DEVELOPMENT TEST REPORT

Report No. ARAI/AED/20212022/3100010138/DT/0370 **CONFIDENTIAL**
Dated: 24-JUN-2021

1.0	**Name and address of the customer**	ROTEX MANUFACTURERS & ENGINEERS PRIVATE LIMITED R852/853, TTC Industrial Area, Rabale MIDC, Navi Mumbai, Maharashtra, India. 400701	
2.0	**Customer letter reference**	Email Dated: 10-MAY-2021	
3.0	**Description of the Device Under Test (DUT)**	**DUT Name**	Electrohydraulic Actuator
		Manufacture Name	ROTEX MANUFACTURERS & ENGINEERS PRIVATE LIMITED
		Model Name	EHF SERIES
		Model No	EHF-RO-DRS-A-HY-50-X-E7-D-SP-EFC-E-20-H-4MO-M-1A2-P-M-C2
		Part No.	1000816/051/02/01
		Hardware Version	EHA-V2
		Software Version	1.6.2
4.0	**Test objective**	To carry out EMI/EMC tests as per details given in table 9.0	
5.0	**Condition of the test component**	The test component was received in good condition.	

		Digitally signed by MANOJ MADHUKAR DESAI Date: 2021.07.01 08:14:15 +05'30'
A S MADALGI **MANAGER**	**A A PAPADE** **MANAGER**	**M M DESAI** **GENERAL MANAGER**

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ARAI Homologation & Technology Centre (ARAI-HTC), Chakan
ARAI Forging Industry Division (ARAI-FID), Chakan
ARAI Regional Centre South (ARAI-RCS), Chennai

6.0 FUNCTIONALITY VERIFICATION
DUT was a Electrohydraulic Actuator powered with 440V AC supply. 230V AC supply was given for emergency shutdown of device. Electrohydraulic Actuators are self-contained actuators operated solely by electrical power, used to operate the Valves for ON/OFF (Emergency Shut Down Valves) and Modulating Application. For functionality verification pressure and position was monitored during test and Valve status with percentage was displayed On Unit was also monitored.

8.0 FUNCTIONAL PERFORMANCE CRITERIA
8.1 Criteria A
Normal performance within limits specified by the manufacturer, requestor or purchaser.
8.2 Criteria B
Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention.
8.3 Criteria C
Temporary loss of function or degradation of performance, the correction of which requires operator intervention.
8.4 Criteria D
Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

9.0 TEST DETAILS

Sr. No.	Test Title	Annexure No.	Number of Pages	Reference Standard	Customer Acceptance Criteria	Functional Performance Criteria
9.1	Radiated RF Immunity – Enclosure Port	01	06	IEC 61000-4-3:2006	Criteria A	Criteria A

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10.0 LIST OF TEST EQUIPMENT'S			
Radiated Immunity Equipment List			
Description	**ARAI ID**	**Status**	**Cal Due Date**
Signal Generators			
Rohde & Schwarz SML 02 Signal Generator	AED/GEN/02	■	19/11/2022
Rohde & Schwarz SMB 100A Signal Generator	AED/GEN/04	□	27/12/2022
Antennas			
Frankonia Gmbh BTA-M Broad Band Antenna (1MHz-3000MHz)	AED/ANT/09	■	N/A
ETS-Lindgren 3109PX Biconical Antenna (Type 2) (20MHz-300MHz)	AED/ANT/11	■	N/A
Schwarzbeck Mess Elektronik BBHA 9120 D Double Ridge Horn Antenna (1GHz-18GHz)	AED/ANT/14	□	N/A
Amplifiers			
AR 500W1000AM1 500W RF Power Amplifier	AED/RFAMP/04	■	N/A
AR BLMA 0820-200 200W RF Power Amplifier	AED/RFAMP/05	■	N/A
AR 1000A225 RF Power Amplifier	AED/RFAMP/06	□	N/A
Power Sensors			
Rohde & Schwarz NRP-Z91Power Sensor	AED/Power Sensor/04	■	N/A
Rohde & Schwarz NRP-Z91Power Sensor	AED/Power Sensor/05	■	N/A
Power Meters			
Rohde & Schwarz NRP2 Power Meter	AED/RFPM/03	■	N/A
Laser Powered Field Probe			
RF FL 7006 Star Probe 2 Laser Powered Field Probe	AED/Field Probe/07	□	18/04/2022
Oscilloscopes			
Tektronics DPO 7104 Digital Phosphor Oscilloscope	AED/OSC/05	□	---
Tektronics DPO 3052 Digital Phosphor Oscilloscope	AED/OSC/07	□	30/08/2022
Rohde & Schwarz RTM 2052 Digital Oscilloscope	AED/OSC/09	□	30/08/2022
Test Facility			
Frankonia Gmbh Semi-Anachoic ALSE Chamber, ARAI Pune.	AED/ALSE/02	■	29/09/2022
Software			
Rhode & Schwarz EMC32 Measurement Software Ver. 9.21.00	N/A	■	N/A
Miscellaneous			
Aplab L3210 Regulated DC Power Supply	AED/RPS/18	■	N/A
Freemans Measuring Tape	AED/TAPE/01	□	23/12/2022
Automotive Battery 12V	N/A	□	N/A

■ - Option considered for the test
□ - Option not considered for the

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Place of Issue: ARAI,Pune.

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□ - Option not considered for the

ANNEXURE 01	
1.1 TEST SPECIFICATIONS	
TEST DETAILS	RADIATED SUCCESPTIBILITY TEST AS PER IEC 61000-4-3:2006 STANDARD
TEST DATE	07-JUN-2021
TEST LOCATION	EMI/EMC TEST LAB, KOTHRUD, ARAI

1.2 DUT OPERATING CONDITIONS			
DUT MODE OF OPERATION	FULL OPERATING ■	PARTIAL OPERATING ☐	POWER ON STATE ☐
DIAGNOSTIC TOOLS CONNECTED	CAN BUS CONV. ☐	USB BUS CONV. ☐	RS232 BUS CONV. ☐

1.3 MONITORING OF DUT	
PASS/FAIL criteria automatically controlled by EMC Software ☐	PASS/FAIL criteria manually controlled by Operator ■
PASS/FAIL criteria not verified ☐	PASS/FAIL criteria controlled and evaluated by the Customer ☐

1.4 LABORATORY ENVIRONMENT TEST CONDITIONS 4					
AMBIENT TEMPERATURE	+ 25.7°C.	Required (23±5)°C.	RELATIVE HUMIDITY	50.5 %RH.	----

1.5 TEST SETUP DETAILS		
DUT Setup Details	**Status**	**Remarks**
a) Test setup was done according to	IEC 61000-4-3:2006	---
b) Test table surface	Wooden ☐ Metallic ■	---
c) Test table 0.80 m above the ALSE chamber ground floor	Yes ☐ No ■	---
d) Whether DUT and the wiring harness of the DUT was above the ground plane?	Yes ■ No ☐	---
e) Whether DUT was grounded (GND) or isolated (ISO) from the ground plane?	GND ☐ ISO ■	---

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DUT Setup Details	Status	Remarks
f) Antenna height from the ALSE chamber ground plane during the test.	1 m	---
g) Antenna distance from the DUT.	2 m	---
h) Antenna phase center focused to DUT	Yes	---
i) No. of DUT orientations	1	---

1.6 DUT SUPPLY VOLTAGE DETAILS		
A.C. Supply voltage	**440V A.C. System**	**Current Consumption**
A.C. Mains supply	(440, ±5) V ■	<5 A
D.C. Supply voltage	**12/24/32V D.C. System**	**Current Consumption**
D.C. Supply (*L= Positive Line and PE= Negative Line*)	(12, ±1) V ☐	---
	(24, ±1) V ☐	---
	(32, ±1) V ☐	---

1.7 TEST PARAMETERS				
Frequency Range	80 MHz to 1000 MHz ■		1000 MHz to 2700 MHz ■	
Frequency Step Size	1% Logarithmic			
Field Strength	1 V/m ☐	3 V/m ☐	10 V/m ■	30 V/m ☐
Dwell Time	3 Sec. (Required >0.5Sec as per std.)			
Antenna Polarization	Horizontal ■		Vertical ■	
Test Signal Quality	Any spurious spectral line shall be at least 15 dB below the carrier level.			
Frequency Range with Modulation	80 MHz to 1000 MHz ■		1000 MHz to 2700 MHz ■	
Frequency Modulation Details	Amplitude Modulation (AM) (80% in depth with 1 kHz sine wave) ■		AM(Peak)=CW(Peak) ☐	
			AM(Peak)>CW(Peak) ■	
			AM(RMS)=CW(RMS) ☐	
	Continuous Wave (CW) ☐		Unmodulated Sine Wave ☐	

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1.8 TEST PROCEDURE
1.8.1The radiated immunity tests were done inside the anechoic chamber.
1.8.2 **CALIBRATION:** The calibration was done with a closed loop system where the field strength levels were measured using a field probes that was placed in close proximity to the DUT. The calibration file contains the signal generator levels and power levels required to generate a specific field strength level over the test frequency range.
1.8.3 **VERIFICATION:** The calibrated settings were verified by emitting a field and monitoring field strength.
1.8.4 **DUT IMMUNITY:** The DUT was tested by replaying the calibrated test levels (the signal generated levels) from the calibration file. The DUT was tested for immunity over a fixed time called “dwell period” at a particular frequency with the desired field strength.

1.9 TEST OBSERVATION:

Sr. No.	Frequency Range	Modulation	Antenna Polarization	Observation
1.0	80 MHz to 1000 MHz	Amplitude Modulation (AM)	Vertical/ Horizontal	No deviation was Observed. **Performance criteria A**
2.0	1000 MHz to 2700 MHz	Amplitude Modulation (AM)	Vertical/ Horizontal	No deviation was Observed. **Performance criteria A**

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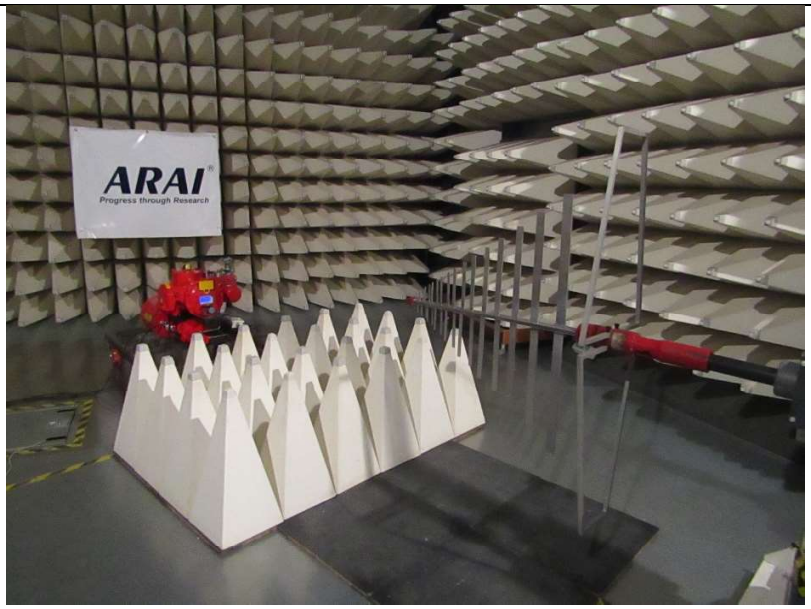
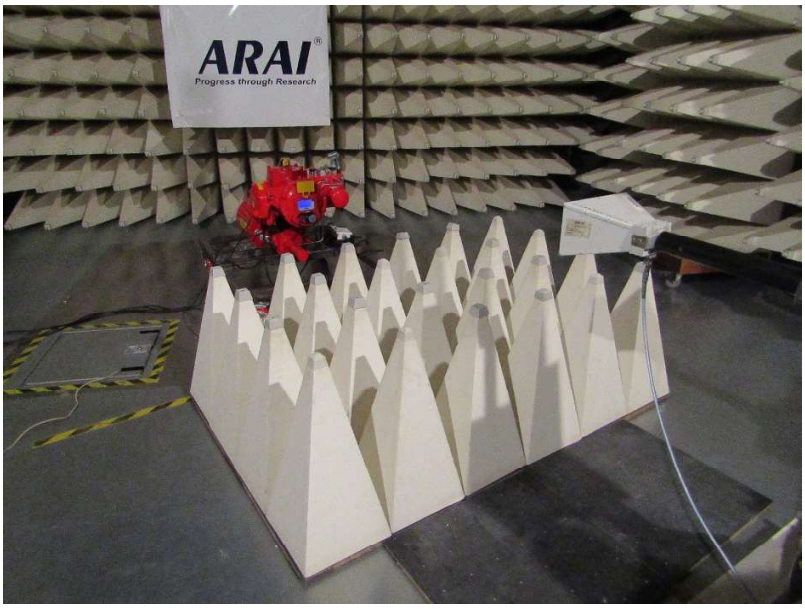
1.10 TEST SETUP PHOTO





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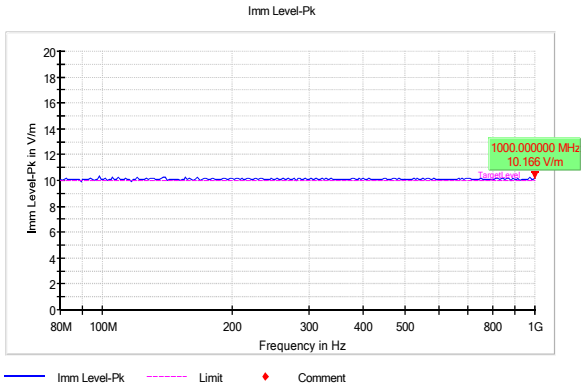
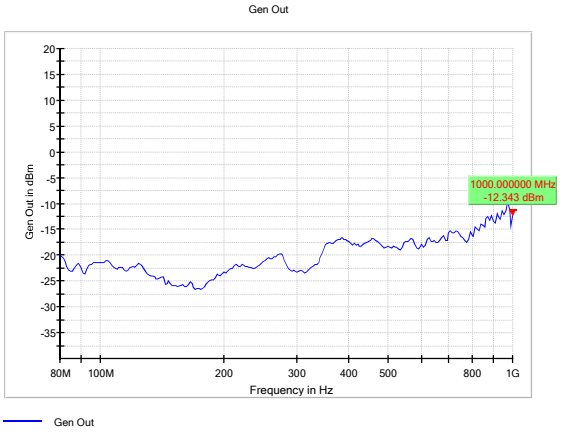
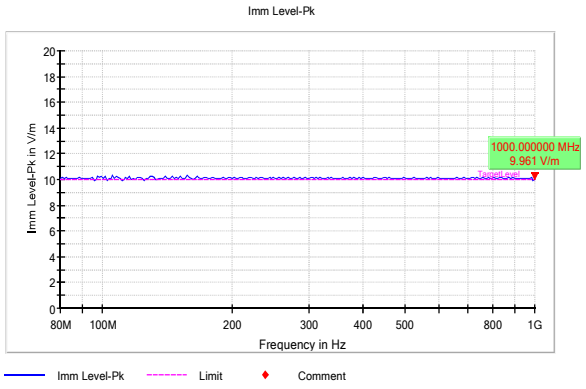
1.11 MEASUREMENT GRAPH

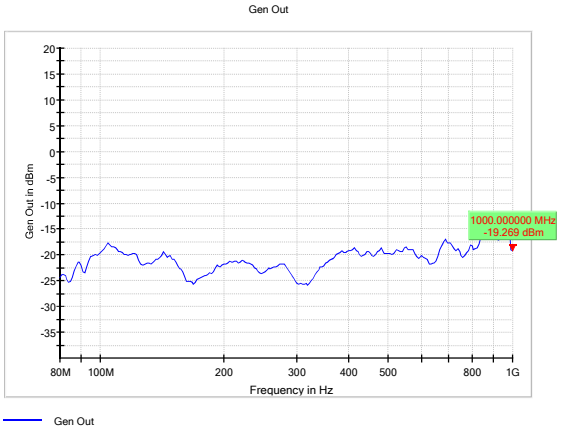
1.11.1 Frequency Range from 80 MHz to 1000 MHz with Amplitude Modulation (AM) with Horizontal Polarization





1.11.2 Frequency Range from 80 MHz to 1000 MHz with Amplitude Modulation (AM) with Vertical Polarization





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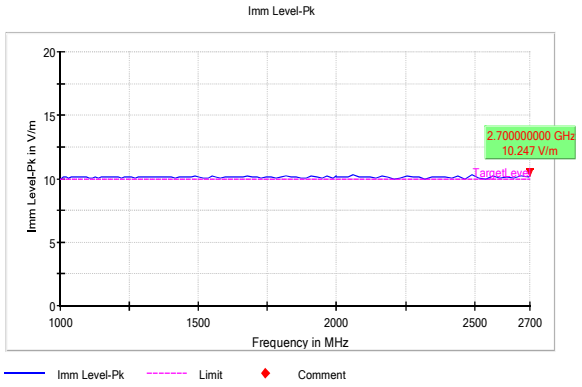
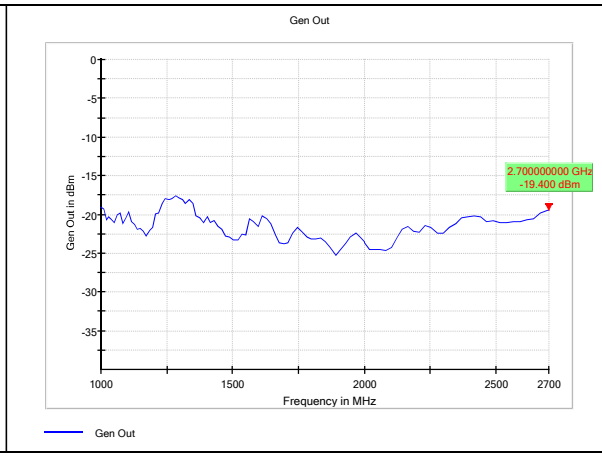
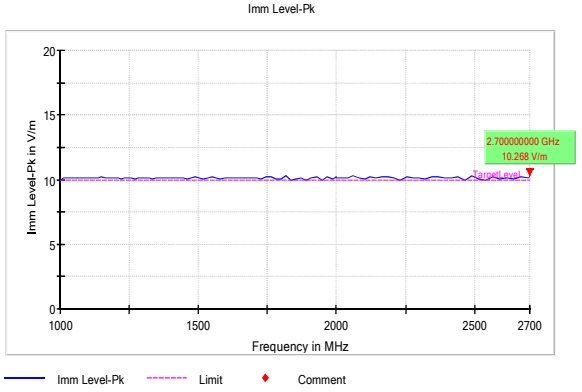
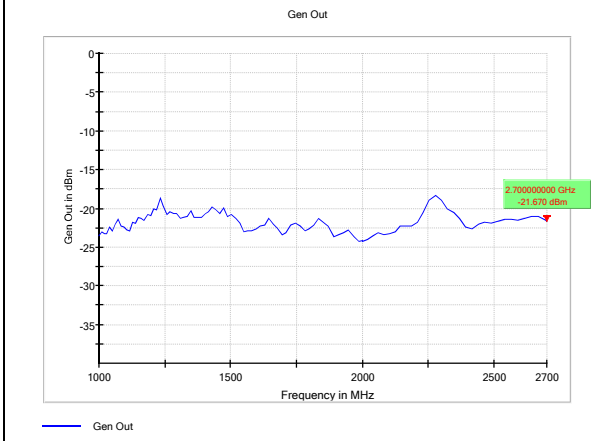
1.11.3 Frequency Range from 1000 MHz to 2700 MHz with Amplitude Modulation (AM) with Horizontal Polarization





1.11.4 Frequency Range from 1000 MHz to 2700 MHz with Amplitude Modulation (AM) with Vertical Polarization





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END OF ANNEXURE 01

■ - Option considered for the test

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