EMC TEST REPORT

EN IEC 61000-6-3:2021
EN IEC 61000-6-1:2019
MEASUREMENT AND TEST REPORT

For

Shenzhen Ico-tec Co.,Ltd

Room 705, Building 2, China Phoenix Building, No. 2008 Shennan Avenue, Fuzhong Community, Lianhua Street, Futian District, Shenzhen

Model:ulli-5,ulli-10,ulli-20,ulli-25,ulli-40,ulli-50,ulli-60,ulli-100,ulli-200,ulli-600

2025-04-07

This Report Concerns:	**Equipment Type:**
Original Report	valve actuator

Test Engineer:	Engine Chen/ Engine Chen
Report Number:	TH2503219-C03-R01
Test Date:	2025-03-31 to 2025-04-07
Reviewed By:	Eric Tao/ Eric Tao
Approved By:	Prince Huang/ Prince Huang
Prepared By:	**Shenzhen Tian Hai Test Technology Co.,Ltd.** 401-501, Building A5, The Silicon Valley Power Intelligent Terminal Industrial Park, No. 20, Dafu Industrial Zone, Dafu Community, Guanlan Street, Longhua District, Shenzhen, Guangdong, China Tel : +86-755-86615100 Fax: +86-755-86615105

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 TianHai Compliance Testing Laboratory 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	EN IEC 61000-6-3 :2021	EN IEC 61000-6-3 :2021	See Section 4	PASS
Radiated disturbance	EN IEC 61000-6-3 :2021	EN IEC 61000-6-3 :2021	See Section 5	PASS
Harmonic current emissions	EN IEC 61000-6-3 :2021	EN IEC 61000-3-2 :2019/A1:2021	See Section 6	PASS
Voltage fluctuations & flicker	EN IEC 61000-6-3 :2021	EN 61000-3-3 :2013/A1:2019	See Section 7	PASS
IMMUNITY				
Description of Test Item	**Test Standard**	**Basic Standard**	**Test configuration**	**Results**
Electrostatic discharge (ESD)	EN IEC 61000-6-1 :2019	IEC 61000-4-2 :2008	See Section 8.1	PASS
Radio-frequency, Continuous radiated disturbance	EN IEC 61000-6-1 :2019	IEC 61000-4-3 :2020	See Section 8.2	PASS
Electrical fast transient (EFT)	EN IEC 61000-6-1 :2019	IEC 61000-4-4 :2012	See Section 8.3	PASS
Surge (Input a.c. power ports)	EN IEC 61000-6-1 :2019	IEC 61000-4-5 :2014+AMD1:2017	See Section 8.4	PASS
Radio-frequency, Continuous conducted disturbance	EN IEC 61000-6-1 :2019	IEC 61000-4-6 :2013	See Section 8.5	PASS
Power frequency magnetic field*	EN IEC 61000-6-1 :2019	IEC 61000-4-8 :2009	See Note	N/A
Voltage dips and interruptions	EN IEC 61000-6-1 :2019	IEC 61000-4-11 :2020	See Section 8.6	PASS

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.

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1.2 DESCRIPTION OF PERFORMANCE CRITERIA

General Performance Criteria

During or after the immunization test, the manufacturer shall provide functional instructions and definitions of the specific performance standards of the equipment being tested (EUT), as indicated in the test report.

1.2.1 Performance criterion A

The EUT shall continue to operate as expected during and after testing. When the EUT is used as expected, no performance degradation or loss of function is allowed below the manufacturer-specified performance level. If the manufacturer does not specify the performance level, this may come from the product description and documentation, and what the user may reasonably expect from the device if used as intended.

1.2.2 Performance criterion B

After the test ends, the EUT shall continue to operate as expected. When the EUT is used as expected, no performance degradation or loss of function is allowed below the manufacturer-specified performance level. The performance level can be replaced with the allowable performance loss. However, performance during testing but not changes in the actual running state or stored data. If the manufacturer does not specify the minimum performance level or the allowable performance loss, both can be drawn from the product description and documentation, and what the user can reasonably expect from the device if used as intended.

1.2.3 Performance criterion C

Allows temporary loss of function during the test, provided that function can be self-restored or by controlled manipulation.

If the EUT becomes dangerous or unsafe by applying the tests as defined in this standard, it should be considered as a test failure

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2 - GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST EUT

Client Information

Applicant:	Shenzhen Ico-tec Co.,Ltd
Address:	Room 705, Building 2, China Phoenix Building, No. 2008 Shennan Avenue, Fuzhong Community, Lianhua Street, Futian District, Shenzhen
Manufacturer:	AOITEC (GD) Co.,Ltd
Address:	Floor 11, Factory Building No. 18, Factory Building No. 5, Xinghe Zhongkai Artificial Intelligence Industrial Park, Chenjiang Street, Zhongkai High-tech Zone, Huizhou

General Description of E.U.T

EUT Name:	valve actuator
Trade Mark:	ulli
Model No.:	ulli-5,ulli-10,ulli-20,ulli-25,ulli-40,ulli-50,ulli-60,ulli-100,ulli-200,ulli-600
Model Difference:	All models have the same circuit structure and principle，just the appearance and the power are different
Sample No.:	TH2503219
Ratings:	Input:AC 220V, 50/60Hz
Test Mode:	Normal Working
Note:	All test results are based on model ulli-600

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	Expanded Uncertainty(U_{lab})	Expanded Uncertainty(U_{cispr})
Conducted disturbance at mains terminals	9kHz to 150kHz 150kHz to 30MHz	±2.63 dB ±2.36 dB	±3.8 dB ±3.4 dB
Radiated disturbance	30MHz to 1GHz	±5.78 dB	±6.3 dB
Mains Harmonic	Voltage	± 1.80%	N/A
Voltage Fluctuations & Flicker	Voltage	± 0.64%	N/A

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(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 & 6 & 7 & 8
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 model ulli-600

2.7 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Kind of Equipment	Manufacturer	M/N	S/N
/	/	/	/

The EUT was tested with following cables:

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

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3 - TEST EQUIPMENT LIST AND DETAILS

Kind of Equipment	Manufacturer	Type	S/N	Calibrate until
Conducted Emission				
EMI Test Receiver	R&S	ESR7	102333	2025-11-14
L.I.S.N	Schwarzbeck	NNLK 8128	5089	2025-11-14
8-Wire ISN CAT6	Schwarzbeck	NTFM 8158	231	2025-11-14
Pulse Limiter	Schwarzbeck	VTSD 9561-F	847	2025-11-14
Test software	EZ	EMC-CON 3A1.1	/	/
Disturbance power				
EMI Test Receiver	R&S	ESR7	102333	2025-11-14
EMI Absorbing Clamp	Teseq	MDS 21B	58115	2025-11-17
Test software	EZ	EMC-CON 3A1.1	/	/
LLAS Radiated Disturbance (2m)				
EMI Test Receiver	R&S	ESR7	102333	2025-11-14
Loop Antenna	Schwarzbeck	HXYZ 9170	353	2025-11-14
Test software	EZ	EMC-CON 3A1.1	/	/
Radiated Emission (3m)				
EMI Test Receiver	R&S	ESR7	102333	2025-11-14
MXA Signal Analyzer	Keysight	N9020A	MY51281805	2025-04-22
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2025-11-17
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2025-11-14
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2025-11-14
Pre-Amplifier	GUANGGU ELECTRONIC	GLNA18-40GK-5372	20210331001	2025-11-14
Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00148	2025-11-14
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2025-11-17
Test software	FALA	/	FA-03A2 RE	/
Harmonics & Flicker				
5kVA AC Power Source	AMETEK CTS	5001iX-CTS-400	2046A03237	2025-11-14
Signal Conditioning Unit	AMETEK CTS	PACS-1	2046A03238	2025-11-17
Test software	AMETEK CTS	CTS 4	Version 4.26.0	/
Electrostatic discharge (ESD)				
ESD Simulator	TESEQ	NSG 437	1569	2025-11-14

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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	2025-11-14
Coupling Clamp	3C TEST	CCC 100	CCC 20092269	2025-11-14
CCS	3C TEST	V4.2.7	ES027000120015	/
Surge				
Surge simulator	3C TEST	CWS 600CT	ES058000920005	2025-11-14
Three phases CDN	3C TEST	SPN 3832T	ES0911910	2025-11-14
CDN for unshielded symmetrical high-speed Telecom cable	3C TEST	CDN405T8A	ES064001220010	2025-11-14
CDN for Telecom cable	3C TEST	CDN405M40-5	ES1071910	2025-11-14
CWS	3C TEST	V1.0.5.2	ES058000920005	/
Radio-frequency,Continuous conducted disturbance (CS)				
Conducted Immunity Test System	3C TEST	CST 1075	ES096000120008	2025-11-14
6dB Attenuator	3C TEST	DTC75-6	ES095000120006	2025-11-14
Single phase CDN	3C TEST	CDN M2M3	ES064002620007	2025-11-14
Three phases CDN	3C TEST	CDN M5-16	ES064003320004	2025-11-14
Calibration Set	3C TEST	CDN 100KIT	ES064002820016	2025-11-14
Calibration Set	3C TEST	EM CL100KIT	EM C20032816	2025-11-14
EM-Clamp	3C TEST	EM CL100	EM C20032811	2025-11-14

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EMC-s	SKET	V1.4.0.54	/	/
Power Frequency Magnetic Field (PFMF)				
PFMF simulator	3C TEST	MFS 400	ES045000720001	2025-11-14
Transformer	3C TEST	MFT 400	ES046000220003	2025-11-14
Magnetic field antenna	3C TEST	TCXS111	TCXS20060910	2025-11-14
CWS	3C TEST	V4.2.7	ES045000720001	/
Voltage dips &Voltage interruptions				
Power failure simulator	3C TEST	PFS 2216SD	ES049001220003	2025-11-14
CCS	3C TEST	V4.2.8	ES049001220003	/

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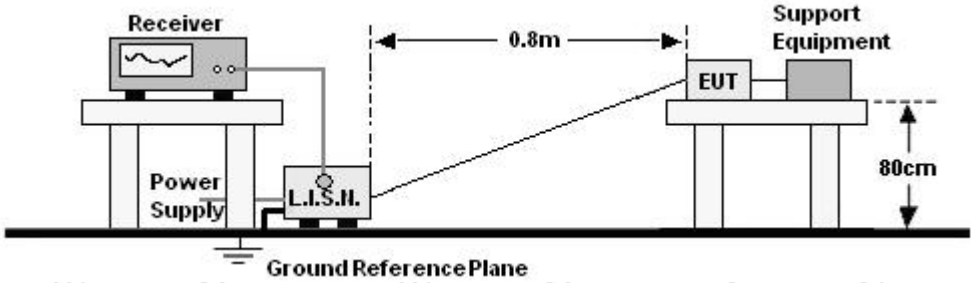
4 - CONDUCTED EMISSION MEASUREMENT

4.1 BLOCK DIAGRAM OF TEST SETUP



4.2 LIMITS

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	66～56*	56～46*
0.500～5.000	56	46
5.000～30.00	60	50

Remark: * means decreasing linearly with logarithm of frequency.
The lower limit shall apply at the transition frequencies.

4.3 TEST PROCEDURE

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through a Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN IEC 61000-6-3:2021 regulations during conducted emission measurement.

The bandwidth of the field strength meter is set at 9kHz.

The frequency range from 150kHz to 30MHz is investigated. The scanning waveform please refer to the next page.

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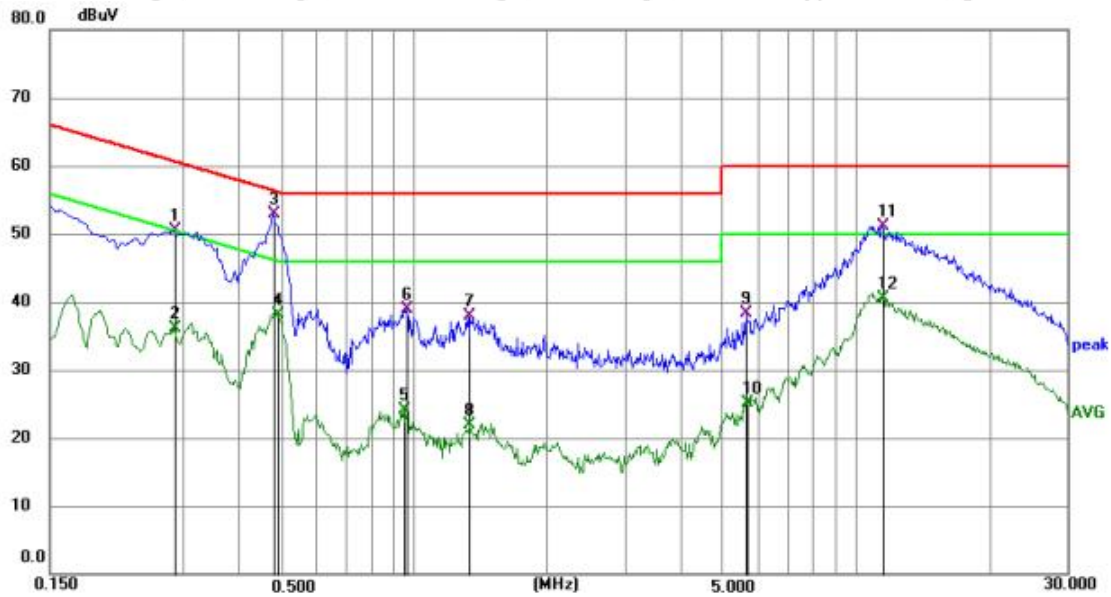
4.4 TEST RESULTS AND DATA

EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	23℃
Humidity:	55%
Atmosphere pressure:	101Kpa
Test Results	Pass

Phase:L1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2850	39.90	10.60	50.50	60.67	-10.17	QP	P
2	0.2850	25.46	10.60	36.06	50.67	-14.61	AVG	P
3 *	0.4785	42.19	10.62	52.81	56.37	-3.56	QP	P
4	0.4920	27.48	10.62	38.10	46.13	-8.03	AVG	P
5	0.9555	13.41	10.66	24.07	46.00	-21.93	AVG	P
6	0.9645	28.34	10.66	39.00	56.00	-17.00	QP	P
7	1.3290	27.30	10.66	37.96	56.00	-18.04	QP	P
8	1.3425	11.22	10.66	21.88	46.00	-24.12	AVG	P
9	5.6390	27.53	10.72	38.25	60.00	-21.75	QP	P
10	5.6795	14.41	10.72	25.13	50.00	-24.87	AVG	P
11	11.4490	40.40	10.79	51.19	60.00	-8.81	QP	P
12	11.5075	29.79	10.79	40.58	50.00	-9.42	AVG	P

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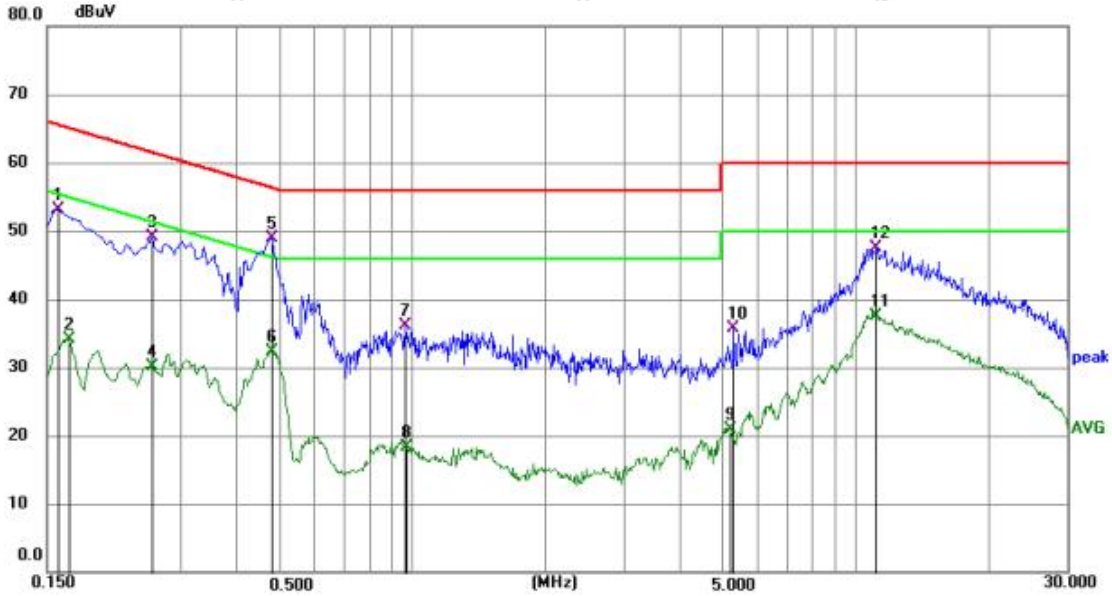
Phase:N



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1590	42.52	10.57	53.09	65.52	-12.43	QP	P
2	0.1680	23.61	10.57	34.18	55.06	-20.88	AVG	P
3	0.2580	38.47	10.59	49.06	61.50	-12.44	QP	P
4	0.2580	19.59	10.59	30.18	51.50	-21.32	AVG	P
5 *	0.4784	38.26	10.62	48.88	56.37	-7.49	QP	P
6	0.4784	21.77	10.62	32.39	46.37	-13.98	AVG	P
7	0.9645	25.36	10.66	36.02	56.00	-19.98	QP	P
8	0.9735	7.70	10.66	18.36	46.00	-27.64	AVG	P
9	5.2294	10.25	10.72	20.97	50.00	-29.03	AVG	P
10	5.3060	24.89	10.72	35.61	60.00	-24.39	QP	P
11	11.0844	26.65	10.85	37.50	50.00	-12.50	AVG	P
12	11.1430	36.60	10.85	47.45	60.00	-12.55	QP	P

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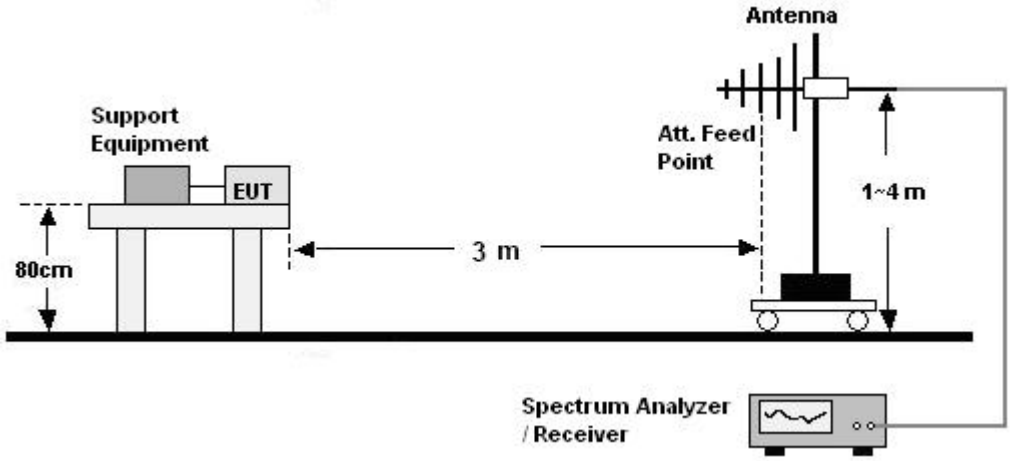
5- RADIATED DISTURBANCE MEASUREMENT

5.1 BLOCK DIAGRAM OF TEST SETUP



5.2 LIMITS

Frequency (MHz)	Quasi-peak Limits at 3m dB(μV/m)
30-230	40
230-1000	47

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

5.3 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

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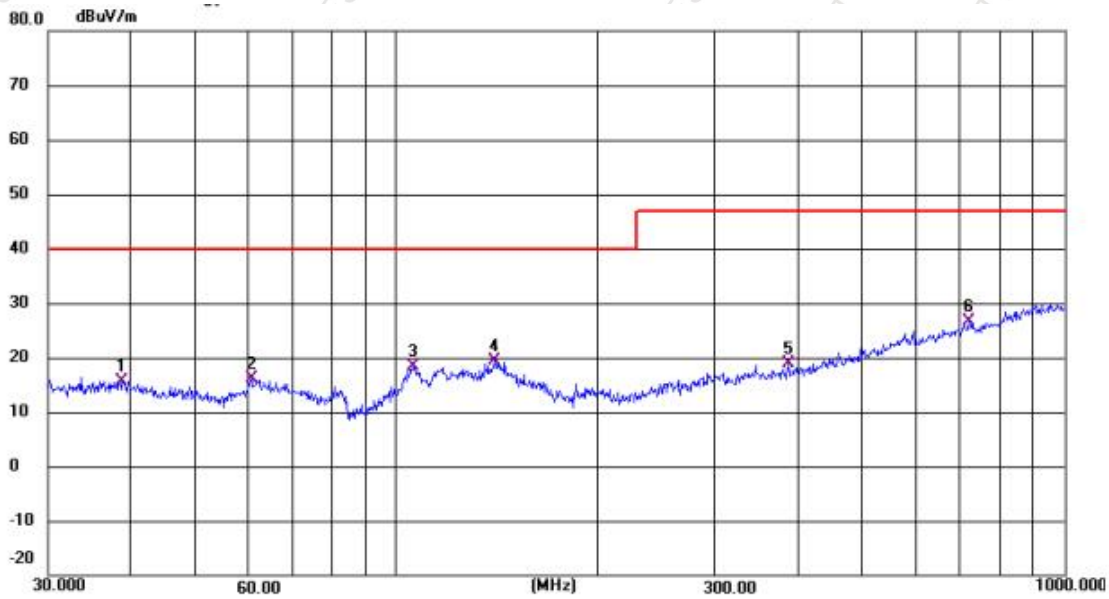
5.4 TEST RESULTS AND DATA

EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
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	38.7857	29.19	-13.50	15.69	40.00	-24.31	QP
2	60.5555	32.39	-16.19	16.20	40.00	-23.80	QP
3	105.7713	36.54	-18.24	18.30	40.00	-21.70	QP
4	140.2191	34.82	-15.53	19.29	40.00	-20.71	QP
5	387.7879	31.29	-12.49	18.80	47.00	-28.20	QP
6 *	719.8303	32.37	-5.74	26.63	47.00	-20.37	QP

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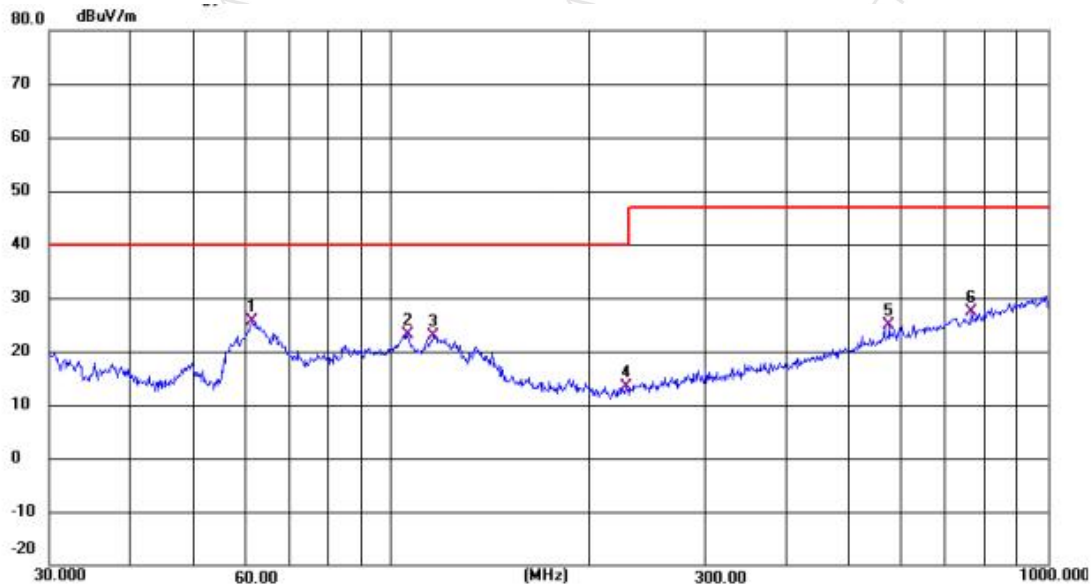
Polarization:Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	61.3141	41.83	-16.27	25.56	40.00	-14.44	QP
2	105.6601	41.31	-18.25	23.06	40.00	-16.94	QP
3	115.8678	40.08	-17.26	22.82	40.00	-17.18	QP
4	227.9703	30.59	-17.09	13.50	40.00	-26.50	QP
5	574.0217	32.97	-8.19	24.78	47.00	-22.22	QP
6	764.4472	32.29	-5.01	27.28	47.00	-19.72	QP

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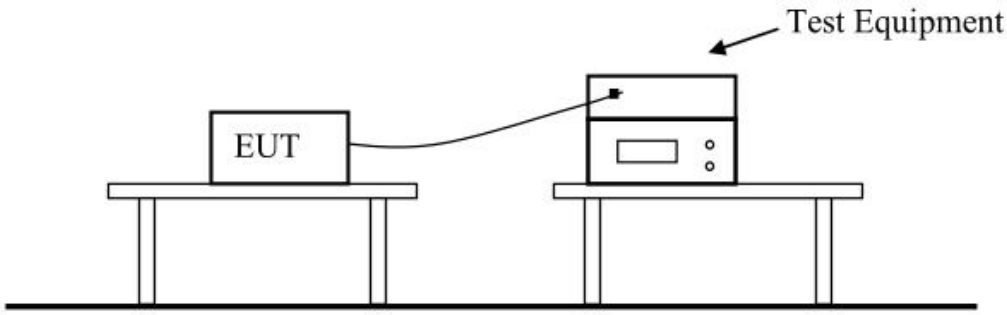
6 - HARMONIC CURRENT EMISSION MEASUREMENT

6.1 BLOCK DIAGRAM OF TEST SETUP



6.2 TEST STANDARD

Please refer to EN IEC 61000-3-2:2019/A1:2021

6.3 TEST PROCEDURE

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the maximum harmonic components under normal Test Modes for each successive harmonic component in turn.

b. The correspondent test program of test instrument to measure the current harmonics emanated from Product was chosen. The measure time shall be not less than the time necessary for the Product to be exercised.

6.4 TEST RESULTS

PASS

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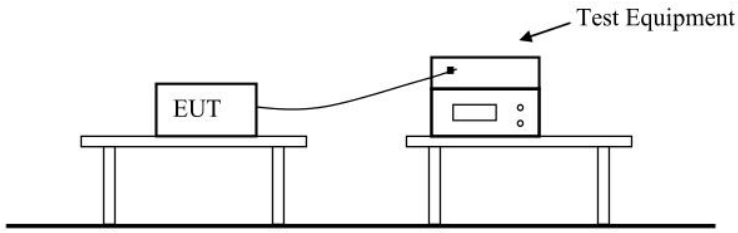
7 - VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.1 BLOCK DIAGRAM OF TEST SETUP



7.2 TEST STANDARD

Please refer to EN 61000-3-3:2013/A1:2019

7.3 TEST PROCEDURE

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the most unfavorable sequence of voltage changes under normal Test Modes.

b. During the flick test, the measure time shall include that part of whole operation cycle in which the Product procedure the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4 TEST RESULTS

PASS

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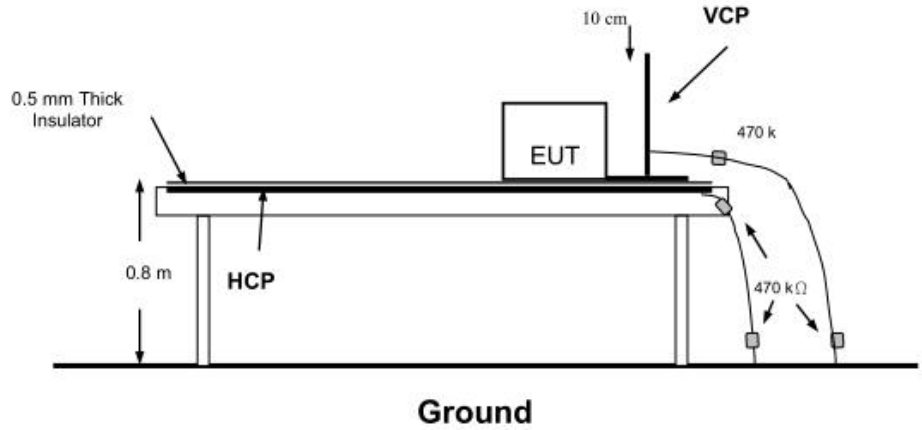
8 - IMMUNITY TEST

8.1 ELECTROSTATIC DISCHARGE IMMUNITY TEST

8.1.1 Block Diagram of Test Setup



8.1.2 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

8.1.3 Test Procedure

8.1.3.1. 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.

8.1.3.2. Contact Discharge

All the procedure shall be same as Section 8.1.3.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

8.1.3.3. 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.

8.1.3.4. 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.

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8.1.4 Test Results

Electrostatic Discharge	
Basic Standard:	IEC 61000-4-2:2008
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	25℃
Humidity:	55%
Atmosphere pressure:	101Kpa

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Performance Criteria	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

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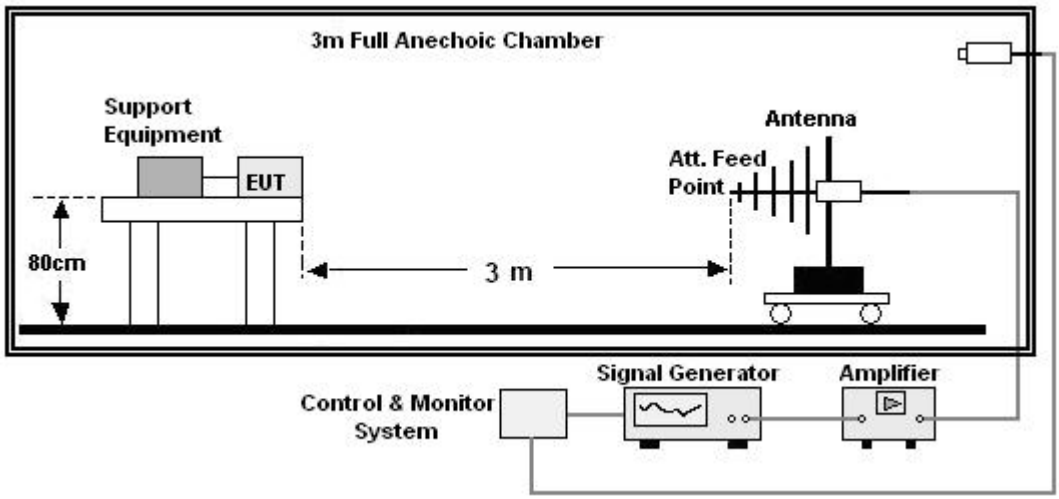
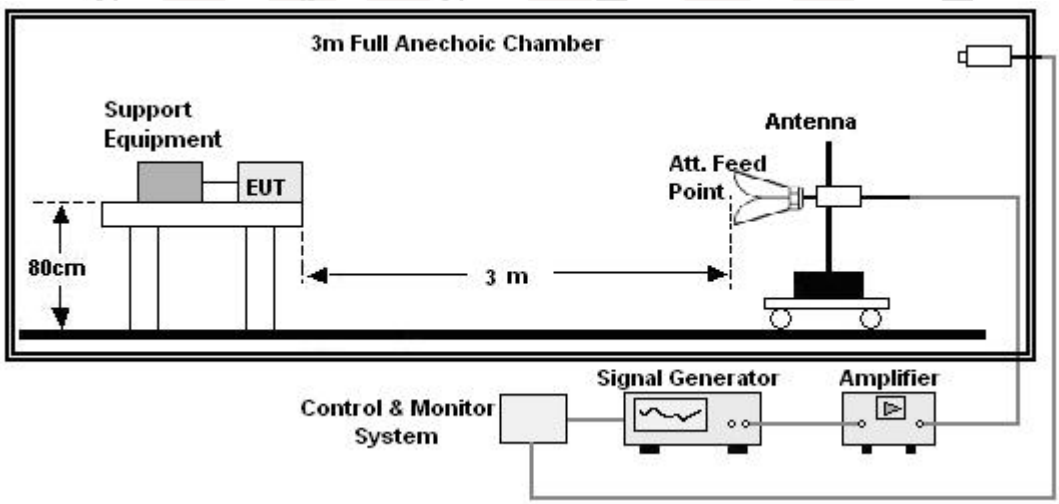
8.2 RADIO FREQUENCY ELECTROMAGNETIC FIELDS

8.2.1 Block Diagram of Test Setup

80-1000MHz:



1000-6000MHz:



8.2.2 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

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8.2.3 Test Procedure

a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.

b. 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 1.5x 10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%.

c. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

8.2.4 Test Results

Radio frequency electromagnetic fields	
Basic Standard:	IEC 61000-4-3:2020
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

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

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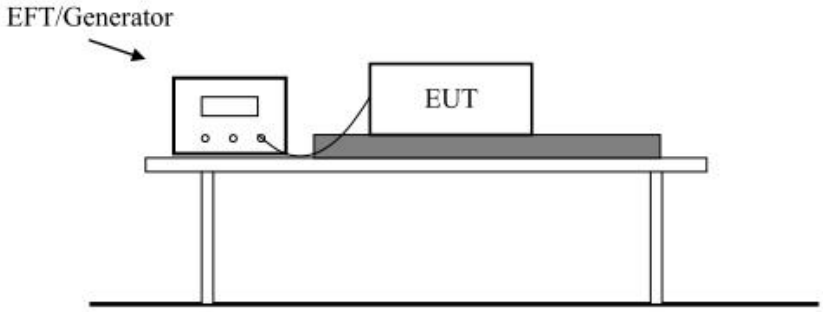
8.3 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

8.3.1 Block Diagram of Test Setup



8.3.2 Test Specification

Basic Standard	:	IEC 61000-4-4:2012
Test Port	:	input a.c. power port
Impulse Frequency	:	5kHz
Impulse Wave-shape	:	5/50 ns
Burst Duration	:	15 ms
Burst Period	:	300 ms
Test Duration	:	2 minutes per polarity

8.3.3 Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

8.3.3.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

8.3.3.2. For signal lines and control lines ports:

No I/O ports. It’s unnecessary to test.

8.3.3.3. For DC output line ports:

No DC output ports. It’s unnecessary to test.

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8.3.4 Test Results

Electrical Fast Transient/Burst	
Basic Standard:	IEC 61000-4-4:2012
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

Line	Test Voltage	Polarity	Performance Criteria	Results
L+N	1kv	±	B	Pass

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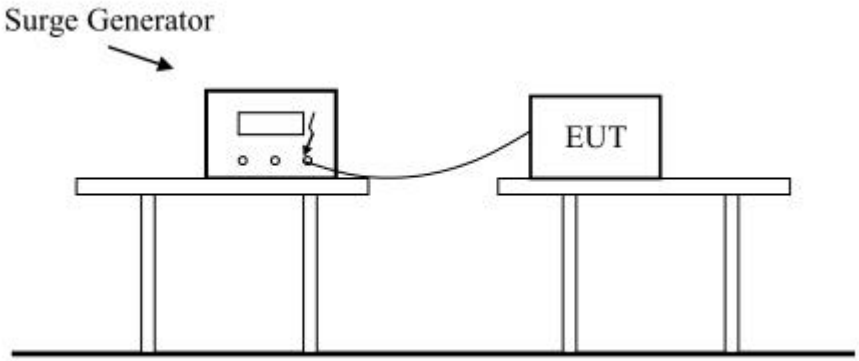
8.4 SURGE IMMUNITY TEST

8.4.1Block Diagram of Test Setup



8.4.2 Test Specification

Basic Standard	IEC 61000-4-5:2014+AMD1:2017
Test Port	input a.c. power port
Wave-Shape	Open Circuit Voltage - 1.2 / 50 us Short Circuit Current - 8 / 20 us
Pulse Repetition Rate	1 pulse / min.
Test Events	Five positive polarity pulses and five negative polarity pulses

8.4.3 Test Procedure

8.4.3.1. Set up the EUT and test generator as shown on Section 8.4.1.

8.4.3.2. For line to line coupling mode, provide a 1.0 KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

8.4.3.3. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test

8.4.3.4. Different phase angles are done individually.

8.4.3.5. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

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8.4.4 Test Results

SURGE IMMUNITY	
Basic Standard:	IEC 61000-4-5:2014+AMD1:2017
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

Coupling Line	Voltage (kV)	Phase Angle	Performance Criteria	Results
L - N	±1	0° ,90° ,180° ,270°	B	Pass

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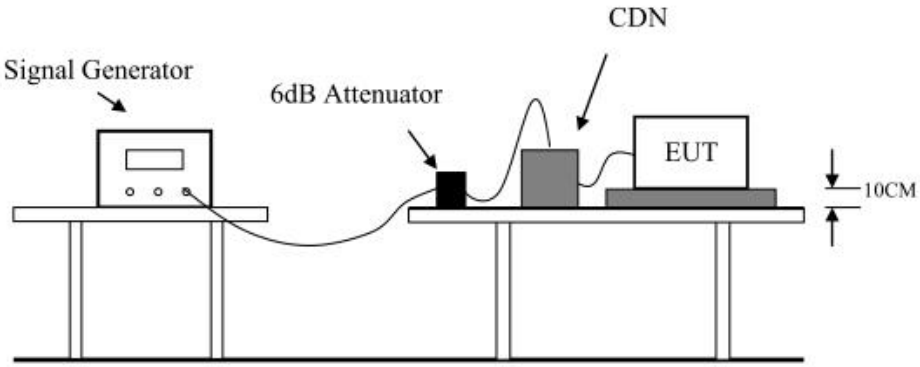
8.5 INJECTED CURRENTS SUSCEPTIBILITY TEST

8.5.1 Block Diagram of Test Setup



8.5.2 Test Specification

Basic Standard	:	IEC 61000-4-6:2013
Test Port	:	input a.c. power port
Step Size	:	1%
Modulation	:	1kHz,80% AM
Dwell Time	:	1 second

8.5.3 Test Procedure

8.5.3.1. Set up the EUT, CDN and test generators as shown on Section 8.5.1.

8.5.3.2. Let the EUT work in test mode and measure it.

8.5.3.3. The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

8.5.3.4. The disturbance signal described below is injected to EUT through CDN.

8.5.3.5. The EUT operates within its operational mode(s) under intended climatic conditions after power on.

8.5.3.6. The frequency range is swept from 150kHz to 230MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.

8.5.3.7. The rate of sweep shall not exceed 1.5*10 -3 decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

8.5.3.8. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

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8.5.4 Test Results

INJECTED CURRENTS SUSCEPTIBILITY	
Basic Standard:	IEC 61000-4-6:2013
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
Humidity:	58%
Atmosphere pressure:	101Kpa

Frequency Range (MHz)	Injected Position	Strength (Non-modulated)	Performance Criteria	Results
0.15 ~ 80	AC Mains	3V r.m.s.	A	PASS

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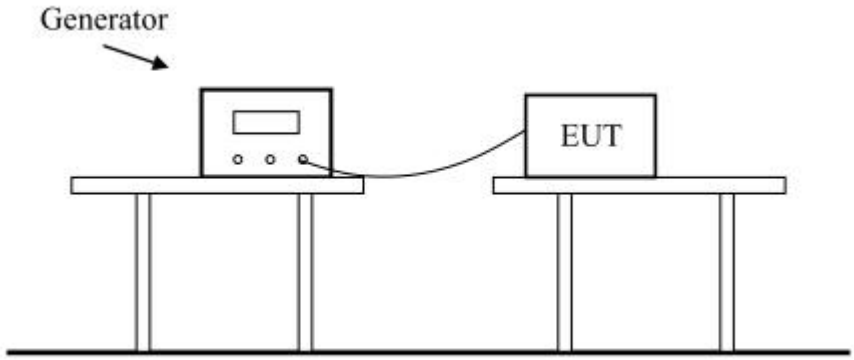
8.6 VOLTAGE DIPS AND INTERRUPTIONS TEST

8.6.1 Block Diagram of Test Setup



8.6.2 Test Specification

Basic Standard	:	IEC 61000-4-11:2020
Test Port	:	input a.c. power port
Phase Angle	:	0°, 180°

8.6.3 Test Procedure

8.6.3.1. Set up the EUT and test generator as shown on Section 8.6.1.

8.6.3.2. The interruptions is introduced at selected phase angles with specified duration.

8.6.3.3. Record any degradation of performance.

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8.6.4 Test Results

VOLTAGE DIPS AND INTERRUPTIONS	
Basic Standard:	IEC 61000-4-11:2020
EUT:	valve actuator
M/N:	ulli-600
Test Mode:	Normal Working
Test Voltage:	AC 220V,50Hz
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

Test Level % U_T	Voltage dips in % U_T	Duration (cycles)	Performance Criteria	Results
		50Hz		
0	100	0.5	B	Pass
0	100	1	B	Pass
70	30	25	C	Pass
0	100	250	C	Pass

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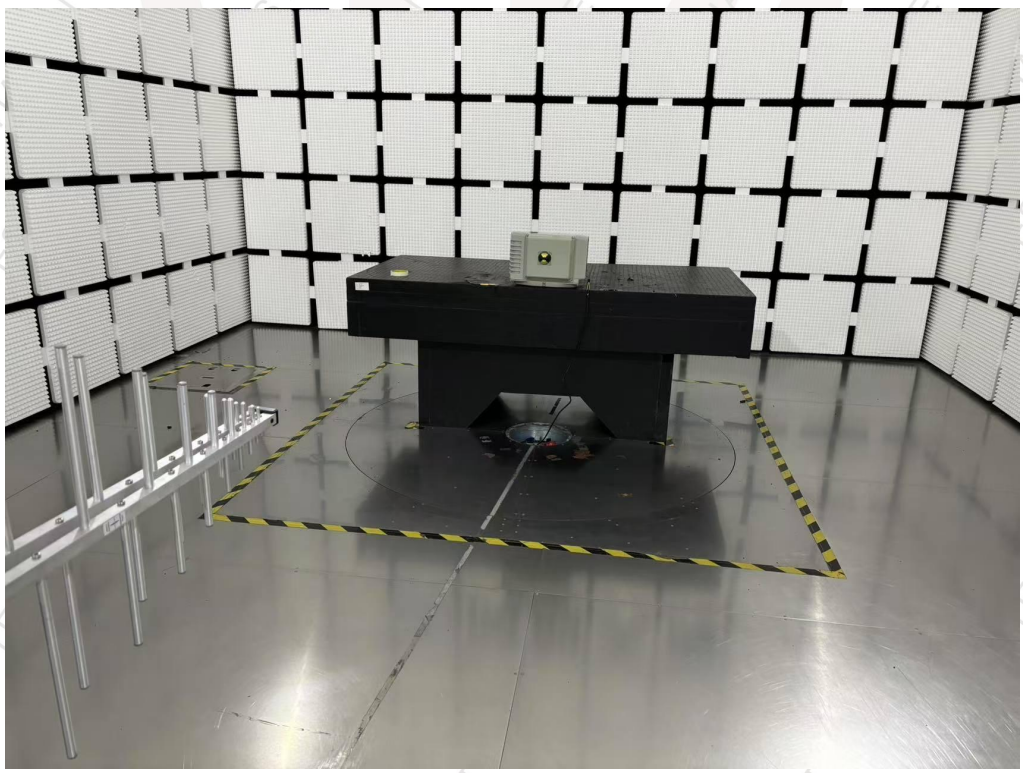
APPENDIX A - TEST SETUP PHOTOGRAPHS

Photograph 1:Setup for Conducted Emission

Photograph 2:Setup for Radiated Emission



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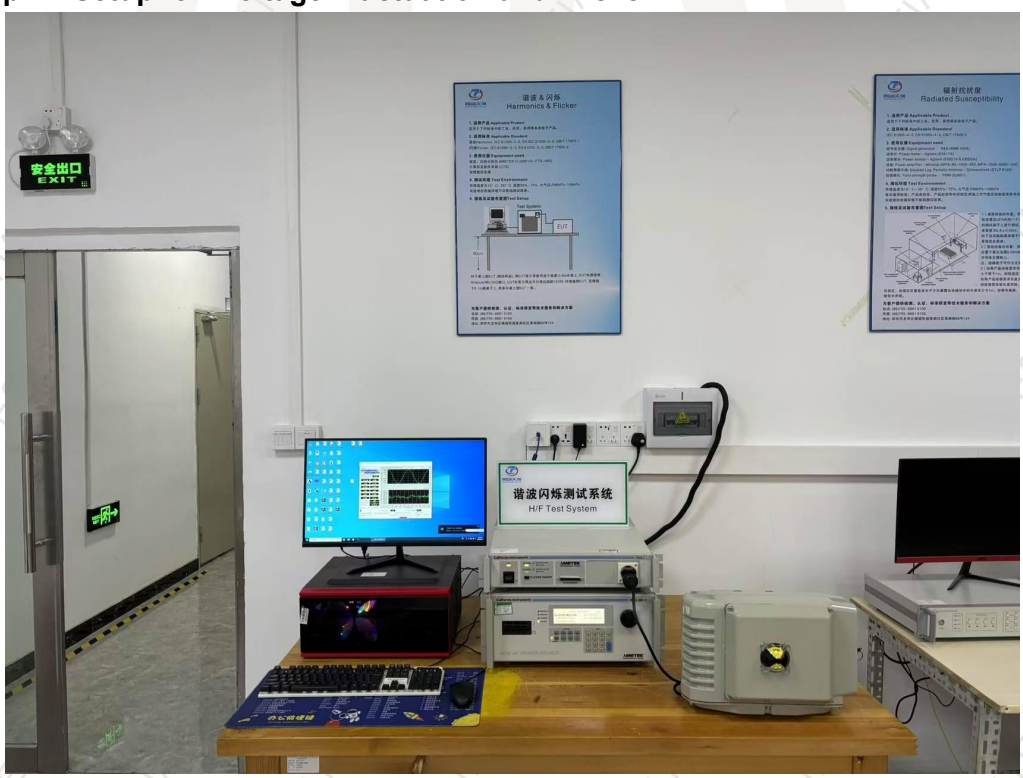
Photograph 3:Setup for Harmonic Current Emission

Photograph 4:Setup for Voltage Fluctuation and Flicker



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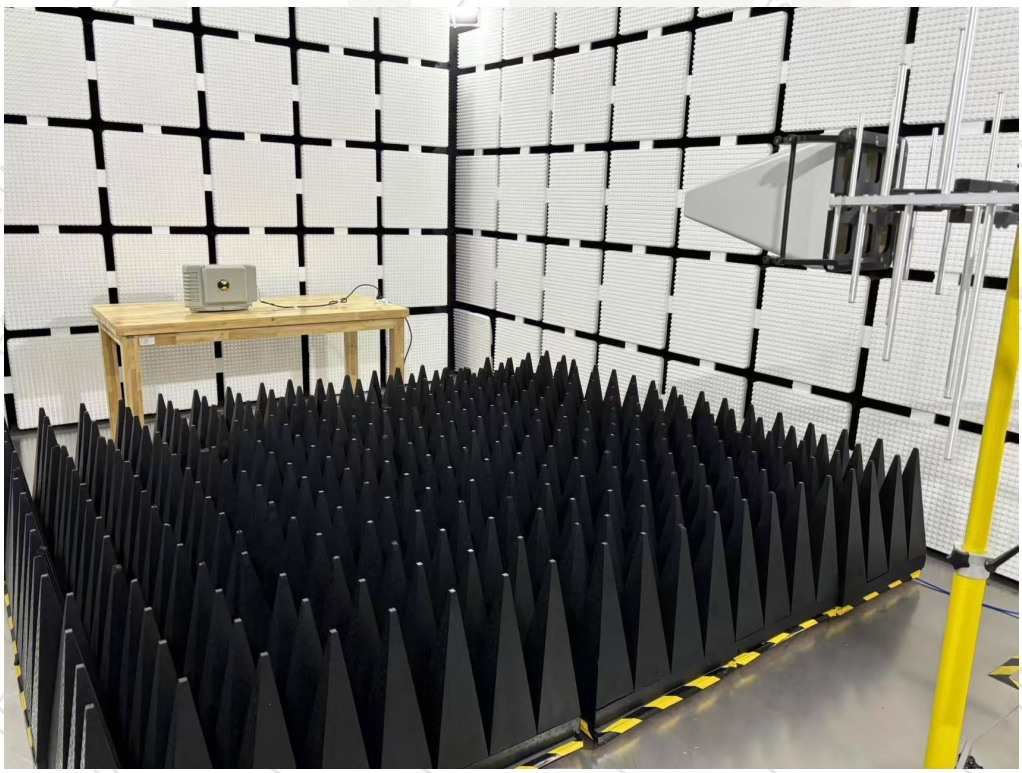
Photograph 5:Setup for Electrostatic Discharge

Photograph 6:Setup for Radio Frequency Electromagnetic Fields



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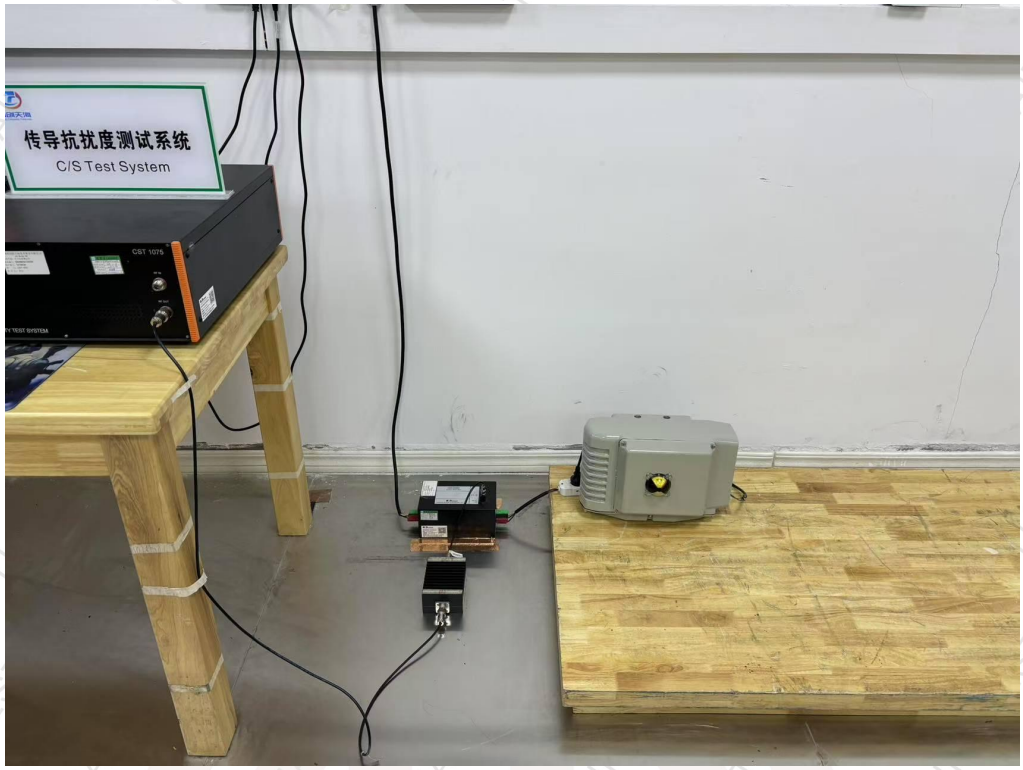
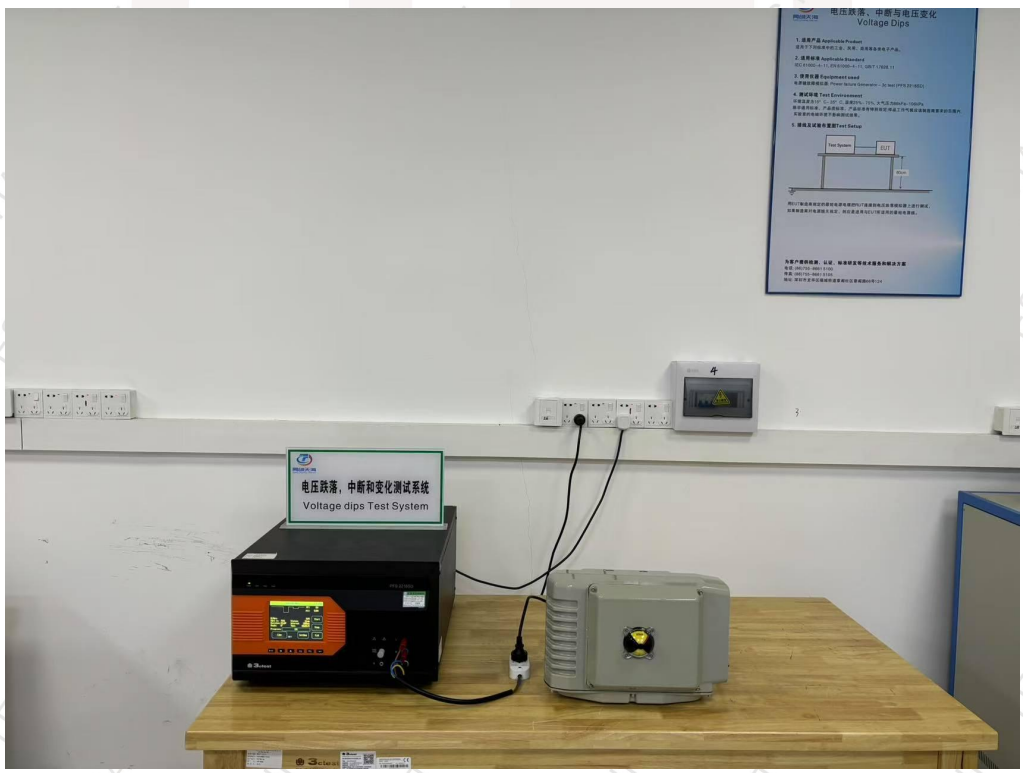
Photograph 7:Setup for Electrical Fast Transient/Burst

Photograph 8:Setup for Surge

Photograph 9:Setup for Injected Currents Susceptibility

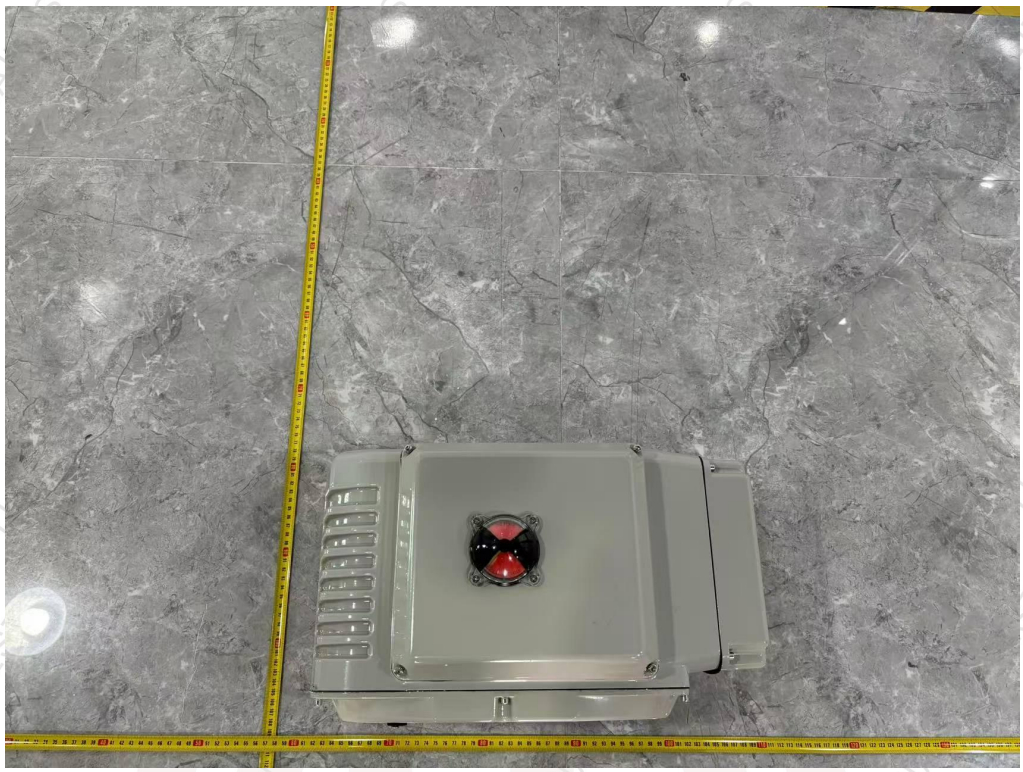


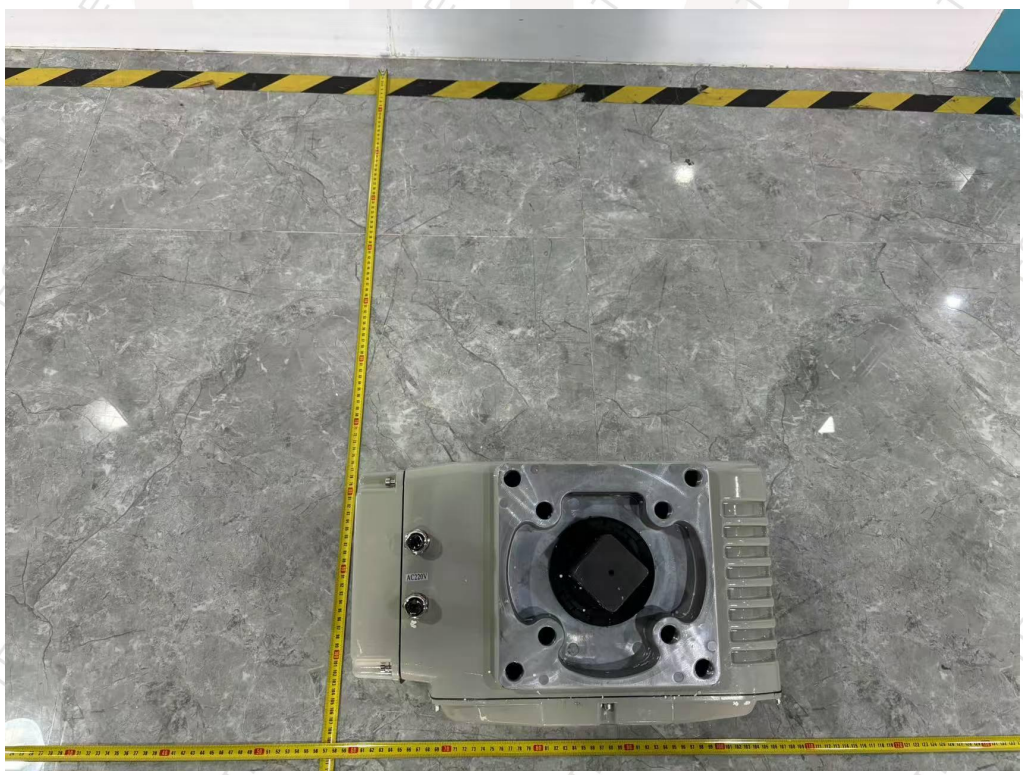
Photograph 10:Setup for Voltage Dips And Interruptions



APPENDIX B - EUT PHOTOGRAPHS

Model:ulli-600





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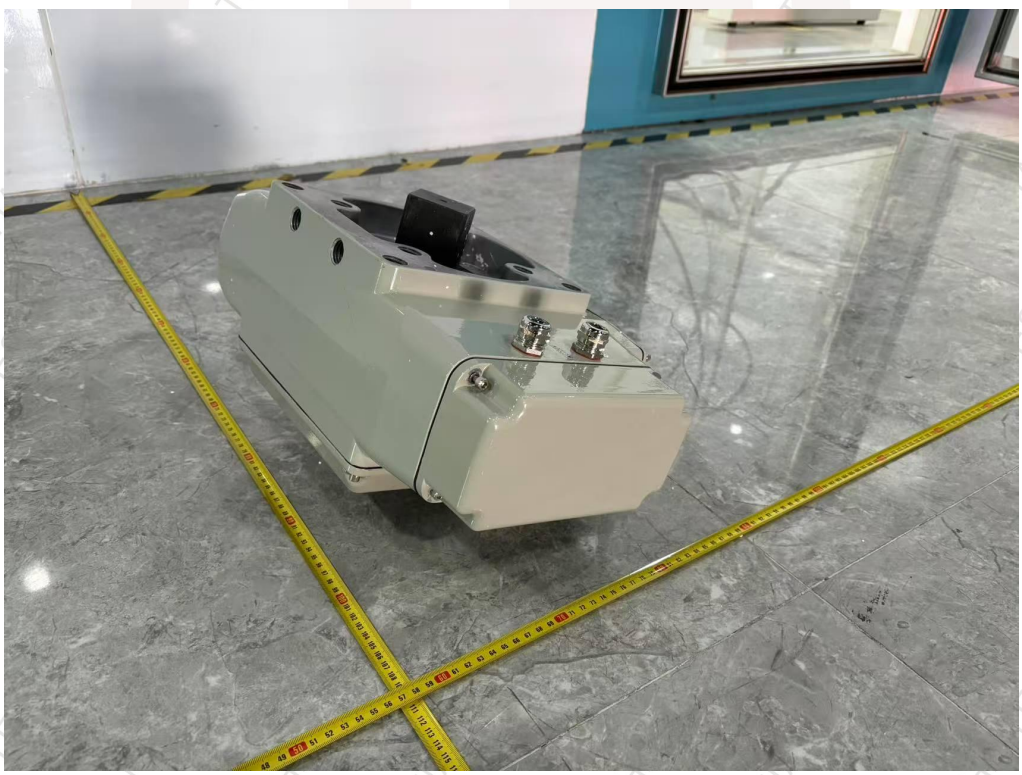

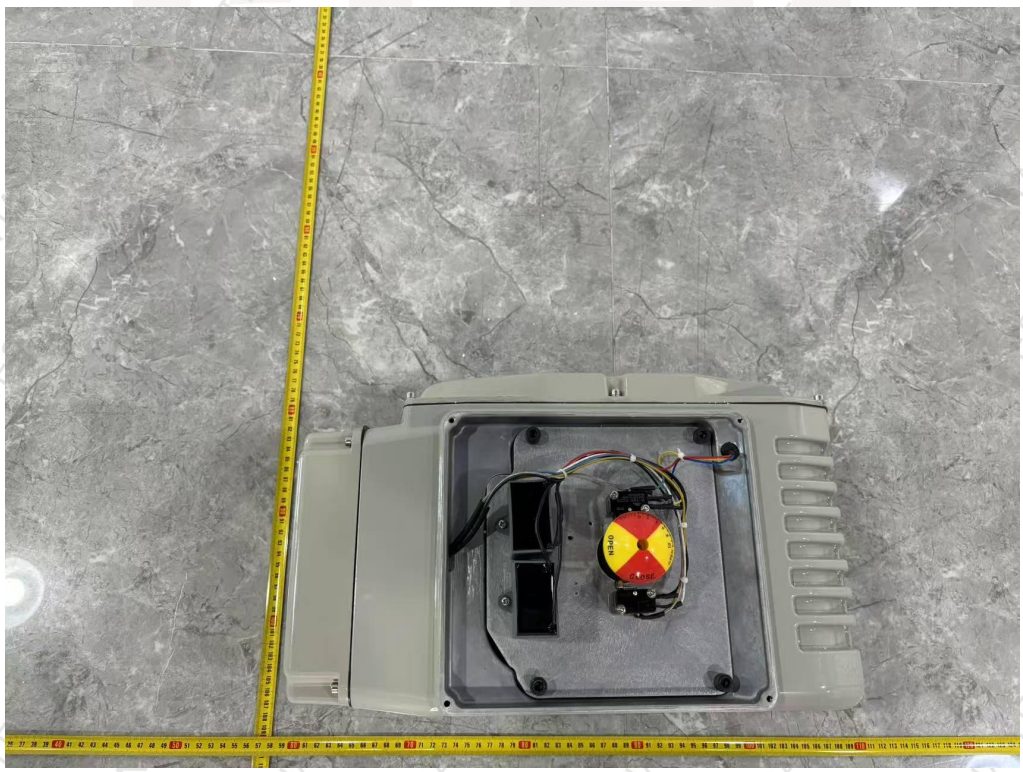

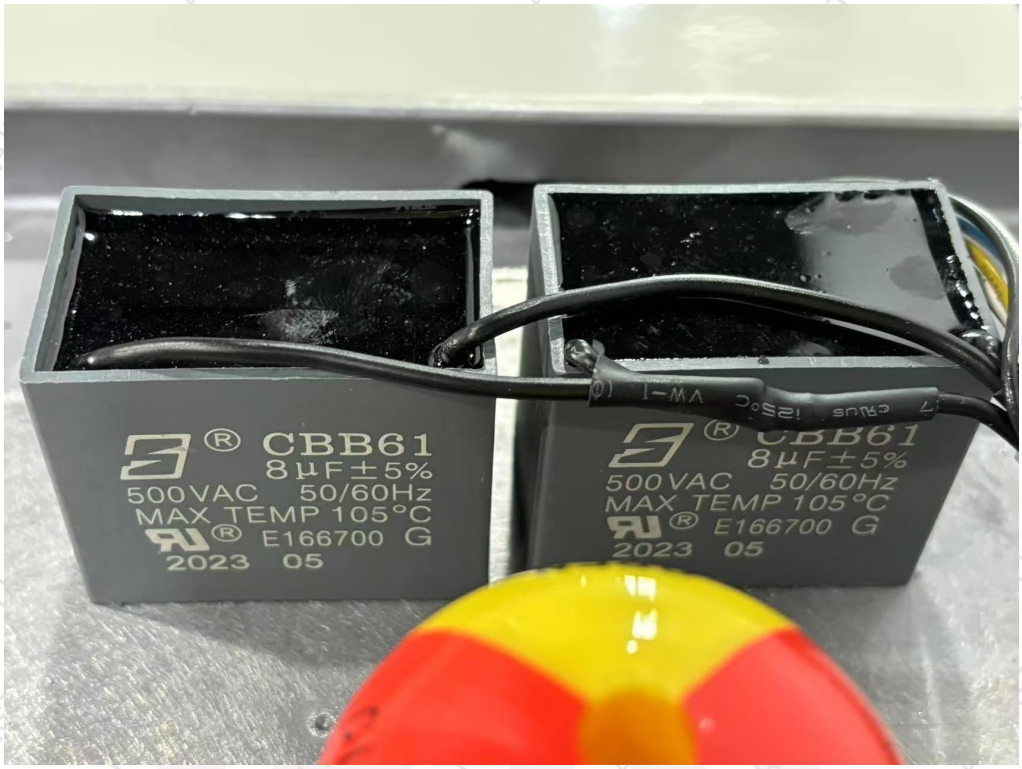

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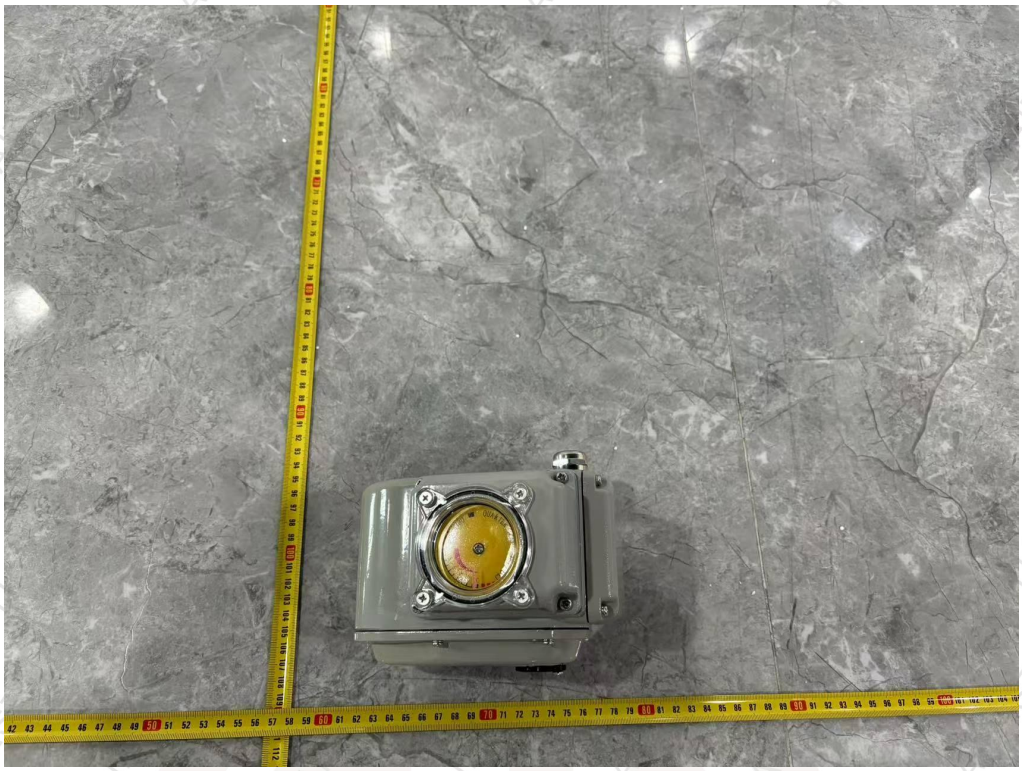
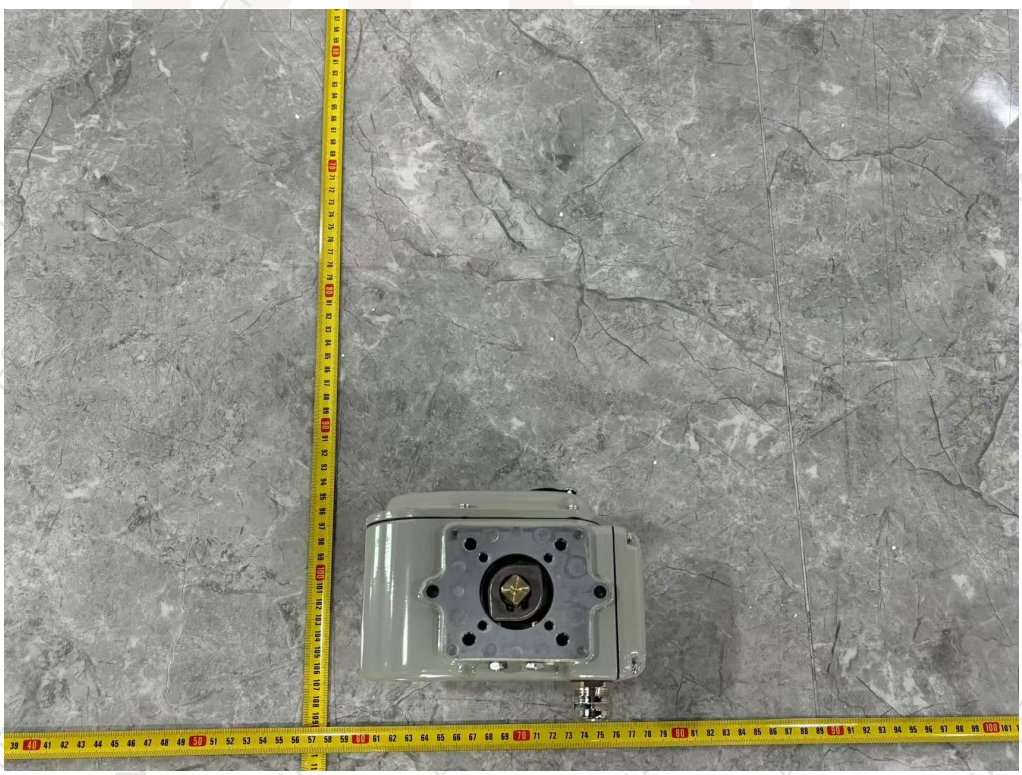
Model:ulli-5





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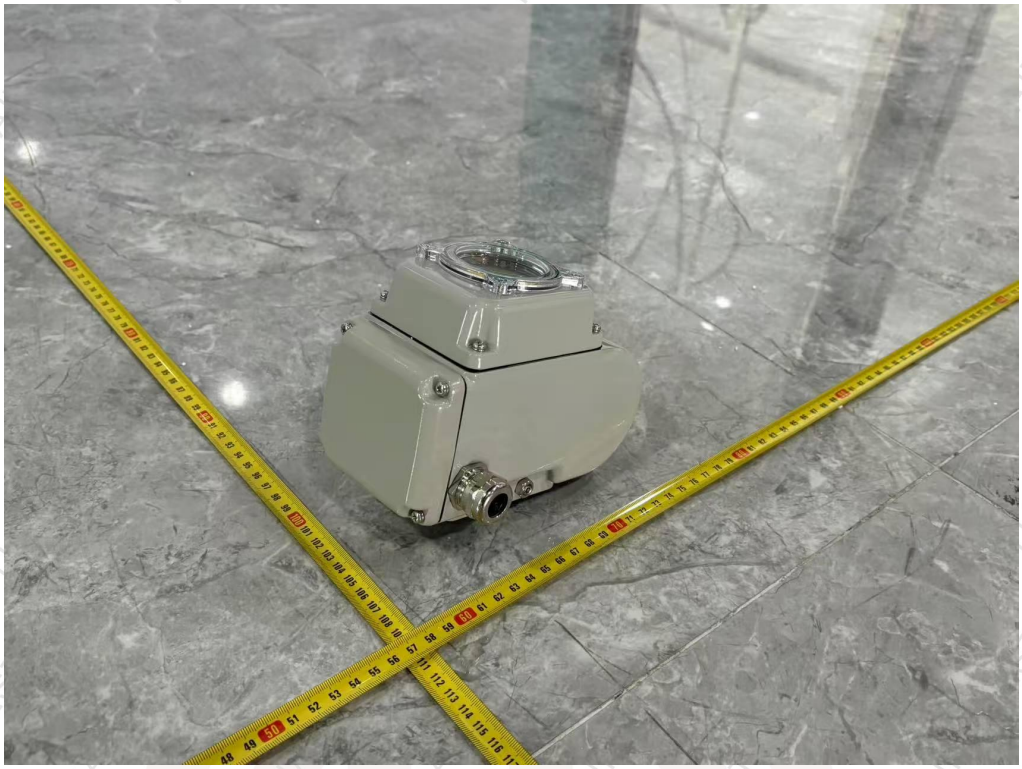

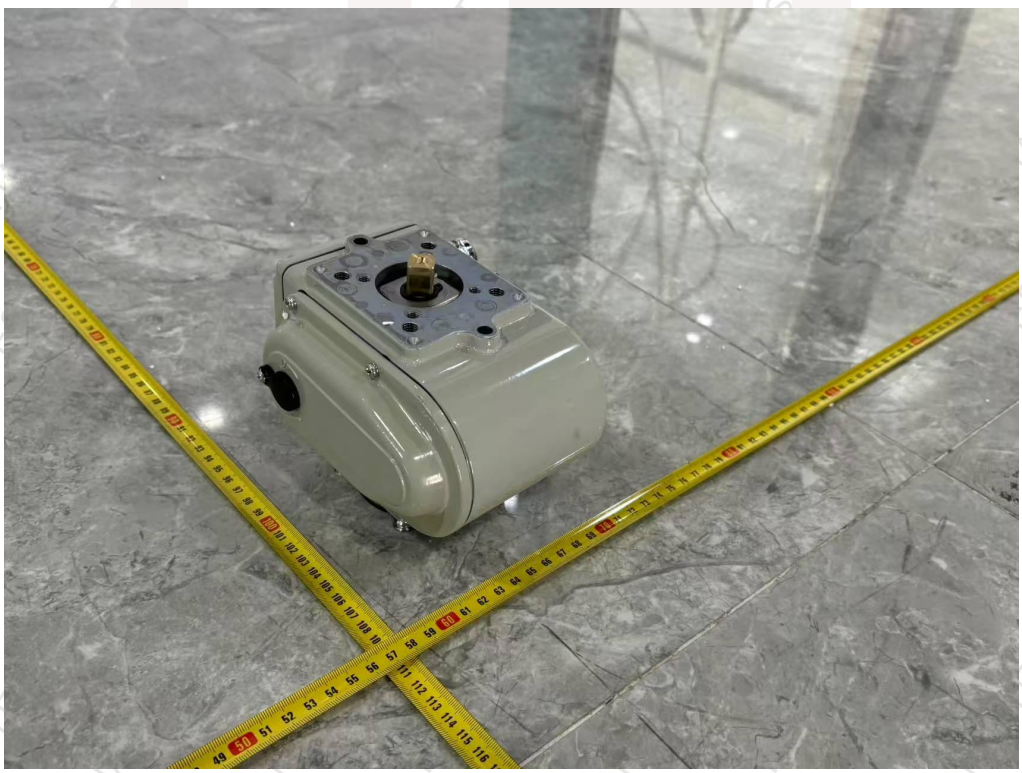

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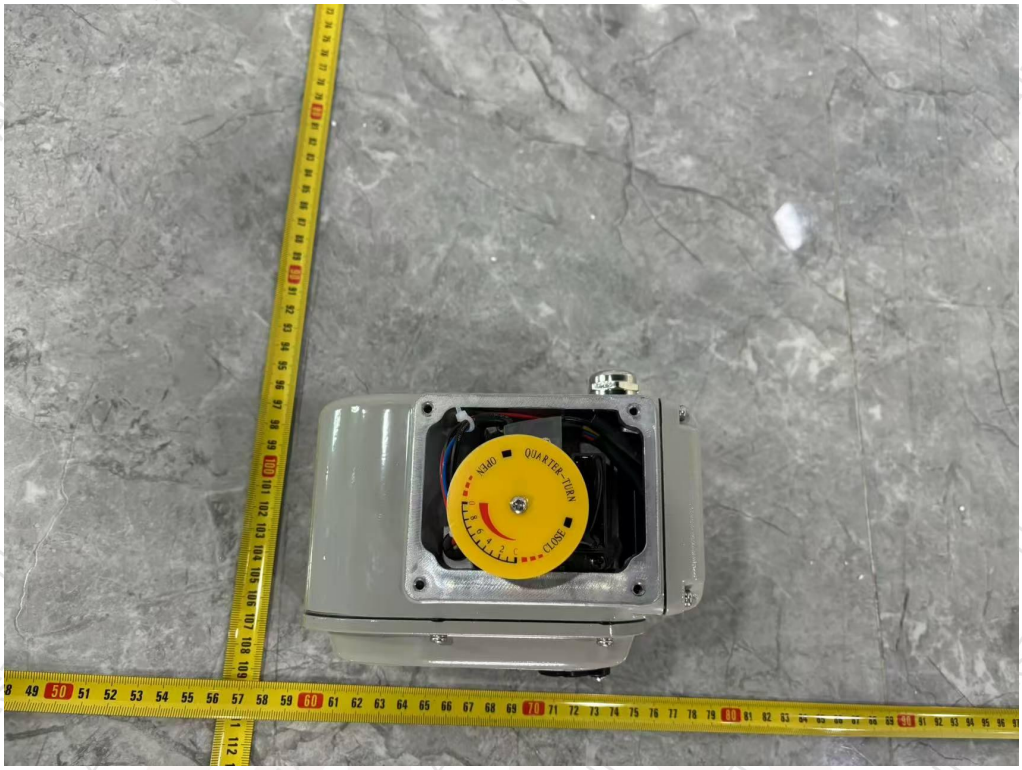

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