EMC Test Report

Product Name:	**DIGITAL LEVEL AND PROTRACTOR**
Model Number:	**2179-360**
Applicant:	**INSIZE CO., LTD.**

KeySense Testing & Certification International Co., Ltd.

1-3F, Lab Building, No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China

Test Report of EMC				
Product name	DIGITAL LEVEL AND PROTRACTOR			
Model number	2179-360			
Series number	2170-1, 2171-250, 2172-360A, 2174-225, 2175-360, 2176-200, 2176-300, 4910-400, 4910-600, 4778-100, 4778-150, 4778-200, 4779-120, 4779-150, 4779-200, ISE-2DT (Only the model is different)			
Applicant	**Name**	INSIZE CO., LTD.		
	Address	80 Xiangyang Road, Suzhou New District, 215009 China		
Manufacturer	**Name**	INSIZE CO., LTD.		
	Address	80 Xiangyang Road, Suzhou New District, 215009 China		
Factory	**Name**	INSIZE CO., LTD.		
	Address	80 Xiangyang Road, Suzhou New District, 215009 China		
Trade Name	INSIZE			
Receipt date	June 28, 2021	**Quantity**	1	
Standard	EN IEC 61000-6-1:2019 EN 61000-6-3:2007/A1:2011/AC:2012 EN IEC 61000-3-2:2019 EN 61000-3-3:2013/A1:2019			
Test site	1F,Lab Building,No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China.			
Test period	June 28, 2021 to July 01, 2021	**Issue Date**	July 06, 2021	
Test result	The equipment under test was found to be compliance with the requirements of the standards applied.			

Tested by: Bing.He	**Sign:**	**Date:** 2021.7.6	
Reviewed by: Lake. Wang	**Sign:**	**Date:** 2021.7.6	(Stamp)
Approved by: Jack. Li(Supervisor)	**Sign:**	**Date:** 2021.7.6	

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1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION(EN 61000-6-3:2007/A1:2011/AC:2012)			
Description of Test Item	Standard	Results	Remark
Conducted disturbance at mains terminals	EN 61000-6-3:2007/A1:2011/AC:2012	N/A	/
Radiated Disturbance (30-1000MHz)	EN 61000-6-3:2007/A1:2011/AC:2012	PASS	Minimum passing margin is -20.1dB at 541.3724MHz
Radiated Disturbance (1-6GHz)	EN 61000-6-3:2007/A1:2011/AC:2012	N/A	N/A
Harmonic current emission	EN IEC 61000-3-2:2019	N/A	/
Voltage fluctuations &flicker	EN 61000-3-3:2013/A1:2019	N/A	/

IMMUNITY(EN IEC 61000-6-1:2019)				
Description of Test Item	Basic Standard	Results	Performance Criteria	Observation Criteria
Electrostatic discharge	EN 61000-4-2:2009	PASS	B	A
Radio-frequency Continuous radiated disturbance	EN IEC 61000-4-3:2020	PASS	A	A
Electrical fast transient	EN 61000-4-4:2012	N/A	N/A	N/A
Surge	EN 61000-4-5:2014/A1:2017	N/A	N/A	N/A
Radio-frequency Continuous conducted disturbance	EN 61000-4-6:2014/A1:2015	N/A	N/A	N/A
Power frequency magnetic field	EN 61000-4-8:2010	PASS	A	A
Voltage dips, 100% reduction	EN IEC 61000-4-11:2020	N/A	N/A	N/A
Voltage dips, 60% reduction		N/A	N/A	N/A
Voltage dips, 30% reduction		N/A	N/A	N/A
N/A is an abbreviation for Not Applicable.				
Final Judgment :**Pass**				

2 GENERAL INFORMATION

2.1 Description of Device(EUT)

Description:	DIGITAL LEVEL AND PROTRACTOR
Model Number:	2179-360
Series number	2170-1, 2171-250, 2172-360A, 2174-225, 2175-360, 2176-200, 2176-300, 4910-400, 4910-600, 4778-100, 4778-150, 4778-200, 4779-120, 4779-150, 4779-200, ISE-2DT (Only the model, the appearance is different;Everything else is exactly the same)
Input :	3Vdc

2.2 EUT operating mode(s)

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating mode 1	Normal working

Remark: After the preliminary scan, The worst case data was selected and recorded in this report.

2.3 Tested Supporting System Details

No.	Description	KST No.	Manufacturer	Model	Serial Number
/	/	/	/	/	/

☒ Cable Description

No.	From		To		Type of Cable		
	Device	I/O Port	Device	I/O Port	Length (m)	Shielded or Unshielded	Ferrite Core [Y/N]
/	/	/	/	/	/	/	/

* Shielded or Unshielded : Unshielded=U, Shielded=S

2.4 Block Diagram of connection between EUT and simulators

EMI:



EMS:



2.5 Test Facility

Site Description:	1-3F, Lab Building, No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China
Name of Firm:	KeySense Testing & Certification International Co., Ltd.
EMC Lab:	Certificated by CNAL, CHINA
	Registration No.:L9678
	Date of registration: Feb 07, 2017

2.6 Measurement Uncertainty(95% confidence levels, k=2)

Test Item	Uncertainty
Uncertainty for Conduction emission test in shielding room	2.5dB(150kHz to 30MHz)
Uncertainty for Radiation Emission test in 10m chamber	4.14dB(30M~1GHz,Polarize:V)
	4.25dB(30M~1GHz,Polarize:H)

2.7 Test Equipments

2.7.1 For radiated disturbance test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	R&S	ESR3	101661	2020.12.15	1 year
Trilog-boardband antenna	SCHWARZBECK	VULB 9163D	9163-971	2019.05.18	3 years
Pre-amplifier (Low Freq)	Claviio	BDLNA-0001-27 2007	1600015	2019.09.02	3 years

2.7.2 For Electrostatic discharge Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Electrostatic discharge generator	Noiseken	ESS-L1611	ESS1643151	2020.09.11	1 year

2.7.3 For Radio-frequency electromagnetic fields Test

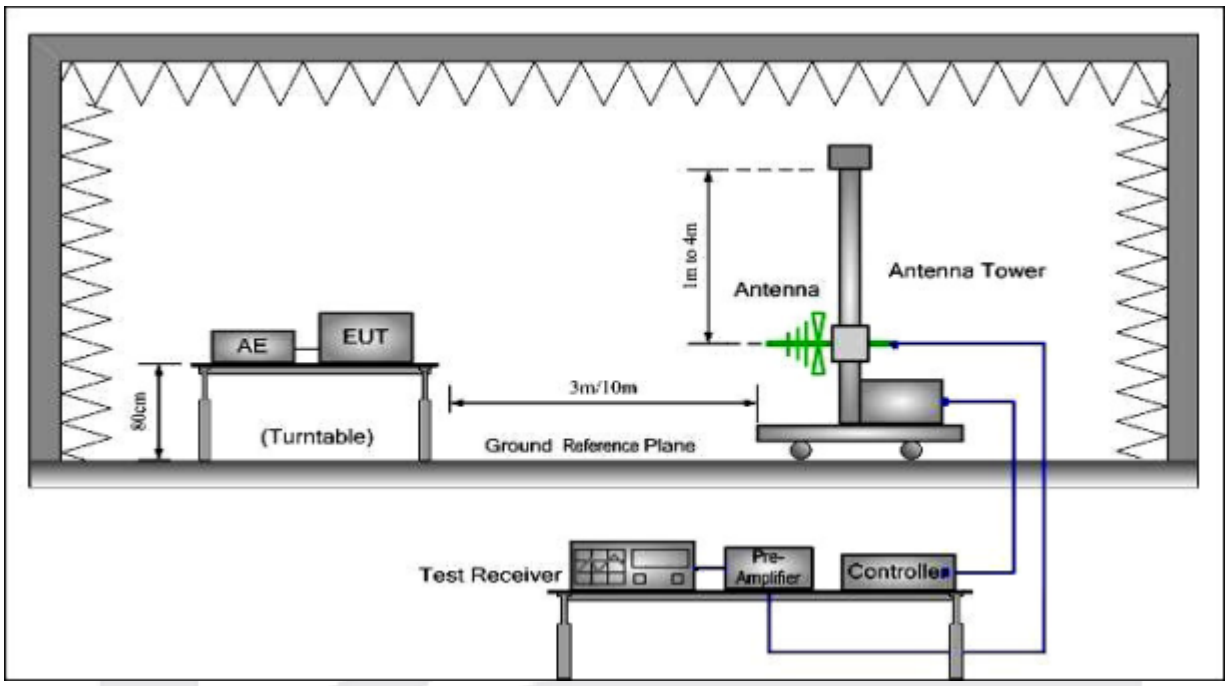
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal generator	R&S	SMC100A	105651	2020.12. 15	1 year
Power amplifier	PRANA	MT400	1507-1746	2020.12. 15	1 year
Trilog-boardband antenna	SCHWARZBECK	STLP 9128E	9128ES-136	2019.09.02	3years
Power amplifier	PRANA	SV70	1602-1820	2020.12. 15	1 year
Power amplifier	PRANA	SV70	1602-1820	2020.12.15	1 year
Horn antenna	Schwarzbeck	BBHA 9120E	BBHA9120E6 98	2020.10.25	3 years

2.7.4 For Power magnetic field Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Power magnetic field simulator	NARDA	PMM-1008	010WT60502	2020.09.09	1 year

3 RADIATED DISTURBANCE TEST

3.1 Block Diagram of Test Setup



3.2 Test Standard

EN 61000-6-3:2007/A1:2011/AC:2012

3.3 Limits for radiated disturbance

Frequency MHz	Distance	Limits dB(μV)/m
30 ~ 230	10m	30(Quasi Peak)
230 ~ 1000	10m	37(Quasi Peak)

3.4 Operating Condition of EUT

Test date	Ambient temperature	Relative humidity	Atmospheric pressure
June 29, 2021	20°C	60%	101.5kPa

3.5 Test Procedure

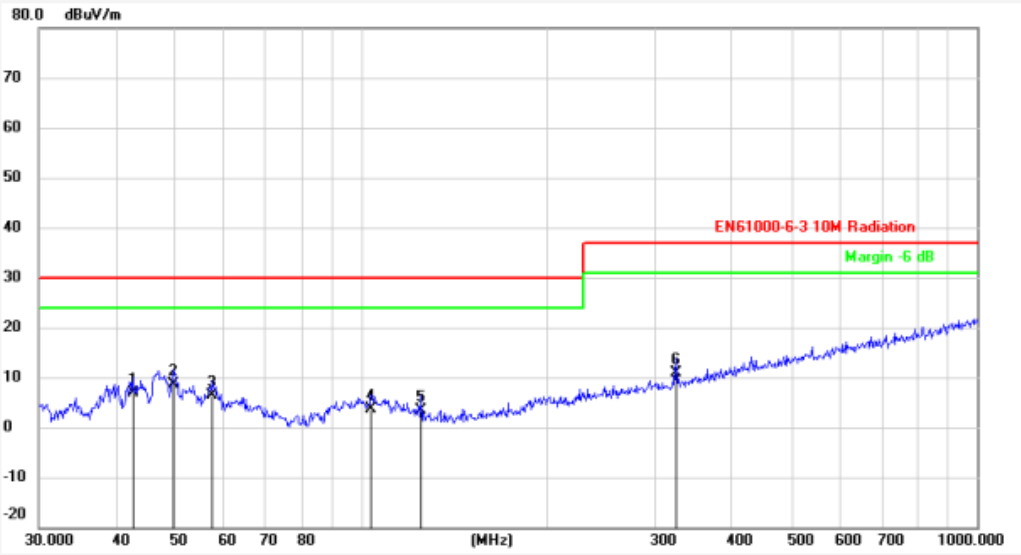
The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 10 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth setting on the test receiver was 120 kHz.

3.6 Test Data

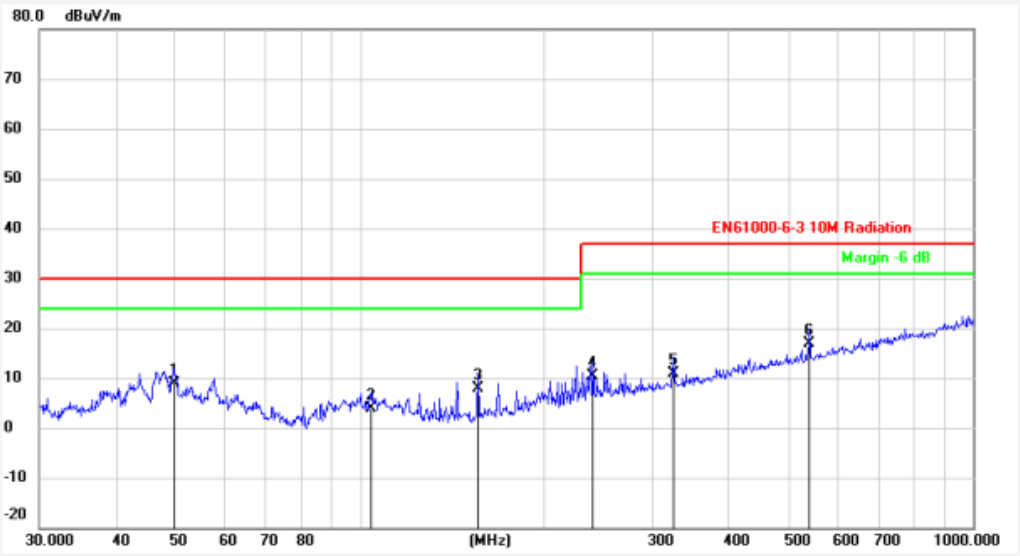
EUT:	DIGITAL LEVEL AND PROTRACTOR	Model Name:	2179-360
Test Mode:	Normal working	Test Date:	2021.6.29
Polarization:	Horizontal	Test Voltage:	DC 3V
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Preamp. (dB)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m	Margin (dB)	Detector	Remark
1	42.6000	22.71	13.44	30.53	1.38	7.00	30.00	-23.00	QP	
2	49.5328	24.01	13.66	30.49	1.42	8.60	30.00	-21.40	QP	
3	57.3922	22.77	12.51	30.44	1.46	6.30	30.00	-23.70	QP	
4	103.8054	20.50	11.61	30.12	1.71	3.70	30.00	-26.30	QP	
5	125.0066	23.02	8.48	29.99	1.79	3.30	30.00	-26.70	QP	
6	324.4560	24.58	13.71	29.74	2.35	10.90	37.00	-26.10	QP	

Remarks:1. Result=Reading+Antenna-Preamp+Cable
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

EUT:	DIGITAL LEVEL AND PROTRACTOR	Model Name:	2179-360
Test Mode:	Normal working	Test Date:	2021.6.29
Polarization:	Vertical	Test Voltage:	DC 3V
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Preamp. (dB)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m	Margin (dB)	Detector	Remark
1	49.7068	24.43	13.64	30.49	1.42	9.00	30.00	-21.00	QP	
2	104.1701	20.77	11.63	30.11	1.71	4.00	30.00	-26.00	QP	
3	155.9100	27.84	7.98	29.83	1.91	7.90	30.00	-22.10	QP	
4	239.9874	26.03	11.99	29.76	2.14	10.40	37.00	-26.60	QP	
5	324.4560	24.68	13.71	29.74	2.35	11.00	37.00	-26.00	QP	
6	541.3724	25.45	17.48	30	3.97	16.90	37.00	-20.10	QP	

Remarks:1. Result=Reading+Antenna-Preamp+Cable
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

4 IMMUNITY TEST RESULT

Description of Performance Criteria:

Performance criteria A

The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criteria B

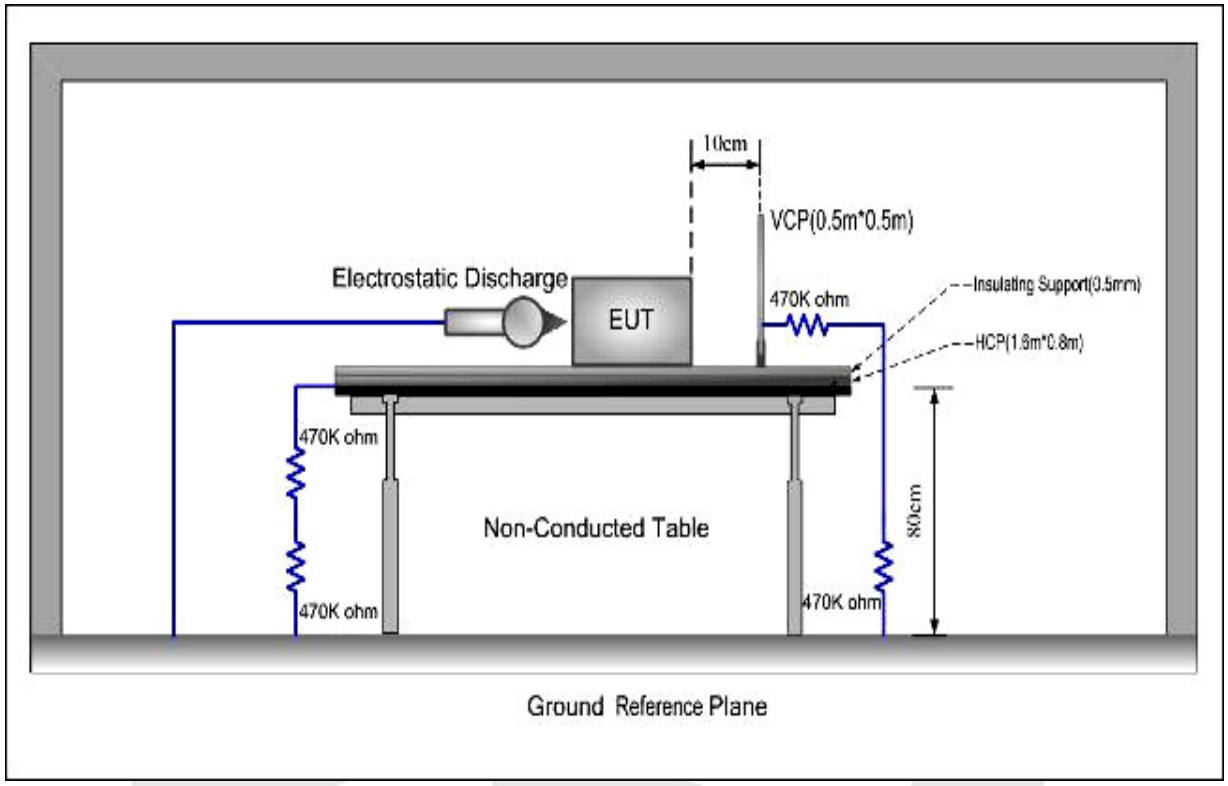
The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however. 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, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criteria C

Temporary loss of function is allowed, provided the function is self- recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

5 ELECTROSTATIC DISCHARGE TEST

5.1 Block Diagram of Test Setup



5.2 Test Standard

EN IEC 61000-6-1:2019
(Severity Level 1&2&3 for Air Discharge at 8kV;
Severity Level 1&2 for Contact Discharge at 4kV)

5.3 Severity Levels and Performance Criterion

Severity Levels	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)	Performance criterion
1.	2	2	B
2.	4	4	
3.	6	8	
4.	8	15	
x	Special	Special	

5.4 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1	Normal working

5.5 Test Procedure

5.5.1 Air Discharge

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This procedure was repeated until all the air discharge completed.

5.5.2 Contact Discharge

All the procedure was same as Section 8.5.1. except that the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. The tip of the discharge electrode was touch the EUT before the discharge switch was operated.

5.5.3 Indirect discharge for horizontal coupling plane

At least 20 single discharges were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

5.5.4 Indirect discharge for vertical coupling plane

At least 20 single discharge were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

5.6 Test Data

Electrostatic Discharge Test Results

EUT	:	DIGITAL LEVEL AND PROTRACTOR	Test Date	:	2021.6.30
M/N	:	2179-360			
Test Voltage	:	DC 3V	Temperature	:	24℃
Humidity	:	55%	Pressure	:	100.9kPa
Required Performance	:	B	Actual Performance	:	A

Air Discharge: ±8kV	# For Air Discharge each Point Positive 10 times and negative 10 times discharge
Contact Discharge: ±4kV	# For Contact Discharge each point positive 10 times and negative 10 times discharge

For the time interval between successive single discharges an initial value of one second.
After discharge to the ungrounded part of EUT, it needs the bleeder resistor to remove the charge prior to next ESD pulse

Discharge Voltage (kV)	Type of discharge	Dischargeable Points	Performance		Result (Pass/Fail)
			Required	Observation	
±4	Contact	Center of VCP	B	A	**Pass**
±4	Contact	Center of HCP	B	A	**Pass**
±4	Contact	1,2	B	A	**Pass**
±8	Air	3,4,5	B	A	**Pass**

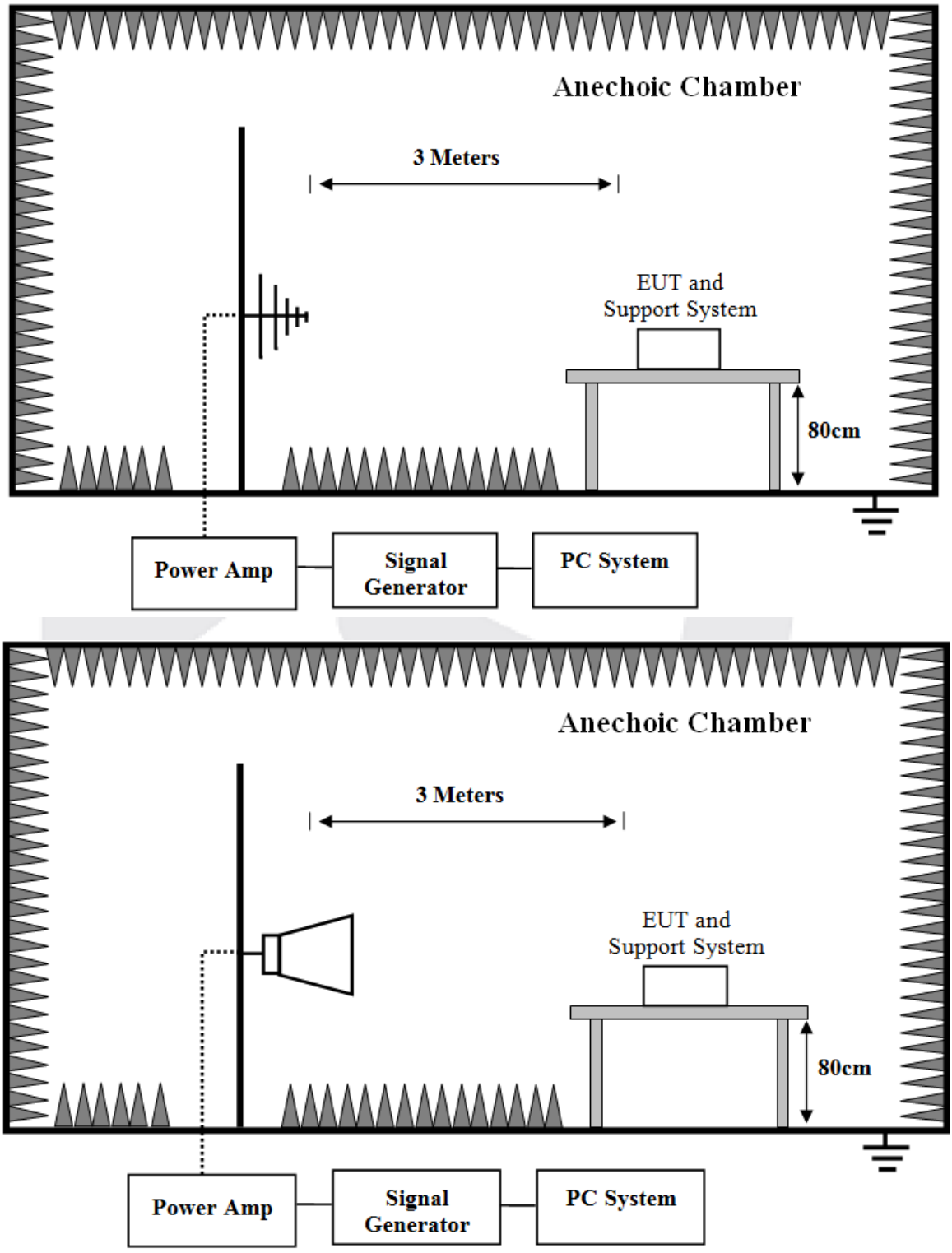
Discharge Points Description

1	Metal	8	/
2	Screw	9	/
3	Button	10	/
4	Screen	11	/
5	Gap	12	/
6	/	13	/
7	/	14	/

Performance:
The EUT was no change compared with initial operation during the test.

6 Radio Frequency Electromagnetic Field Immunity Test

6.1 Block Diagram of Test Setup



6.2 Test Standard

EN IEC 61000-6-1:2019(EN IEC 61000-4-3),

Frequency Range：80-1000MHz,1400MHz-6000MHz

Severity Level 2 at 3V/m

Radio Frequency Electromagnetic Field Immunity Test levels

Level	Test field strength V/m
1	1
2	3
3	10
4	30
X	Special
Note: X is an opoen test level and the associated field strength may be any value. This level may be given in the product standard.	

6.3 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

6.4 Test Procedure

The field sensor is placed on the EUT table (0.8 meter above the ground) which is 3 meters away from the transmitting antenna. Through the signal generator, power amplifier and transmitting antenna to produce a uniformity field strength (3V/m measured by field sensor) around the EUT table from frequency range specified and records the signal generator‘s output level at the same time for whole measured frequency range. Then, put EUT and its simulators on the EUT turn table and keep them 3 meters away from the transmitting antenna which is mounted on an antenna tower and fixes at 1 meter height above the ground. Using the recorded signal generator’s output level to measure the EUT from frequency range specified and both horizontal & vertical polarization of antenna must be set and measured. Each of the four sides of EUT must be faced this transmitting antenna and measures individually.

All the scanning conditions are as follows **:**

Test Level	
Frequency	80-1000MHz,1400MHz-600MHz
Test level	3V/m (Severity Level 2)
Antenna polarization	Horizontal & Vertical
Modulation	80%, 1kHz Amplitude Modulation
Steps increment	1%

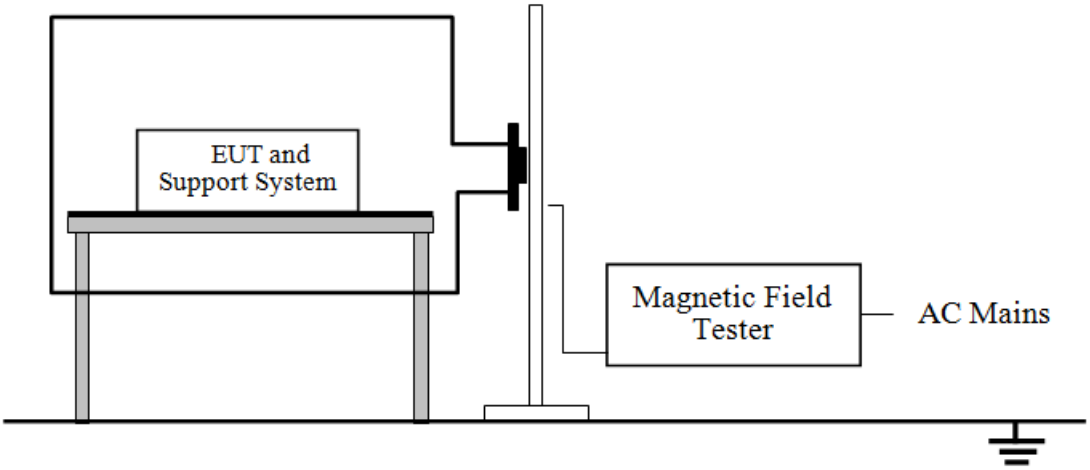
6.5 Test Data

Radio-frequency Continuous radiated disturbance Test Results

Field Strength (V/m)	Test Frequency (MHz)	Test mode (worst case)	Polarization of antenna	Required Performance	Actual Performance	Result
3	80-1000MHz, 1400-6000MHz	Normal working	H	A	A	PASS
			V	A	A	

7 Power Frequency Magnetic Field Immunity Test

7.1 Block Diagram of Test Setup



7.2 Test Standard

EN IEC 61000-6-1:2019 (EN 61000-4-8)

7.3 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

7.4 Test Procedure

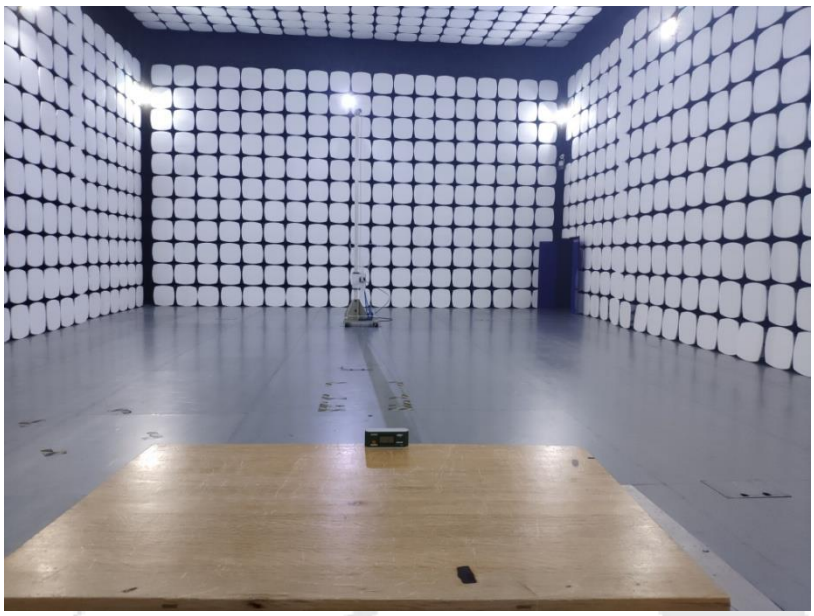
The EUT was subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m). The induction coil then was rotated by 90°in order to expose the EUT to the test field with different orientations

7.5 Test Data

EUT: DIGITAL LEVEL AND PROTRACTOR			Test Date: 2021.7.1	
M/N: 2179-360				
Test Voltage: DC 3V			Temperature: 23℃	
Humidity: 55%			Pressure: 100.6kPa	
Required Performance: A			Actual Performance: A	
Test Level	Testing Duration	Coil Orientation	Performance Criterion	Result
3A/m	5 min	X	A	PASS
3A/m	5 min	Y	A	PASS
3A/m	5 min	Z	A	PASS
Performance: There was no change compared with initial operation during the test.				

8 Test setup photo

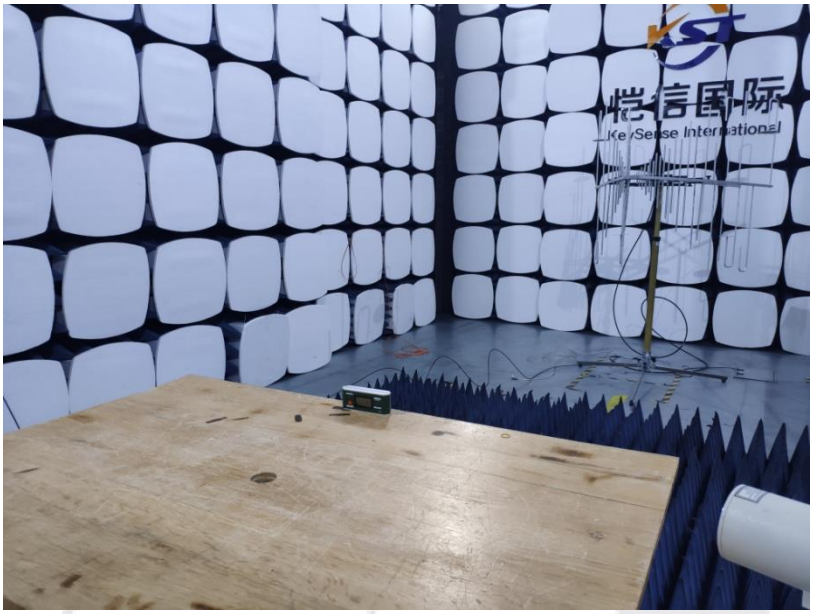
Radiated disturbance Test



Electrostatic discharge Test



Radio-frequency Continuous radiated disturbance Test(80MHz-1000MHz)

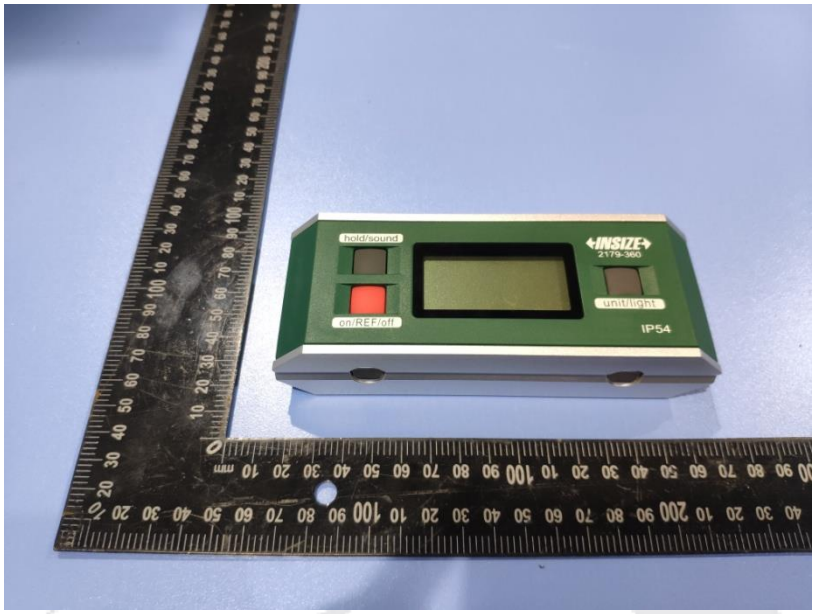


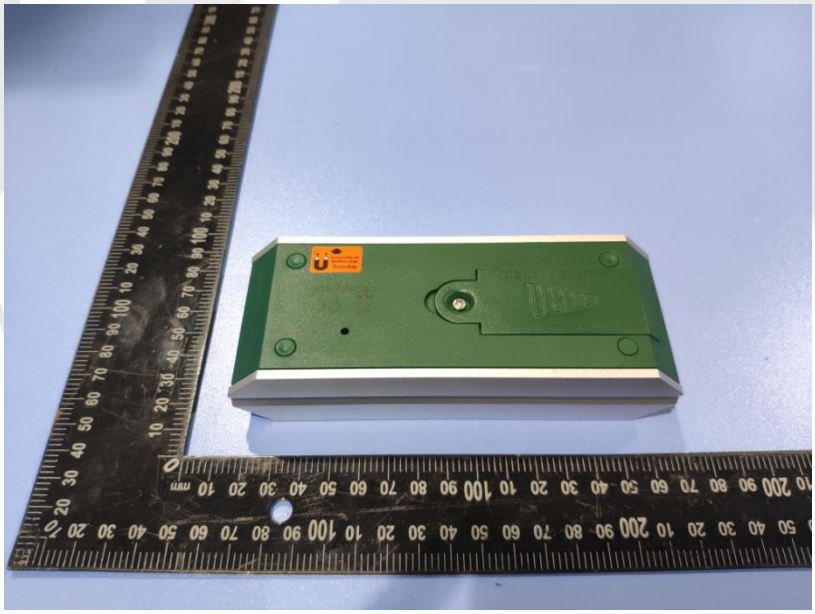
Power Frequency Magnetic Field Test



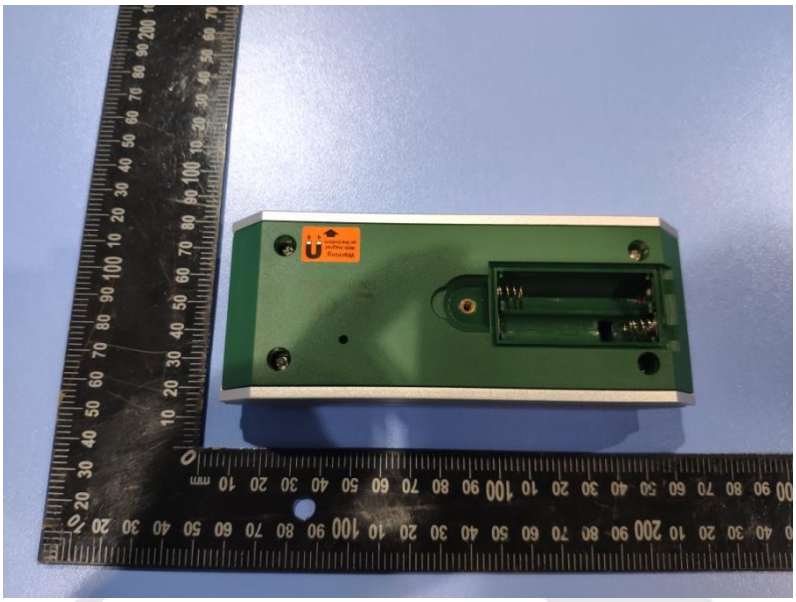
9 PHOTOS OF THE EUT

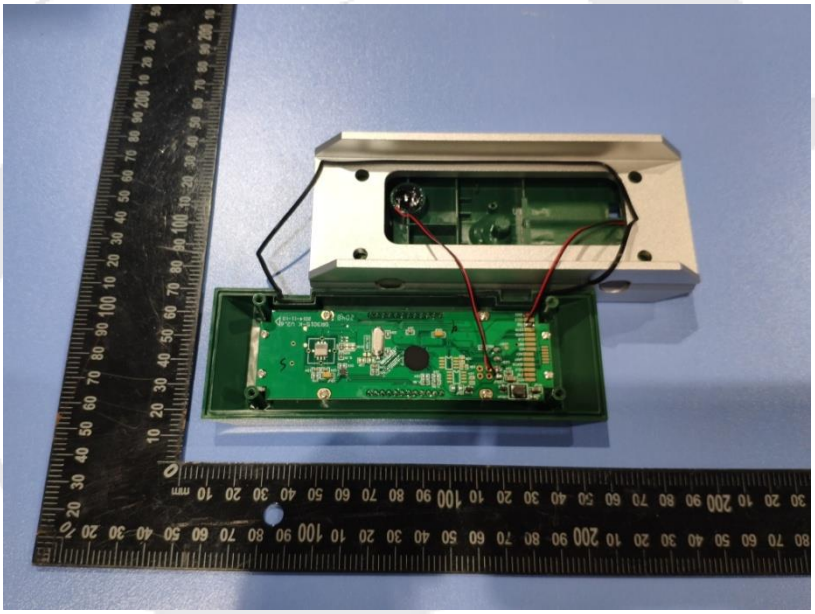
EUT photos



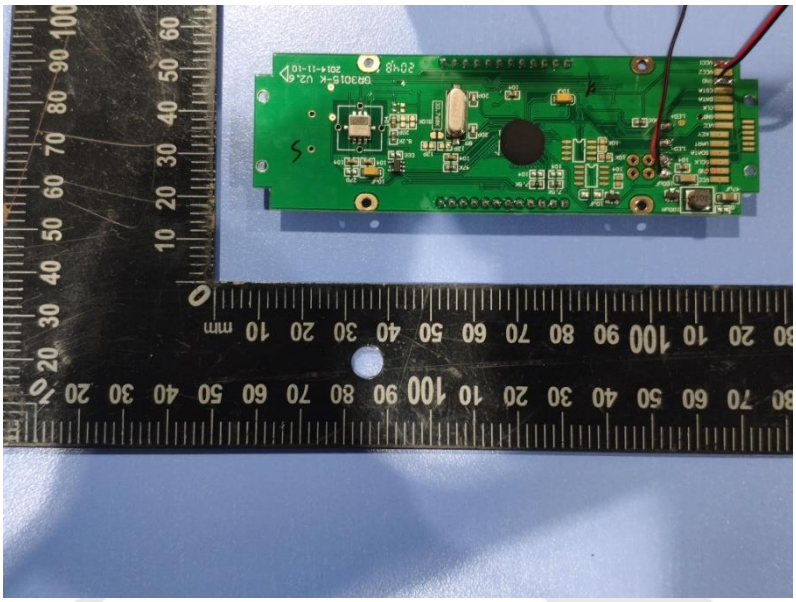


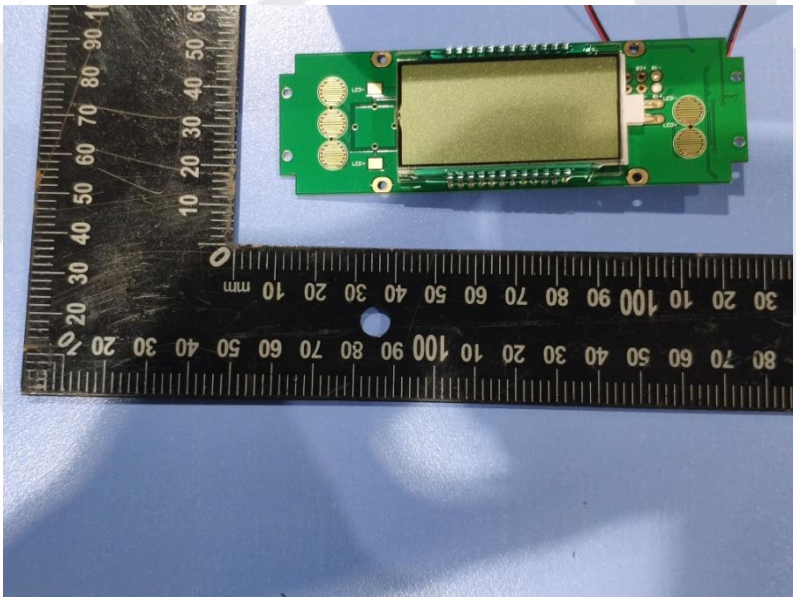
EUT photos





Internal photos





..... End of Report .....

Statement

1. The calibration and measurement of test equipments used in our laboratory are traceable to National primary standard of measurement and BIPM.
2. The report is invalid without the special test seal of the company.
3. The test report is invalid without the signature of main tester,examiner and approver.
4. The report is invalid if altered and added or deleted.
5. The test results in this report only apply to the tested samples.
6. This test report shall not be reproduced except in full, without the written approval of our laboratory.
7. “☆”item cannot be Accredited by CNAS.
8. Any objections must be raised to KeySense within 15days since the date when report is received.

Test Laboratory: KeySense Testing & Certification International Co., Ltd.

Address: 1-3F,Lab Building,No.29 District,ZhongKai Hi-Tech Industrial Development Park,Huizhou,Guangdong,China

Postcode: 516006 Fax: 0752-3219929

Tel: 0752-3219929 E-mail: keysense@kst-cert.com