## EMC TEST REPORT

#### For

## Chang Zhou Dings Electrical&Mechanical Co.,Ltd

#### Non-captive PM stepper Linear Actuator

#### Model No.: 25N

#### Additional Model No.: 20N, 36N

Changzhou, Jiangsu, China

Prepared for Address

Prepared by Address

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:	August 02, 2017
:	1
:	Prototype
:	August 02, 2017~ August 18, 2017
:	August 22, 2017
	: : :

# CE

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Report No.: LCS170802049AE

EN 55014-1: 2006+A1: 2009+A2: 2011         Requirements for household appliances, electric tools and similar apparatus Part 1: Emiss EN 55014-2: 2015         Report Reference No.       LCS170802049AE         Date Of Issue       August 22, 2017         Testing Laboratory Name       Shenzhen LCS Compliance Testing Laboratory Ltd.         Address.       I/F., Xingyuan Industrial Park, Tongda Road, Bao'an Aven Bao'an District, Shenzhen, Guangdong, China         Testing Location/ Procedure       Full application of Harmonised standards         Partial application of Harmonised standards       Other standard testing method         Address.       3rd floor, Block C, Tian ´ an Industrial Park, New District, Changzhou, Jiangsu, China         Test Specification:       Standard.       EN 55014-1: 2006+A1: 2009+A2: 2011         EN 55014-2: 2015       Test Report Form No.       LCSEMC-1.0         TRF Originator       Shenzhen LCS Compliance Testing Laboratory Ltd.         Master TRF       Dated 2011-03         SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication may be reproduced in whole or in part for non-commercial purposes as long as SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication may be reproduced material and to its placement and context.         This publication may be reproduced in whole or in part for non-commercial purposes as long as SHENZHEN LCS COMPLIANCE TESTING LABORA	
Requirements for household appliances, electric tools and similar apparatus Part 2: Immun         Product family standard         Report Reference No.       LCS170802049AE         Date Of Issue.       August 22, 2017         Testing Laboratory Name       Shenzhen LCS Compliance Testing Laboratory Ltd.         Address.       1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Aven Bao'an District, Shenzhen, Guangdong, China         Testing Location/ Procedure       Full application of Harmonised standards         Partial application of Harmonised standards       Partial application of Harmonised standards         Address.       3rd floor, Block C, Tian ' an Industrial Park, New District, Changzhou, Jiangsu, China         Test Specification:       Standard         Standard       EN 55014-1: 2006+A1: 2009+A2: 2011         EN 55014-2: 2015       Test Report Form No.         Test Report Form No.       LCSEMC-1.0         TRF Originator.       Shenzhen LCS Compliance Testing Laboratory Ltd.         Master TRF.       Dated 2011-03         SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication may be reproduced in whole or in part for non-commercial purposes as long as SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. Las convolvedged as copyri owner and source of the material. SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. Is acknowledged as copyri owner and source of the material. SHENZHEN LCS COMPLIANCE TESTING LABORATORY L	ssion
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Bao'an District, Shenzhen, Guangdong, China         Testing Location/ Procedure       Full application of Harmonised standards         Partial application of Harmonised standards       Other standard testing method         Applicant's Name       Chang Zhou Dings Electrical&Mechanical Co.,Ltd         Address       3rd floor, Block C, Tian ´ an Industrial Park, New District, Changzhou, Jiangsu, China         Test Specification:       Standard         Standard       EN 55014-1: 2006+A1: 2009+A2: 2011         EN 55014-2: 2015       Test Report Form No.         Test Report Form No.       LCSEMC-1.0         TRF Originator       Shenzhen LCS Compliance Testing Laboratory Ltd.         Master TRF       Dated 2011-03         SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication may be reproduced in whole or in part for non-commercial purposes as long as SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication of the reproduced material due to its placement and context.         Test Item Description       Non-captive PM stepper Linear Actuator         Trade Mark       DINGS'         Model/ Type Reference       25N         Ratings       DC 1-24V, 0.5-8A         Result       Positive	
Other standard testing method         Applicant's Name         Applicant's Name         Standard testing method         Address         3rd floor, Block C, Tian ' an Industrial Park, New District, Changzhou, Jiangsu, China         Test Specification:         Standard         Standard         EN 55014-1: 2006+A1: 2009+A2: 2011         EN 55014-2: 2015         Test Report Form No.         Ic LCSEMC-1.0         TRF Originator         Shenzhen LCS Compliance Testing Laboratory Ltd.         Master TRF         Dated 2011-03         SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.         This publication may be reproduced in whole or in part for non-commercial purposes as long as SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. is acknowledged as copyri owner and source of the material. SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. is acknowledged as copyri owner and source of the material. SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. takes no responsibility for and will not assume liability for damages resulting from the reacinterpretation of the reproduced material due to its placement and context.         Test Item Description       Non-captive PM stepper Linear Actuator         Trade Mark       DINGS'         Model/ Type Reference       25N         Ratings       DC 1-24V, 0.5-8A         Result       Positive <td>enue,</td>	enue,
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Changzhou, Jiangsu, China         Test Specification:         Standard	
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Trade Mark DINGS' Model/ Type Reference	as the yright DRY
Model/ Type Reference	
Ratings       DC 1-24V, 0.5-8A         Result       Positive         Compiled by:       Supervised by:         Supervised by:       Supervised by:	
Result       Positive         Compiled by:       Supervised by:         Supervised by:       Supervised by:	
Compiled by: Supervised by: Approved by:	
Ramer Fer Davapare Davapare	y.
	e a
Raing Ye/ File administrators Davey Xu/ Technique principal Gavin Liang/Man	>//

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SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

# **EMC -- TEST REPORT**

Test Report No. :	LCS170802049AE
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August 22, 2017 Date of issue

Positive

Type / Model	: 25N
EUT	: Non-captive PM stepper Linear Actuator
Applicant	: Chang Zhou Dings Electrical&Mechanical Co.,Ltd
Address	: 3rd floor, Block C, Tian ´ an Industrial Park, New District,
	Changzhou, Jiangsu, China
Telephone	:/
Fax	:/
March Production	
	: Chang Zhou Dings Electrical&Mechanical Co.,Ltd
Address	: 3rd floor, Block C, Tian´an Industrial Park, New District,
	Changzhou, Jiangsu, China
Telephone	
Fax	:/
Factory	: Chang Zhou Dings Electrical&Mechanical Co.,Ltd
Address	: 3rd floor, Block C, Tian ´ an Industrial Park, New District,
	Changzhou, Jiangsu, China
Telephone	:/
Fax	:/

The test report merely corresponds to the test sample.

**Test Result** according to the standards on page 6:

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## **Revision History**

Revision	Issue Date	Revisions	Revised By
000	August 22, 2017	Initial Issue	Gavin Liang

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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 55014-1: 2006+A1: 2009+A2: 2011)						
Description of Test Item		Standard		Limits	Results	
Conducted disturbance at mains terminals	EN 55014-1: 2006+A1: 2009+A2: 2011				N/A	
Clicks	E١	√ 55014-1: 2006+A1: 2009+A2: 20	11		N/A	
Disturbance Power	E١	√ 55014-1: 2006+A1: 2009+A2: 20	11		N/A	
Radiated disturbance		EN 55022: 2010			PASS	
Harmonic current emissions		EN 61000-3-2: 2014		Class A	N/A	
Voltage fluctuations & flicker		EN 61000-3-3: 2013			N/A	
	IMN	IUNITY (EN 55014-2: 2015)		· · · · · · · · · · · · · · · · · · ·		
Description of Test Item		Basic Standard	-	rformance Criteria	Results	
Electrostatic discharge (ESD)		EN 61000-4-2: 2009		В	PASS	
Radio-frequency, Continuous radiated disturbanc	e	EN 61000-4-3: 2006+A1: 2010		А	N/A	
Electrical fast transient (EFT)		EN 61000-4-4: 2012		В	N/A	
Surge (Input a.c. power ports)		EN 61000-4-5: 2014		В	N/A	
Radio-frequency, Continuous conducted disturban	се	EN 61000-4-6: 2014		А	N/A	
Power frequency magnetic field		EN 61000-4-8: 2010		А	N/A	
Voltage dips, 60% reduction Voltage dips, 30% reduction Voltage interruptions				С	N/A	
		EN 61000-4-11: 2004		С	N/A	
				С	N/A	
N/A is an abbreviation for Not App	licat	ble.				

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## 1.2. Description of Performance Criteria

#### **General Performance Criteria**

Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:

— essential operational modes and states;

— tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.);

- quality of software execution;
- quality of data display and transmission;
- quality of speech transmission.

#### 1.2.1.Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacture when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

#### 1.2.2.Performance criterion B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacture, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operation state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

#### 1.2.3.Performance criterion 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 manufacture's instructions.

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

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2.

## 2. GENERAL INFORMATION

EUT	: Non-captive PM stepper Linear Actuator
Trade Mark	: DINGS'
Model Number	: 25N
Power Supply	: DC 1-24V, 0.5-8A
EUT Clock Freque	ncy: $\leq 15$ MHz
.2.Test Facility	
Site Description	
EMC Lab.	CNAS Registration Number. is L4595.
	FCC Registration Number. is 899208.
	Industry Canada Registration Number. is 9642A-1.
	ESMD Registration Number. is ARCB0108.
	UL Registration Number. is 100571-492.
	TUV SUD Registration Number. is SCN1081.
	TUV RH Registration Number. is UA 50296516-001

#### 2.3.Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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Test Item	Test ItemFrequency RangeExpanded uncertainty (Ulab)		Expanded uncertainty (Ucispr)
Radiated Emission	Level accuracy (9kHz to 30MHz)	± 3.68 dB	N/A
Radiated Emission	Level accuracy (30MHz to 1000MHz)		± 5.2 dB
Radiated EmissionLevel accuracy (above 1000MHz)		± 3.90 dB	N/A

## 2.4. Measurement Uncertainty

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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# **3. MEASURING DEVICES AND TEST EQUIPMENT**

## 3.1.Radiated Disturbance (Electric Field)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17
2	EMI Test Receiver	ROHDE & SCHWARZ	ESR 7	101181	2017-06-17
3	Log per Antenna	SCHWARZBECK	VULB9163	9163-470	2017-04-17
4	EMI Test Software	AUDIX	E3	N/A	2017-06-17
5	Positioning Controller	MF	MF-7082	/	2017-06-17

## 3.2.Electrostatic Discharge

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	SCHLODER	SESD 230	604035	2017-06-17

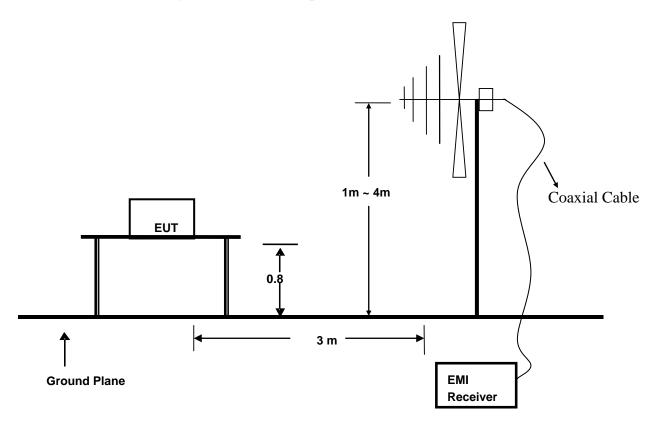
## 3.3.RF Field Strength Susceptibility

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	<b>RF POWER AMPLIFIER</b>	OPHIR	5225R	1052	2017-03-22
2	<b>RF POWER AMPLIFIER</b>	OPHIR	5273F	1019	2017-03-24
3	Stacked Broadband Log	SCHWARZBECK	STLP	9128ES-145	2017-04-28
5	Periodic Antenna	SCHWARZDECK	9128	912005-145	
4	Stacked Mikrowellen	SCHWARZBECK	STLP	9149-482	2017-04-28
4	LogPer Antenna	SCHWARZDECK	9149	9149-402	
5	Signal Generator	Agilent	E4438C	MY42081396	2016-11-18
6	Electric field probe	Narda S.TS./PMM	EP601	611WX70332	2017-02-05
7	Power Meter	Agilent	E4419B	MY45104493	2017-06-17
8	Power Sensor	Agilent	E9301H	MY41495234	2017-06-17
9	Power Sensor	Agilent	E4412A	MY41500229	2017-06-17

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# **4. RADIATED EMISSION MEASUREMENT**

## 4.1.Block Diagram of Test Setup



#### 4.2.Test Standard

EN 55014-1: 2006+A1: 2009+A2: 2011 (EN 55022: 2010)

#### 4.3.Radiated Emission Limits

FREQUENCY	DISTANCE	FIELD STRENGTHS LIMIT
(MHz)	(Meters)	(dBµV/m)
30-230	3	40
230-1000	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

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#### 4.4.EUT Configuration on Test

The EN 55022 regulations test method must be used to find the maximum emission during radiated emission measurement.

## 4.5. Operating Condition of EUT

4.5.1.Turn on the power.

4.5.2.After that, let the EUT work in test mode (ON) and measure it.

#### 4.6.Test Procedure

The EUT is placed on a turntable, which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. By-log antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver is set at 120kHz.

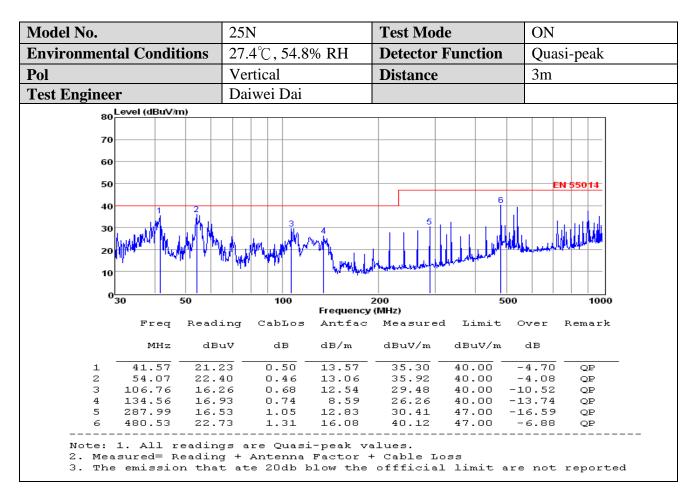
The frequency range from 30MHz to 1000MHz is investigated.

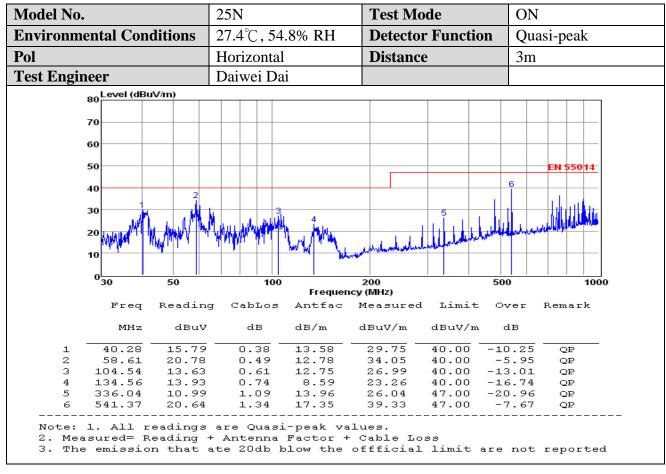
## 4.7.Test Results

#### PASS.

The scanning waveform please refer to the next page.

Report No.: LCS170802049AE

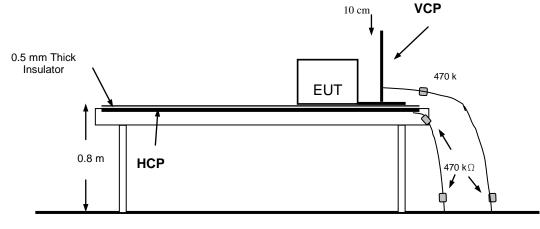




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# 5. ELECTROSTATIC DISCHARGE IMMUNITY TEST

## 5.1.Block Diagram of Test Setup



Ground

## 5.2.Test Standard

EN 55014-2: 2015 (EN 61000-4-2: 2009, Severity Level: 3 / Air Discharge: ± 8KV, Level: 2 / Contact Discharge: ±4KV)

# 5.3. Severity Levels and Performance Criterion

5.3.1.Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.	<u>±2</u>	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X	Special	Special

5.3.2.Performance criterion: B

## 5.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.7.

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## 5.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.5 except the test set up replaced by Section 5.1.

#### 5.6.Test Procedure

#### 5.6.1.Air Discharge

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

#### 5.6.2.Contact Discharge

All the procedure shall be same as Section 5.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.6.3.Indirect Discharge For Horizontal Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

5.6.4.Indirect Discharge For Vertical Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

#### 5.7.Test Results

#### PASS.

Please refer to the next page.

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Standard	□ IEC 61000-4-2 ☑ EN 61000-4-	2		
Applicant	Chang Zhou Dings Electrical&Mechanical Co.,Ltd			
EUT	Non-captive PM stepper Linear Actuator	Temperature	25.6°C	
M/N	25N	Humidity	54%	
Criterion	В	Pressure	1021mbar	
Test Mode	Normal	Test Engineer	Daiwei Dai	

			Air Discharg	ge			
	Test Levels				Results		
Test Points	± 2KV	±4KV	± 8KV	Pass	Fail	Performance Criterion	
Front	$\square$	$\square$	$\square$	$\square$			
Back	$\square$		$\square$	$\square$			
Left	$\square$	$\square$		$\square$			
Right	$\square$	$\square$		$\square$			
Тор	$\square$	$\square$		$\square$		$\Box A \square B$	
Bottom	$\square$	$\square$	$\square$	$\square$		$\Box A \square B$	
		Co	ontact Discha	arge	-		
		Test Level	S		Res	sults	
Test Points	± 2 KV	7	±4 KV	Pass	Fail	Performance Criterion	
Front	$\boxtimes$		$\boxtimes$	$\boxtimes$			
Back	$\boxtimes$		$\boxtimes$	$\square$			
Left	$\boxtimes$		$\boxtimes$	$\boxtimes$			
Right	$\boxtimes$		$\boxtimes$	$\square$			
Тор	$\boxtimes$		$\boxtimes$	$\square$			
Bottom	$\boxtimes$		$\boxtimes$	$\square$		$\Box A \boxtimes B$	
	I	Discharge	To Horizont	al Coupling	Plane		
		Test Levels		Results			
Side of EUT	± 2 KV	7	± 4 KV	Pass	Fail	Performance Criterion	
Front			$\boxtimes$	$\square$			
Back	$\square$		$\boxtimes$	$\square$		$\Box \mathbf{A}  \boxtimes \mathbf{B}$	
Left	$\square$		$\boxtimes$	$\square$			
Right	$\square$		$\boxtimes$	$\square$		$\Box A \boxtimes B$	
	I	Discharge	To Vertical	Coupling Pl	ane		
		Test Levels			Results		
Side of EUT	± 2 KV	7	± 4 KV	Pass	Fail	Performance Criterion	
Front			$\boxtimes$	$\square$			
Back			$\boxtimes$	$\square$			
Left			$\boxtimes$				
Right	$\square$		$\boxtimes$	$\square$			

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# 6. PHOTOGRAPH

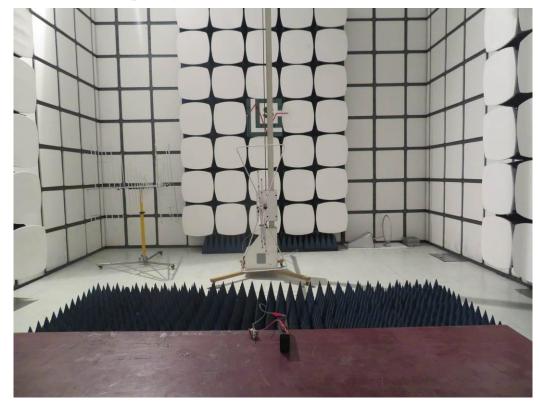
6.1. Photo of Radiated Measurement



6.2. Photo of Electrostatic Discharge Test



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## 6.3.Photo of Radio-frequency, Continuous radiated disturbance

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# 7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

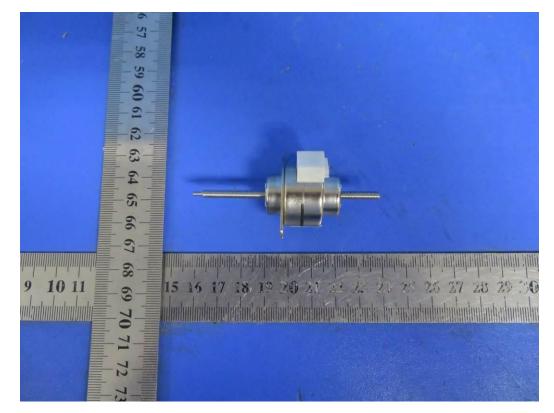
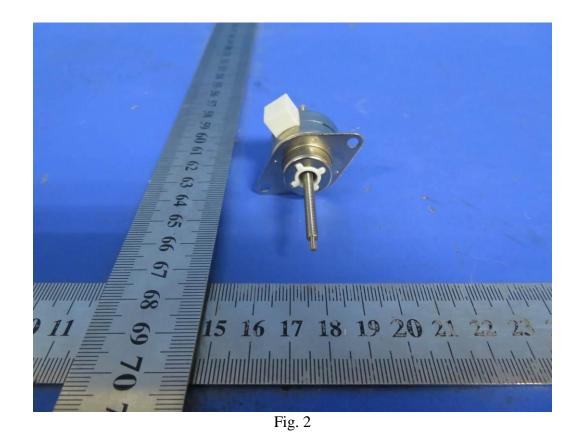


Fig. 1



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Fig. 3

## -----THE END OF TEST REPORT-----

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