



LVD TEST REPORT

EN 61800-5-1:2023

Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

For

Shenzhen Rtelligent Technology Co.,Ltd

2F-6F, A Building, Ruitech Industrial Park, Xingyu Road No.23, Xixiang Street, Bao an District, Shenzhen, Guang Dong Province, China, 518102

Model:

DM456-V-24,R60C,R60S,R28S,R42S,R60S,R86S,ECT86S

2024-07-15

This Report Concerns:

☒ Original Report

Equipment Type:

Stepper Servo Drives/Microstep Drives

Test Engineer:

Eric Tao/

Eric Tao

Report Number:

TH2407145-C04-R01

Test Date:

2024-07-08 to 2024-07-15

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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of Shenzhen Tian Hai Test Technology Co.,Ltd.



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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				
Description of Test Item	Test Standard	Basic Standard	Requirement	Results
Conducted disturbance	/	/	/	N/A
Radiated disturbance	EN 55011:2016/A2:2021 EN IEC 61000-6-4:2019 EN IEC 61800-3:2018	EN 55011:2016 /A2:2021 EN IEC 61000-6-4: 2019 EN IEC 61800-3:2018	See Section 4	PASS
Harmonic current emissions	/	/	/	N/A
Voltage fluctuations & flicker*	/	/	/	N/A
IMMUNITY				
Description of Test Item	Test Standard	Basic Standard	Test configuration	Results
Electrostatic discharge (ESD)	EN IEC 61000-6-2 :2019 EN IEC 61800-3:2018	IEC 61000-4-2:2008	See Section 5.1	PASS
Radio-frequency, Continuous radiated disturbance	EN IEC 61000-6-2 :2019 EN IEC 61800-3:2018	IEC 61000-4-3:2020	See Section 5.2	PASS
Electrical fast transient (EFT)	/	/	/	N/A
Surge (Input a.c. power ports)	/	/	/	N/A
Radio-frequency, Continuous conducted disturbance	/	/	/	N/A
Power frequency magnetic field*	/	/	/	N/A
Voltage dips and interruptions	/	/	/	N/A
Note: N/A is an abbreviation for Not Applicable “ * ” : The EUT does not contain devices susceptible to magnetic fields; therefore the Power-Frequency Magnetic Fields test is not necessary.				



1.2 DESCRIPTION OF PERFORMANCE CRITERIA

General Performance Criteria

A functional description and a definition of specific performance criteria, during or as a consequence of immunity testing of equipment under test (EUT), shall be provided by the manufacturer and noted in the test report.

1.2.1 Performance criterion A

The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

1.2.2 Performance criterion B

The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

1.2.3 Performance criterion C

Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.



2 - GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST EUT

Client Information

Applicant: Shenzhen Rtelligent Technology Co.,Ltd
Address: 2F-6F, A Building, Ruitech Industrial Park, Xingyu Road No.23, Xixiang Street, Bao an District, Shenzhen,Guangdong Province China,518102
Manufacturer: Shenzhen Rtelligent Technology Co.,Ltd
Address: 2F-6F, A Building, Ruitech Industrial Park, Xingyu Road No.23, Xixiang Street, Bao an District, Shenzhen,Guangdong Province China,518102

General Description of E.U.T

EUT Name: Stepper Servo Drives / Microstep Drives
Trade Mark: N/A
Model No.: DM456-V-24,R60C,R60S,R28S,R42S,R60S,R86S,ECT86S
Sample No.: TH2407145
Ratings: Input: DC 48V ,3A,150W
Test Mode: ON
Note: All test results are based on modelDM456-V-24

2.2 STATEMENT OF THE MEASUREMENT UNCERTAINTY TEST FACILITY

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 16-4-2 “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 ENISO/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.

2.3 MEASUREMENT UNCERTAINTY

Test Item	Frequency range	Results	Limits
Conducted disturbance at mains terminals	9kHz to 150kHz	± 2.63 dB	± 3.8 dB
	150kHz to 30MHz	± 2.36 dB	± 3.4 dB
Radiated disturbance	30MHz to 1GHz	± 5.78 dB	± 6.3 dB

- (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%.
- (3) The measurement uncertainty is not included in the test result.



2.4 TEST LOCATION

All tests were performed at Shenzhen Tianhai Test Technology Co., Ltd.
125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District,
Shenzhen, Guangdong Province, P.R. China

2.5 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.

2.6 TEST OPERATION

Test operation refers to test setup in chapter 4 & 5
Pretest in all operation modes, and find out the worst case for compliance test.
According to section 2.1,all test results are based on modelDM456-V-24

2.7 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Kind of Equipment	Manufacturer	Model Number	S/N
/	/	/	/

The EUT was tested with following cables:

Cable name	Length (m)	Shield	Core No.
/	/	/	/



3 - TEST EQUIPMENT LIST AND DETAILS

Kind of Equipment	Manufacturer	Type	S/N	Calibrate until
Conducted Emission				
EMI Test Receiver	R&S	ESR7	102333	2024-11-13
L.I.S.N	Schwarzbeck	NNLK 8128	5089	2024-11-13
8-Wire ISN CAT6	Schwarzbeck	NTFM 8158	231	2024-11-13
Pulse Limiter	Schwarzbeck	VTSD 9561-F	847	2024-11-13
Test software	EZ	EMC-CON 3A1.1	/	/
Disturbance power				
EMI Test Receiver	R&S	ESR7	102333	2024-11-13
EMI Absorbing Clamp	Teseq	MDS 21B	58115	2024-11-20
Test software	EZ	EMC-CON 3A1.1	/	/
LLAS Radiated Disturbance (2m)				
EMI Test Receiver	R&S	ESR7	102333	2024-11-13
Loop Antenna	Schwarzbeck	HXYZ 9170	353	2024-11-13
Test software	EZ	EMC-CON 3A1.1	/	/
Radiated Emission (3m)				
EMI Test Receiver	R&S	ESR7	102333	2024-11-13
MXA Signal Analyzer	Keysight	N9020A	MY51281805	2025-04-22
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2024-11-20
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2024-11-13
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2024-11-13
Pre-Amplifier	GUANGGU ELECTRONIC	GLNA18-40GK-5372	20210331001	2024-11-13
Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00148	2024-11-13
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2024-11-20
Test software	FALA	/	FA-03A2 RE	/
Harmonics & Flicker				
5kVA AC Power Source	AMETEK CTS	5001iX-CTS-400	2046A03237	2024-11-13
Signal Conditioning Unit	AMETEK CTS	PACS-1	2046A03238	2024-11-13
Test software	AMETEK CTS	CTS 4	Version 4.26.0	/
Electrostatic discharge (ESD)				
ESD Simulator	TESEQ	NSG 437	1569	2024-11-15



Radio-frequency,Continuous radiated disturbance (RS)				
Signal generator	R&S	SMB 100A	113650	2025-04-22
Power meter	Agilent	E4417A	MY45100899	2025-04-22
Power sensor	Agilent	E9321A	US40390494	2025-04-22
Power sensor	Agilent	E9322A	MY44420219	2025-04-22
Power amplifier	Micotop	MPA-80-1000-250	MPA2112426	2025-04-22
Power amplifier	Micotop	MPA-1000-6000-100	MPA2201013	2025-04-22
Stacked Log. Periodic Antenna	Schwarzbeck	STLP 9129	201	N/A
Field strength probe	PMM	EP601	811ZX10673	2025-04-22
RF Switch	Emtrace	SW X4	/	N/A
Test Software	Emtrace	EM 3	V1.2.1	N/A
Electrical fast transient (EFT)				
Burst Tester	3C TEST	EFT 500T	ES027000120015	2024-11-13
Coupling Clamp	3C TEST	CCC 100	CCC 20092269	2024-11-13
CCS	3C TEST	V4.2.7	ES027000120015	/
Surge				
Surge simulator	3C TEST	CWS 600CT	ES058000920005	2024-11-13
Three phases CDN	3C TEST	SPN 3832T	ES0911910	2024-11-13
CDN for unshielded symmetrical high-speed Telecom cable	3C TEST	CDN405T8A	ES064001220010	2024-11-13
CDN for Telecom cable	3C TEST	CDN405M40-5	ES1071910	2024-11-13
CWS	3C TEST	V1.0.5.2	ES058000920005	/
Radio-frequency,Continuous conducted disturbance (CS)				
Conducted Immunity Test System	3C TEST	CST 1075	ES096000120008	2024-11-13
6dB Attenuator	3C TEST	DTC75-6	ES095000120006	2024-11-13
Single phase CDN	3C TEST	CDN M2M3	ES064002620007	2024-11-13
Three phases CDN	3C TEST	CDN M5-16	ES064003320004	2024-11-13
Calibration Set	3C TEST	CDN 100KIT	ES064002820016	2024-11-13
Calibration Set	3C TEST	EM CL100KIT	EM C20032816	2024-11-13
EM-Clamp	3C TEST	EM CL100	EM C20032811	2024-11-13

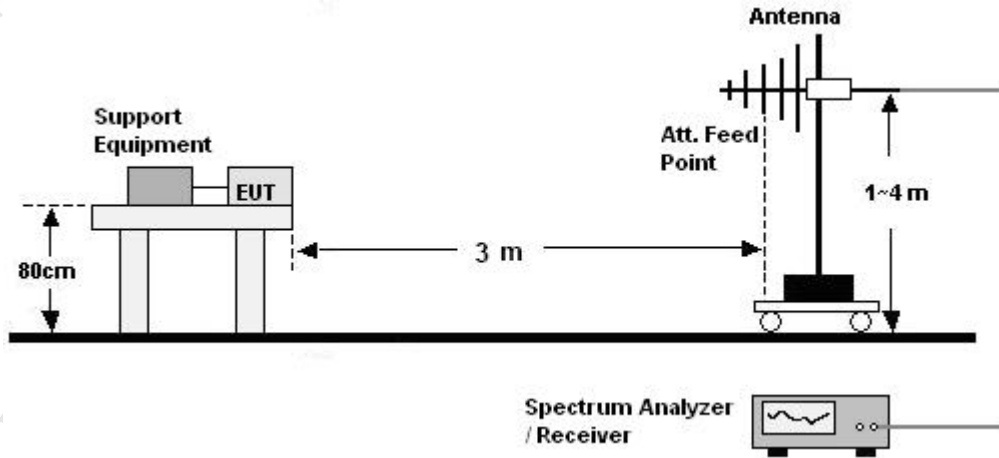


EMC-s	SKET	V1.4.0.54	/	/
Power Frequency Magnetic Field (PFMF)				
PFMF simulator	3C TEST	MFS 400	ES045000720001	2024-11-13
Transformer	3C TEST	MFT 400	ES046000220003	2024-11-13
Magnetic field antenna	3C TEST	TCXS111	TCXS20060910	2024-11-13
CWS	3C TEST	V4.2.7	ES045000720001	/
Voltage dips & Voltage interruptions				
Power failure simulator	3C TEST	PFS 2216SD	ES049001220003	2024-11-13
CCS	3C TEST	V4.2.8	ES049001220003	/



4- RADIATED DISTURBANCE MEASUREMENT

4.1 BLOCK DIAGRAM OF TEST SETUP



4.2 LIMITS

Frequency (MHz)	Quasi-peak Limits at 3m dB(μ V/m)
30-230	50
230-1000	57

NOTE: The lower limit shall apply at the transition frequencies.

4.3 TEST PROCEDURE

a. The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

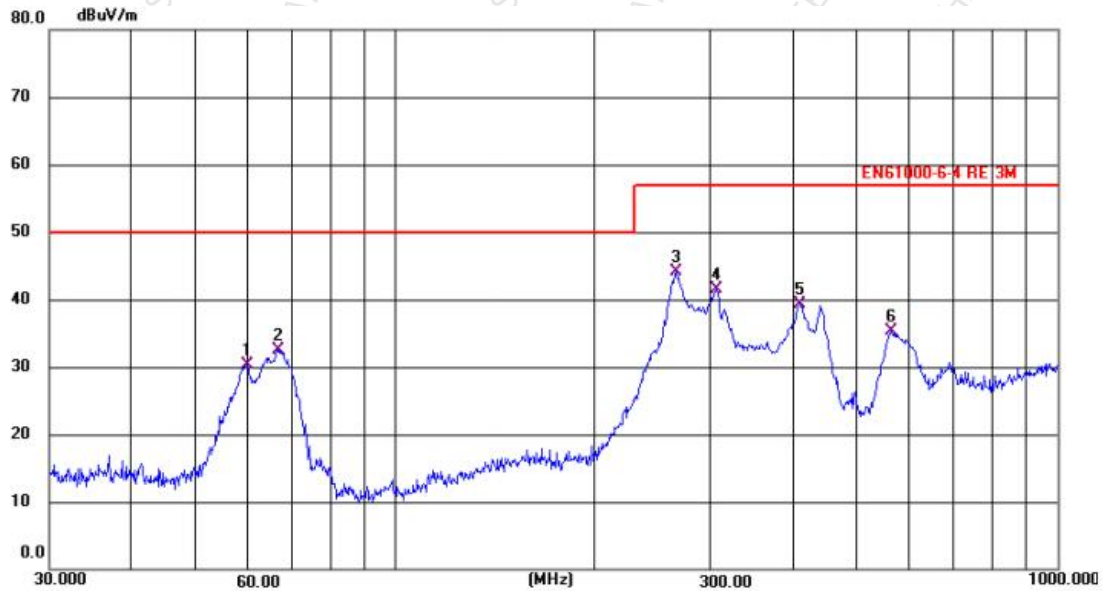
c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value



4.4 TEST RESULTS AND DATA

EUT: Stepper Servo Drives
M/N: DM456-V-24
Test Mode: ON
Test Voltage: DC 48V
Temperature: 24°C
Humidity: 60%
Atmosphere pressure: 101Kpa
Test Results Pass

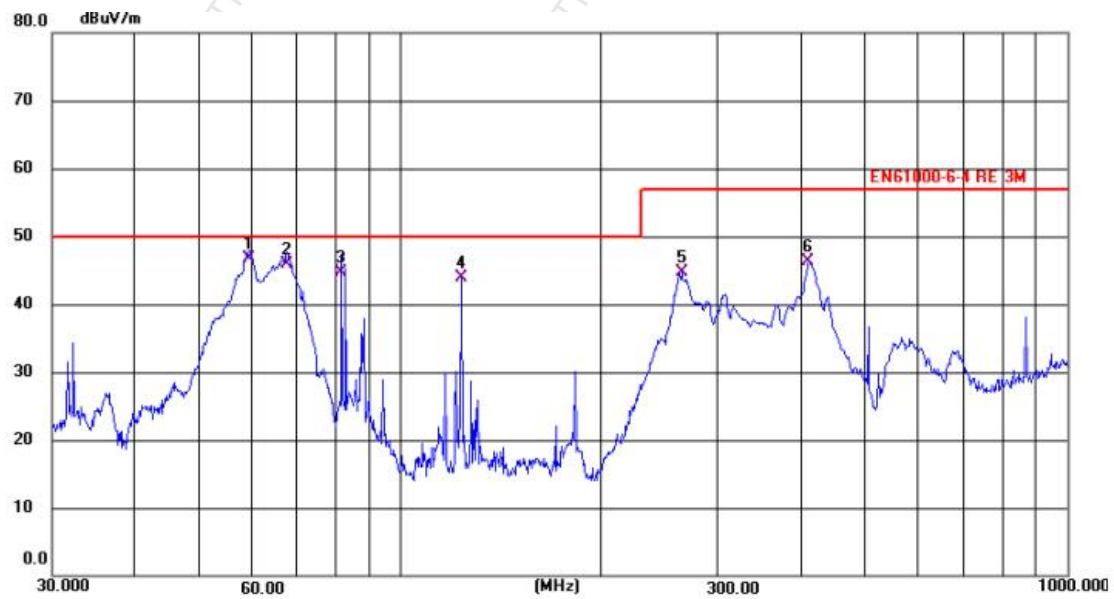
Polarization:Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	59.8588	45.99	-15.72	30.27	50.00	-19.73	QP
2	66.6741	49.54	-17.03	32.51	50.00	-17.49	QP
3 *	265.9553	59.47	-15.29	44.18	57.00	-12.82	QP
4	305.7336	55.48	-13.97	41.51	57.00	-15.49	QP
5	407.7289	50.77	-11.41	39.36	57.00	-17.64	QP
6	561.6767	43.49	-8.12	35.37	57.00	-21.63	QP



Polarization:Vertical



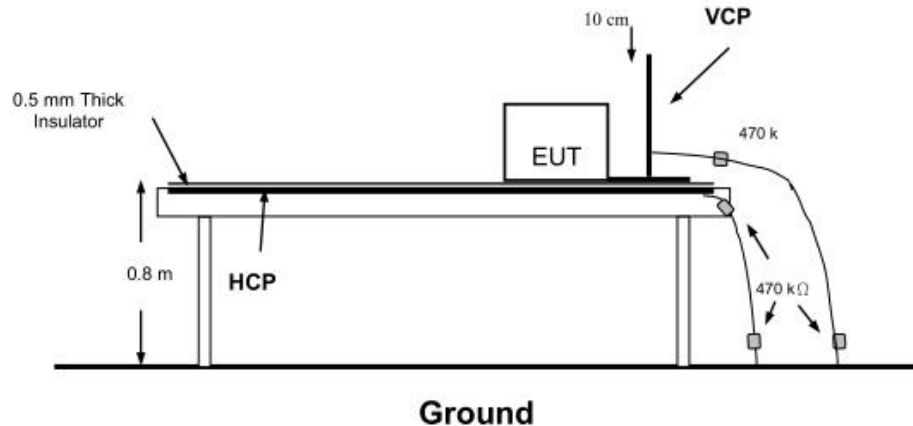
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	59.4405	62.23	-15.56	46.67	50.00	-3.33	QP
2	67.6633	62.71	-16.82	45.89	50.00	-4.11	QP
3	81.7116	63.75	-18.97	44.78	50.00	-5.22	QP
4	123.2871	59.97	-16.10	43.87	50.00	-6.13	QP
5	263.8653	61.82	-17.06	44.76	57.00	-12.24	QP
6	411.3909	57.56	-11.35	46.21	57.00	-10.79	QP



5 - IMMUNITY TEST

5.1 ELECTROSTATIC DISCHARGE IMMUNITY TEST

5.1.1 Block Diagram Of Test Setup



5.1.2 Test Specification

Basic Standard	: IEC 61000-4-2:2008
Test Port	: Enclosure port
Discharge Impedance	: 330 ohm / 150 pF
Discharge Mode	: Single Discharge
Discharge Period	: one second between each discharge

5.1.3 Test Procedure

5.1.3.1. 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.

5.1.3.2. Contact Discharge

All the procedure shall be same as Section 5.1.3.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.1.3.3. 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.

5.1.3.4. 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.



5.1.4 Test Results

Electrostatic Discharge	
Basic Standard:	IEC 61000-4-2:2008
EUT:	Stepper Servo Drives
M/N:	DM456-V-24
Test Mode:	ON
Test Voltage:	DC 48V
Temperature:	25°C
Humidity:	55%
Atmosphere pressure:	101Kpa

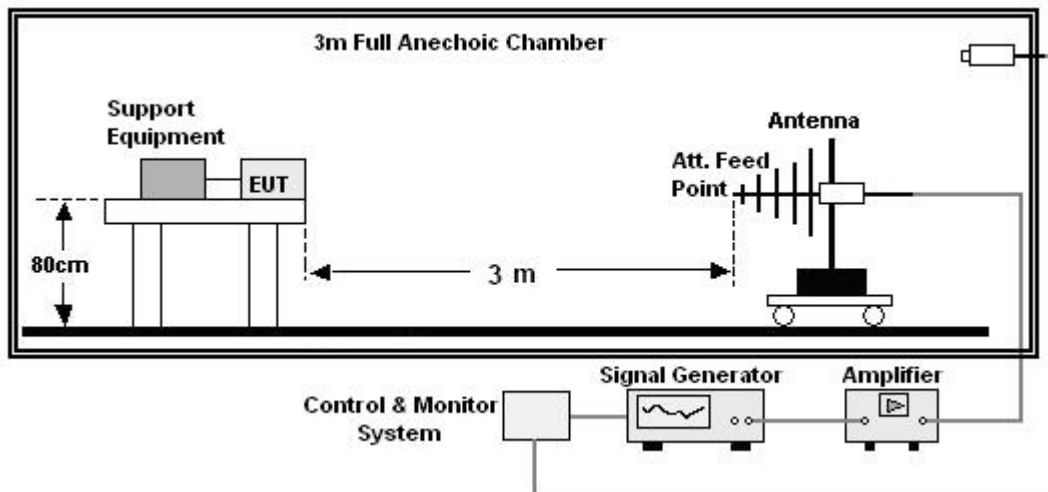
Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Performance Criterion	Test Results
Contact Discharge	Conductive Surfaces	4	10	B	Pass
	Indirect Discharge HCP	4	10	B	Pass
	Indirect Discharge VCP	4	10	B	Pass
Air Discharge	Slots, Apertures, and Insulating Surfaces	8	10	B	Pass



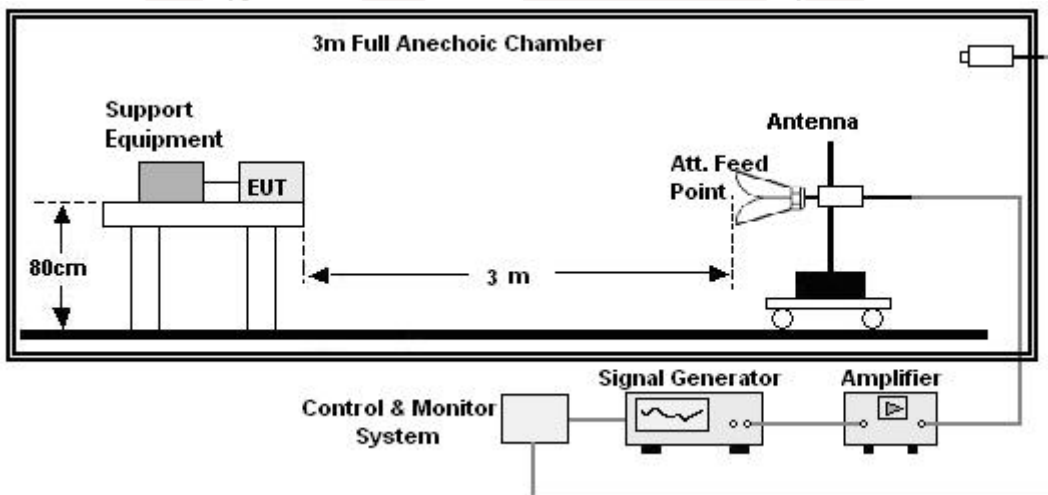
5.2 RADIO FREQUENCY ELECTROMAGNETIC FIELDS

5.2.1 Block Diagram of Test Setup

80-1000MHz:



1000-6000MHz:





5.2.2 Test Specification

Basic Standard	: IEC 61000-4-3:2020
Test Port	: Enclosure port
Step Size	: 1%
Modulation	: 1kHz, 80% AM
Dwell Time	: 1 second
Polarization	: Horizontal & Vertical

5.2.3 Test Procedure

- The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.
- The frequency range is swept from 80MHz to 1000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%.
- The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

5.2.4 Test Results

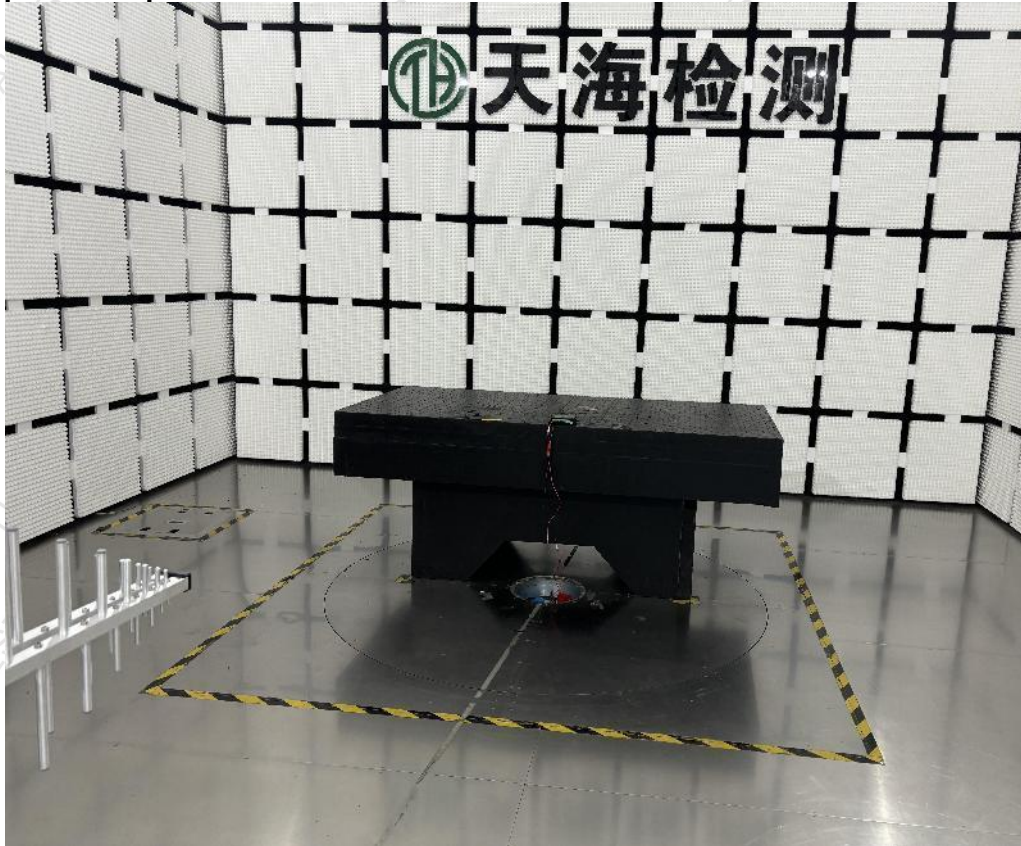
Radio frequency electromagnetic fields	
Basic Standard:	IEC 61000-4-3:2020
EUT:	Stepper Servo Drives
M/N:	DM456-V-24
Test Mode:	ON
Test Voltage:	DC 48V
Temperature:	26°C
Humidity:	55%
Atmosphere pressure:	101Kpa

Frequency (MHz)	Position	Field Strength (V/m)	Performance Criterion	Test Results
80 - 1000	Front, Right, Back, Left	10	A	Pass
1400-6000	Front, Right, Back, Left	3	A	Pass



APPENDIX A - TEST SETUP PHOTOGRAPHS

Photograph 1 :Setup for Radiated Emission



Photograph 2 :Setup for Electrostatic Discharge



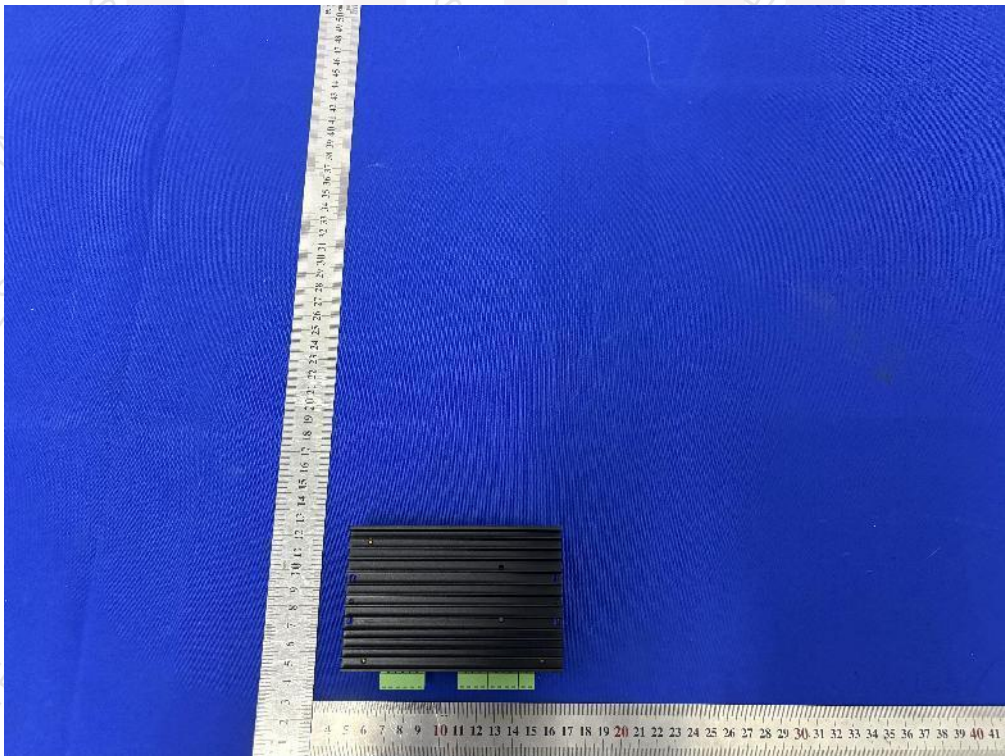
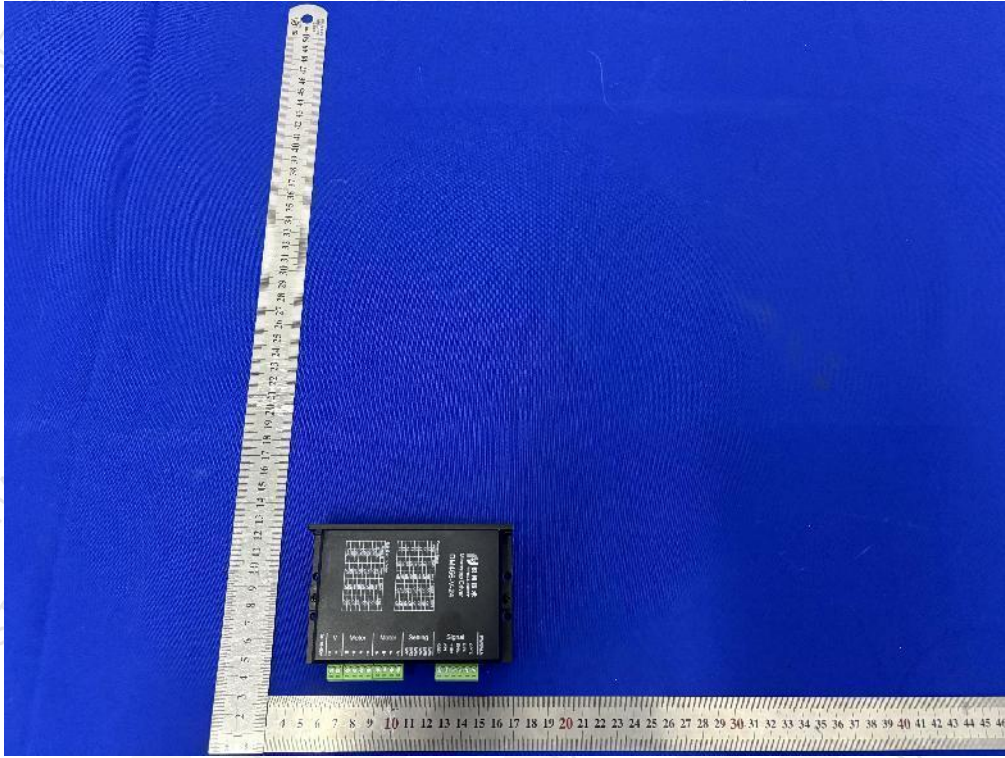


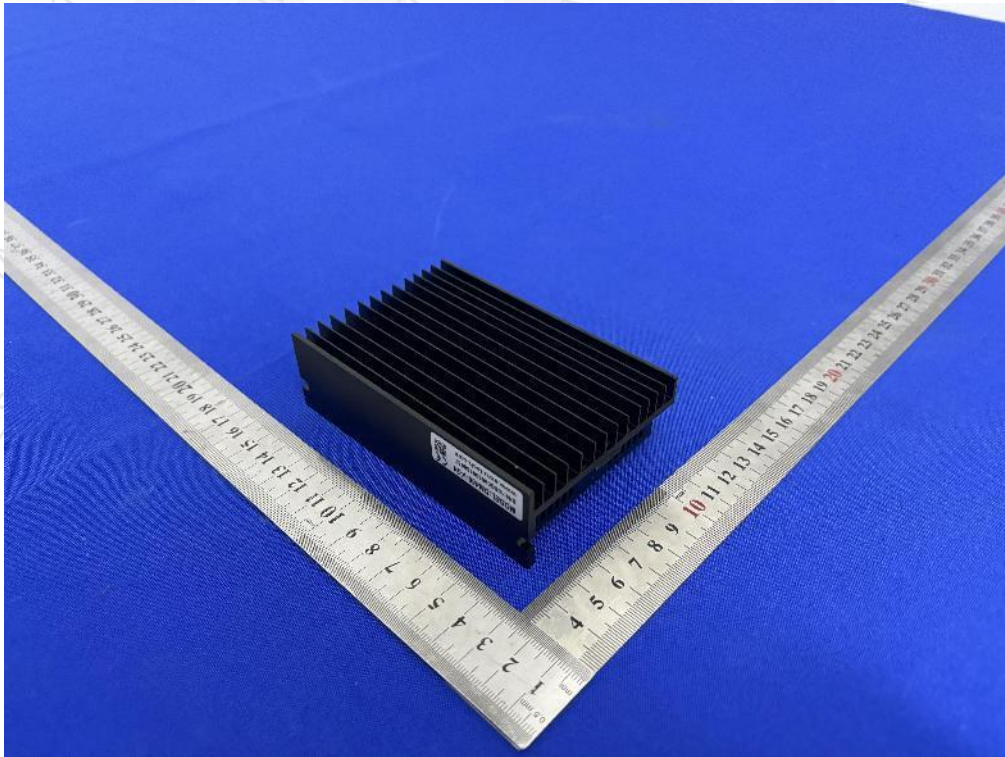
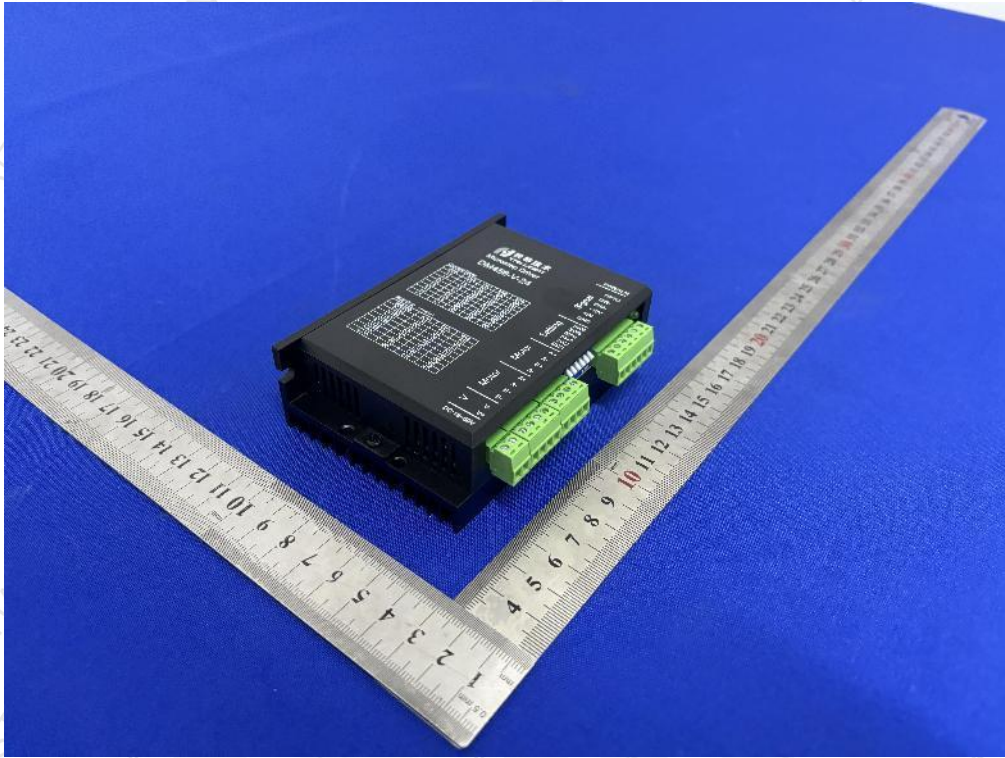
Photograph 3 :Setup for Radio Frequency Electromagnetic Fields

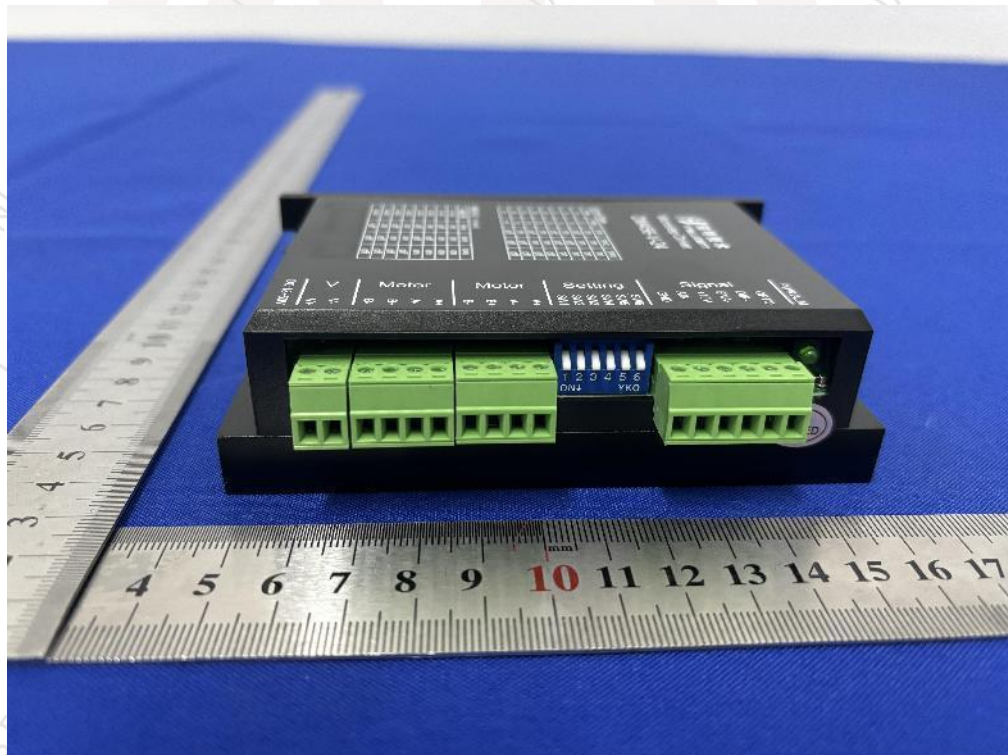
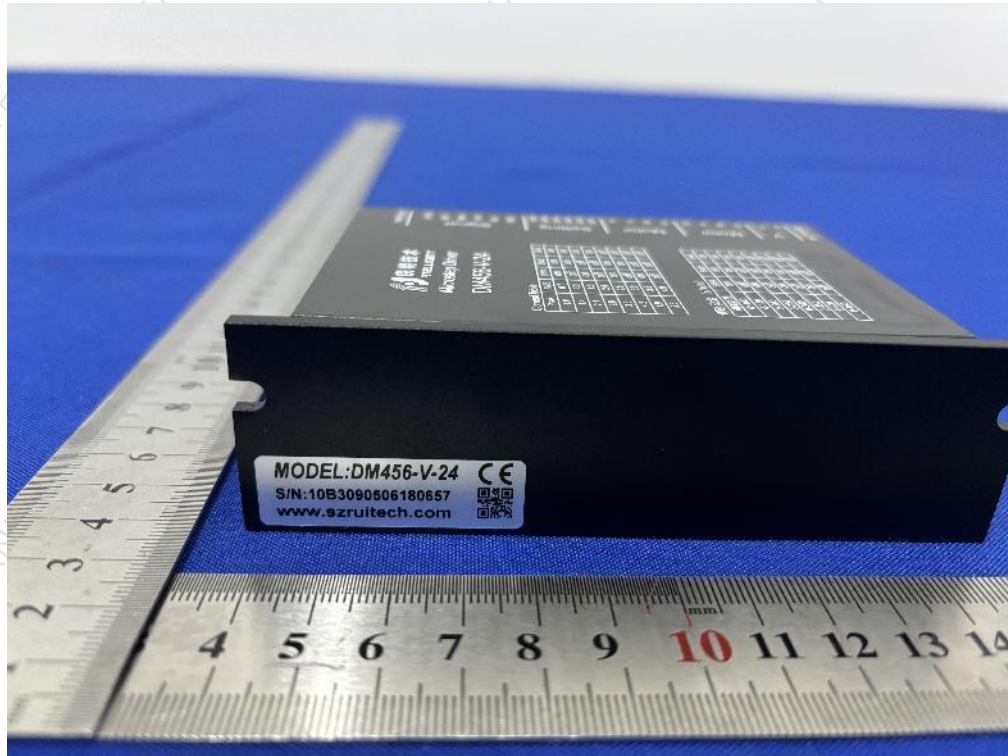




APPENDIX B - EUT PHOTOGRAPHS







*****END OF THE REPORT*****