2018/03/16
17:19:09
KST

TEST REPORT

DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si,
Gyeonggi-do, Korea 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DREKCEE1803-0228

2. Customer

- Name : SENKO CO., LTD.
- Address : 73, Oesammi-ro, 15beon-gil, Osan-si, Gyeonggi-do, Korea

3. Use of Report : CE Marking

4. Product Name / Model Name : Portable Multi Gas Trap / SP-MGT-N

5. Test Method Used : EN 50270 : 2015
EN 61000-3-2 : 2014
EN 61000-3-3 : 2013

6. Date of Test : 2018-03-05 ~ 2018-03-13

7. Testing Environment : Temperature (20 ~ 22) °C , Humidity (30 ~ 34) % R.H.

8. Test Result : Refer to the attached Test Result

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose.
This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

Affirmation	Tested by Name : BumSeok Oh (Signature)	Technical Manager Name : KyoungHwan Bae (Signature)

The above test report is the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2018 . 03 . 16 .

DT&C Co., Ltd.
Accredited by KOLAS, Republic of KOREA

* This laboratory is not accredited for the test results marked

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

CONTENTS

1. General Remarks

This report contains the result of tests performed by:

DT&C Co., Ltd.

Address : 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042

http://www.dtnc.net

Tel: +82-31-321-2664 Fax: +82-31-321-1664

2. Test Laboratory

DT&C Co., Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
	South Africa	SABS	0006	ISO/IEC 17025
Site Filing	USA	FCC	KR0034 101842 678747, 596748, 804488, 165783	Accredited 2.948 Listed
	Canada	IC	5740A-3 5740A-4	Registered
	Japan	VCCI	C-1427 R-1364, R-3385, R-4076, R-4180, T-1442, G-10338, G-754, G-10815	Registered
Certification	Korea	KC	KR0034	Designation
	Germany	TUV	CARAT 17 11 89112 005	ISO/IEC 17025

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.

3. General Information of EUT

Product Name	Portable Multi Gas Trap
Model Name	SP-MGT-N
Add Model Name	None
Serial No	None
Type of Sample Tested	Pre-Production
Rating Power Supply	DC 3.7 V
Supplied Power for Test	AC 230 V 50 Hz
Applicant	SENKO CO., LTD. 73, Oesammi-ro, 15beon-gil, Osan-si, Gyeonggi-do, Korea
Manufacturer	SENKO CO., LTD. 73, Oesammi-ro, 15beon-gil, Osan-si, Gyeonggi-do, Korea
Factory	SENKO CO., LTD. 73, Oesammi-ro, 15beon-gil, Osan-si, Gyeonggi-do, Korea

4. Test Summary

4.1 Applied standards and test results

Test Items	Remarks	Results
I. Emission		
Conducted Disturbance	EN 61000-6-4 : 2007 / A1 : 2011 CISPR 16-1-2 and CISPR 16-2-1	**C**
Radiated Disturbance	EN 61000-6-4 : 2007 / A1 : 2011 CISPR 16-1-4, CISPR 16-1-5 and CISPR 16-2-3	**C**
Harmonic Current Emission	EN 61000-3-2 : 2014 (IEC 61000-3-2 : 2014)	**C**
Voltage Change, Fluctuations and Flicker	EN 61000-3-3 : 2013 (IEC 61000-3-3 : 2013)	**C**
II. Immunity		
Electrostatic Discharge	EN 50270 : 2015 EN 61000-4-2 : 2009 (IEC 61000-4-2 : 2008)	**C**
Radio-Frequency Electromagnetic Field	EN 50270 : 2015 EN 61000-4-3 : 2006 / A1 : 2008 / A2 : 2010 (IEC 61000-4-3 : 2010)	**C**
Fast Transient	EN 50270 : 2015 EN 61000-4-4 : 2012 (IEC 61000-4-4 : 2004 / A1:2010)	**C**
Surges	EN 50270 : 2015 EN 61000-4-5 : 2006 (IEC61000-4-5 : 2005)	**C**
Radio-Frequency Continuous Conducted	EN 50270 : 2015 EN 61000-4-6 : 2014 (IEC61000-4-6 : 2013)	**C**
Power Frequency Magnetic Fields	EN 50270 : 2015 EN 61000-4-8:2010 (IEC61000-4-8:2009)	**N/A (Note 1)**
Voltage Dips and Interruptions	EN 50270 : 2015 EN 61000-4-11 : 2004 (IEC 61000-4-11 : 2004)	**C**
Voltage Dips and Interruptions(DC Input Power)	EN 50270 : 2015 EN 61000-4-29 : 2000 (IEC 61000-4-29 : 2000)	**N/A (Note 2)**

The data in this test report are traceable to the national or international standards.

Note 1) This test was not required because EUT does not have magnetic field sensitive devices.

Note 2) This test was not required because EUT is not used DC power.

4.2 Test environment and conditions

Test Items	Test date (YYYY-MM-DD)	Temp (℃)	Humidity (% R.H.)	Pressure (kPa)
I. Emission				
Conducted Disturbance	2018-03-06	20	34	-
Radiated Disturbance	2018-03-06	21	34	
Harmonic Current Emission	2018-03-13	22	30	
Voltage Change, Fluctuations and Flicker	2018-03-13	22	30	
II. Immunity				
Electrostatic Discharge	2018-03-05	20	34	101.9
Radio-Frequency Electromagnetic Field	2018-03-06 ~ 2018-03-07	20 ~ 21	31 ~ 32	101.6 ~ 101.9
Fast Transient	2018-03-08	20	33	102.0
Surges	2018-03-08	20	33	102.0
Radio-Frequency Continuous Conducted	2018-03-08	20	33	102.0
Voltage Dips and Interruptions	2018-03-08	20	33	102.0

5. Test Set-up and operation mode

5.1 Principle of Configuration Selection

Emission : The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity : The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

5.2 Test Operation Mode

- Measure Mode : EUT was in a closed bag filled with mixed gas and tested by checking density of the each gas (O_2, CO, H_2S, CH_4).
- Charging Mode : EUT was charged by AC/DC adapter.

MODE No.	Operating Mode
MODE 1	Measure Mode
MODE 2	Charging Mode

5.3 Support Equipment Used

Type	Model No	Serial No	Manufacturer	Cable		
				Connect type	Length (m)	Shield
Adapter	ICP12-060-1200D	N/A	I.T.E POWER SUPPLY	DC IN	1.6	Non-Shield

NOTE

- See “APPENDIX 2 Photographs” for actual system test setup

6. Test Results : Emission

6.1 Conducted Disturbance

6.1.1 Measurement Procedure

In the range of 10 kHz to 30 MHz, the conducted disturbance was measured and set-up was made accordance with **EN 61000-6-4.**

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN, if any.

Unused measuring port of the LISN was resistively terminated by 50 ohm terminator.

The measuring port of the LISN for EUT was connected to spectrum analyzer.

Using conducted emission test software, the emissions were scanned with peak detector mode.

After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has Quasi-Peak detector and Average detector.

By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.

For further description of the configuration refer to the picture of the test set-up.

6.1.2 Limit for Conducted Disturbance

(1) Conducted disturbance at mains ports.(EN61000-6-3) AC POWER

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1) At transitional frequencies the lower limit applies. Note 2) The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz. Note 3) The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 log10 150 / I = 44 dB)		

(2) Conducted disturbance at mains ports.(EN 61000-6-4) AC POWER

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.5	79	66
0.5 to 30	73	60
Note 1 The lower limit shall apply at the transition frequencies.		

(3) Conducted disturbance at telecommunication ports.

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.5	97 to 87	84 to 74
0.5 to 30	87	74
Note 1) The limit decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. Note 2) The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 log10 150 / I = 44 dB)		

Measurement uncertainty :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	2.36 dB

Test Result

< Mains ports _ Mode 2 >

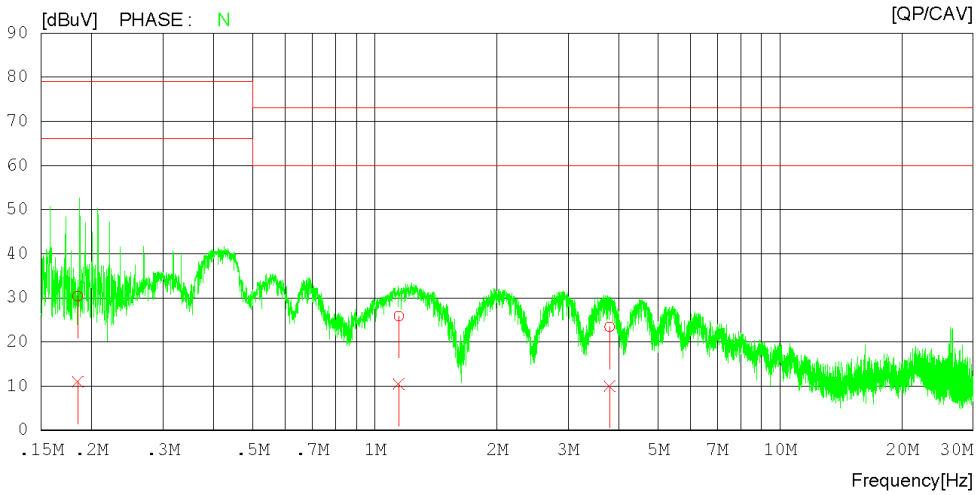
Results of Conducted Emission

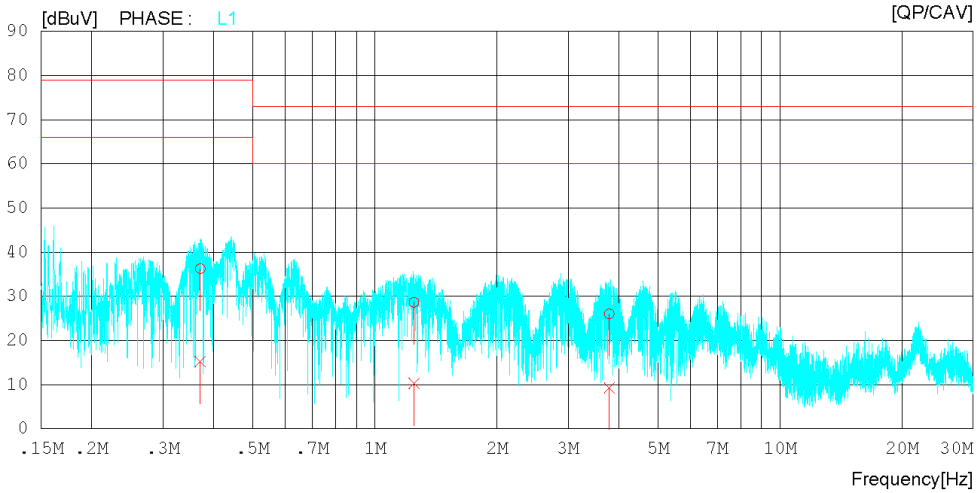
Date : 2018-03-06

Orderl No.	:	DTNC1802-01098	:	
Power Supply	:	230 V 50 Hz	:	
Temp/Humi.	:	20 'C 34 % R.H.	:	
	:		:	

Test mode : Charging mode

LIMIT : CISPR22_A QP
CISPR22_A AV





Results of Conducted Emission

Date : 2018-03-06

Orderl No.	:	DTNC1802-01098	:	
Power Supply	:	230 V 50 Hz	:	
Temp/Humi.	:	20 'C 34 % R.H.	:	
	:		:	

Test mode : Charging mode

LIMIT : CISPR22_A QP
CISPR22_A AV

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.18450	20.33	0.98	10.04	30.37	11.02	79.00	66.00	48.63	54.98	N
2	1.14537	15.79	0.42	10.08	25.87	10.50	73.00	60.00	47.13	49.50	N
3	3.79554	13.28	-0.15	10.17	23.45	10.02	73.00	60.00	49.55	49.98	N
4	0.37053	26.22	5.14	10.03	36.25	15.17	79.00	66.00	42.75	50.83	L1
5	1.24899	18.52	0.16	10.08	28.60	10.24	73.00	60.00	44.40	49.76	L1
6	3.79236	15.84	-0.88	10.16	26.00	9.28	73.00	60.00	47.00	50.72	L1

6.2 Radiated Disturbance

6.2.1 Measurement Procedure

The radiated disturbance was measured and set-up was made accordance with **EN 61000-6-4.**

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 3 m or 10 m away from the interference receiving antenna in the **10 m semi-anechoic chamber.**

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For below 1 GHz frequency range, Quasi-Peak detector with 120 kHz RBW was used.

Also Peak and Average detector with 1 MHz RBW were used for above 1 GHz frequency range.

For further description of the configuration refer to the picture of the test set-up.

- The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1 000
108 – 500	2 000
500 – 1 000	5 000
Above 1 000	6 000

6.2.2 Limit for Radiated Disturbance

(1) Radiated Disturbance at a measuring distance of 10m accordance with EN61000-6-3

Frequency range (MHz)	Quasi-peak limits (dBμV/m)
30 to 230	30
230 to 1000	37
Note 1 The lower limit shall apply at the transition frequency. Note 2 If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz.	

(2) Radiated Disturbance at a measuring distance of 10m accordance with EN 61000-6-4

Frequency range (MHz)	Quasi-peak limits (dBμV/m)
30 to 230	40
230 to 1000	47
Note 1 The lower limit shall apply at the transition frequency. Note 2 If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz.	

(3) Radiated Disturbance above 1 000 MHz at a measurement distance of 3 m

Frequency range (GHz)	Peak limits (dBμV/m)		Average limits (dBμV/m)	
	EN 61000-6-4	EN61000-6-3	EN 61000-6-4	EN61000-6-3
1 to 3	76	70	56	50
3 to 6	80	74	60	54
Note 1 The lower limit shall apply at the transition frequency.				

Measurement uncertainty (10m Chamber) :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	4.16 dB, (30 ~ 1 000) MHz 3.74 dB, (1 ~ 6) GHz

Test Result

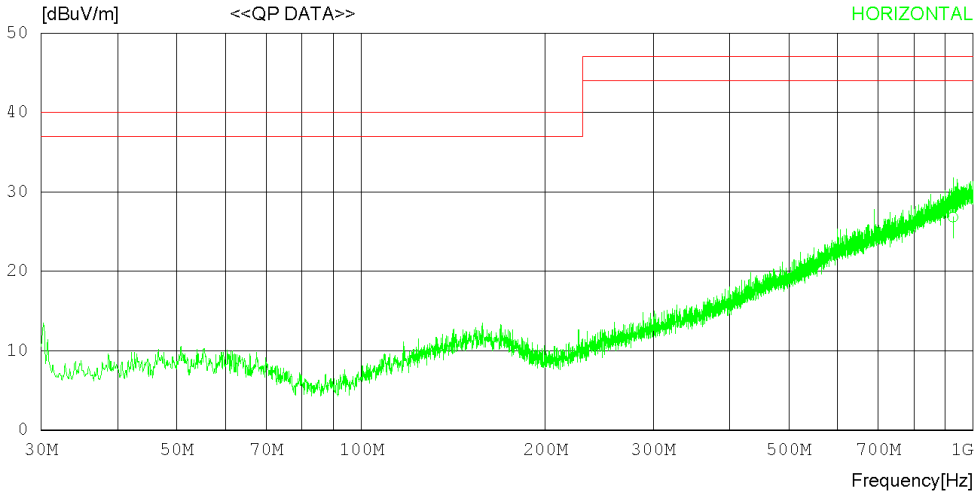
< 30 MHz ~ 1 GHz _ Mode 1 >

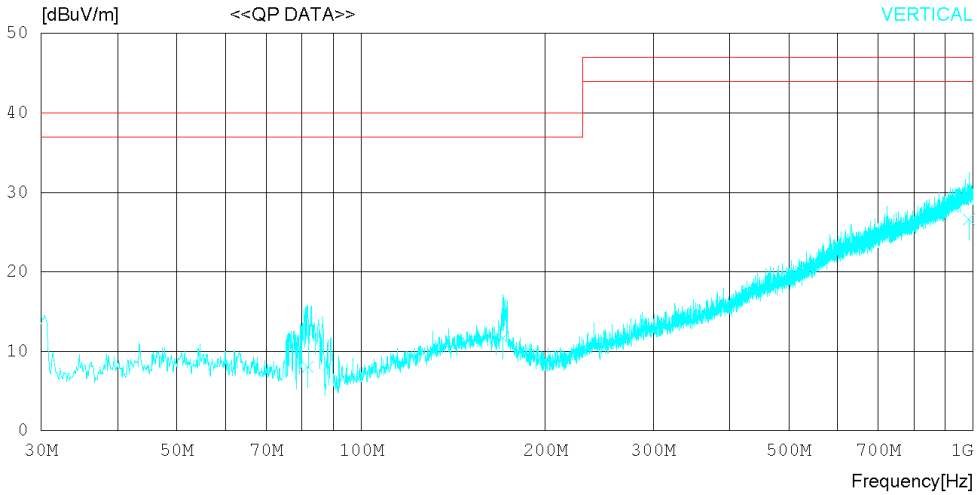
RADIATED EMISSION

Date 2018-03-06

Order No.	DTNC1802-01098
Power Supply	-
Temp/Humi	21 'C 34 % R.H.
Test Condition	

LIMIT : CISPR Pub.11 Class A (10m)
MARGIN: 3 dB





RADIATED EMISSION

Date 2018-03-06

Order No.	DTNC1802-01098
Power Supply	-
Temp/Humi	21 'C 34 % R.H.
Test Condition	

LIMIT : CISPR Pub.11 Class A (10m)
MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	926.965	22.30	23.87	8.70	28.06	26.81	47.00	20.19	400	231
----- Vertical ------										
2	81.773	26.80	8.09	2.61	29.44	8.06	40.00	31.94	100	207
3	170.647	24.70	12.55	3.71	29.29	11.67	40.00	28.33	200	311
4	985.178	21.30	24.35	8.97	28.00	26.62	47.00	20.38	300	242

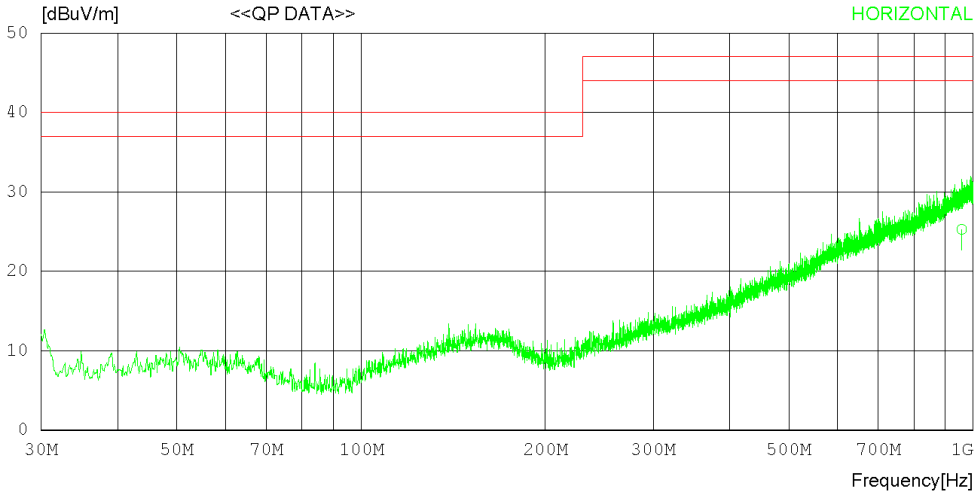
< 30 MHz ~ 1 GHz _ Mode 2 >

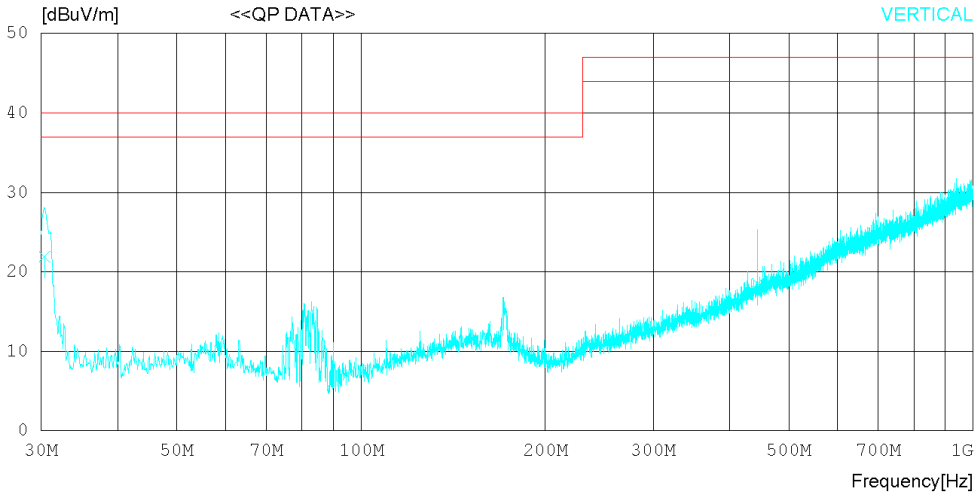
RADIATED EMISSION

Date 2018-03-06

Order No.	DTNC1802-01098
Power Supply	230 V 50 Hz
Temp/Humi	21 'C 34 % R.H.
Test Condition	Charging mode

LIMIT : CISPR Pub.11 Class A (10m)
MARGIN: 3 dB





RADIATED EMISSION

Date 2018-03-06

Order No.	DTNC1802-01098
Power Supply	230 V 50 Hz
Temp/Humi	21 'C 34 % R.H.
Test Condition	Charging mode

LIMIT : CISPR Pub.11 Class A (10m)
MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	958.012	20.30	24.16	8.84	28.01	25.29	47.00	21.71	400	315
----- Vertical ------										
2	30.364	38.60	11.21	1.68	29.62	21.87	40.00	18.13	100	167
3	444.057	24.80	16.82	5.99	29.11	18.50	47.00	28.50	400	276

7. Test Results : Immunity

Description of Performance Criteria

Performance criterion A:

The apparatus shall continue to operate as intended both during and after the test.

For those functions specified by the manufacturer as being safety functions, when the apparatus is used as intended no loss of function is allowed and the performance requirements shall be complied with.

Performance criterion B:

During the test

- degradation of performance is allowed but the performance requirements shall not be exceeded by more than a factor of 2, or
- the apparatus shall show a specified fault indication and/or output.

After the test any degradation in performance shall be self-recoverable and the apparatus shall continue to operate as intended. No permanent change of actual operating state or stored data or continuous deactivation of alarm is allowed.

Performance Criteria C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost

7.1 Electrostatic Discharge

7.1.1 Measurement Procedure

The immunity against electrostatic discharge was tested in accordance with **EN 50270.**
The test set-up was made accordance with **EN 61000-4-2.**
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 table top equipment, EUT was placed on the reference plane on 80 cm of insulating support. And a vertical coupling plane (VCP) of (0.5 x 0.5) m was located 10 cm from the EUT's sides. The VCP was connected to the reference plane via a cable with a 470 kΩ (2ea) resistor.
The test was made by applying contact and air discharges to the EUT and contact discharges to the VCP/HCP.
When applying the discharges to the VCP the tip of the generator was located at the middle edge of the VCP. The VCP was located 10 cm from each side of the EUT.
Contact discharges were applied to various points of the EUT at conductive surfaces and to the HCP/VCP. Air discharges were applied to various points of the EUT at non-conductive surfaces.

Test voltages and kind of discharge	
Direct : Air Discharges (kV)	8 (kV)
Contact Discharges (kV)	6 (kV)
Indirect : HCP / VCP (kV)	6 (kV)
Polarity	+ and -
Discharge impedance	330 Ω / 150 pF
Discharge Repetition	≥1 sec
Number of discharges per point for each voltage and polarity	≥10
Performance criteria	A
Test Mode	All Test Modes

Measurement uncertainty :

Uncertainty = 5 %
It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least 95 % confidence.

7.1.2 Test Point and Result

- Indirect Discharge

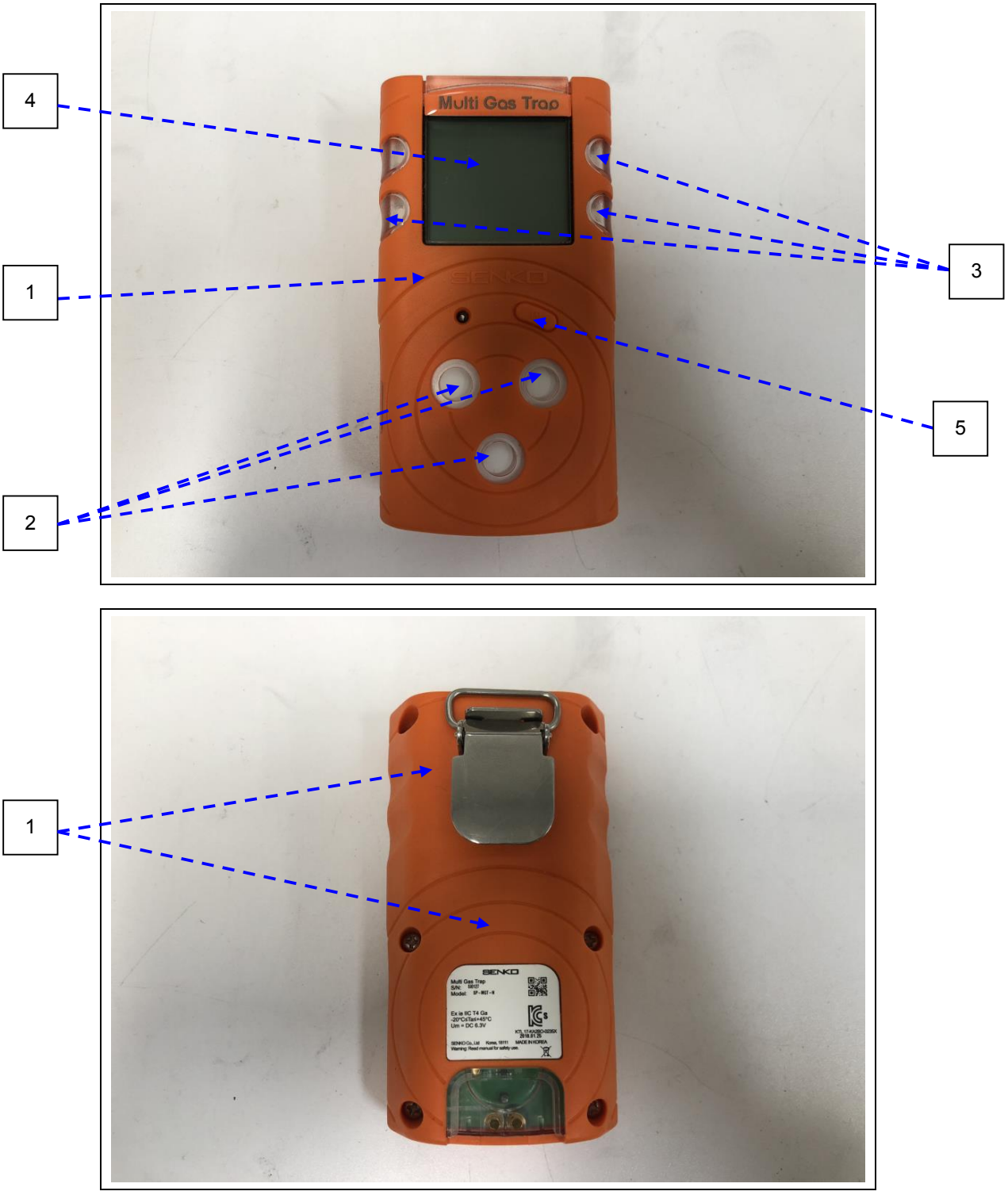
No.	Position	Kind of Discharge	Test level	Performance Criteria	Result
1	Horizontal Coupling Plane	Contact	±6 kV	A	A
2	Vertical Coupling Plane				A

- Direct Discharge

No.	Position	Kind of Discharge	Test level	Performance Criteria	Result
1	Enclosure	Air	±8 kV	A	A
2	Sensors				A
3	LEDs				A
4	Display				A
5	Button				A

ESD

7.1.3 Discharge Position



7.2 Radio-Frequency Electromagnetic Field

7.2.1 Measurement Procedure

The immunity against radio-frequency electromagnetic field was made accordance with **EN 50270.**
The test set-up was made accordance with **EN 61000-4-3** in semi-anechoic chamber.
The EUT has been placed in center of a wooden turntable.
The height of this table was 0.8 m. The field strength was monitored by an isotropic sensor during the complete test.
The isotropic sensor was located beside the equipment.
The antenna has been orientated for both horizontal and vertical polarization.
The distance between antennas the equipment under testing was at least 3 m.
The tests have been performed with the antenna facing each of the four side of the EUT.

Field strength (V/m)	10 V/m	10 V/m	3 V/m
Frequency range	80 MHz ~ 1.0 GHz	1.4 GHz ~ 2.0 GHz	2.0 GHz ~ 2.7 GHz
Amplitude Modulation	AM, 80 %, 1 kHz sine-wave		
Step size	1 % of fundamental		
Sweep capability	$\leq 1.5 \times 10^{-3}$ decade/s		
Performance criterion	A		
Test Mode	All Test Modes		

Measurement uncertainty :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	1.22 dB

7.2.2 Test Result

Frequency	Test Level (V/m)	ANT Polarization	EUT Position	Performance Criteria	Result	Remark
80 ~ 1 000 MHz	10 V/m	Horizontal	Front	A	A	-
			Rear		A	-
			Right		A	-
			Left		A	-
		Vertical	Front		A	-
			Rear		A	-
			Right		A	-
			Left		A	-
1.4 ~ 2.0 GHz	10 V/m	Horizontal	Front		A	-
			Rear		A	-
			Right		A	-
			Left		A	-
		Vertical	Front		A	-
			Rear		A	-
			Right		A	-
			Left		A	-
2.0 ~ 2.7 GHz	3 V/m	Horizontal	Front		A	-
			Rear		A	-
			Right		A	-
			Left		A	-
		Vertical	Front		A	-
			Rear		A	-
			Right		A	-
			Left		A	-

Radio-frequency electromagnetic field

7.3 Fast Transients

7.3.1 Measurement Procedure

The immunity against fast transients was tested in accordance with **EN 50270.**
The test set-up was made accordance with **EN 61000-4-4.**
The EUT has been placed on a wooden table 10 cm above the reference ground plane.
The reference ground plane exceeded the projected geometry of the EUT and the capacitive clamp by more than 20 cm. The clamp has placed directly on the reference ground plane.
The distance between the EUT and all other conductive structures except the ground plane beneath the EUT was more than 50 cm.
The distance between noise generator and EUT was about 50 cm.

	AC power ports	DC power ports / Signal ports
Test voltage (kV)	2 (kV)	1, 2 (kV)
Polarity	+ and -	
Repetition frequency	5 kHz	
Tr/Th ns	5 / 50	
Performance criteria	A	
Test Mode	Mode 2	

Measurement uncertainty :

Uncertainty = 10 %
It has been demonstrated that the EFT/Burst generator meets the specified requirements in the standard with at least 95 % confidence.

7.3.2 Test Result

Line	Test Level (kV)	Performance Criteria	Result	Remark
N	±2 kV	A	A	-
L1			A	-
N - L1			A	-

EFT / Power Line

Line	Test Level (kV)	Performance Criteria	Result	Remark
-	-	-	-	-

EFT / Signal Line

7.4 Surges

7.4.1 Measurement Procedure

The immunity against surges was tested in accordance with **EN 50270.**
The test set-up was made accordance with **EN 61000-4-5.**
The test consists of the injection of slow high energy transients in the AC/DC mains supply lines in both line-to-line and line-to-ground coupling mode, and into the signal and extra low voltage supply lines in line-to-ground coupling mode. The impedance of the transient generator is characterized by the shape of the open-circuit voltage and the circuit current pulses.
To simulate typical installation impedances, 40 are inserted when the generator when extra low voltage and signal lines are tested, and 10 are inserted when the line-to-ground test is conducted on the AC/DC mains lines. The test pulses are coupled into the leads to be tested by means of appropriate coupling networks, which maintain the test pulses within their speci-fication. The reference ground plane exceeded the projected geometry of the EUT and the back filler by more than 20 cm. The back filler has been placed directly on a separated refer-ence ground plane. Both ground planes were connected together. The ground terminal of the back filler has been connected directly with its reference ground plane.

	AC power ports	DC power ports	Signal ports
Test voltage (kV)	Line to Line : 1 (kV) Line to Ground : 2 (kV)	Line to Ground : 1, 2 (kV)	Line to Ground : 1, 2 (kV)
Polarity	+ and -		
Waveshape, open circuit voltage	1.2 μs / 50 μs		
Waveshape, short circuit current	8 μs / 20 μs		
Phase shifting	0°, 90°, 180°, 270° (AC power ports)		
Repetition rate	60 sec		
Number of surges	5		
Performance criteria	B		
Test Mode	Mode 2		

Measurement uncertainty :

Uncertainty = 10 %
It has been demonstrated that the Surge generator meets the specified requirements in the standard with at least 95 % confidence.

7.4.2 Test Result

Line	Test Level (kV)	Performance Criteria	Result	Remark
N - L1	±1 kV	B	A	-

Surges / Power Line

Line	Test Level (kV)	Performance Criteria	Result	Remark
-	-	-	-	-

Surges / Signal Line

7.5 Radio-Frequency Continuous Conducted

7.5.1 Measurement Procedure

The immunity against radio-frequency continuous conducted was tested in accordance to **EN 50270.**

Test set-up was made according to **EN 61000-4-6.**

The EUT has been placed on a wooden table 10 cm above the reference ground plane.

The reference ground plane exceeded the projected geometry of the EUT and the Coupling /Decoupling Network (CDN) by more than 30 cm. The CDN has been placed directly on the reference ground plane. The cable between CDN and EUT has a length of 30 cm.

Applied voltage	10 V
Frequency range	150 kHz ~ 80 MHz
Modulation	AM, 80 %, 1 kHz sine-wave
Step size	1 % of fundamental
Sweep capability	1.5 x 10^{-3} decade/s
Performance criteria	A
Test Mode	Mode 2

Measurement uncertainty :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	2.66 dB (CDN) 4.08 dB (CLAMP)

7.5.2 Test Result

Port	Test Level (V)	Performance Criteria	Result	Remark
Power Line (M2)	10 V	A	A	-

Radio-frequency continuous conducted / Power Line

Port	Test Level (V)	Performance Criteria	Result	Remark
-	-	-	-	-

Radio-frequency continuous conducted / Signal Line

7.6 Voltage Dips and Interruptions

7.6.1 Measurement Procedure

The immunity against voltage dips and interruptions was tested in accordance with **EN 50270.**
The test set-up was made accordance in with **EN 61000-4-11.**

Voltage Dips

At 50 Hz

Voltage reduction	40 %	70 %	100 %
Number of periods	10	25	1
Performance criterion	C	C	C

Voltage Interruptions

Voltage reduction	100 %
Number of periods	250
Number of reductions (periods) at each duration	3
Interval between reductions	≥10
Performance criteria	C

At 60 Hz

Voltage reduction	40 %	70 %	100 %
Number of periods	12	30	1
Performance criterion	C	C	C

Voltage Interruptions

Voltage reduction	100 %
Number of periods	300
Number of reductions (periods) at each duration	3
Interval between reductions	≥10
Performance criteria	C

Test Mode	Mode 2

Measurement uncertainty :

Uncertainty = 5 %
It has been demonstrated that the Voltage dip generator meets the specified requirements in the standard with at least 95 % confidence.

7.6.2 Test Result

At 50 Hz

Voltage dips % Ut	Cycle	Performance Criteria	Result	Remark
40	10	C	A	-
70	25	C	A	-
100	1	C	A	-
Note 1) During the test, EUT was turned off but operating again by itself.				

Voltage Dips

Voltage dips % Ut	Cycle	Performance Criteria	Result	Remark
100	250	C	B	(Note 1)
Note 1) During the test, the charging was stopped but it operated normally again after the test without operator's intervention.				

Voltage interruptions

8. Harmonic Current Emission

8.1 Measurement Procedure

The harmonic current emission in the frequency from 0 to 2 kHz was tested in accordance with **EN 61000-3-2.**
The measurement was carried out under steady conditions using power analyzer.
The measurement was performed with the test software.

Decide the classification of the EUT as following;

Class A :
- balanced three-phase equipment
- household appliances, excluding equipment identified as class D
- tools, excluding portable tools
- dimmers for incandescent lamps
- audio equipment
- equipments not specified in one of the three other classes

Class B :
- portable tools
- arc welding equipment which is not professional equipment

Class C :
- lighting equipment

Class D :
- Equipment specified power less than or equal to 600 W of the following types
- personal computers and personal computer monitors
- television receiver

Note)
1) According to EN 61000-3-2 the manufacturer shall specify the power of the apparatus. This value shall be used for establishing limits; the specified power shall be within ±10 % of the measured power.
2) Limit are not specified for
   - Equipment with a rated power of 75 W or less (other than lighting equipment)
   - Professional equipment with a total rated power greater than 1 kW
   - Symmetrically controlled heating elements with a rated power less than or equal to 200 W
   - Independent dimmers for incandescent lamps with a rated power less than or equal to 1 kW

8.2 Limit for harmonic current emission

- Limit for Class A equipment

Harmonic order (n) Odd harmonics	Maximum permissible Harmonic current (A)	Harmonic order (n) Even harmonics	Maximum permissible Harmonic current (A)
3 5 7 9 11 13 15 ≤ n ≤ 39	2.30 1.14 0.77 0.40 0.33 0.21 0.15 15/n	2 4 6 8 ≤ n ≤ 40	1.08 0.43 0.3 0.23 8/n

- Limit for Class B equipment

It shall not exceed the value give in Class A multiplied by a factor of 1.5.

- Limit for Class C equipment

Harmonic order (n)	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2 3 5 7 9 11 ≤ n ≤ 39 (odd harmonics only)	2 30·λ(λ is the circuit power factor) 10 7 5 3

- Limit for Class D equipment

Harmonic order (n)	Maximum permissible Harmonic current per watt (mA/W)	Maximum permissible Harmonic current (A)
3 5 7 9 11 13 ≤ n ≤ 39 (odd harmonics only)	3.4 1.9 1.0 0.5 0.35 3.85/n	2.30 1.14 0.77 0.40 0.33 See Class A

Measurement uncertainty :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	1.50 %

< MODE 2 >

Test Report	
Report Number :	DTNC1802-01098
Test Standard :	IEC 61000-3-2 (Edition 4) Limits for harmonic current emissions (equipment input current < 16 A per phase)
Test Date :	3/13/2018 8:56:25 AM

Result			
E.U.T. :	Passed	Source :	Passed

Climatic Conditions					
Temperature :	22 °C	Pressure :	100 kPa	Humidity :	30 %

Measures & Analysis

Measure Window :	10 periods	Voltage Range :	500 V
Refresh Interval :	2 s	Current Range :	70 A
Sampling Rate :	6.4 kS/s		
Scaled Window :	Rectangular		
According :	IEC 61000-3-2 (Edition 4) Limits for harmonic current emissions (equipment input current < 16 A per phase)		

Measure Results

Standard Specific Results for IEC 61000-3-2 (Edition 4)

Standard Group: Industry

Standard Name: IEC 61000-3-2 (Edition 4)
Limits for harmonic current emissions (equipment input current < 16 A per phase)

Device Under Test: PASS
Power Source: PASS

Class A
Application of Limits less than or equal to 150 %

Current limits are disabled because rated power is less than 75W.

Check Harmonics 2..40 [exception odd 21..39]			
First detected harmonic order > 150 %			
Line 1:	None		
Harmonics orders > 150 %			
Line 1:	None		
Harmonics orders with average > 100 %			
Line 1:	None		

Check Odd Harmonics 21..39			
First detected time window with partial > partial limits			
	time window (time)	*measured value*	*limit*
Line 1:	None		-
Maximal time window with partial > partial limits			
	time window (time)	*measured value*	*limit*
Line 1:	None		-
First detected harmonic order > 150 %			

Line 1:	None
Harmonics orders > 150 %	
Line 1:	None
Harmonics orders with average > 150 %	
Line 1:	None

Measured values	
Fundamental Current	
Line 1:	0.013 A
Active input Power	
Line 1:	2.714 W *
Circuit power factor	
Line 1:	0.287 *

** Absolute value.*

Current Test Result

Average and Maximum harmonic current results									
Hn	Average				Maximum				Harmonic
	Ieff [A]	Ieff [%]	Limit [A]	Result	Ieff [A]	Ieff [%]	Limit [A]	Result	Result
1	0.013	100.000			0.013	100.000			
2	0.001	5.846			0.001	6.344			
3	0.016	122.209			0.016	120.694			
4	0.001	6.275			0.001	6.630			
5	0.015	113.900			0.015	113.155			
6	0.001	7.129			0.001	8.084			
7	0.014	110.242			0.014	109.353			
8	0.001	6.000			0.001	7.053			
9	0.013	103.408			0.013	102.451			
10	0.001	5.991			0.001	6.621			
11	0.012	97.415			0.012	96.111			
12	0.001	5.135			0.001	5.926			
13	0.011	88.759			0.011	87.781			
14	0.001	5.032			0.001	5.389			
15	0.010	79.921			0.010	78.848			
16	0.001	5.386			0.001	5.611			
17	0.009	70.643			0.009	70.030			
18	0.001	5.195			0.001	5.631			
19	0.008	61.238			0.008	60.805			
20	0.001	5.416			0.001	5.665			

21	0.007	52.128			0.007	51.792			
22	0.001	5.456			0.001	5.700			
23	0.006	43.459			0.006	43.269			
24	0.001	5.455			0.001	5.748			
25	0.005	35.341			0.005	35.413			
26	0.001	5.466			0.001	5.847			
27	0.004	28.290			0.004	28.326			
28	0.001	5.369			0.001	5.724			
29	0.003	22.579			0.003	22.790			
30	0.001	5.170			0.001	5.469			
31	0.002	18.346			0.002	18.541			
32	0.001	4.932			0.001	5.333			
33	0.002	15.826			0.002	16.011			
34	0.001	4.665			0.001	5.018			
35	0.002	14.561			0.002	14.725			
36	0.001	4.392			0.001	4.770			
37	0.002	14.212			0.002	14.430			
38	0.001	4.135			0.001	4.550			
39	0.002	14.109			0.002	14.435			
40	0.000	3.883			0.001	4.281			

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Voltage Source Verification

Harmonic voltage results				
Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.471	100.205		
2	0.179	0.078	0.200	PASS
3	0.063	0.027	0.900	PASS
4	0.072	0.031	0.200	PASS
5	0.042	0.018	0.400	PASS
6	0.051	0.022	0.200	PASS
7	0.060	0.026	0.300	PASS
8	0.036	0.016	0.200	PASS
9	0.055	0.024	0.200	PASS
10	0.029	0.013	0.200	PASS
11	0.034	0.015	0.100	PASS
12	0.027	0.012	0.100	PASS

13	0.033	0.014	0.100	PASS
14	0.023	0.010	0.100	PASS
15	0.018	0.008	0.100	PASS
16	0.021	0.009	0.100	PASS
17	0.017	0.007	0.100	PASS
18	0.022	0.010	0.100	PASS
19	0.019	0.008	0.100	PASS
20	0.021	0.009	0.100	PASS
21	0.016	0.007	0.100	PASS
22	0.020	0.009	0.100	PASS
23	0.017	0.007	0.100	PASS
24	0.011	0.005	0.100	PASS
25	0.012	0.005	0.100	PASS
26	0.013	0.006	0.100	PASS
27	0.014	0.006	0.100	PASS
28	0.012	0.005	0.100	PASS
29	0.018	0.008	0.100	PASS
30	0.009	0.004	0.100	PASS
31	0.017	0.008	0.100	PASS
32	0.016	0.007	0.100	PASS
33	0.018	0.008	0.100	PASS
34	0.012	0.005	0.100	PASS
35	0.019	0.008	0.100	PASS
36	0.014	0.006	0.100	PASS
37	0.012	0.005	0.100	PASS
38	0.007	0.003	0.100	PASS
39	0.014	0.006	0.100	PASS
40	0.020	0.009	0.100	PASS

9. Voltage Change, Fluctuations and Flicker

9.1 Measurement Procedure

The Voltage change, fluctuations and flicker was tested in accordance with **EN 61000-3-3.**
EUT was connected to the Power Analyzer system. Measurements were conducted to obtain the desired flicker parameters.
The measuring time depends on which parameters are to be measured.
The measurement was performed with the test software.

9.2 Limit for voltage change, fluctuations and flicker

- the short-term flicker indicator, P_{st}, shall not be greater than 1.0
- the long-term flicker indicator, P_{lt}, shall not be greater than 0.65
- the relative steady-state voltage change, d_c shall not exceed 3.3 %
- the voltage change with time, d(*t*), during a voltage change shall not exceed 3.3 % for more than 500 ms
- the maximum relative voltage change, d_{max}, shall not exceed

a) 4 % without additional conditions
b) 6 % for equipment which is switched manually, if any
c) 7 % for equipment which is attended whilst in use, if any

Measurement uncertainty :

Expended uncertainty *U* (95 %, Confidence level, *k* = 2)	2.14 %

Test Result

< MODE 2 >

Test Report	
Report Number :	DTNC1802-01098
Test Standard :	IEC 61000-3-3 (Edition 3) Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
Test Date :	3/13/2018 9:36:48 AM

Result	
E.U.T. :	Passed

Climatic Conditions					
Temperature :	22 °C	Pressure :	100 kPa	Humidity :	30 %

Flicker Results

Standard Specific Results for IEC 61000-3-3 (Edition 3)

Standard Group: Industry

Standard Name: IEC 61000-3-3 (Edition 3)
Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

Test Condition: General Test Conditions

Analysis Status: PASS

Flicker Measurements Settings	
Main line:	230V, 50Hz
Flicker Meter:	230V / 50Hz
Flicker Impedance:	Zref
Observation Time:	3 × 10 min
Measurements performed:	3

Flicker Measurements	P_{lt}	Max P_{st}	Max D_c	Max D_{max}	Max T_{max}
Line 1:	0.017	0.028	0	0.188	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

Maximum Permissible Flicker Impedance	Impedance [Ω]
$Z_{sys}1$ (dmax)	10.024
$Z_{sys}2$ (dc)	
$Z_{sys}3$ (Pst)	103.044
$Z_{sys}4$ (Plt)	107.999
Z_{max} smallest value in [$Z_{sys}1$; $Z_{sys}4$]	**10.024**
Z_{max} smallest value in [$Z_{sys}1$; $Z_{sys}2$]	**10.024**

(According to IEC 61000-3-11 Ed. 1 clause 6.2.2)

Pst Data

Flicker (Line 1)

Meas. Number	P0,1	P1s	P3s	P10s	P50s	Pst	dc [%]	dmax [%]	Tmax [s]
1	0	0	0	0.001	0.005	0.028	0	0.188	0
2	0	0	0	0.001	0.005	0.028	0	0.053	0
3	0	0	0	0.001	0.005	0.028	0	0.051	0

Short-term Flicker Severity (Pst) (Line 1)

Long-term Flicker Severity (Plt) (Line 1)

Appendix 1

List of Test and Measurement Instruments

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment is identified by the Test Laboratory.

1. Conducted Disturbance

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	MEASUREMENT SOFTWARE	EMI-C VER. 2.00.0171	TSJ	N/A	N/A	N/A
☒	EMI TEST RECEIVER	ESR	ROHDE & SCHWARZ	101767	2017.12.26	2018.12.26
☐	LISN	NNLK 8129	SCHWARZBECK	8129-272	2017.08.14	2018.08.14
☒	LISN	NNLK8121	SCHWARZBECK	NNLK8121-580	2017.07.27	2018.07.27
☒	PULSE LIMITER	ESH3-Z2	ROHDE & SCHWARZ	101334	2017.12.26	2018.12.26
☐	TERMINATION	CT-01	TME	N/A	2017.12.26	2018.12.26

2. Radiated Disturbance

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	MEASUREMENT SOFTWARE	EMI-R VER. 2.00.0177	TSJ	N/A	N/A	N/A
☒	EMI TEST RECEIVER	ESR7	ROHDE & SCHWARZ	101061	2018.02.13	2019.02.13
☒	BILOG ANTENNA	VULB9160	SCHWARZBECK	3151	2016.11.11	2018.11.11
☒	LOW NOISE PRE AMPLIFIER	MLA-010K01-B01-27	TSJ	1844538	2018.02.27	2019.02.27

3. Electrostatic Discharge

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	ELECTROSTATIC DISCHARGE SYSTEM	ESS-2000	NOISEKEN	ESS0675752	2018.02.14	2019.02.14
☒	ESD GUN	TC-815R	NOISEKEN	ESS0675835	2018.02.14	2019.02.14

4. Radio-Frequency Electromagnetic Field

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	SIGNAL GENERATOR	N5182A	AGILENT	MY47420161	2017.05.10	2018.05.10
☒	POWER METER	NRP2	ROHDE & SCHWARZ	105627	2017.11.16	2018.11.16
☒	HORN ANTENNA	BBHA9120A	SCHWARZBECK	556	N/A	N/A
☒	LOG-PER.ANTENNA	VULP9118E	SCHWARZBECK	917	N/A	N/A
☒	POWER AMPLIFIER	MT 700	PRANA	1703-2017	N/A	N/A
☒	POWER AMPLIFIER	SV 120	PRANA	1703-2018	N/A	N/A

5. Fast Transients

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	COMPACT NX GENERATOR	COMPACT NX5 BSP-1-300-16	EMTEST	P1602169866	2018.03.06	2019.03.06

6. Surges

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	COMPACT NX GENERATOR	COMPACT NX5 BSP-1-300-16	EMTEST	P1602169866	2018.03.06	2019.03.06

7. Radio-Frequency Continuous Conducted

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1	EMTEST	P1251106909	2017.05.11	2018.05.11
☒	ATTENUATOR	ATT6/75	EMTEST	1012-55	2017.05.11	2018.05.11
☒	CDN	CDN M2N/32A	EMTEST	0113-30	2017.06.07	2018.06.07

8. Voltage Dips and Interruptions

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	COMPACT NX GENERATOR	COMPACT NX5 BSP-1-300-16	EMTEST	P1602169866	2018.03.06	2019.03.06
☒	MOTORIZED VARIAC	MV 2616	EMTEST	P1532162317	2018.03.06	2019.03.06

9. Harmonic Current Emission & Voltage Change, Fluctuations and Flicker

Name of Instrument		Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒	MULTIFUNCTION AC / DC POWER SOURCE	NETWAVE 60-400	EMTEST	P1311115470	2018.02.20	2019.02.20
☒	DIGITAL POWER ANALYZER	DPA 503N	EMTEST	P1303109858	2018.02.20	2019.02.20
☒	THREE-PHASE FLICKER IMPEDANCE	AIF 503N63	EMTEST	P1311114936	2018.02.20	2019.02.20

Appendix 2

Photographs of the Test Configurations

1. Conducted Disturbance

2. Radiated Disturbance

3. Electrostatic Discharge

4. Radio-Frequency Electromagnetic Field

5. Fast Transient

6. Surges

7. Radio-Frequency Continuous Conducted

8. Voltage Dips and Interruptions

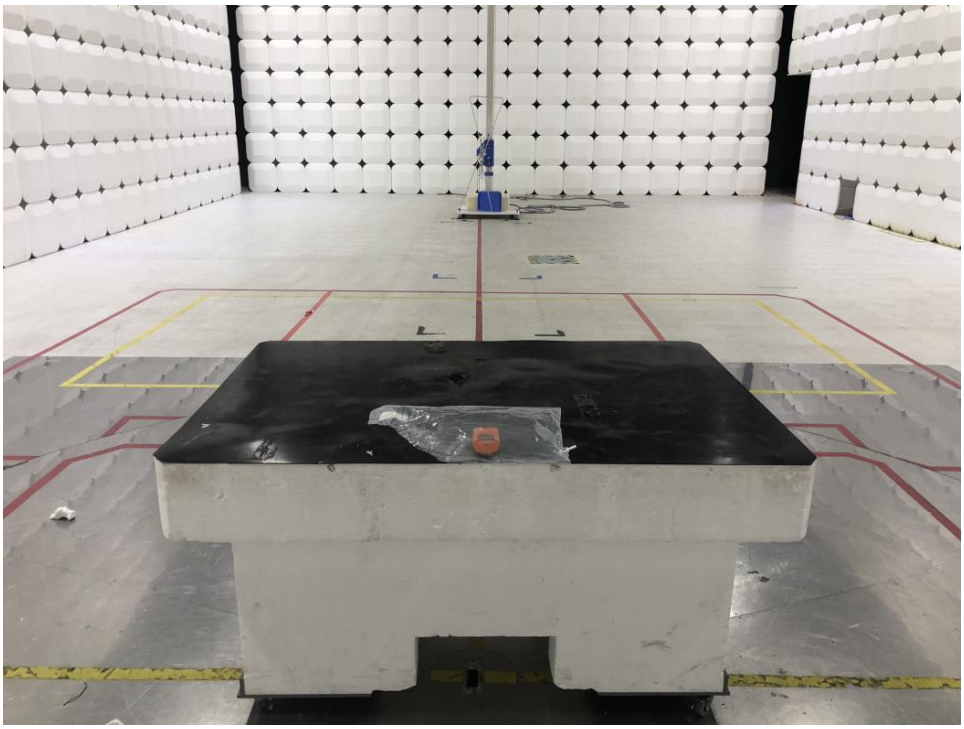
9. Harmonic Current Emission & Voltage Change, Fluctuations and Flicker

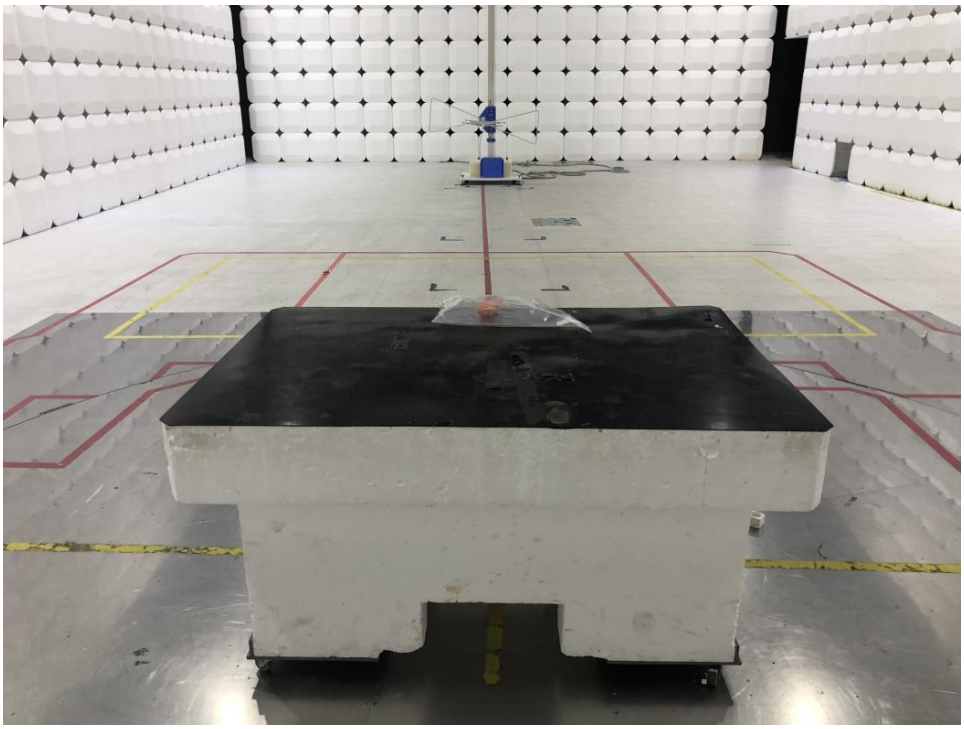
A2-1. Conducted Disturbance

< Mains ports _ Mode 2 >

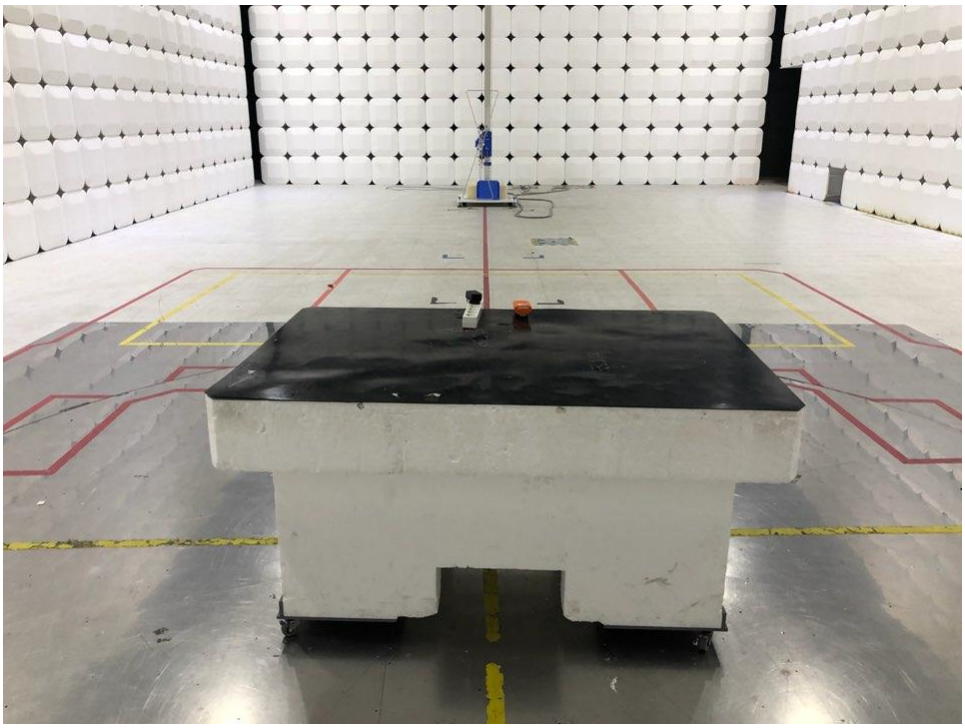
A2-2. Radiated Disturbance

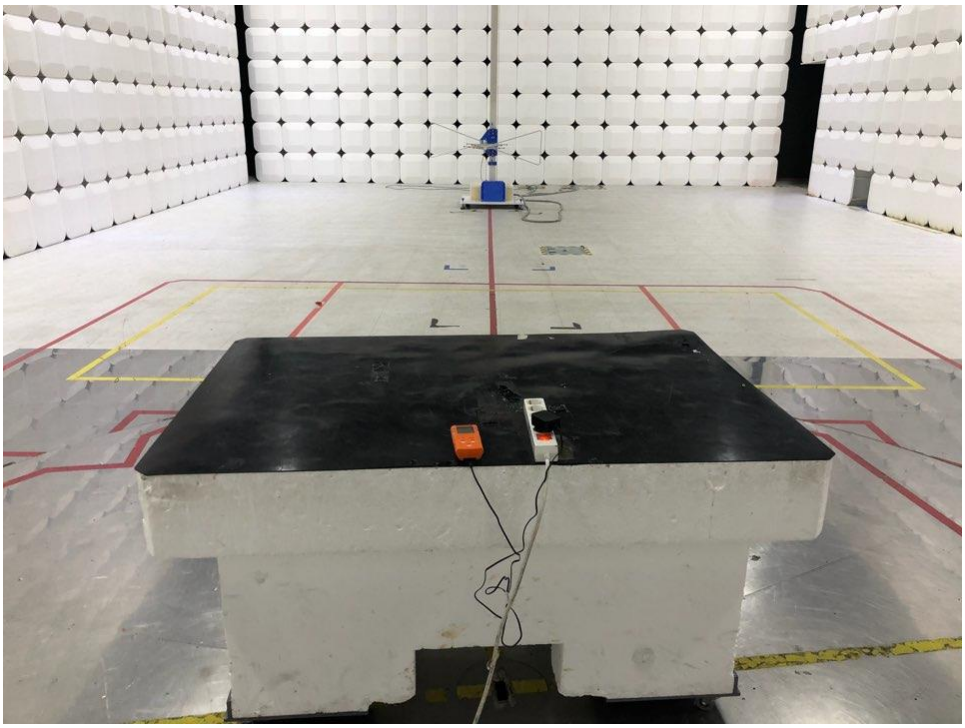
< 30 MHz ~ 1 GHz _ Mode 1 >





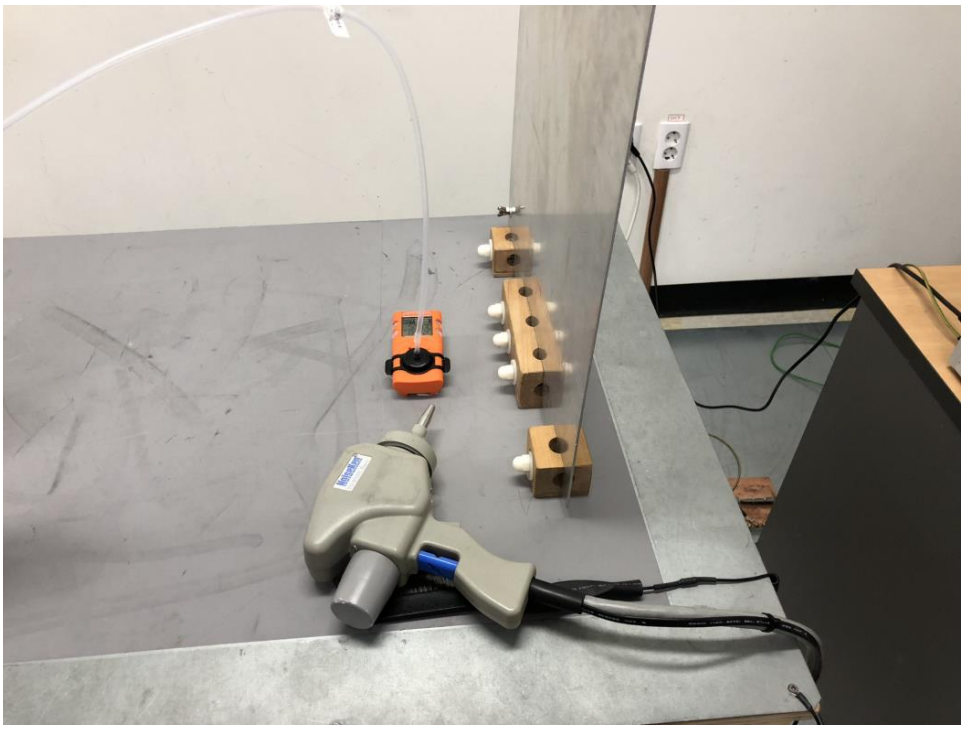
< 30 MHz ~ 1 GHz _ Mode 2 >





A2-3. Electrostatic Discharges

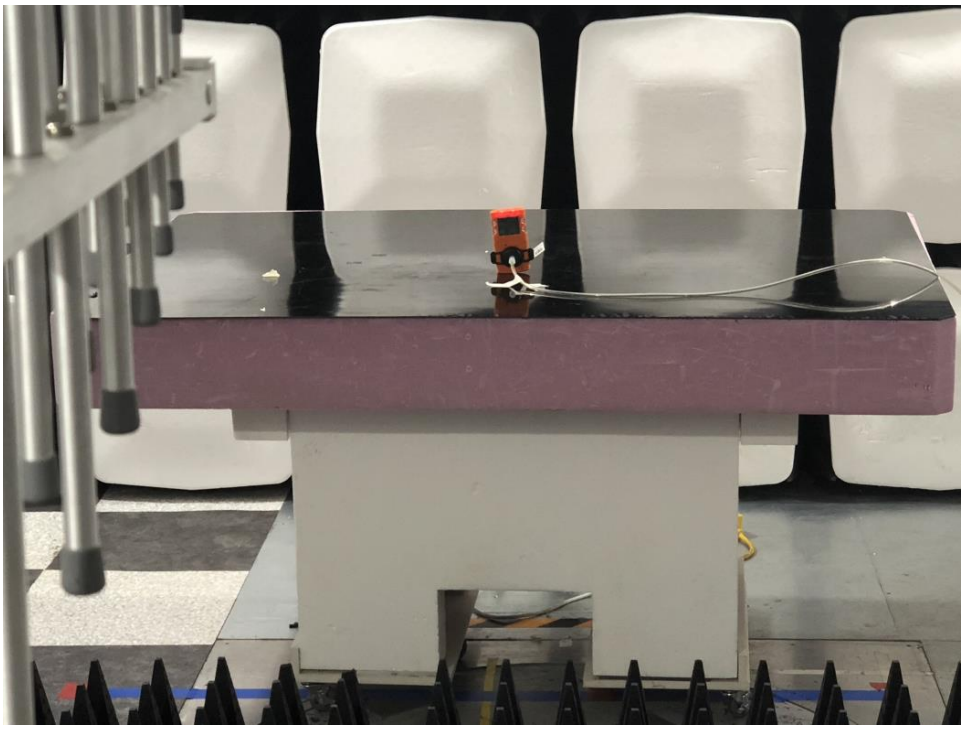
< Mode 1 >



< Mode 2 >

A2-4. Radio-Frequency Electromagnetic Field

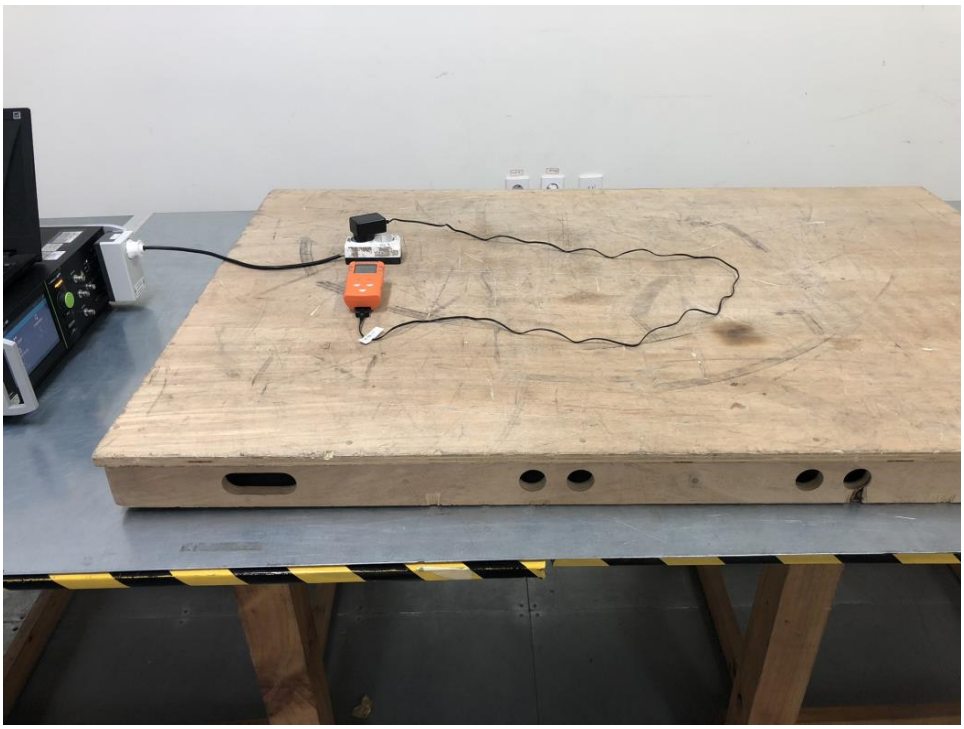
< Mode 1 >



< Mode 2 >

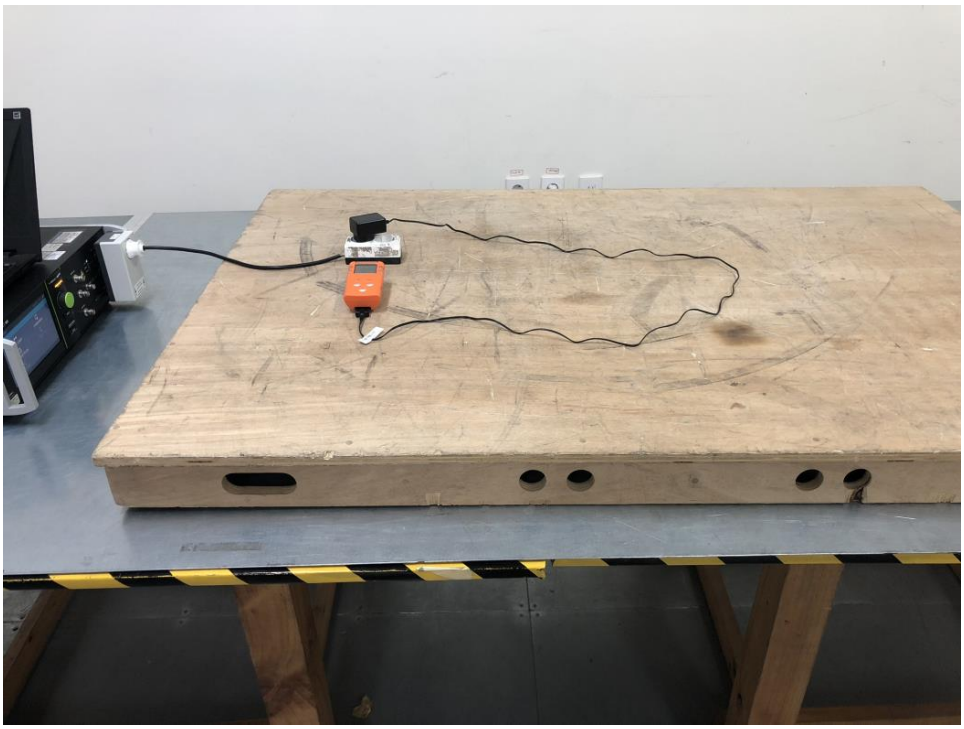
A2-5. Fast Transients

< POWER _ Mode 2 >



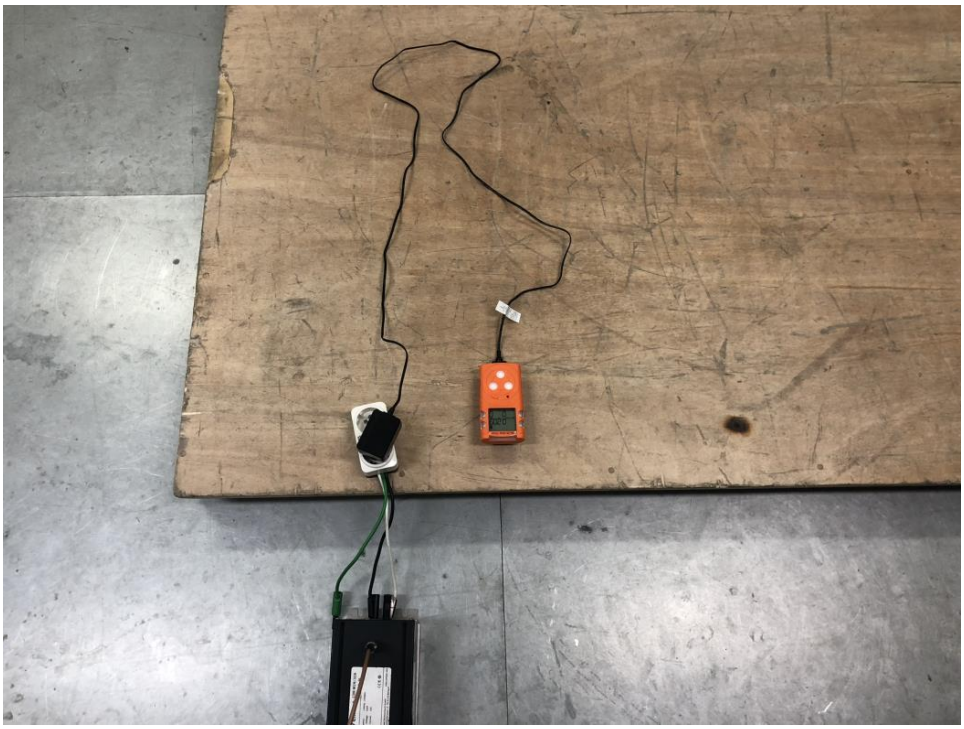
A2-6. Surges

< POWER _ Mode 2 >



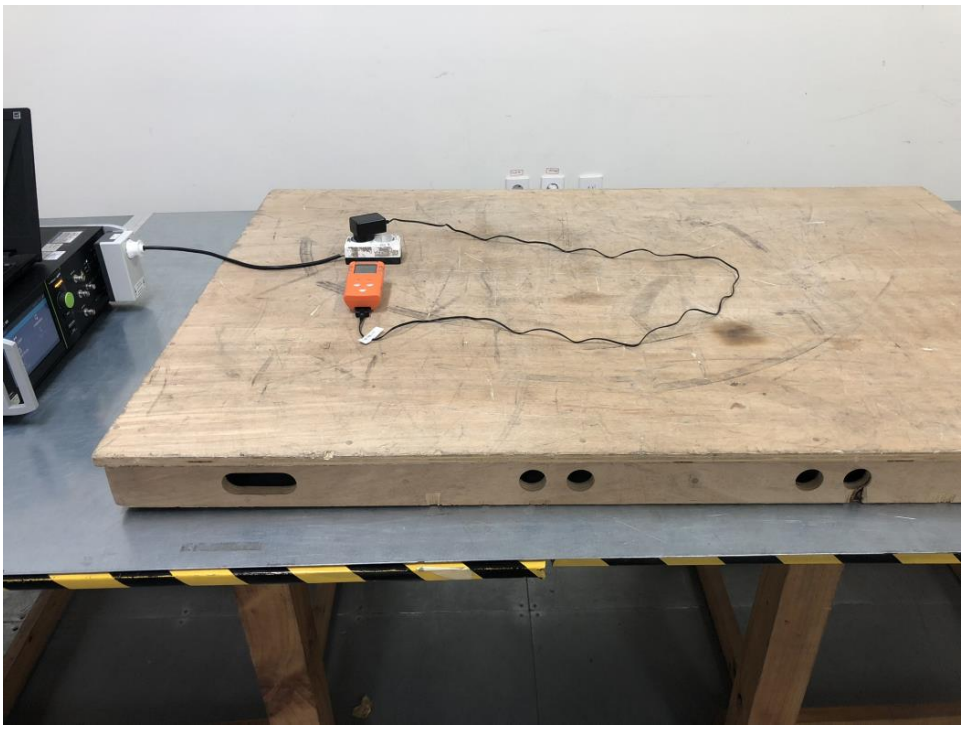
A2-7. Radio-Frequency Continuous Conducted

< POWER _ Mode 2 >

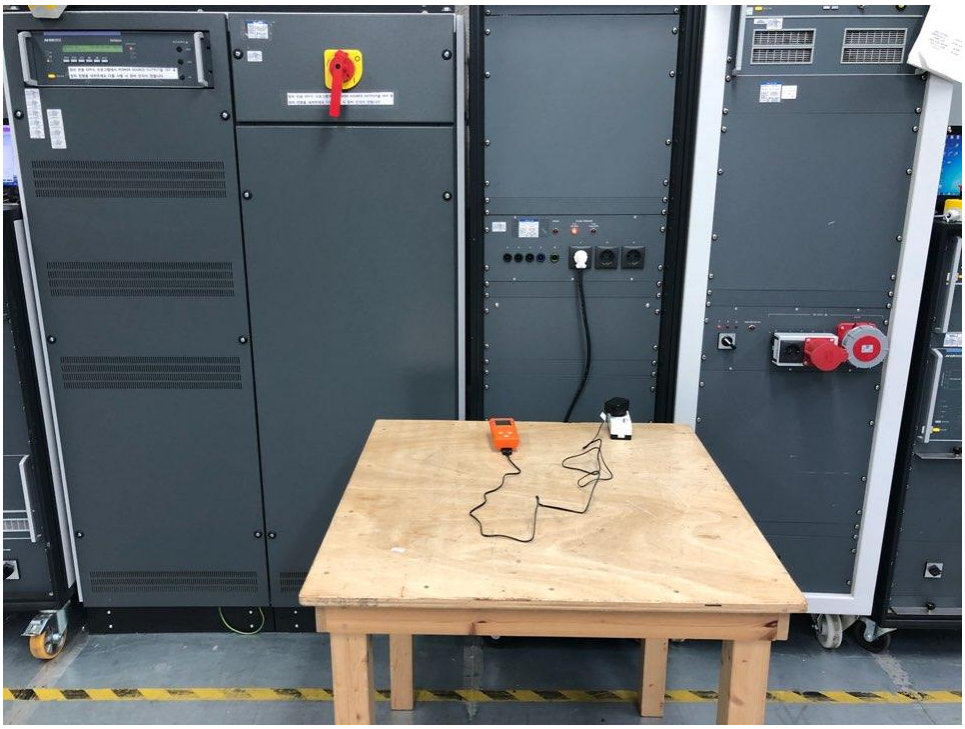


A2-8. Voltage Dips and Interruptions

< Mode 2 >



A2-9. Harmonic Current Emission & Voltage Change, Fluctuations and Flicker



Appendix 3

Photographs of EUT

A3. EUT

1. Front View of Product

2. Rear View of Product

3. Inside View of Product

4. Front View of Adapter

5. Rear View of Adapter

6. Label View of Product

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None	Original	N/A	N/A