

ENGINEERING SUMMARY REPORT	Report #	CE20-0903
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Evaluation of VITA 46 R-VPX Evolution 2 series connectors to product standards	Revision #:	A
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Revision History

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A

User

GSP

Date

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Summary

1.1. Purpose of Test

Testing was performed on Amphenol's R-VPX Evolution 2 (EVO2) ruggedized VITA 46 connector to determine if its performance meets or exceeds the requirements of the rugged Military/Aerospace market.

1.2. Product Description

The EVO2 connector is a derivative of Amphenol's previously qualified R-VPX connector, with design modifications to improve data transfer speeds, delivering in excess of 32 Gbps (Engineering report S20-0221). These connectors form a ruggedized, high-speed, board-to-board interconnect system, meeting and exceeding VITA 46 standards. This connector system gives users modularity and flexibility by utilizing PCB wafer construction with customized wafer-loading patterns, a copper alloy cantilever beam type contact system, in a rugged LCP housing. As a product derivative where the mating interface design remained unchanged (thereby establishing intermateability), several qualification tests which were deemed a test of that mating interface were "Qualified through Similarity" as listed herein.

1.3. References

The following documents were referenced for testing in this report. Unless specified, the version in effect at the time of testing shall have been followed.

- ESR-9553_rev3 (2-19-2018 Amphenol R-VPX Qualification summary)
- ESR-9702_A (2-8-2018 Amphenol R-VPX Mate/Unmate test report)
- CE15-0519 (AAO R-VPX Test plan)
- CE19-0614 (AAO EVO2 Test plan)
- CE20-0221 (AAO EVO2 Signal Integrity Test Results)
- Telecordia GR-1217-CORE
- EN-61000-4-2, Electrostatic Discharge Immunity Test
- MIL-STD-1344
- MIL-STD-810G
- EIA Publication 364
- ASTM G85

1.4. Testing Agencies

Contech Research, Inc.
750 Narragansett Park Drive
Rumford, RI 02916-1035

Amphenol TCS Test Laboratory
200 Innovative Way
Nashua, NH 03062

Conclusion

The R-VPX Evolution 2 ruggedized VITA 46 connectors listed in paragraph 2.1., conform to the electrical, mechanical, and environmental performance requirements of test plan CE19-0614 which demonstrates reliable performance in the Mil/Aero market.

Samples and TestSchedule

2.1. Samples

Test specimens selected for testing were representative of normal production lots. Specimens identified with the following part numbers were used for test.

Sample	Part Number	Description	Sample Coding
EVO2 Mated pair (5) Mixed flowing gas	RVPX-PE216DM2	Vertical Backplane, 16 pos.	E24A, E24B, E24C, E24D, E24E
	RVPX-JE216MM2	Right angle daughtercard 16 pos.	
EVO2 Mated pair (3) Shock/Vibe Grp1	RVPX-PE216DM2	Vertical Backplane, 16 pos.	G1-1, G1-2, G1-3
	RVPX-JE216MM2	Right angle daughtercard 16 pos.	
EVO2 Mated pair (3) T-life/Shock/Vibe Grp2	RVPX-PE216DM2	Vertical Backplane, 16 pos.	G2-1, G2-2, G2-3
	RVPX-JE216MM2	Right angle daughtercard 16 pos.	

Table 1: Sample Description

2.2. Qualification through Similarity

There are a number of qualification requirements that are a test of the mating interface only. Since the mating interface is wholly unchanged from previously qualified product, these tests shall be considered as qualified through similarity as listed in Table 2 below and detailed in section 4 herein.

Test	Section
Safety Ground	3.14
Bench Handling	3.15
Humidity/Temperature Cycling	3.16
Salt Fog w/SO ₂	3.17
Electrostatic Discharge	3.18
Current Overload	3.19

Table 2: Qualification through Similarity

2.3. Test sequence

Tests Performed	Coded Samples – Test sequence (numbers indicate order of tests)		
Sample ID ➡	E24A, E24B, E24C, E24D, E24E	G1-1, G1-2, G1-3	G2-1, G2-2, G2-3
Sample Preparation	1	1	1
LLCR	2,4,7, 14,17	3,5,7, 14	2,4,6, 8,10,17
Thermal Aging	3		
Durability	5,16	4,12	7,15
Mate/Unmate Force	6	2	5
MFG (UNMATE)	8		
LLCR 5 th Day	9		
LLCR 10 th Day	10		
MFG (MATED)	11		
LLCR 15 th Day	12		
LLCR 20 th Day	13		
Disturbance	15		
Temperature Life			3
Dust		6	9
Mechanical Shock		8	11
LLCR 1 st , 2 nd , 3 rd Axis		9,11	12,14
Random Vibration		10	13
Mate/Unmate Force		13	16

(Last Cycle)			
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Table 3: Test Sequence

Summary of Testing – Test Results (A) & Test Methods (B)

3.1. Initial Examination of product

- A. **RESULT: PASSED** - All specimens submitted for testing were representative of normal production lots. Specimens were visually examined and no evidence of physical defects detrimental to product performance was observed. (Reference 4.1 for Test Methods)
- B. **METHODS:** Specimens were visually examined according to the product drawings. Parts were checked for proper assembly and mounting. Parts were checked for evidence of physical abnormality detrimental to product performance.

3.2. Low Level Contact Resistance (LLCR)

- A. **RESULT: PASSED** - All low level contact resistance measurements were taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. All measurements had a maximum average change in resistance (ΔR) of less than 5 milliohms after testing, and a maximum individual change in resistance (ΔR) of less than 10 milliohms after testing.
- B. **METHODS:** LLCR measurements were performed per EIA-364-23B or MIL-STD-1344A, method 3002.1. LLCR testing was performed at the beginning of each test group to establish a baseline and after tests according to the test sequence plan. Failure is defined as a resistance increase of greater than 10 m Ω on any individual contact.

3.3. Thermal Aging

- A. **RESULT: PASSED** - All specimens submitted for testing were exposed to a temperature of 105° C for 300 hours, then allowed to cool to room ambient temperature prior to measuring change in LLCR. There was no evidence of visual or physical damage and the change in LLCR was < 5 milliohm (< 10 milliohm requirement).
- B. **METHODS:** The test samples were tested in accordance with TB-2023, Rev. F and EIA 364, Test Procedure 17. The samples were placed in the test chamber in the mated condition and mounted. Failure is defined as either evidence of physical damage or deterioration of the test samples after exposure or a change in LLCR of greater than 10.0 milliohms.

3.4. Dielectric Withstanding Voltage (DWV)

- A. **RESULT: PASSED** - The connectors covered under this report were 100% DWV tested during an in-process production test. A passing DWV test result is indicated by a physical mark placed on the connector housing upon passing the test.
- B. **METHODS:** In-Process Dielectric withstanding voltage was tested at the following parameters: 550 V AC, .1 milliamp max current, connection and LV insulation resistance of 1.0 K ohm, DC duration .01 second, Insulation resistance 10.0 M ohm, for .002 seconds, Max soak .1 second. The test is applied to all pins.

3.5. Random Vibration

- A. **RESULT: PASSED** – Change in LLCR data did not exceed the +10 milliohms requirement. Following the vibration testing, no cracks, breaks, or loose parts on the specimens were visible.
- B. **METHODS:** Samples underwent random vibration tests, according to EIA 364, Test Procedure 28, Test Condition V, Letter A. (Power spectral density $0.02 \text{ G}^2/\text{Hz}$, G 'RMS' 5.35, Frequency 50 to 2000 Hz, Duration 2 hours /axis (3 axes total). Failure is defined as evidence of physical damage to the test samples as tested, or a change in LLCR of greater than 10 milliohms.

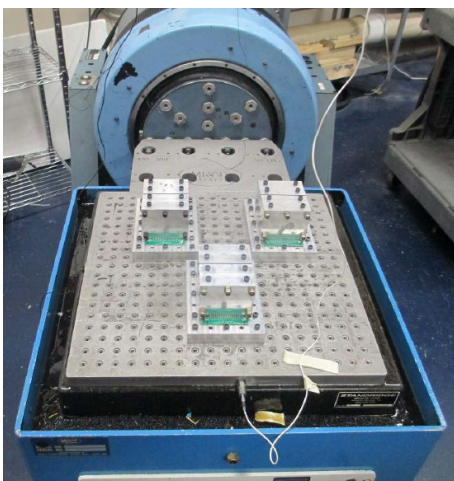


Figure 1: Vibration test set-up

3.6. Mechanical Shock

- A. **RESULT: PASSED** – Change in LLCR measurements did not exceed the +10 milliohms requirement. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.
- B. **METHOD:** Each sample underwent shock following EIA 364, Test Procedure 27, Test Condition A, 30 g in all axes, 11 ms, 3 hits from both directions in each of 3 mutually perpendicular axes (for a total of 18 hits). Failure is defined as evidence of physical damage to the test samples as tested, or a change in LLCR of greater than 10 milliohms.

