

# EMC TEST REPORT

**Test Report File No** : KR0140-CE-20002

**Date of Issue** : 2020. 04.01

**Date of Testing** : 2020. 03.30 ~ 2020. 03.31

**Model** : IC-D18-08NO

**Kind of Product** : MCU Type Proximity Switch

**Applicant** : Kun Hung Electric Co., Ltd.

**Address** : 183, Hancheon-ro, Dongdaemun-gu, Seoul, 02534 Rep. of Korea

**Manufacture** : Kun Hung Electric Co., Ltd.

**Address** : 183, Hancheon-ro, Dongdaemun-gu, Seoul, 02534 Rep. of Korea

**Test Standards** : EN 55011 : 2016 / A1 : 2017  
EN 60947-5-2 : 2007 / A1 : 2012

**Testing Laboratory** : EMC Labs Co., Ltd.

**Test Result** : **Complied**

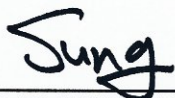
This product complies with the requirements of the EMC Directive 2014/30/EU.

The results in this report apply only to the sample tested.


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**Tested by:**

**Approved by:**



PARK, SUNG-KEUN



BAEK, JEONG-SOO

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## 1. Revision history

Issued report No.	Version	Issued date	Revisions
KR0140-CE-20002	Rev.00	April 1, 2020	Original

## 2. Test Regulation

☒ Emission : EN 55011 : 2016 / A1 : 2017

☒ EN 55011 : 2016 / A1 : 2017

☒ Class B Equipment ☐ Class A Equipment

☒ Generic

☐ EN61000-3-2 : 2014

☐ EN 61000-3-3 : 2013

☒ Immunity : EN 60947-5-2 : 2007 / A1 : 2012

☒ 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 61000-4-11 : 2004 / A1 : 2017

### 3. Applicant Information

- ◆ **Applicant :** Kun Hung Electric Co., Ltd.
- ◆ **Address :** 7F, NICE Building, 55, Sangil-ro 6-gil, Gangdong-gu, Seoul, Korea, 05288
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- ◆ **Fax. :** + 82-2-2244-2011
- ◆ **E-Mail :** mkz0325@koino.co.kr
- ◆ **Contact name :** Moon Seung Heum
- ◆ **Manufacture :** Kun Hung Electric Co., Ltd.
- ◆ **Address :** 7F, NICE Building, 55, Sangil-ro 6-gil, Gangdong-gu, Seoul, Korea, 05288

## 4. Laboratory Information

### Address

**EMC Labs Co., Ltd.**

Laboratory : 100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, 17396, Korea  
Telephone Number : +82-31-637-8895  
Facsimile Number : +82-505-116-8895

### SITE MAP



**EMC Labs Co., Ltd.**

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## 5. Equipment Under Test

### 5.1 Product Specification

Operate Voltage : 12 ~ 24 VDC,

Control Output Ampere : 200mA(max)

Detection object : Magnetic, non-magnetic metal

Operate indication : Green LED

Surge protection circuit

Overcurrent protection circuit

Reverse voltage protection circuit

Temperature : -25 °C ~ + 70 °C

Humidity : 35 ~ 95 %RH

Waterproof : IP67

### 5.2 EUT Modification

- Not modifications.

### 5.3 General Information

- ☐ Table-Top ☐ Floor – Standing
- ☒ Table-Top & Floor-Standing ( Combination )

### 5.4 Configuration of the equipment under test

Equipment	Model	Manufacture	Serial No.
JIG	-	-	-
Magnet	-	-	-
DC Power Supply	SDP 30-10D	SM techno	3010DKE088

Type	Description	Connection	Spec.	Length(m)
EUT	DC IN	JIG	Non-Shield	1.8
	Magnetic side	Magnet	-	-



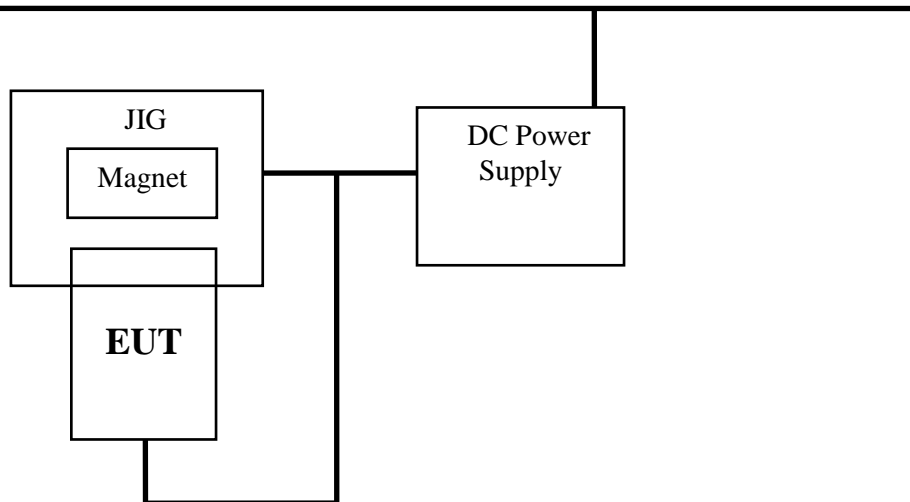
## 5.5 Operating Conditions

The equipment under test was operated during the measurement under following

Test mode	Normal Operating
1	After setting, each I / O port of the EUT was connected each peripherals.
2	After that, the EUT was tested in a state of continuously operating.

## 5.6 The drawing of general test setup

AC 230V / 50Hz



## 6. Summary of Test Result

### 6.1 Summary of EMI emission test result

EN 55011 : 2016 / A1 : 2017

Industrial, scientific and medical equipment -Radio-frequency disturbance characteristics - Limits and methods of measurement

Test items		Result
Continuous disturbance voltage	EN 55011 : 2016 / A1 : 2017	Not Applicable
Radiated disturbances below 1 GHz (30 MHz ~ 1 000 MHz)	EN 55011 : 2016 / A1 : 2017	Pass
Radiated disturbances above 1 GHz (1 GHz ~ 18 GHz)	EN 55011 : 2016 / A1 : 2017	Not Applicable

EN 61000-3-2 : 2014

Limits for harmonic-current emissions (equipment input current up to including 16A per phase)

Test items	Test methods	Result
Harmonics	EN 61000-3-2 : 2014	Not Applicable

EN 61000-3-3 : 2013

Limitation of voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16A per phase and not subject to conditional connection

Test items	Test methods	Result
Flicker	EN 61000-3-3: 2013	Not Applicable

### 6.2 Summary of immunity test result

EN 60947-5-2:2007+A1:2012

Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements — Proximity switches

Test items	Test methods	Result
Electrostatic discharge	EN 61000-4-2:2009	Pass
Electromagnetic field	EN 61000-4-3:2006/A2:2010	Pass
Electric fast transient/burst	EN 61000-4-4:2012	Pass
Surge	EN 61000-4-5:2014/A1:2017	Not Applicable
Conducted Immunity	EN 61000-4-6:2014	Pass
Magnetic field Immunity	EN 61000-4-8:2010	Pass
Voltage dip/interruption	EN 61000-4-11:2004/A1:2017	Not Applicable

### 6.3 Performance criteria

Item	Acceptance criteria		
	A	B	C
Overall performance	No noticeable changes of the operating characteristic. Operating as intended <sup>a</sup>	During the tests, the state of the switching element shall not change for more than 1 ms for d.c. devices and one half cycle of supply frequency for a.c. devices	Temporary degradation or loss of performance which requires operator intervention or system reset
Operation of displays and signalling components	No changes to visible display information.  Only slight light intensity fluctuation of LEDs, or Slight movement of characters	Temporary visible changes or loss of information.  Undesired LED Illumination	Shut down, permanent loss of display or wrong information  Unpermitted operating mode.  Not self-recoverable
Information processing And sensing functions	Undisturbed Communication and data Interchange to external devices remains within the specification	Temporarily disturbed communication, which is detected and is self-recoverable	Erroneous processing of information.  Undetected loss of data and/or information.  Errors in communication.  Not self-recoverable
a The manufacturer shall state in his literature the operating frequency and bandwidth where conducted radio frequencies may cause malfunction			

## 7. Test Results

### 7.1 Conducted Emission

Environmental Conditions

Temperature °C

Humidity % R.H.

Test Area Conducted Room

Test date

#### 7.1.1 Measurement procedure

##### Mains

The measurements were performed in a shielded room. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane.

EUT was power through the LISN, which was bonded to the ground plane.

The LISN power was filtered. Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source. All I.O cables are positioned to simulate typical actual usage according to the test standard. Both lines of power cord, hot and neutral, were measured.

#### 7.1.2 Used equipments

Equipment	Model	Manufacturer	Serial No.	Next Cal. Date	Used
Test Receiver	LSA-30	LIG Nex1	L07126026	2020-01-18	<input type="checkbox"/>
LISN	ENV216	ROHDE	100409	2020-01-17	<input type="checkbox"/>
LISN	3825/2	EMCO	8901-1458	2020-01-18	<input type="checkbox"/>

#### 7.1.3 Measurement uncertainty

Conducted emission measurement : (k=2, 95%)

9kHz-150 kHz : ± 3.263 [dB]

150kHz-30 MHz : ± 3.8 [dB]

#### 7.1.4 Test data

Not Applicable.

#### 7.1.5 Conducted emission test graph

Not Applicable. \* This test doesn't apply to EUT because the EUT uses DC power.

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## 7.2 Radiated emission

### Environmental Conditions

Temperature	22.1	°C
Humidity	47	% R.H.
Test Area	10m Chamber	
Test date	2020.03.30	

### 7.2.1 Measurement procedure

#### Mains

A pretest was performed at 3m distance in a semi-anechoic chamber for searching correct frequency.

The final test was done at a 10m open area test site with a quasi-peak detector.

EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

Cables were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

## 7.2.2 Used equipments

\* Below 1GHz

Equipment	Model no	Manufacturer	Serial no.	Next cal. date	Used
Spectrum Analyzer	E4401B	US39440387	HP.Agilent	2021-02-04	<input checked="" type="checkbox"/>
EMI TEST RECEIVER	ESVS10	846285/004	ROHDE&SCHWARZ	2021-01-17	<input checked="" type="checkbox"/>
Controllers	CO3000-4port	Innco Systems GmbHRE	CO3000/1060/42111117/P	-	<input checked="" type="checkbox"/>
Antenna Masts	MA4640/800-XP-ET	Innco Systems GmbHRE	-	-	<input checked="" type="checkbox"/>
Turn tables	DS3000-S-1t	Innco Systems GmbHRE	-	-	<input checked="" type="checkbox"/>
Amplifier	PO-LS960	PANOPTICS	PL181004	2020-09-16	<input checked="" type="checkbox"/>
Bi-Log Ant	VULB9168	Schwarzbeck	902	2020-06-27	<input checked="" type="checkbox"/>

\* Above 1GHz

Equipment	Model no	Manufacturer	Serial no.	Next cal. date	Used
Test Receiver	ESR7	Rohde&Schwarz	101616	2020-06-28	<input type="checkbox"/>
Controllers	CO3000-4port	Innco Systems GmbHRE	CO3000/1061/42111117/P	-	<input type="checkbox"/>
Antenna Masts	MA4640/800-XP-ET	Innco Systems GmbHRE	-	-	<input type="checkbox"/>
Turn tables	DS2000-S-1t	Innco Systems GmbHRE	-	-	<input type="checkbox"/>
Horn ANT	BBHA9120D	Schwarzbeck	1497	2021-08-09	<input type="checkbox"/>
Amplifier	ASF4-00100800-28-20P-4	SELLEX	1663658	2020-09-16	<input type="checkbox"/>

## 7.2.3 Measurement uncertainty

Radiated Emission measurement : (k=2, 95%)

30 - 1000 MHz ; 3 m:  $\pm 3.721$  [dB], 10 m:  $\pm 4.2$  [dB]

Above 1GHz ; 3 m:  $\pm 4.52$  [dB]

## 7.2.4 Test data

\* Receiving Antenna Mode : Horizontal, Vertical

\* 10 m OATS

\* Note : Reading = Test Receiver meter,

P= Polarization → H = Horizontal, V = Vertical

Result = Field Strength (Antenna factor + Cable factor + Reading)

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## 7.2.5 Test Result

### a) [ Below 1 GHz ]

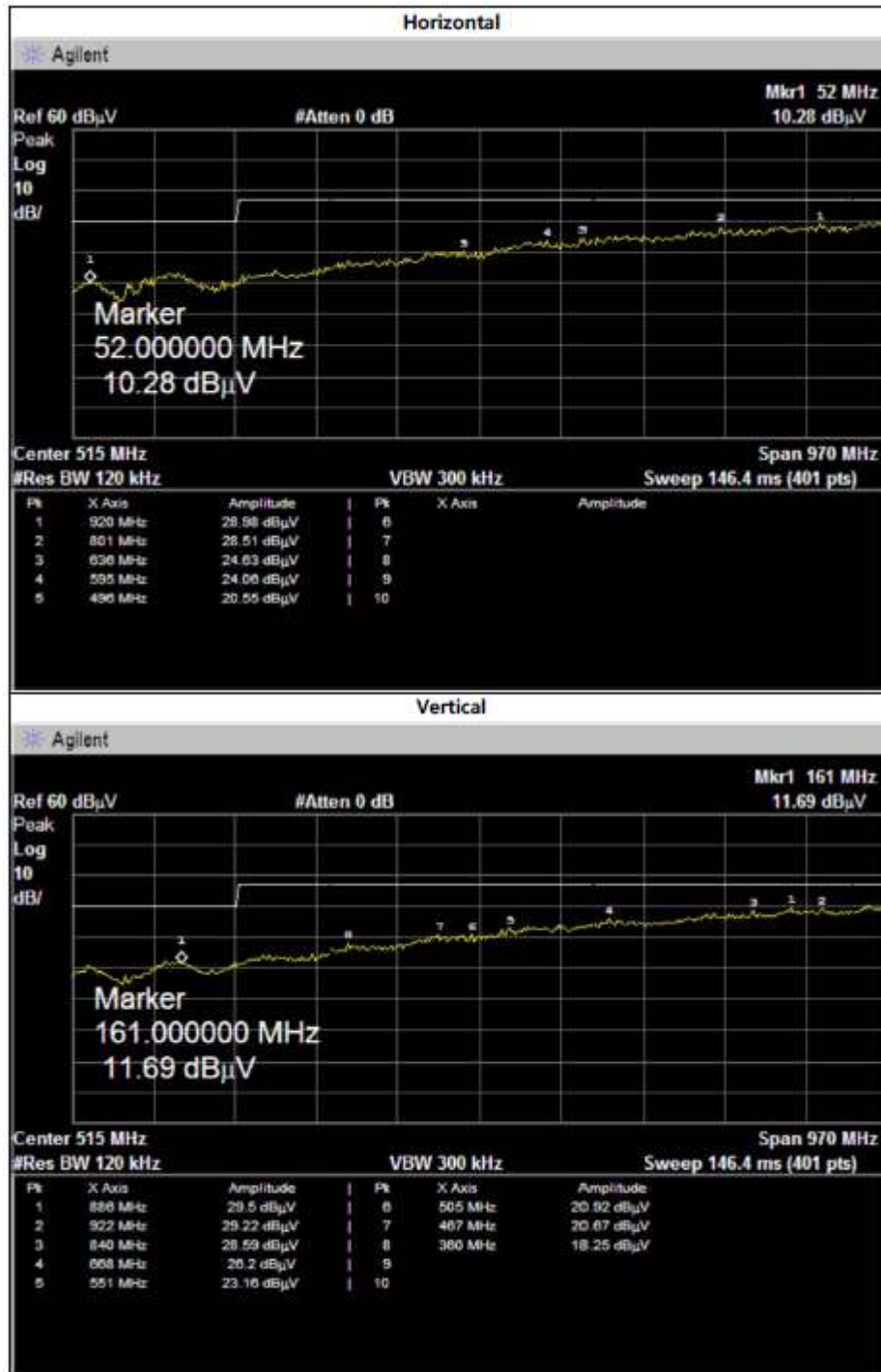
B

Frequency [ MHz ]	Total Reading [ dB $\mu$ V ]	Pol.	Height [ m ]	Reading [ dB $\mu$ V ]	Correction			Limits [ dB $\mu$ V/m ]	Result [ dB $\mu$ V/m ]	Margin [ dB $\mu$ V/m ]
					Antenna [ dB/m ]	Cable [ dB ]	Amp Gain [ dB ]			
52,21	36,00	H	4,0	(26,35)	13,06	2,05	41,46	30	9,65	20,35
636,33	37,30	H	4,0	(12,74)	20,60	8,58	41,93	37	24,56	12,44
800,72	37,50	H	2,6	(10,13)	22,64	9,77	42,54	37	27,37	9,63
839,88	36,40	V	1,0	(9,72)	22,97	10,07	42,76	37	26,68	10,32
885,69	37,50	V	1,2	(9,26)	23,35	10,40	43,02	37	28,24	8,76
921,24	36,60	V	3,0	(8,85)	23,69	10,63	43,18	37	27,75	9,25

### b) [ Above 1 GHz ]

Not Applicable.

\*10m Chamber Pre-scan Data



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## 7.3 Electrostatic Discharge

### Environmental Conditions

Temperature 22.9 °C

Humidity 48 % R.H.

Atmosphere pressure 102.1 kPa

Test Area EMC Test Room

Test date 2020.03.31

### 7.3.1 Measurement procedure

A ground reference plane was located on the floor, and connected to earth via a low impedance connection.

The return cable of the ESD generator was connected to the reference plane. In case of floor standing equipment, EUT was placed on the reference plane on 0.1 m of insulating Support.

In case of table top equipment, EUT was placed on a wooden table 0.8m above the reference grounded floor.

A horizontal coupling plane(HCP) was placed on the table, and Connected to the reference plane via a 470 resistor located in each end (0.5mm insulating support between EUT and HCP).

In both cases a vertical coupling plane(VCP) OF 0.5 X 0.5m was located 10cm from the EUT's sides.

The VCP was connected to the reference plane in the same matter as the HCP.

### 7.3.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. Date	Used
ESD SIMULATOR #1	PESD1610	HAEFELY	H810682	2020-07-08	<input checked="" type="checkbox"/>
ESD SIMULATOR #2	ESS-B3011	NOISEKEN	ESS1796831	2020-07-03	<input type="checkbox"/>
HCP	-	-	-	-	<input checked="" type="checkbox"/>
VCP	-	-	-	-	<input checked="" type="checkbox"/>

### 7.3.3 Test Data

Test Specification : EN 61000-4-2

Kind of Discharges

- ☒ Contact Discharge
- ☒ Air Discharge
- ☒ HCP / VCP (Indirect Discharge)

Discharge Voltages

- ☒ Contact Discharge :  $\pm 4$  kV
- ☒ Air Discharge :  $\pm 2 / 4 / 8$  kV
- ☒ HCP / VCP :  $\pm 4$  kV

Discharge Impedance

- ☒  $330 \Omega / 150 \text{pF}$  ☐  $2 \text{K}\Omega / 330 \text{pF}$

Number Of Discharge

- ☒ Number of discharges per point, for each voltage and polarity  
: 50 (Interval between discharges :  $\geq 1$  s)

Test point ( Please refer to attached photograph. )

Test Results

- ☒ Complied ☐ Not complied

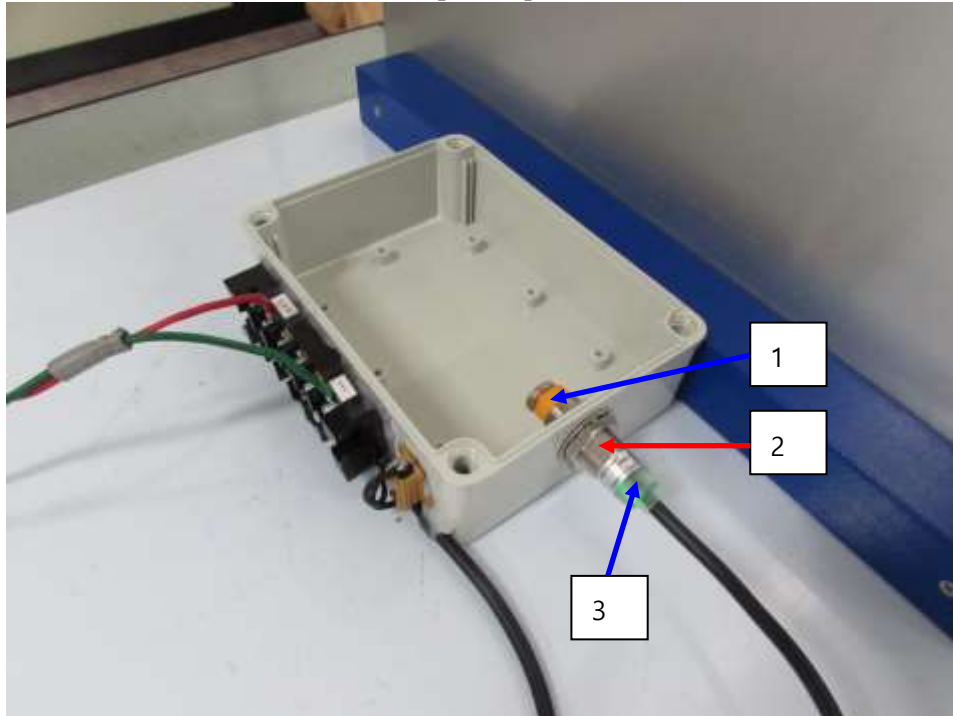
Comment :

- There was no change of operation status during above testing.

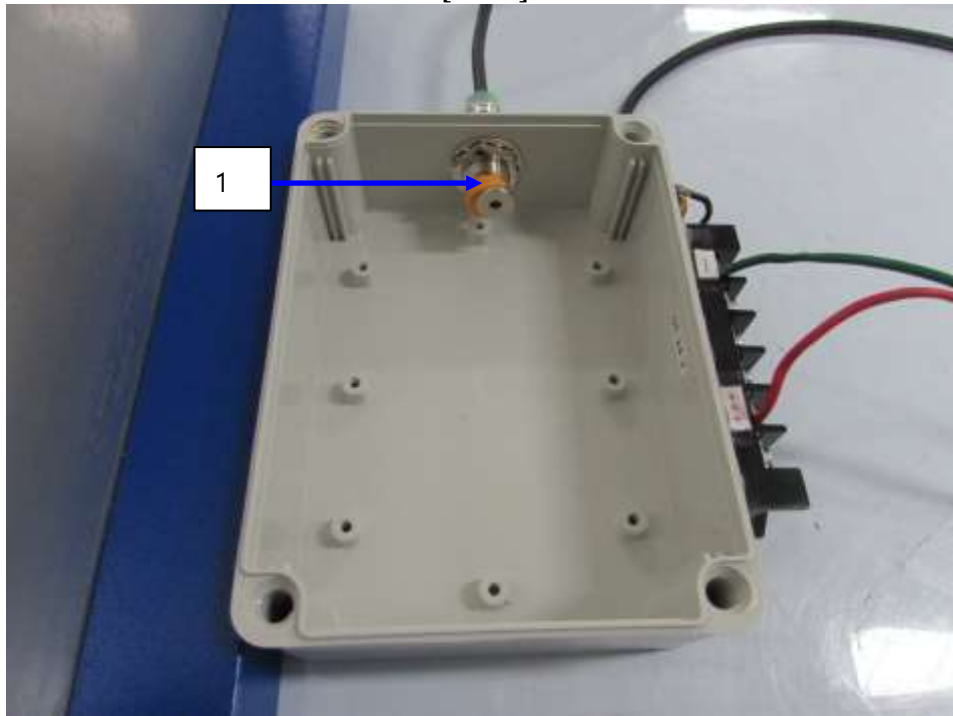
### Electrostatic Discharge (Test Point)

Air discharge →  
Contact discharge →

[ front ]



[ rear ]



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### Indirect Discharge

No.	Test Point	Test Levels (kV)	Discharge	Results ( criterion )
-	HCP	$\pm 4$ (kV)	Contact	A
-	VCP	$\pm 4$ (kV)	Contact	A

### Direct Discharge

No.	Test Point	Test Levels (kV)	Discharge	Results ( criterion )
1	Sensor	$\pm 2/4/8$ (kV)	<input type="checkbox"/> Contact <input checked="" type="checkbox"/> Air	A
2	Case	$\pm 4$ (kV)	<input checked="" type="checkbox"/> Contact <input type="checkbox"/> Air	A
3	LED	$\pm 2/4/8$ (kV)	<input type="checkbox"/> Contact <input checked="" type="checkbox"/> Air	A

## 7.4 Radio Frequency Electromagnetic Fields

### Environmental Conditions

Temperature	23.2	°C
Humidity	49	% R.H.
Atmosphere pressure	102.1	kPa
Test Area	RS Chamber	
Test date	2020.03.31	

### 7.4.1 Measurement procedure

The test was performed at 3m full anechoic chamber.

For floor standing equipment, the EUT was standing on the floor.

For tabletop equipment, the EUT was located on a wooden table 0.8m above the floor.

The EUT was tested all sides, horizontal and vertical polarization.

The field uniformity was calibrated for 3V/m, 10V/m.

### 7.4.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
Amplifier	150W1000M2	AR	331745	-	<input checked="" type="checkbox"/>
Amplifier	ITRS-1030A50	INFINITECH	20121000001	-	<input checked="" type="checkbox"/>
Amplifier	ES3060BP60	SUNGSAN	SA1031-OPT1-0002	-	<input checked="" type="checkbox"/>
Biconilog	3142D	ETS-Lindgren	102179	-	<input checked="" type="checkbox"/>
POWER METER	E4419B	AGILENT	MY41291980	2020-05-16	<input checked="" type="checkbox"/>
DIRECTIONAL COUPLER	DC6180A	AR	331175	2020-05-16	<input checked="" type="checkbox"/>
DIRECTIONAL COUPLER	M2001-2801	-	M2001-0001	2020-09-16	<input checked="" type="checkbox"/>
POWER HEAD SENSOR	E9301A	H.P	US39210340	2020-05-16	<input checked="" type="checkbox"/>
POWER HEAD SENSOR	E9301A	AGILENT	US39212396	2020-05-16	<input checked="" type="checkbox"/>
Signal Generator	8656B	H.P	3315A00341	2020-09-16	<input checked="" type="checkbox"/>
Field Monitor	FM7004	AR	330923	-	<input checked="" type="checkbox"/>
Laser Probe Interface	FI7000	AR	344349	-	<input checked="" type="checkbox"/>

### 7.4.3 Test Data

Test Specification : EN 61000-4-3

Frequency Range

☒ 80MHz – 1000MHz ☒ 1400 MHz – 2000MHz

Test level

☐ 1V/m ☒ 3V/m ☐ 10V/m

Modulation

☒ AM : 1kHz, 80%

☐ PM :

Frequency step

☒ log 1% step ☐ log 3% step ☐ log 5% step

Dwell Time

☐ 3 s ☐ 2 s ☒ 1 s

Test point

☒ Front ( Horizontal / Vertical )

☒ Rear ( Horizontal / Vertical )

☒ Left ( Horizontal / Vertical )

☒ Right ( Horizontal / Vertical )

Test Results

☒ Complied ☐ Not complied

Comment :

- There was no change of operation status during above testing.

## 7.5 Electric Fast Transient/BURST

### Environmental Conditions

Temperature	23.4	°C
Humidity	49	% R.H.
Atmosphere pressure	102.1	kPa
Test Area	EMC Test Room	
Test date	2020.03.31	

### 7.5.1 Measurement procedure

A ground reference plane was located on the floor.

EFT generator was connected to reference ground plane via low impedance connection.

For floor standing equipment, EUT was placed on a 0.1 m wooden table.

For tabletop equipment, EUT was placed on a wooden table(0.1m) above the reference plane.

Test generator and coupling/decoupling network was placed on, and bounded to, the ground reference plane.

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces, except the ground reference plane beneath the coupling clamp, Shall be 0.5 m.

### 7.5.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2020-05-20	<input checked="" type="checkbox"/>
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	<input checked="" type="checkbox"/>
CAPACITIVE COUPLING CLAMP	CCL	EM Test	P1745207364	2020-06-28	<input checked="" type="checkbox"/>

### 7.5.3 Used equipments

Test Specification : EN 61000-4-4

Location of Coupling ( AC cable Length : 0.5m)

☐ AC mains ☒ DC mains ☐ Signal Lines

Test level

☒ Power :  $\pm 2$  kV

☐ Signal Line : kV

Burst frequency : 5 kHz, 5/50 ns

Coupling Time : > 60 s

Test Results

☒ Complied ☐ Not complied

Coupling Point (AC main)	Polarity	Levels (kV)	Results ( criterion )
	$\pm$	2 (kV)	

Coupling Point (Clamp)	Polarity	Levels (kV)	Results ( criterion )
DC mains	$\pm$	2 (kV)	A

Comment :

- There was no change of operation status during above testing.



## 7.6 Surge

### Environmental Conditions

Temperature °C

Humidity % R.H.

Atmosphere pressure kPa

Test Area EMC Test Room

Test date

### 7.6.1 Measurement procedure

A ground reference plane was located on the floor.

SURGE generator was connected to reference ground plane via low impedance connection.

For floor standing equipment, EUT was placed on a 0.8 m wooden table.

For tabletop equipment, EUT was placed on a wooden table(0.8m) above the reference plane.

### 7.6.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2020-05-20	<input type="checkbox"/>
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	<input type="checkbox"/>
CDN	CNV 508N1	EM Test	P1742204935	2020-07-11	<input type="checkbox"/>
CDN	CNV 508T5	EM Test	P1742204981	2020-07-11	<input type="checkbox"/>

### 7.6.3 Test data

Test Specification : EN 61000-4-5

Location of Coupling ( AC cable Length : 1 m)

☐ AC mains ☐ DC mains ☐ Signal Lines

Test level

☐ Power ☐ Line to Line :  $\pm 0.5/1$  kV ☐ Line to Ground :  $\pm 0.5/1/2$  kV☐ Signal Line :☐ Tel. line :

Surge Pulse Shape : Tr / Th = 1.2 / 50

Test mode

- AC Power :

- Signal Line :

Coupling Impedance

☐ 18uF : Line to Line ☐ 10  $\Omega$ +9uF : Line to Ground ☐ 40 $\Omega$ +0.1uF☐ 40 $\Omega$ +0.5uF

Coupling Time : &gt; 1 min

Number of Surge : 5

Angle : ☐0 ☐90 ☐180 ☐270

Test Results

☐ Complied ☐ Not complied

Coupling Point (AC)	Polarity	Levels (kV)	Results ( criterion )
	$\pm$	0.5/ 1 (kV)	
	$\pm$	0.5/ 1 / 2 (kV)	
	$\pm$	0.5/ 1 / 2 (kV)	

Comment :

- Not Applicable.

## 7.7 Conducted Immunity

### Environmental Conditions

Temperature	23.5	°C
Humidity	48	% R.H.
Atmosphere pressure	102.1	kPa
Test Area	EMC Test Room	
Test date	2020.03.31	

### 7.7.1 Measurement procedure

A ground reference plane was located on the floor.

The EUT was isolated 0.1 m isolating support.

The ground plane was connected to floor reference ground plane via low impedance connection.

This test were Performed using CDN for mains, clamp for signal and injection probe.

### 7.7.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
CS GENERATOR	NSG 4070	TESEQ	48185	2021-01-17	<input checked="" type="checkbox"/>
Attenuator (6dB)	ATN 6150	TESEQ	17091901	2020-06-28	<input checked="" type="checkbox"/>
CDN	M016	TESEQ	49312	2020-06-28	<input checked="" type="checkbox"/>
EM Injection Clamp	F-2031-23MM	FCC	091219	2020-05-16	<input checked="" type="checkbox"/>

### 7.7.3 Test Data

Test Specification : EN 61000-4-6

Frequency Range

Frequency (MHz)	Voltage Level (r.m.s.) (V)
0.15 to 80	3

Location of Coupling ( DC cable Length : 0.3m)

☐ AC mains ☒ DC mains ☐ Signal Lines

Modulation

☒ AM : 1kHz, 80%

☐ PM : 1Hz (0.5 s ON : 0.5 s OFF)

Frequency step

☒ log 1% step

☐ log 3% step

☐ log 5% step

Dwell Time

☐ 3 s

☐ 2 s

☒ 1 s

Test Results

☒ Complied

☐ Not complied

Coupling Point (AC)	Coupling Method	Results ( criterion )
DC mains	CDN (M2)	A

Coupling Point (Signal)	Coupling Method	Results ( criterion )
	EM Injection Clamp	
	EM Injection Clamp	

Comment :

- There was no change of operation status during above testing.

## 7.8 Magnetic field Immunity

### Environmental Conditions

Temperature	22.6	°C
Humidity	48	%
Atmosphere pressure	102.1	kPa

Test Area EMC Test Room

Test date 2020.03.31

### 7.8.1 Measurement procedure

The Magnetic field to which equipment is subjected may influence the reliable operation of equipment and systems.

The following tests are intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields related to the specific location and installation condition of the equipment (e.g. proximity of equipment to the disturbance source).

The power frequency magnetic field is generated by power frequency current in conductors or, more seldom, from other devices (e.g. leakage of transformers) in the proximity of equipment.

As for the influence of nearby conductors, one should differentiate between :

- the current under normal operating conditions, which produces a steady magnetic field, with a comparatively small magnitude;
- the current under fault conditions which can produce comparatively high magnetic fields but of short duration, until the protection devices operate (a few milliseconds with fuses, a few seconds for protection relays).

The test with short duration magnetic field related to fault conditions, requires test levels that differ from those for steady state conditions; the highest value apply mainly to equipment to be installed in exposed places of electrical plants.

### 7.8.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2020-06-28	<input checked="" type="checkbox"/>
Motorized Variac	variatic NX1-260-16	EM Test	P1745207277	-	<input checked="" type="checkbox"/>
Current transformer	MC 2630	EM Test	P1730202035	2020-06-28	<input checked="" type="checkbox"/>
Magnetic field coil	MS 100N	EM Test	P1738203462	2020-06-28	<input checked="" type="checkbox"/>

### 7.8.3 Test data

Test specification : EN 61000-4-8

Magnetic field strength : ☐ 1A/m ☐ 3A/m ☒ 30A/m

Frequency : ☒ 50Hz ☐ 60Hz

Coupling time : 60s

Positions	Test level	Results ( criterion )
X	A/m	A
Y	A/m	A
Z	A/m	A

#### Comment :

- There is nothing to do the Magnetic field for immunity test.

## 7.9 Dips and Interruptions

### Environmental Conditions

Temperature	°C
Humidity	% R.H.
Atmosphere pressure	kPa
Test Area	EMC Test Room
Test date	2020.03.31

### 7.9.1 Measurement procedure

The EUT shall be connected to the test generator with the shortest power supply cable specified by the EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT. Tests on 3-Phase EUT must be accomplished by using 3 sets of equipment mutually synchronized.

Type designation of the EUT.

- Information on possible connections (plugs, terminals, etc.) and corresponding cables and peripherals,
- Input power of equipment to be tested,
- Representative operational modes of the EUT for the test,
- Performance criteria used and defined in the technical specifications.

If the actual operating signal sources are not available to the EUT, they may be simulated.

Voltage Dips and Short Interruptions

- The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 seconds minimum (between each test event). Each representative mode of operation shall be tested.

Voltage Variations

- The EUT is tested to each of the specified voltage variations. Three times at 10 second intervals for the most representative modes of operations.

### 7.9.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2020-06-28	<input type="checkbox"/>
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	<input type="checkbox"/>

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### 7.9.3 Test data

Test specification : EN 61000-4-11

Normal Voltage / Frequency : ☐ 115Vac / 50Hz ☐ 230Vac / 50Hz  
☐ 100Vac / 60Hz ☐ 230Vac / 60Hz  
☐ Dips ( 40% )  
☐ Dips ( 70% )  
☐ Dips ( > 95% )  
☐ Interruption ( > 95% )  
Event time : ☐ 25P ☐ 0.5P ☐ 250P  
☐ 1P ☐ 10P ☐ 12P  
☐ 300P ☐ 30P ☐ 50P  
Phase ☐ 0 ° ☐ 180 ° ☐ 360 °

#### Test results

☐ Complied ☐ Not complied

Test Level ( %UT )	Dip / Int. ( %UT )	Period[50 Hz]	Period[50 Hz]	Results ( criterion )
0%	100%	0.5	0.4	B
0%	100%	1	1	C
40%	60%	10	12	C
70%	30%	25	30	C
80%	20%	250	300	C
0%	100%	250	300	C

**Comment : Not Applicable.**

\* This test doesn't apply to EUT because the EUT uses DC power.



## 7.10 Harmonics

### Environmental Conditions

Temperature	°C
Humidity	% R.H.
Atmosphere pressure	kPa
Test Area	EMC Test Room
Test date	

### 7.10.1 Measurement procedure

The equipment is supplied in series with shunt(s) Rm or current transformer(s) from a source having the same nominal voltage and frequency as the rated supply voltage and frequency of the equipment.

Measurements shall be made under normal load, or conditions for adequate heat discharge, and under normal operating conditions.

User's operation controls or automatic programmers shall be set to produce the maximum harmonic component, for each successive harmonic component in turn. For the purpose of harmonic current limitation, equipment is classified as follows :

Class A: Equipment not specified in one of the three other Classes shall be considered as Class A equipment.

- Balanced three-phase equipment;
- Household appliances excluding equipment identified as Class D;
- Tools excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Class B : Portable tools; Arc welding equipment which is not professional equipment.

Class C : Lighting equipment.

Class D : Equipment having a specified power according to 6.2.2 less than or equal to 600 w,  
of the following types:

- Personal computers and personal computer monitors;
- Television receivers.
- refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

### 7.10.2 Used equipments

Equipment	Model no.	Manufacturer.	Serial no.	Next Cal. date	Used
PROGRAMMABLE AC POWER SOURCE	N4A06	Newtons4th Ltd.	91J-13186	2020-06-03	<input type="checkbox"/>
Precision Power Analyzer	PPA5511	Newtons4th Ltd	162-05556	2020-06-04	<input type="checkbox"/>
Impedance Network	IMP161	Newtons4th Ltd	91G-13185	2020-06-11	<input type="checkbox"/>

### 7.10.3 Test data

Not Applicable.

\* This test doesn't apply to EUT because the EUT uses DC power.

### Test results

☐ Complied

☐ Not complied

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## 7.11 Flicker

### Environmental Conditions

Temperature °C

Humidity % R.H.

Atmosphere pressure kPa

Test Area EMC Test Room

Test date

### 7.11.1 Measurement procedure

EUT was connected to the power analyzer system.

Measurement was performed to obtain the desired flicker parameters.

The measuring time depends on which parameters are to be measured.

$P_{lt}$  = 2 h

$P_{st}$  = 10 min

Controls and automatic programs shall be set to produce the most unfavorable sequence of voltage changes, using only those combinations of controls and programs are mentioned by the manufacturer in the instruction manual.

### 7.11.2 Used equipments

Equipment	Model no.	Manufacturer.	Serial no.	Next Cal. date	Used
PROGRAMMABLE AC POWER SOURCE	N4A06	Newtons4th Ltd.	91J-13186	2020-06-03	<input type="checkbox"/>
Precision Power Analyzer	PPA5511	Newtons4th Ltd	162-05556	2020-06-04	<input type="checkbox"/>
Impedance Network	IMP161	Newtons4th Ltd	91G-13185	2020-06-11	<input type="checkbox"/>

### 7.11.3 Test data

Not Applicable.

\* This test doesn't apply to EUT because the EUT uses DC power.

### Test results

☐ Complied

☐ Not complied

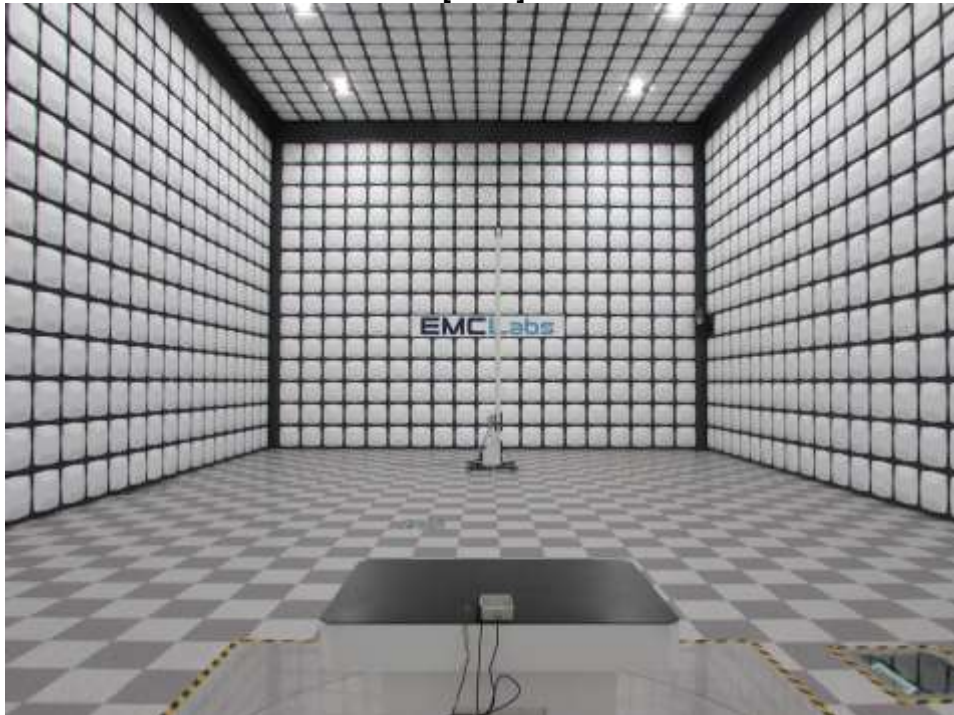
## 8. Test Photographs

### Radiated Emission (Below 1GHz)

[ front ]



[ rear ]



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**Radiated Emission ( Above 1GHz)**

[ front ]

**N/A**

[ rear ]

**N/A**

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**Conducted Emission (Main Power)**

[ front ]

**N/A**

[ rear ]

**N/A**

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### Electrostatic Discharge



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**Radio frequency electromagnetic field**

[ 80 MHz to 1 GHz, 1.4 GHz to 2 GHz ]



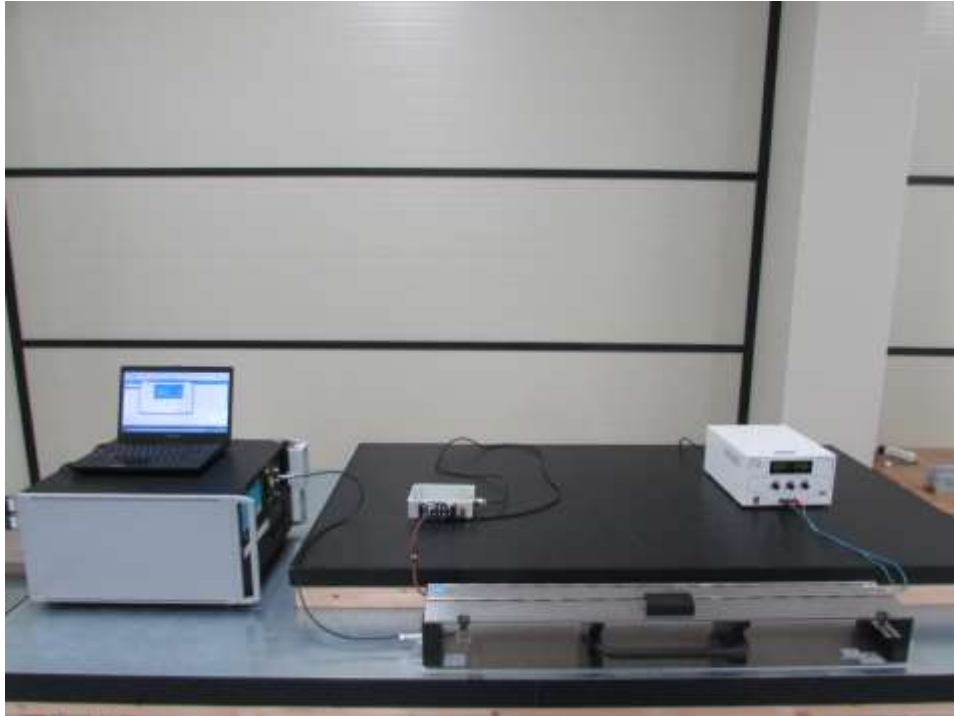
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## Electric Fast Transient

[ DC Power Port ]



Surge

**N/A**

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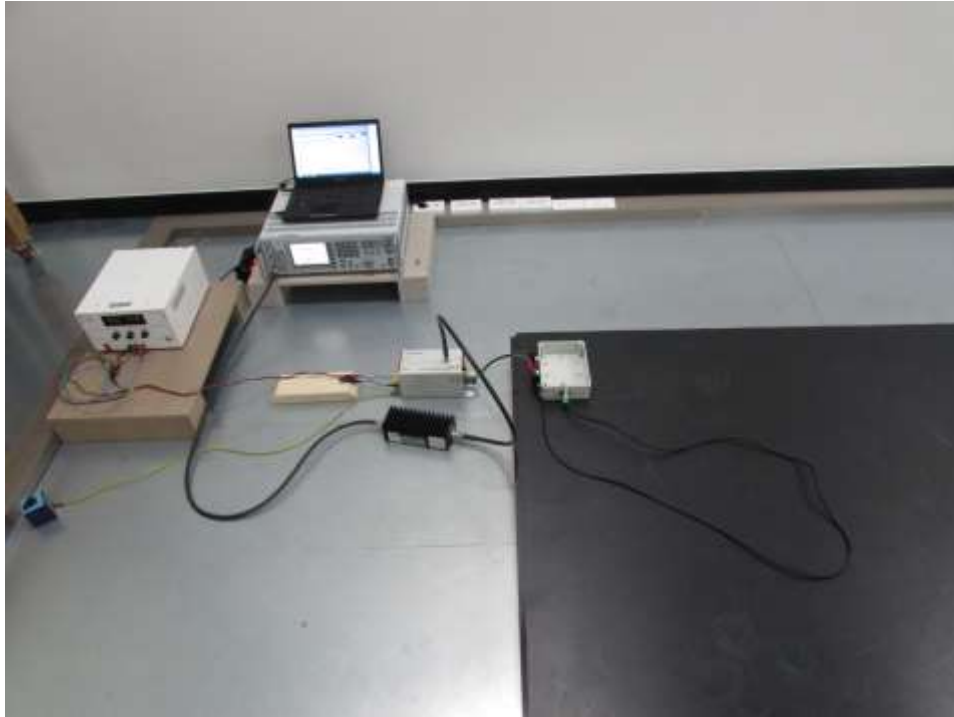
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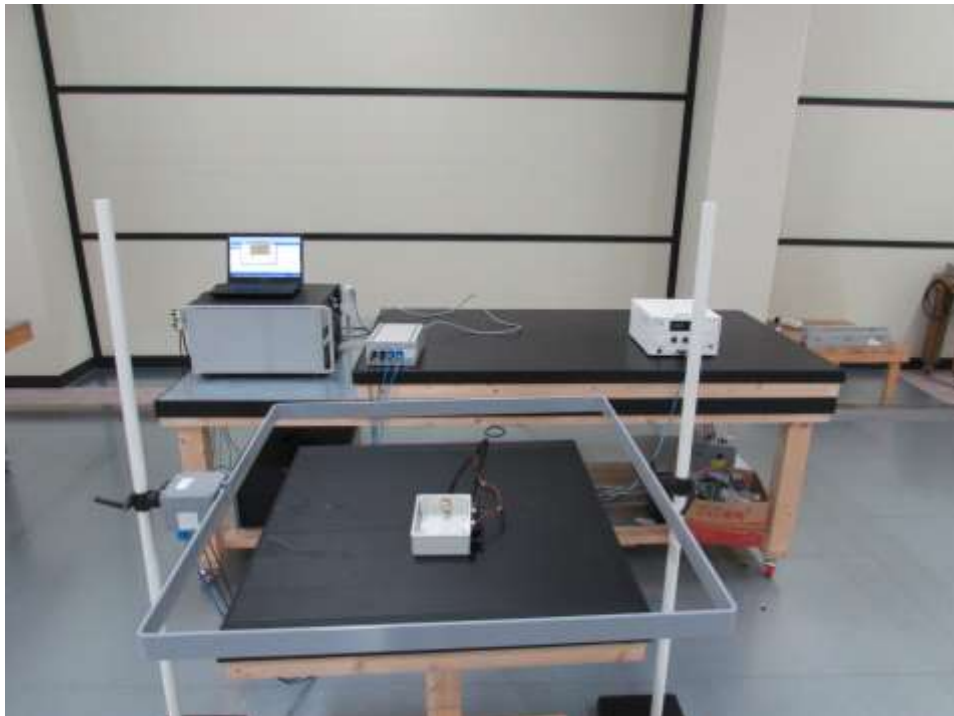


### Conducted Immunity

#### [ Power Port ]



### Power frequency magnetic field



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**Dip/Interruption**

**N/A**

**Harmonics & Flicker**

**N/A**

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## 9. E.U.T. Photographs

[ Front View ]



[ Rear View ]

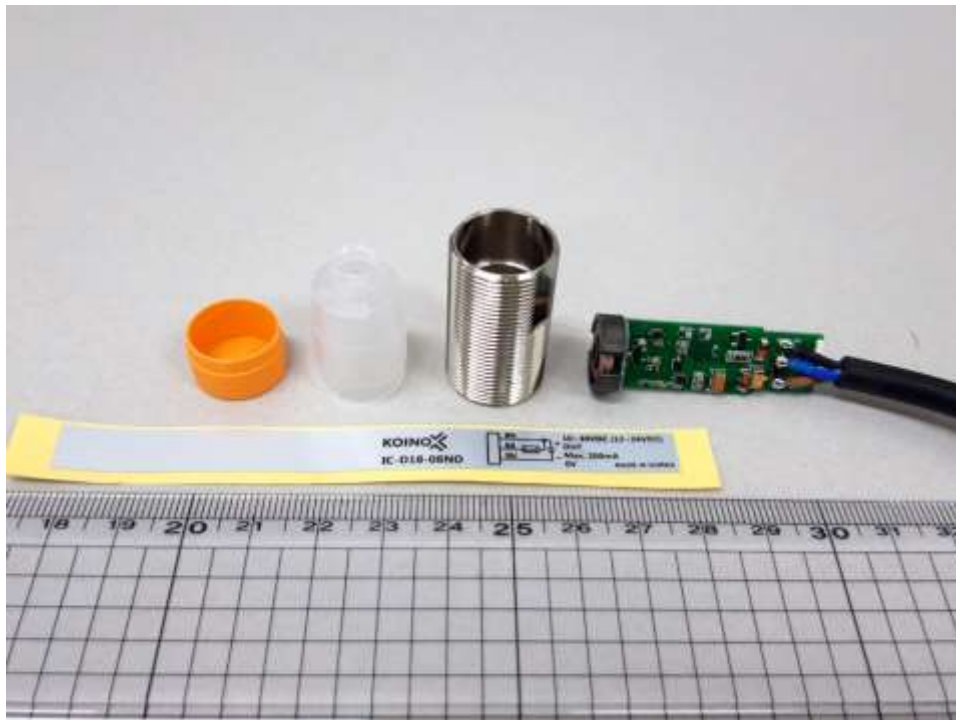


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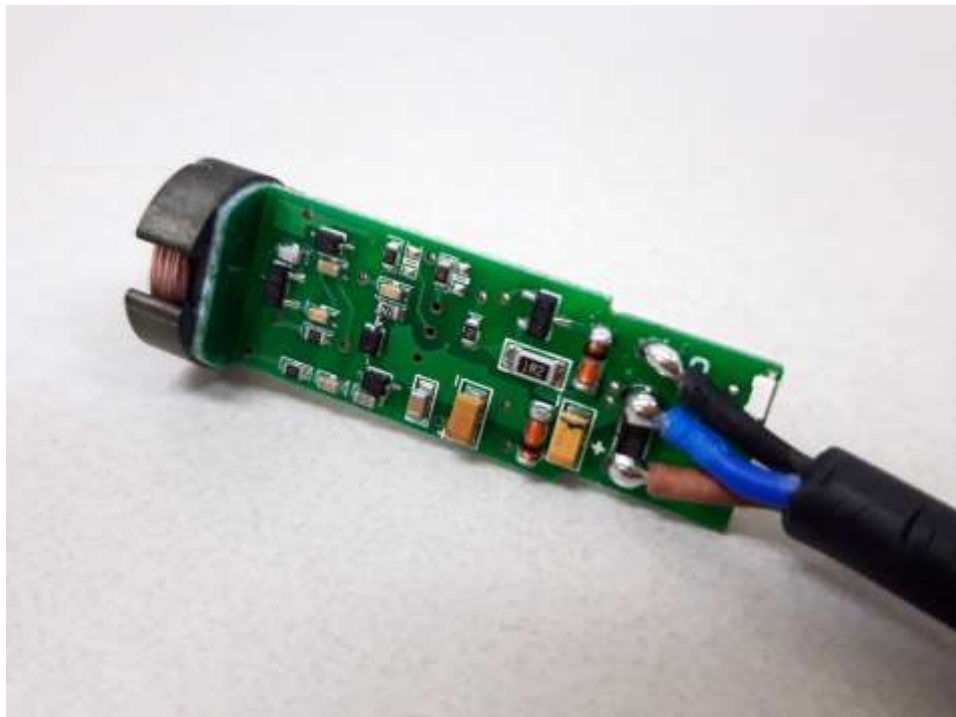
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[ Inside View ]



[ Mainboard\_top ]

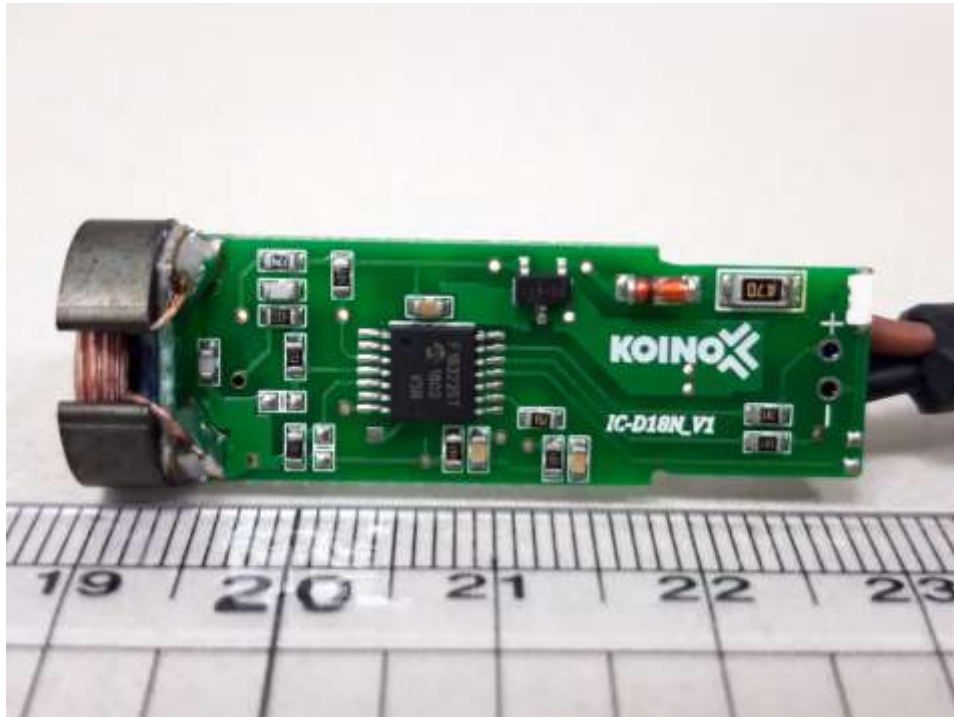


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[ Mainboard\_bottom ]



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