
-	-	<input type="checkbox"/>

NOTE1: Applicant asks only basic model to test. Therefore, testing laboratories just guarantee the unit which has been tested.

3.6 EUT cable description

Port Name	Shielded	Ferrite Bead	Metal Hood	Length (m)	Connected to
Controller for Industry (EUT)	24VDC	No	No	1.8	DC Power Supply (DC OUT)
	DOWNLOAD	No	No	1.5	Notebook 2 (Serial)
	INPUT(8-15)	No	No	0.1	Switch 1
	INPUT(16-23)	No	No	0.1	Switch 2
	OUTPUT (32-39)	No	No	0.2	JIG 1
	OUTPUT (40-45)	No	No	0.2	JIG 2
	RS485 CH3	No	No	0.1	RS-232/485 Device (+5V, GND, 485-, 485+)
	RS232 CH2	No	No	0.2	EUT (RS485 CH1)
RS-232/485 Device	AD 0~20 mA (0, 1, 2, 3, GND)	No	No	0.2	EUT (4, 5, 6, 7, GND)
	+5V, GND, 485-, 485+	No	No	0.1	EUT(RS485 CH3)
Notebook 1	GND, TX, RX, 5 V	No	No	1.5	Notebook 1 (Serial)
	Serial	No	No	1.5	RS-232/485 Device (+5V, GND, Tx, Rx)
Notebook 2	DC Input	No	Yes	2.1	Notebook Adapter 1
	Serial	No	No	1.5	EUT (DOWNLOAD)
DC Power Supply	DC Input	No	Yes	2.1	Notebook Adapter 2
	DC Output	No	No	1.8	EUT (DC IN)
	AC Input	No	No	1.5	AC Mains

4. EUT MODIFICATIONS

- None

5. EMISSION TESTS

5.1 Mains terminal continuous disturbance voltage

5.1.1 Operating environment

- Temperature : 27.0 °C
- Humidity : 50.0 % R.H.

5.1.2 Test set-up

The EUT was placed on a wooden table with 0.8 m height above the floor. The EUT was connected to AC power supply and the input power was supplied through a 50 Ω / 50 μ H \pm 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

The test set-up photos are included in appendix I.

5.1.3 Measurement uncertainty

- Conducted emission, Quasi-peak detection: \pm 3.46 dB
- Conducted emission, CISPR-Average detection: \pm 3.14 dB

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95.45 % with the coverage factor, $k = 2$.

5.1.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	ESC17	Rohde & Schwarz	EMI Test Receiver	100938	Jan. 15, 2018
<input checked="" type="checkbox"/>	ESH3-Z2	Rohde & Schwarz	Pulse Limiter	101631	Jan. 15, 2018
<input checked="" type="checkbox"/>	LT32C	AFJ Instruments	LISN	32031430208	Aug. 21, 2017
<input checked="" type="checkbox"/>	3825/2	EMCO	LISN	9004-1635	Aug. 22, 2017
<input checked="" type="checkbox"/>	ES-SCAN	R&S	EMI Software	N/A	N/A

Remark: All test equipment used is calibrated on the regular basis.

5.1.5 Test data

- Test date : May 30, 2018
- Resolution bandwidth : 9 kHz
- Frequency range : 9 kHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-peak			CISPR-Average		
		Emission level(dBµV)	Limits (dBµV)	Margin (dB)	Emission level(dBµV)	Limits (dBµV)	Margin (dB)
0.16	N	53.93	79.00	25.07	53.60	66.00	12.40
0.21	N	49.29	79.00	29.71	47.68	66.00	18.32
0.47	N	47.45	79.00	31.55	39.38	66.00	26.62
5.48	P	52.60	73.00	20.40	47.41	60.00	12.59
5.54	N	53.08	73.00	19.92	47.50	60.00	12.50
5.96	P	52.34	73.00	20.66	46.94	60.00	13.06

Tabulated test data for Mains Terminal Continuous Disturbance Voltage

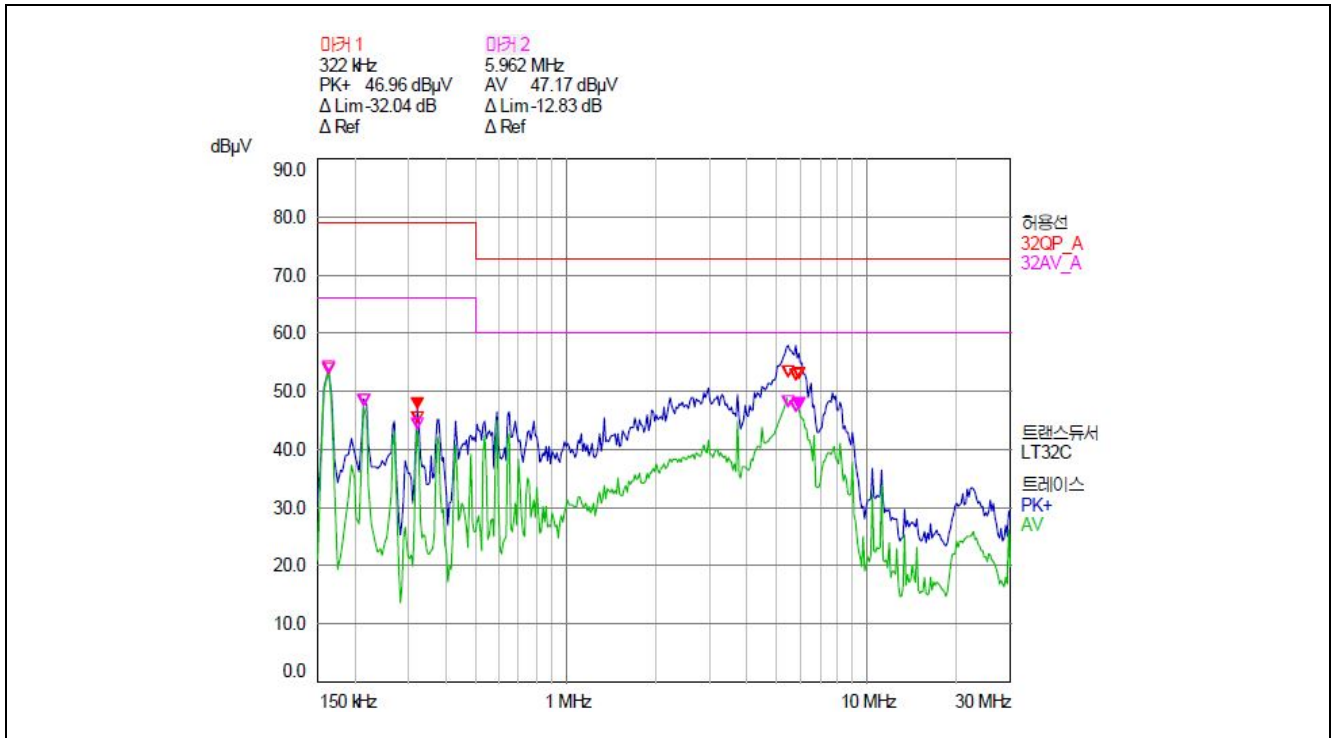
Here, P: Positive Line, N: Negative Line

See next page for an overview sweep performed with quasi-peak and CISPR-Average detector.

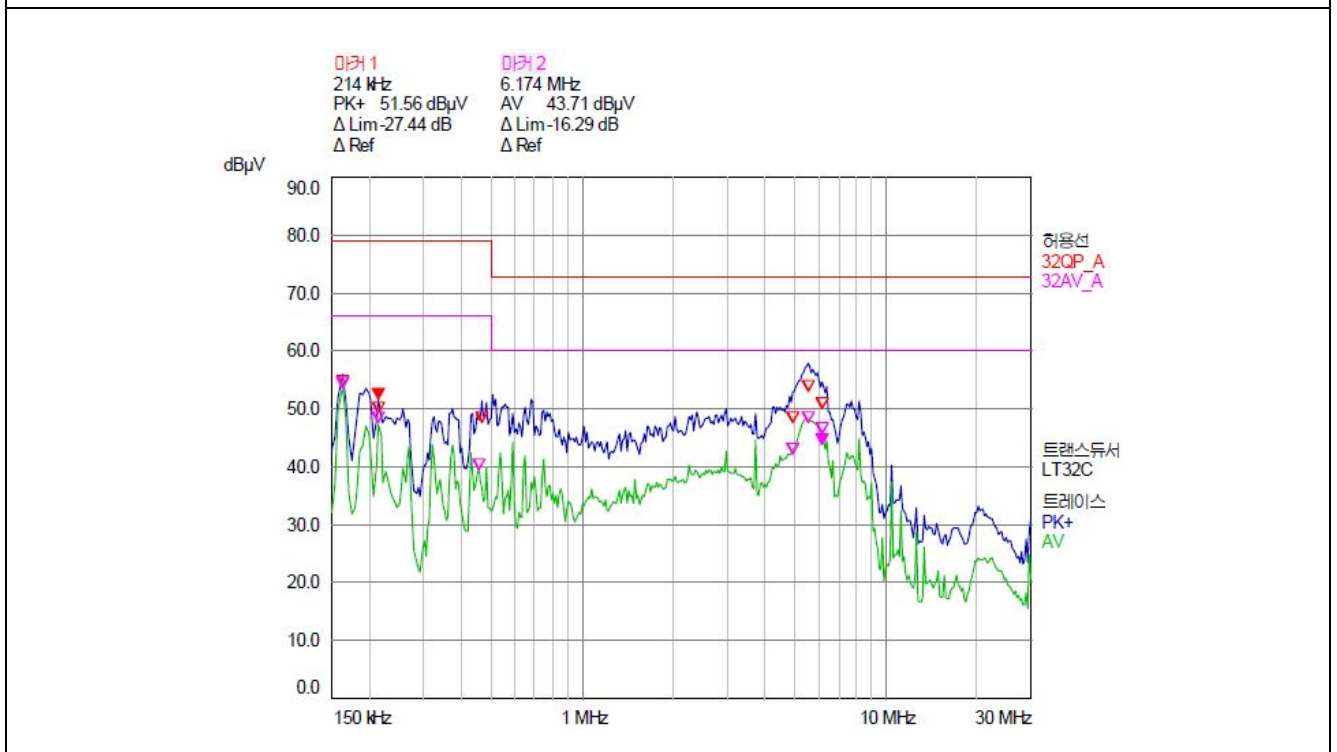


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• Plots



POSITIVE LINE



NEGATIVE LINE

5.2 Radiated electromagnetic field (Below 1 GHz)

5.2.1 Operating environment

- Temperature : 37.5 °C
- Humidity : 20.0 % R.H.

5.2.2 Test set-up

The radiated emissions were measured at the 10 m Open Area Test Site. The EUT was placed on a wooden table with 0.8 meters height above the ground plane.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels at each frequency recorded. The table was rotated 360° and the antenna was varied in height between 1.0 m and 4.0 m in order to detect the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The test set-up photos are included in appendix II.

5.2.3 Measurement uncertainty

- Radiated emission electric field intensity in the range of 30 MHz ~ 1 000 MHz, Quasi-peak detection: ± 4.36 dB

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

5.2.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	ESS	R&S	EMI Test Receiver	833776/011	Aug. 22, 2017
<input checked="" type="checkbox"/>	DS 1500 S-1t-O	Innco GmbH	Turn Table	N/A	N/A
<input checked="" type="checkbox"/>	MA4000-O	Innco GmbH	Antenna Mast	N/A	N/A
<input checked="" type="checkbox"/>	CO 2000	Innco GmbH	Controller	N/A	N/A
<input checked="" type="checkbox"/>	VHA9103	Schwarzbeck	Biconical Antenna	2217	Nov. 28, 2017
<input checked="" type="checkbox"/>	VULP9118A	Schwarzbeck	Log Periodic Antenna	382	Nov. 28, 2017
<input checked="" type="checkbox"/>	SCU 01	R&S	Pre-AMP	10020	Jan. 15, 2018

Remark: All test equipment used is calibrated on the regular basis.

5.2.5 Test data

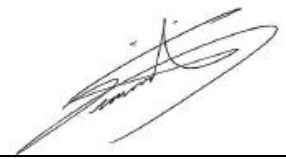
- Test date : June 01, 2018
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 10 meter

▪ Test mode: DC mode

Frequency (MHz)	Reading (dBμV)	ANT Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	CL+AG (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
34.88	47.70	V	1.20	10.00	16.38	-38.38	25.70	30.00	4.30
40.83	49.80	V	1.00	360.00	14.46	-38.36	25.90	30.00	4.10
47.77	52.90	V	1.00	20.00	11.94	-38.27	26.57	30.00	3.43
825.74	47.30	H	4.00	180.00	22.33	-35.87	33.76	37.00	3.24
855.24	47.00	H	4.00	180.00	22.65	-35.96	33.69	37.00	3.31
884.72	46.10	H	4.00	190.00	22.96	-35.74	33.32	37.00	3.68

Tabulated test data for Radiated Electromagnetic Field

Here, H = Horizontal, V = Vertical, CL = Cable loss, AG = AMP gain



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6. IMMUNITY TESTS

6.1 Electrostatic discharge immunity test

The measurement of the Immunity against Electrostatic Discharge was performed in a shield room.

- Test Location : Shielded Room (S121)
- Date : May 22, 2018

Here, S121 = Shield room number

6.1.1 Operating environment

Item	Measured	Recommended
Ambient temperature	24.0 °C	15 °C ~ 35 °C
Humidity	52.0 % R.H.	30 % R.H ~ 60 % R.H
Atmospheric pressure	101.3 kPa	86.0 kPa ~ 106.0 kPa

6.1.2 Test set-up

The EUT and all peripheral equipment were placed on non-metallic support with 0.8 m height above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix III

6.1.3 Measurement uncertainty

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least 95 % confidence.

6.1.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	ESS-2000	NOISEKEN	ESD Simulator	ESS0308043	Jan. 30, 2018
<input checked="" type="checkbox"/>	TC-815P	NOISEKEN	ESD Gun	ESS0120522	Jan. 30, 2018

Remark: All test equipment used is calibrated on the regular basis.

6.1.5 Test data

- Test levels : Contact discharge 4 kV, Air discharge 8 kV
- Number of discharges : 25 each pol. at each point for contact discharge, 10 each pol. at each point for air discharge
- Polarity : Positive / Negative
- The EUT Position : Table Top
- Performance criterion required : B
- Test result : Met criterion A
- Monitoring of the EUT : The EUT was in normal operating mode during the test.
- Test mode : DC Input power mode

The test points of the EUT are each location on the surface touchable by hand (see test point in next page) and four sides of the EUT (through VCP and HCP).

The results of selected test points of the EUT are listed in the below table.

Point	Test level [±kV]	Pass / Fail	Description
(2) Frame, LED	8.0 (Air)	Pass	There was no deviation from normal operation condition.
HCP / VCP	4.0 (Con)	Pass	

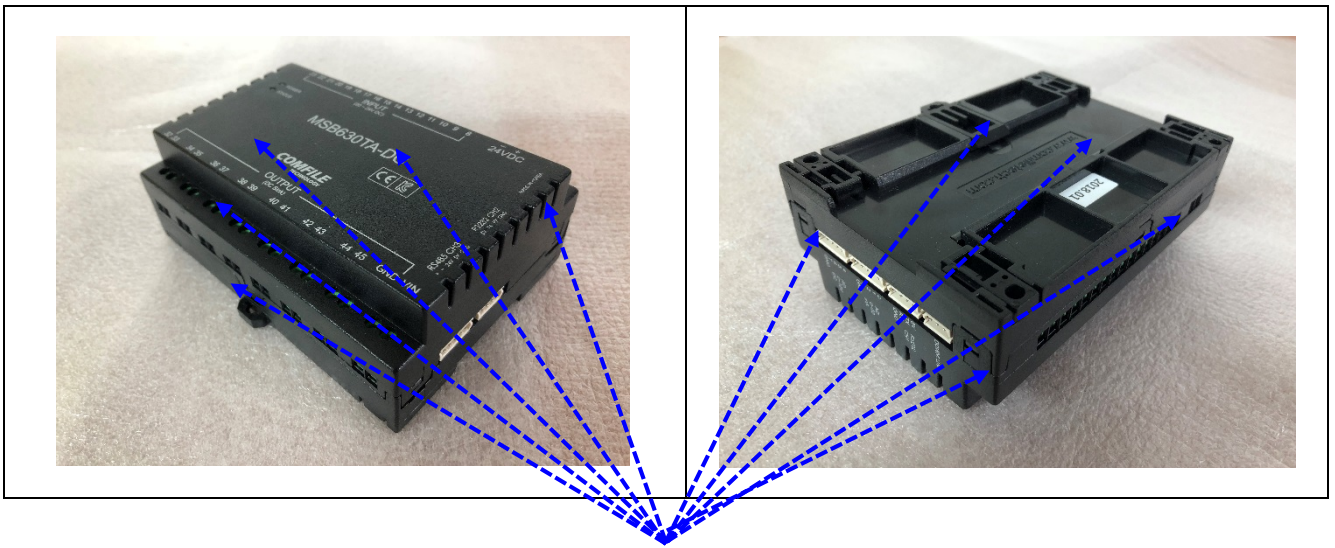


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6.1.6 ESD Test point table

ESD Point		Discharge voltage [\pm kV]	Results
(2)	Frame, LED	8.0 (Air)	Criterion A
	HCP / VCP	4.0 (Contact)	Criterion A

(1)



(2)

6.2 Radiated RF-electromagnetic field immunity test

The measurement of the Immunity against Radiated RF-Electromagnetic Field was performed in an anechoic chamber.

- Test location : Anechoic Chamber (S111)
- Date : May 31, 2018

Here, S111 = Anechoic Chamber number

6.2.1 Operating environment

- Ambient temperature : 21.0 °C
- Humidity : 46.0 % R.H.
- Atmospheric pressure : 100.9 kPa

6.2.2 Test set-up

The EUT and all peripheral equipment were placed on a non-metallic support 0.8 m above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix IV.

6.2.3 Measurement uncertainty

- The measurement uncertainty: ± 0.23 V/m for 1 V/m, ± 0.70 V/m for 3 V/m, and ± 2.30 V/m for 10 V/m.

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95%.

6.2.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	IMS	KTI	Integrated measurement system for EMS	N/A	N/A
<input checked="" type="checkbox"/>	E4432B	Agilent	ESG-D Series Signal Generator	MY43350147	Jan 15, 2018
<input checked="" type="checkbox"/>	NRP-Z91	Rohde&Schwarz	Power Sensor	100882	Aug 21, 2017
<input checked="" type="checkbox"/>	NRP-Z91	Rohde&Schwarz	Power Sensor	100883	Aug 21, 2017
<input checked="" type="checkbox"/>	ITRS-0830K	Infinitech	Power Amplifier	N/A	Jan 17, 2018
<input checked="" type="checkbox"/>	STLP9128D	Schwarzbeck	Log Periodic Dipole Antenna	9128D015	N/A

Remark: All test equipment used is calibrated on the regular basis.

6.2.5 Test data

- Test level : 3 V/m, 1 V/m (AM 80 %, 1 kHz)
- Frequency range : 80 MHz ~ 1 000 MHz, 1400 MHz ~ 2000 MHz, 2000 MHz ~ 2700 MHz
- Frequency step : 1 %
- Dwell time at each frequency : 3 s
- Exposed side : Front / Rear / Left / Right
- Polarization of antenna : Horizontal / Vertical
- The EUT position : Table Top
- Distance from antenna to EUT : 3 m
- Performance criterion required : A
- Test result : Met criterion A
- Monitoring of the EUT : The EUT was in normal operating mode during the test.
- Test mode : DC Input power mode

The results of test are listed in below table.

Freq. Range [MHz]	Ant. Pol.	Exposed side	Pass / Fail	Description
80 ~ 1 000	V	Left / Right / Front / Rear	Pass	There was no deviation from normal operation condition.
80 ~ 1 000	H	Left / Right / Front / Rear	Pass	

Here, H = Horizontal, V = Vertical



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6.3 Electrical fast transient/burst immunity test

The measurement of the Immunity Fast Transient/Burst was performed in a shield room.

- Test location : Shielded Room (S121).
- Date : May 27, 2018

6.3.1 Operating environment

- Ambient temperature : 23.5 °C
- Humidity : 51.0 % R.H.
- Atmospheric pressure : 100.6 kPa

6.3.2 Test set-up

The EUT was placed on non-metallic support with 0.1 m height above a reference ground plane (RGP) and was put into operation according to the specified operating mode. If the manufacturer provides a non-detachable supply cable more than 0.5 m long with the equipment, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1 m above the ground reference plane.

The test set-up photo is included in appendix V.

6.3.3 Measurement uncertainty

It has been demonstrated that the burst generator met the specified requirements in the standard with at least 95 % confidence.

6.3.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	UCS 500N7	EM Test	Ultra Compact Generator	V937105138	Aug 21, 2017
<input checked="" type="checkbox"/>	iec.control	EM Test	Software for industrial and telecom testing	N/A	N/A

Remark: All test equipment used is calibrated on the regular basis.

6.3.5 Test data

- Test level : 0.5 kV (DC-mains supply)
- Burst frequency : 5 kHz
- Polarity : Positive / Negative
- Coupling methods : DC mains – Coupling Decoupling Network (CDN)
- Lines for test : DC mains of the EUT
- Type of line and length : Unshielded 0.5 ± 0.05 m DC power,
- The EUT-position : Table Top
- Performance criterion required : B
- Test result : Met criterion A
- Monitoring of the EUT : The EUT was in normal operating mode during the test.
- Test mode : DC Input power mode

The results of test are listed in below table.

Line for test	Coupling Method	Test level [± kV]	Pass / Fail	Description
DC mains (P)	CDN	0.5	Pass	There was no deviation from normal operation condition.
DC mains (N)	CDN	0.5	Pass	
DC mains (P+N)	CDN	0.5	Pass	

Here, for the AC mains, L = Hot, N = Neutral, PE = Protective Earth, for the DC-mains, P = Positive, N = Negative.



Tested by: Dongsu Jin / Manager

6.4 Surge immunity test

The measurement of the Surge Transients immunity was performed in a shield room.

- Test location : Shielded Room (S121).
- Date : May 27, 2018

6.4.1 Operating environment

- Ambient temperature : 23.5 °C
- Humidity : 51.0 % R.H.
- Atmospheric pressure : 100.6 kPa

6.4.2 Test set-up

The EUT and all peripheral equipment were placed on a non-metallic support with 0.8 m height above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix VI.

6.4.3 Measurement uncertainty

It has been demonstrated that the surge generator meets the specified requirements in the standard with at least 95 % confidence.

6.4.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
☒	UCS 500N7	EM Test	Ultra Compact Generator	V937105138	Aug 21, 2017
☒	iec.control	EM Test	Software for industrial and telecom testing	N/A	N/A

Remark: All test equipment used is calibrated on the regular basis.

6.4.5 Test data

- Test level : 0.5 kV (Line to Line)
- Number of surge : 5 surges / polarity
- Polarity : Positive / Negative
- Repetition rate : 60 s
- Coupling methods : DC mains – Coupling Decoupling Network (CDN)
- Lines for test : DC mains of the EUT
- Type of line and length : Unshielded (0.5 ± 0.05) m DC mains
- The EUT-position : Table Top
- Performance criterion required : B
- Test result : Met criterion A
- Monitoring of the EUT : The EUT was in normal operating mode during the test.
- Test mode : DC Input power mode

The results of test are listed in below table.

Line for test	Coupling Method	Test level [± kV]	Pass/ Fail	Description
DC mains (P+N)	CDN	0.5	Pass	There was no deviation from normal operation condition.

Here, for the AC mains, L = Hot, N = Neutral, PE = Protective Earth, for the DC-mains, P = Positive, N = Negative.



Tested by: Dongsu Jin / Manager

6.5 Conducted disturbance induced by RF fields immunity

The measurement of the Immunity against Injection Current was performed in the Shield Room.

- Test Location : Shielded Room (S121).
- Date : May 22, 2018

6.5.1 Operating environment

- Ambient temperature : 24.0 °C
- Humidity : 52.0 % R.H.
- Atmospheric pressure : 101.3 kPa

6.5.2 Test set-up

The EUT and all peripheral equipment were placed on a non-metallic support with 0.1 m height above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix VII.

6.5.3 Measurement uncertainty

- The measurement uncertainty: ± 0.17 V for 1.8 V, ± 0.50 V for 5.4 V and ± 1.70 V for 18 V.

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95 %.

6.5.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	CWS 500N	EM Test	Continuous Wave Simulator	V0937105141	Aug 22, 2017
<input checked="" type="checkbox"/>	5906 N-50-1	Huber + Suhner	Attenuator 6dB/75W	253452201	Jan. 16, 2018
<input checked="" type="checkbox"/>	FCC-801-M2/M3-16A	FCC	CDN	091759	Aug 21, 2017
<input checked="" type="checkbox"/>	M016	Schaffner	CDN	16678	Aug 21, 2017
<input checked="" type="checkbox"/>	icd.control	EM Test	Software for conducted immunity from DC to 1 GHZ	N/A	N/A

Remark: All test equipment used is calibrated on the regular basis.

6.5.5 Test data

- Test level : 3 V (AM 80 %, 1 kHz)
- Frequency range : 0.15 MHz ~ 80 MHz
- Frequency step : 1 %
- Dwell time at each frequency : 3 s
- Coupling methods : DC power lines – Coupling Decoupling Network (CDN),
- Lines for test : DC mains of the EUT
- Type of line and length : Unshielded (0.5 ± 0.05) m DC mains
- EUT-position : Table Top
- Performance criterion required : A
- Test result : Met criterion A
- Monitoring of the EUT : The EUT was in normal operating mode during the test.
- Test mode : DC Input power mode

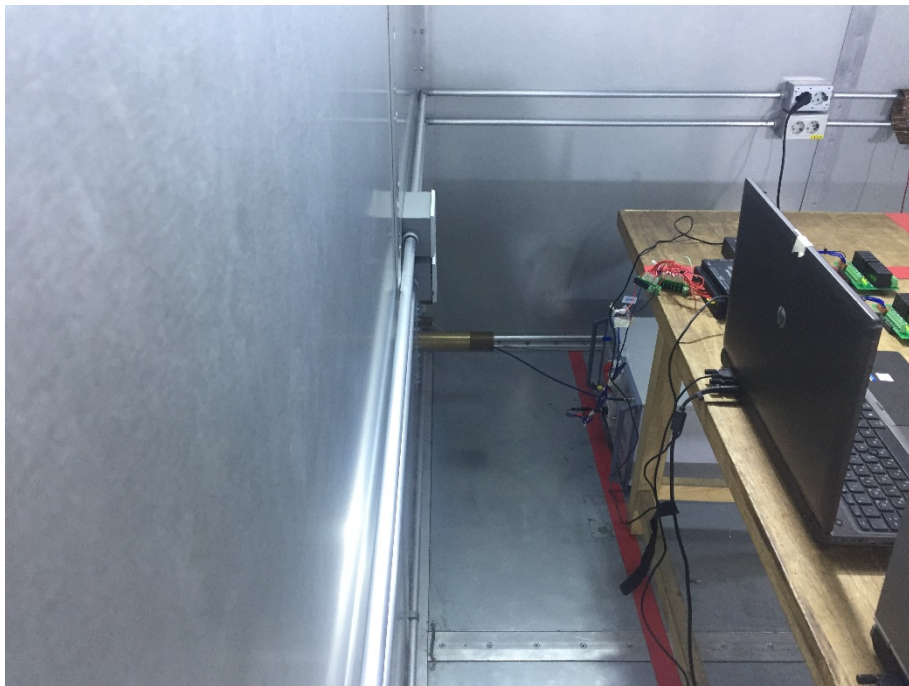
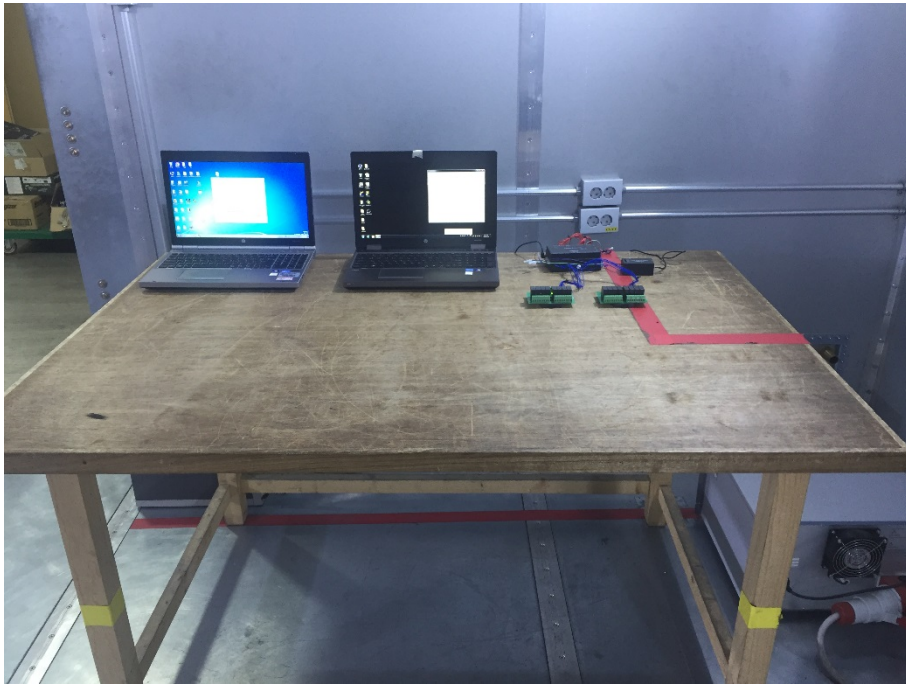
The results of test are listed in below table.

Freq. Range [MHz]	Coupling Method	Line for test	Test level [V]	Pass/Fail	Description
0.15 ~ 80	CDN(M2)	DC power lines	3	Pass	There was no deviation from normal operating condition.



Tested by: Dongsu Jin / Manager

APPENDIX I - TEST SET-UP PHOTOS: Mains terminal disturbance voltage



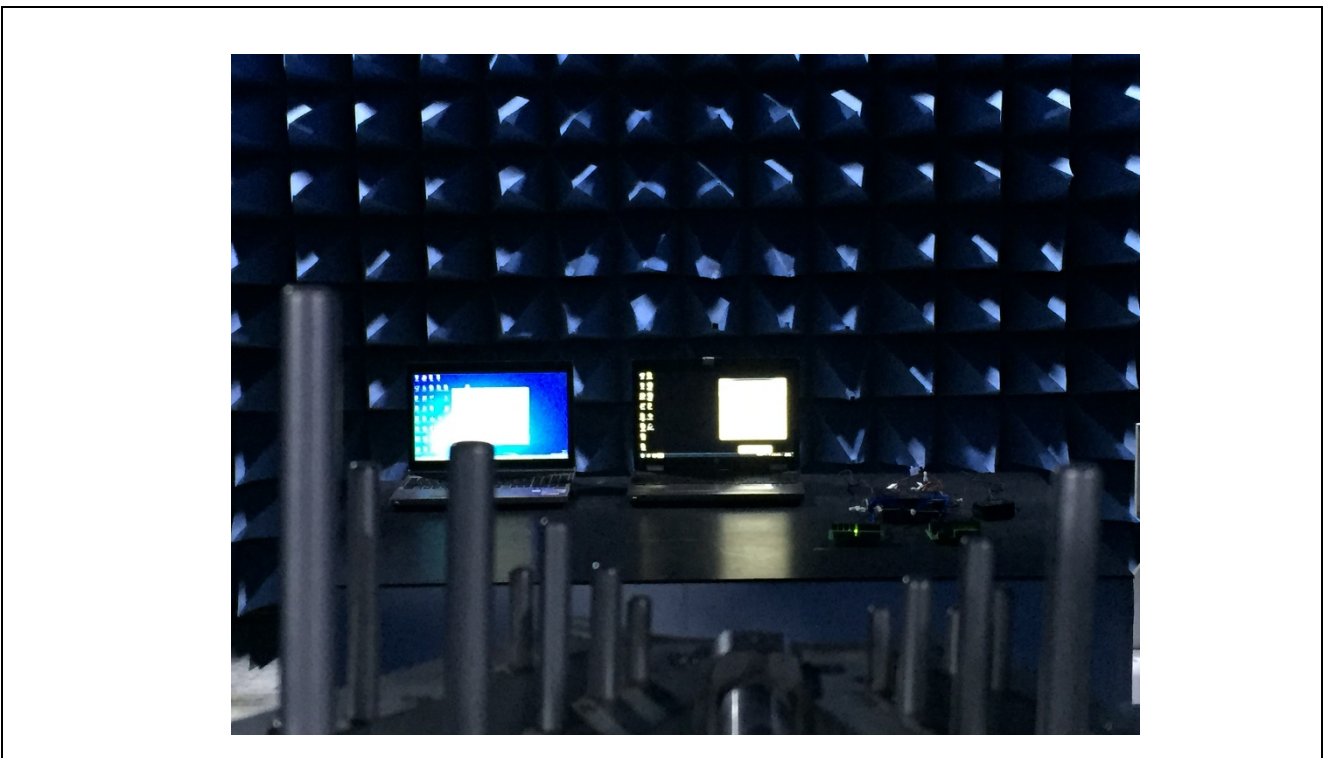
APPENDIX II - TEST SET-UP PHOTOS: Radiated electromagnetic field (Below 1 GHz)



APPENDIX III - TEST SET-UP PHOTO: Electrostatic discharge immunity



APPENDIX IV - TEST SET-UP PHOTO: Radiated frequency electromagnetic field



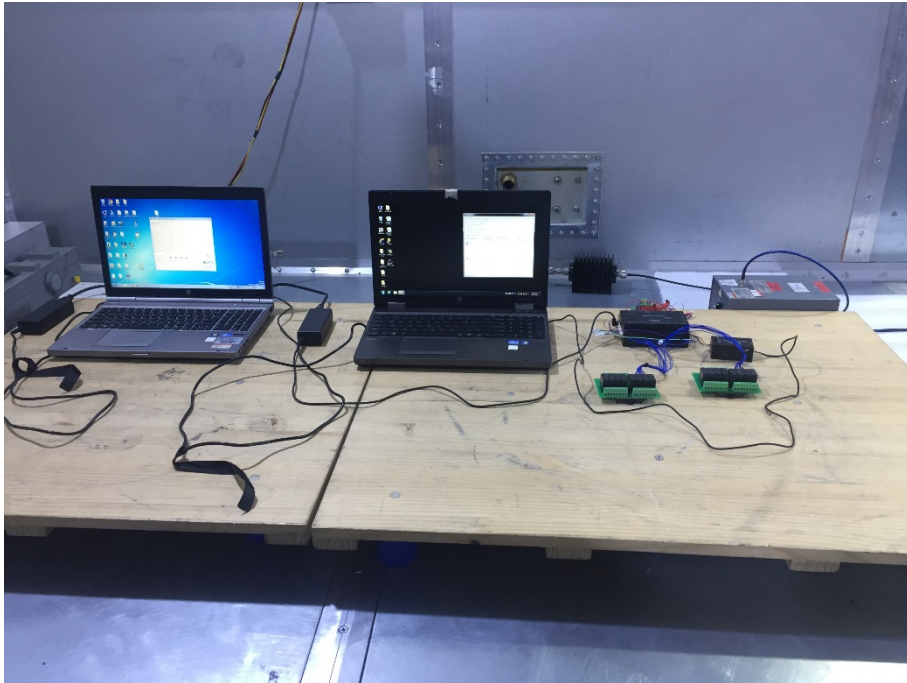
APPENDIX V - TEST SET-UP PHOTO: Electrical fast transient/burst immunity



APPENDIX VI - TEST SET-UP PHOTO: Surge immunity



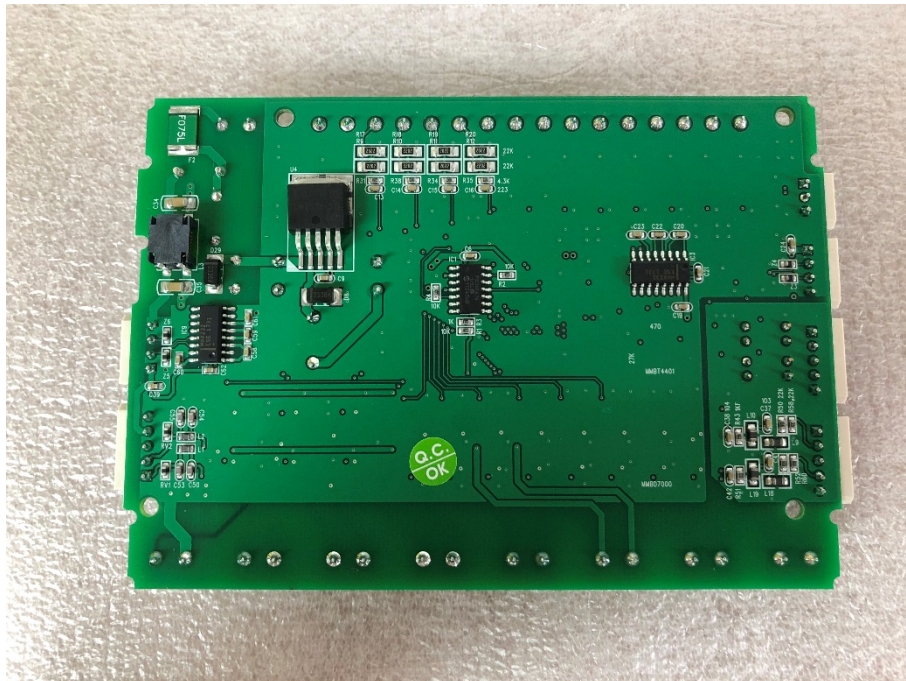
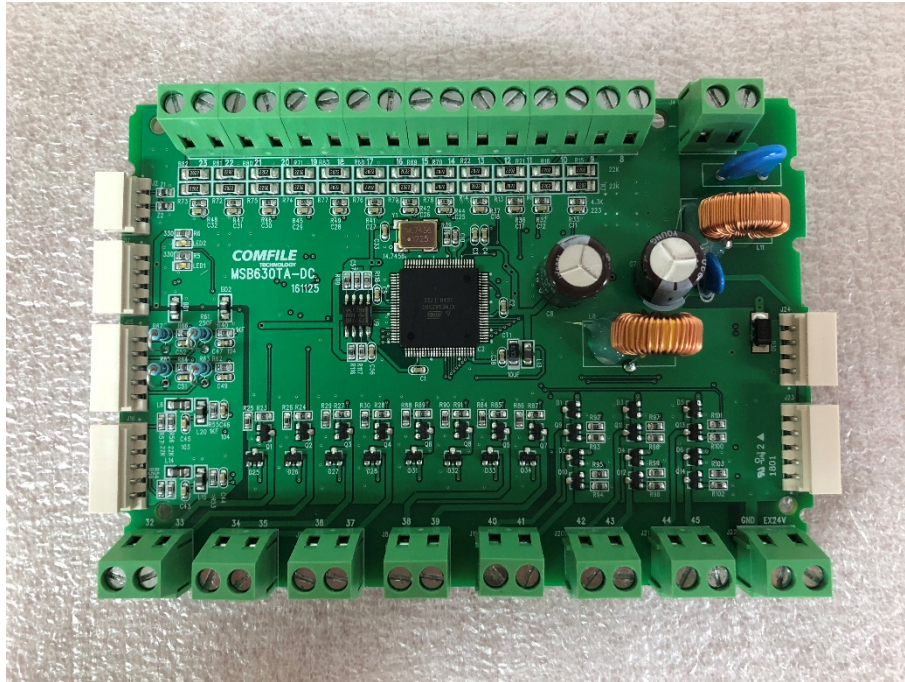
APPENDIX VII - TEST SET-UP PHOTO: Conducted disturbance induced by RF fields Immunity



APPENDIX VIII – PHOTOGRAPHS: Internal and External appearances







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CE-EMCD (Rev.0)

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