

DLA L&M, in an effort to make sure all affected parties have access to this information, requested and obtained Amphenol Aerospace's permission on 09 May to post the following on our public website. Since this data was excerpted from GIDEP document NX4-P-09, we also requested and obtained the GIDEP Program Manager's permission to take this special and urgent action in accordance with GIDEP Distribution Policy.

1. TITLE (Class, Function, Type, etc.)		2. DOCUMENT NUMBER
Leak Test Failure on MIL-DTL-38999, Series III Connectors		NX4-P-16-01A
		3. DATE (DD-MMM-YY)
		01-APR-16
4. MANUFACTURER AND ADDRESS	5. PART NUMBER	6. NATIONAL STOCK NUMBER
Amphenol Aerospace Operations	M38999	Not Available
40-60 Delaware Ave	7. SPECIFICATION	8. GOVERNMENT PART NUMBER
Sidney, NY 13838-1304	MIL-DTL-38999	M38999
	9. LOT DATE CODE START	10. LOT DATE CODE END
	1201	1352
11. MANUFACTURER'S POINT OF CONTACT	12. CAGE	13. MANUFACTURER'S FAX
Ron Williams	77820	Not Available
14. MFR. POC PHONE	15. MANUFACTURER'S E-MAIL	
(607) 563-5344	rwilliams@amphenol-aao.com	
16. SUPPLIER - Not Applicable	17. SUPPLIER ADDRESS - Not Applicable	18. SUPPLIER CAGE - Not Applicable

19. PROBLEM DESCRIPTION / DISCUSSION / EFFECT
 Amendment A has been issued to remove references to photos that were not included in the original document.

Amphenol Aerospace (AAO) is currently delinquent in submitting MIL-DTL-38999 periodic group C retention of qualification testing. In AAO's most recent report, submitted March 2016, AAO experienced cavity-to-cavity leakage failure. The requirements of the test are outlined in:

- a. 3.48 Cavity-to-cavity leakage bonding integrity. When tested as specified in 4.5.44, there shall be no airleakage between contact cavities.
- b. 4.5.44 Cavity-to-cavity leakage bonding integrity. See 3.48. Unmated connectors shall be tested in accordance with test procedure EIA-364-78.

AAO has no knowledge of any field failures associated with cavity-to-cavity leakage.

20. ACTION TAKEN/PLANNED
 DLA imposed a stop production and stop shipment on AAO relative to MIL-DTL-38999 product for delinquent retention testing. In addition, DLA requested that AAO disclose failures associated to the delinquent retention testing. After thorough review of past group C retention test reports, AAO observed cavity-to-cavity leakage failure. The noted containment was group A electrical testing; 100% IR and DWV electrical tests. AAO intends to continue MIL-DTL-38999 production under the controls of the 100% group A electrical testing. AAO plans to lift this stop production and stop shipment upon resolution of open actions with DLA.

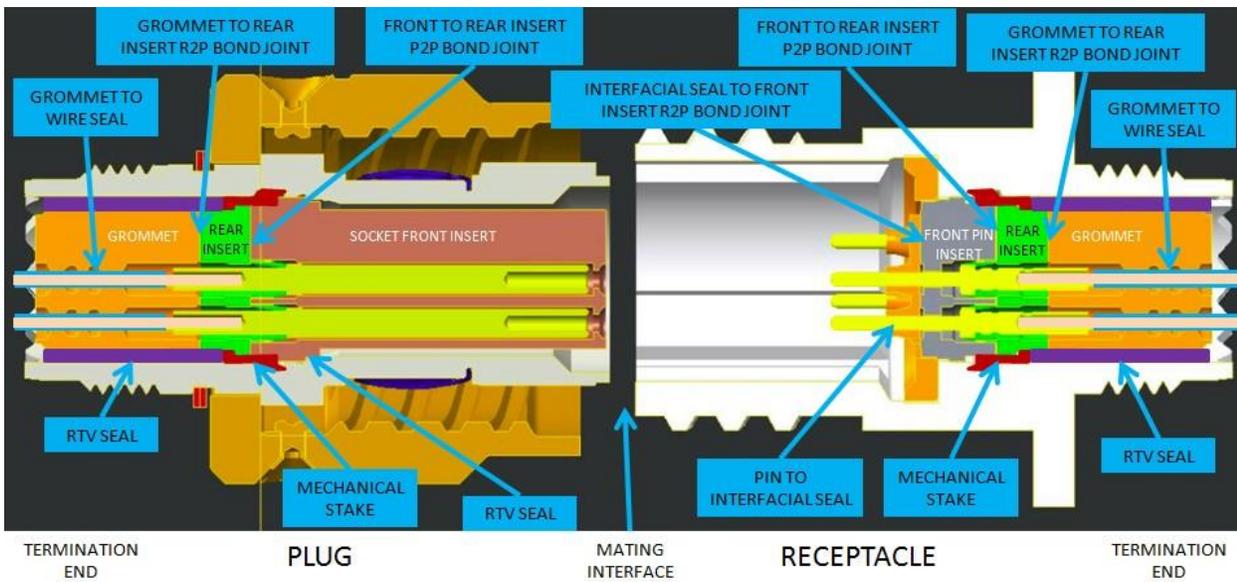
21. DATE MFR. NOTIFIED/ SUPPLIER NOTIFIED - Not Applicable	22. MFR./SUPPLIER RESPONSE - Not Applicable <input type="checkbox"/> REPLY ATTACHED <input type="checkbox"/> NO REPLY	23. ORIGINATOR ADDRESS/POINT OF CONTACT Ron Williams, Amphenol Aerospace 191 Delaware Ave Sidney, NY 13838-1304 rwilliams@amphenol-aao.com (607) 563-5344	25. SIGNATURE Signature on File	26. DATE 31-MAR-16
24. GIDEP REPRESENTATIVE Lori Shaw				

Block 19 Continued:

The most logical potential failure mode on a connector that fails cavity-to-cavity leakage is for a fluid to migrate into the cavity-to-cavity leakage path, which could reduce insulation resistance between adjacent contacts. This ability of a fluid to migrate into a cavity-to-cavity leakage path is not an easy one, as there are a number of sealing features that prevent the ingress of fluid into the contact cavities in both the mated and unmated state of the connectors, including:

1. (3) sealing webs within each grommet cavity
2. RTV (grommet to shell)
3. RTV (insert to shell)
4. Main joint gasket
5. Interfacial seal tower

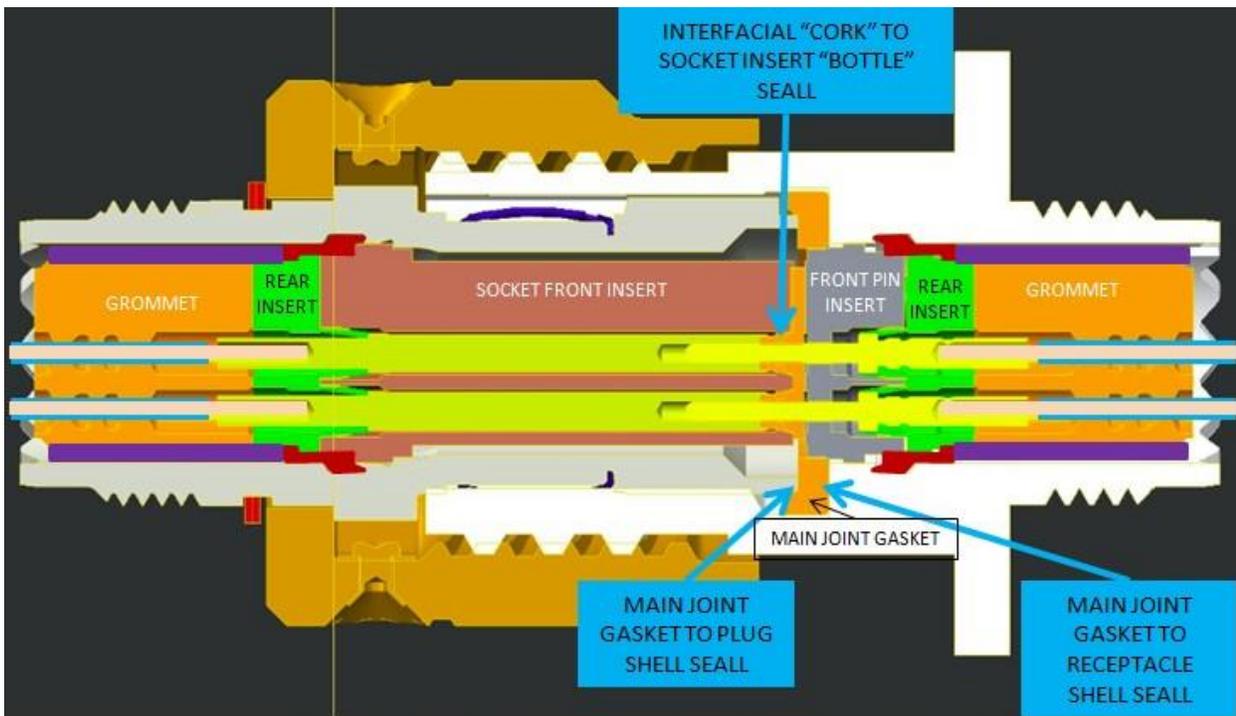
From the termination end of a connector, the interior of the contact cavities are protected by 3 sealing webs in each contact cavity of the rear silicone grommet. As long as the minimum diameter specified by the MIL-DTL-38999 spec is met by the wire, PC tail, and/or the sealing plug, there will be no leakage path. In addition, an RTV sealant is applied between the grommet and the inside of the shell.



From the mating face of the connectors, an RTV sealant is applied at the forward stop shoulder of the front insert and the shell. On the pin insert connectors, the pins interfere with the towers of the interfacial seal, sealing each individual cavity.

For a fluid to ingress to a cavity-to-cavity leakage path when the connectors are unmated, the only vulnerability to access of the contact cavities would be at the mating face of the socket contact cavities.

In the mated condition, there are two sealing elements that engage to further protect the individual contact cavities. First is the main joint gasket, which is compressed between the plug and receptacle shells. In parallel to the main joint gasket, the towers on the interfacial seal on the pin side seal into the rigid chamfered main interface of the socket insert, creating a “cork and bottle” seal.



PLUG MATED TO THE RECEPTACLE

For a fluid to ingress to a cavity-to-cavity leakage path of a pair of mated connectors, the numerous previously mentioned seals would have to be defeated.

Per group A testing requirements outlined in MIL-DTL-38999, AAO performs Insulation Resistance (IR) and Dielectric Withstanding Voltage (DWV) testing on 100% of production assemblies.

Based on the numerous seals provided by the 38999 connector design, 100% electrical testing of all contact cavities, and zero known field failures attributed to cavity-to-cavity leakage, AAO believes there to be an extremely low risk of an electrical failure when using connectors exhibiting this condition.

To verify minimal risk of electrical failure in product exhibiting this condition, AAO conducted IR and DWV electrical testing after the following conditioning:

- 1) Connectors were immersed in the mated condition
- 2) Connectors were immersed in the unmated condition

The results of both tests were excellent.

For the connectors that were fully mated and immersed in water, (D38999/20WC35PN and D38999/26WC35SN), the IR and DWV performance was unchanged, as expected (IR was greater than the 5 GΩ requirement for a dry connector at 500 VDC, and no DWV issues at 1300 VAC), proving that the multiple seals served their functional purpose. The cavity to cavity leakage performance was confirmed after this test, and the pin connector had eight of twenty-two leaking cavities.

Two additional, fully wired connectors (which had already been through vibration) were totally immersed in water in the unmated state (D38999/20MD35SN and D38999/26MD35PN), shaken off, and then fully

mated. The IR met the 100 MΩ post-humidity requirement at 500 VDC, and met the DWV requirement at 1300 VDC. The cavity-to-cavity leakage performance was confirmed after this test, and the socket connector had twenty-six of thirty-five leaking cavities.

Background:

As part of the 24-month periodic test for MIL-DTL-38999, connectors were assembled in Nogales, MX and tested at AAO, Sidney. The insert arrangements failed cavity-to-cavity leakage bonding integrity when tested per procedure EIA-364-78.

Type	Arrang.	Failed Cavity Locations
Socket-Plug	17-35	2,3,4,10
Socket-Plug	17-35	14,15,16,21,22,23,26,27,28,29,30,33,34,35,36,37,38,41,42,43,45,47,48,49,50
Pin-Receptacle	17-35	All cavities except 26
Pin-Receptacle	17-35	6,7,8,9,12,14,15,16,18,20,21,22,23,28,29,30,33,35,36,37,38,42,43,44,45,46,47,48,51

Failure Analysis:

DPA was performed on connector serial numbers 12-10B and 12-14B. The insert sandwiches were pushed out of the shells and examined. They were constructed of PPS front inserts and torlon retention discs, bonded together with AAO silicone adhesive. The two insert components were split apart to examine the bond-line and it was observed that the silicone adhesive was not completely cured. There were areas that appeared glossy or wet and the majority of the silicone was soft and could be easily moved on the surface. An AAO acceptance criterion states that when the parts are separated, the silicone should have a tough, rubbery, matte (or dull) appearance on both bond surfaces. We suspected cure inhibition of the silicone adhesive in these samples caused by some type of contamination. To verify this, we placed the components in a 400°F oven for more than an hour and as suspected, it did not cure any further.

Conclusion:

AAO understands this cure-inhibition to be caused by contamination introduced during the silicone adhesive application. Due to this finding, a material handling deep-dive was performed and determined the true root cause to be the use of inadequate protective latex tissue finger cots. AAO took corrective measure by requiring all bonding areas to employ the use of medical-grade nitrile gloves. Formal training was, and continues to be, conducted to ensure operators understand the requirements relative to the frequency of glove changes and proper material handling. These are now the only type of gloves ordered and stocked in the bonding areas. The most-recent internal audit resulted in a pass and was performed on 12/29/2015.