

**UNCLASSIFIED**

NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION  
PATUXENT RIVER, MARYLAND



**TECHNICAL REPORT**

REPORT NO: NAWCADPAX/TR-2020/01

**MIL-DTL-32628/01-X Reusable EMI Shield Termination Band on MIL-DTL-38999  
Electrical Connector Accessory Braid Termination / Tensile Qualification Test Report**

Approved for Public Release

**UNCLASSIFIED**

DEPARTMENT OF THE NAVY  
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION  
PATUXENT RIVER, MARYLAND

NAWCADPAX/TR-2020/01  
7 January 2020

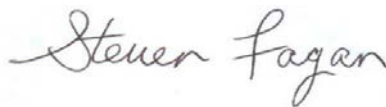
MIL-DTL-32628/01-X REUSABLE EMI SHIELD TERMINATION BAND ON MIL-DTL-38999 ELECTRICAL CONNECTOR ACCESSORY BRAID TERMINATION/TENSILE QUALIFICATION TEST REPORT

PREPARED BY:

Oliviu (Ollie) Muja  
EWIS Technical Publication Support  
NAVAIR-Aircraft Wiring Systems

Matthew Stanley  
Mechanical Engineering Technician  
NAVAIR 4.3.4.1  
Metals and Ceramics Test Laboratory

RELEASED BY:



---

STEVEN FAGAN / Electrical Power & Wiring Systems Senior Engineer/ January 7, 2020  
Power and Energy Division  
Naval Air Warfare Center Aircraft Division

<b>REPORT DOCUMENTATION PAGE</b>			Form Approved OMB No. 0704-0188		
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
1. REPORT DATE 7 January, 2020		2. REPORT TYPE Test Report		3. DATES COVERED 15 Aug 2019 – 16 Aug 2019	
4. TITLE AND SUBTITLE  MIL-DTL-32628/01-X Reusable EMI Shield Termination Band on MIL-DTL-38999 Electrical Connector Accessory Braid Termination / Tensile Qualification Test Report			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Oliviu Muja NAVAIR Aircraft Wiring Systems  Matthew Stanley AIR-4.3.4.1 (Materials Evaluation)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Air Warfare Center Aircraft Division NAVAIR-4.3.4.1 48066 Shaw Rd. Bldg 2188 Patuxent River, Maryland 20670-1161			8. PERFORMING ORGANIZATION REPORT NUMBER  2020-01		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Air Systems Command NAVAIR Aircraft Wiring Systems 48298 Shaw Rd, Bldg 1461, Ste: 117F Patuxent River, Maryland 20670-1547			10. SPONSOR/MONITOR'S ACRONYM(S) OM		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2020-01		
12. DISTRIBUTION/AVAILABILITY STATEMENT  Distribution unlimited / Unclassified					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Reusable constant force spring force bands (CFSB) M32628/01-10 thru 13 (ISOTDS1 thru 4) shield termination bands were evaluated for tensile strength performance as described in SAE AS85049™ and AS85049/128™. The shield bands are employed on shielded wire harness constructions to secure the shield on to the connector accessory/backshell banding platform in order to protect the wires in the bundle from electromagnetic interference (EMI). Four sizes of CFSBs (M32628/01-X, ISOTDS1-X) shield termination bands were tested on the eight shell sizes of connector accessories, thus eight test articles. The shield bands were installed on shield braid of suitable width A-A-59569, on shell size A- H of M85049/88™ backshells, mated to interface connector fixtures. The M85049/88™ backshells mate to the Mil-Dtl-38999 Series 3 connectors, the most common electrical connector types employed in aerospace applications. The braid retention / tensile tests were performed as per AS85049/128™, para 2a requirements. All shield bands, configurations and sizes tested in this effort passed tensile test requirements. None of the M32628/01-10 thru -13 constant force spring band configuration test articles exhibited shifting, loosening, or other damage after exposure to prescribed linear force. All CFSB test articles passed tensile testing.					
15. SUBJECT TERMS  EMI bands, tensile test evaluation, Mil-					
16. SECURITY CLASSIFICATION OF: UNCLASSIFIED			17. LIMITATION OF ABSTRACT  N/A	18. NUMBER OF PAGES  11	19a. NAME OF RESPONSIBLE PERSON Matthew Stanley
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			19b. TELEPHONE NUMBER (301)342-9765

Table of Contents

	<u>Page No.</u>
Report Document Page.....	i
Table of Contents.....	ii
Introduction.....	1
Test Summary.....	1
Test Set-up.....	2
Test Results.....	3
Laboratory Information.....	5
Conclusion.....	6
Distribution.....	7

**LIST OF FIGURES**

Figure 1: Test Setup.....	3
Figure 2: Test Article Before Tensile Testing (e.g. Test articles 1-8).....	4
Figure 3: Typical Test Performance/Results for Test Samples 1 thru 6.....	4
Figure 4: Typical Test Performance/Results for Test Samples 7 and 8.....	5
Figure 5: Typical Test Article 1 thru 6 Shown After Test.....	5
Figure 6: Typical Test Article 7 thru 8 Shown After Test.....	5

**LIST OF TABLES**

Table 1: Test Articles.....	2
Table 2: Test Results.....	5

## 1. Introduction

Reusable constant force spring force bands (CFSB) M32628/01-10 thru 13 (ISOTDS1 thru 4) shield termination bands were evaluated for tensile strength performance as described in SAE AS85049™ and AS85049/128™. The M32628/01 shield termination bands are employed on shielded wire harness constructions to secure the shield on to the connector accessory/backshell banding platform in order to protect the wires in the bundle from electromagnetic interference (EMI). Four sizes of constant force spring bands were tested applied to the eight shell sizes of connector accessories/backshells. The CFSBs were installed on A-A-59569 shield braid of suitable width, on shell size A- H of M85049/88™ backshells, mated to interface connector fixtures. The M85049/88™ backshells mate to the Mil-Dtl-38999 Series 3 connectors. The braid retention / tensile tests requirements are per AS85049/128F™, para 2a. To pass the test, the M32628/01-10 thru -13 constant force spring band test articles may not shift, loosen, break or slip after exposure to the prescribed linear force.

## 2. Test Summary

- a. The test articles in the configurations described in Table 1 were evaluated for tensile strength performance per the configuration described in SAE AS85049/128F™ paragraph 2 and 2a:

“2. BAND TERMINATION TEST (CONFIGURATION 2 AND 4 ONLY): FOR EACH DASH NUMBER TO BE QUALIFIED, PERFORM THE FOLLOWING TESTS ON TWO BAND SPECIMENS FOR EACH ACCESSORY SHELL SIZE FOR A TOTAL OF SIX SPECIMENS. A 6-INCH BRAID SHALL BE CLAMPED BY EACH SPECIMEN TO THE ACCESSORY. THE BRAID SHALL BE TIN COATED COPPER IN ACCORDANCE WITH A-A-59569 WITH A 90% COVERAGE. TWO SPECIMENS EACH SHALL BE CLAMPED TO AN M85049/82-10\*03, M85049/82-18\*03, AND M85049/82-28\*03 ACCESSORY RESPECTIVELY. THE BAND SHALL BE ASSEMBLED TO THE ACCESSORY WITH THE APPLICABLE BAND INSTALLATION TOOL IN ACCORDANCE WITH TABLE 2.

a. BRAID RETENTION: WITH ACCESSORY SUITABLY ASSEMBLED WITH BRAID, PULL THE BRAID AT A RATE OF 1 INCH PER MINUTE TO A FORCE OF 100 POUNDS MINIMUM FOR BRAID .50 INCH AND UNDER AND 150 POUNDS MINIMUM FOR BRAID OVER .50 INCH. THE BRAID SHALL NOT PULL OUT. BAND SLIPPAGE SHALL NOT EXCEED .025 INCH WHEN MEASURED FROM A FIXED POINT ON THE ADAPTER. BRAID BREAKAGE DUE TO TENSILE LOAD WILL NOT BE VIEWED AS A FAILURE.”

- b. The test article configuration defined in paragraph 2 of SAE AS85049/128™ (above) are applied and fit on AS50151™ connectors. This test was performed using the same CFSB types with passing results in February 2018, see NAWCADP AX/TR-2018/01, “REUSABLE ELECTRICAL CONNECTOR ACCESSORY EMI SHIELD TERMINATION BAND, BRAID TERMINATION/TENSILE QUALIFICATION TEST REPORT”. Since the majority of the connectors used in aerospace employ both the AS50151 and the Mil-Dtl-38999 Series III connectors, this test effort focused on the performance of the CFSBs applied to accessories which fit on Mil-Dtl-38999 Series III connectors. The corresponding configuration of connector accessories/backshells are the AS85049/88 sizes A thru H. They correspond to the AS85049/82 used on AS5015 connectors, which were employed in the previous test.
- c. The test articles in the configurations described in Table 2 were evaluated for tensile strength performance. Test articles were built per the configuration described in SAE AS85049™ and

AS85049/128F™ para 2a. This test was performed to assess the tensile strength performance characteristics of the M32628/10-10 thru -13 (ISOTDS1 thru 4) reusable constant force shield bands when installed on the legacy Mil-Dtl-38999 Series III compatible M85049/88™ EMI accessory. All shell sizes were tested, versus only the three called out in the AS85049/128F™ para 2.

- d. All backshells tested were M85049/88™, size -9 thru -23 (A-H). They were aluminum base metal, with W=Cadmium plating per AS85049™ with the suitable cable entry sizes.
- e. Test articles: 1 thru 6 used tin plated copper shield braid: A-A-59569R34T0500 which is 0.5 inch wide. Based on the width of the shield, test articles 1-6 required 100-pound force applied. Test articles 7 and 8 used braid A-A-59569R30T1000, which was larger than 0.5 inch, thus required a 150-pound force applied (see requirement paragraph 2a requirements).

Table 1. Test Articles

Test IDs	Connector Plug Compatibility	Backshells Under Test	Spring Band Under Test
1	JD38999/26WA35SN	M85049/88-9W	M32628/01-10
2	JD38999/26WB98SN	M85049/88-11W	M32628/01-10
3	JD38999/26WC8PN	M85049/8813W	M32628/01-10
4	JD38999/26WD18SN	M85049/88-15W	M32628/01-11
5	JD38999/26WE8PN	M85049/88-17W	M32628/01-11
6	JD38999/26WF11PN	M85049/88-19W	M32628/01-12
7	JD38999/26WG16SN	M85049/88-21W	M32628/01-12
8	JD38999/26WH21SN	M85049/88-23W	M32628/01-13

*Note: Spring Band M32628/01-XX is equivalent part to ISOTDSX*

### 3. Test set-up

Specimens were tested using an electromechanical 100 KN MTS load frame. A smaller 10 KN Load cell was utilized to minimize error in the test data. Specimens were fixtured using a mechanical wedge grip and fittings that were manufactured to interface with the different connector assemblies (see figure 1). The tensile test set-up, as seen in Figure 1, was programmed to apply a tensile load by increasing the displacement between fixed ends of the assembly using a rate of 1 inch per minute until the desired load was reached. For accessory shell sizes 9 thru 19 (Test article 1 thru 6) connectors a minimum force of 100 pounds was the required load while using .50 inch or less width braid. For the shell sizes 21 and 23 (test articles 7 and 8), the minimum force applied was 150 pounds as the braid was wider than .50 inches (one inch). Once the maximum force requirement was reached, the applied force dwell / hold was one minute on average. Note that the specification does not define the minimum force dwell duration.

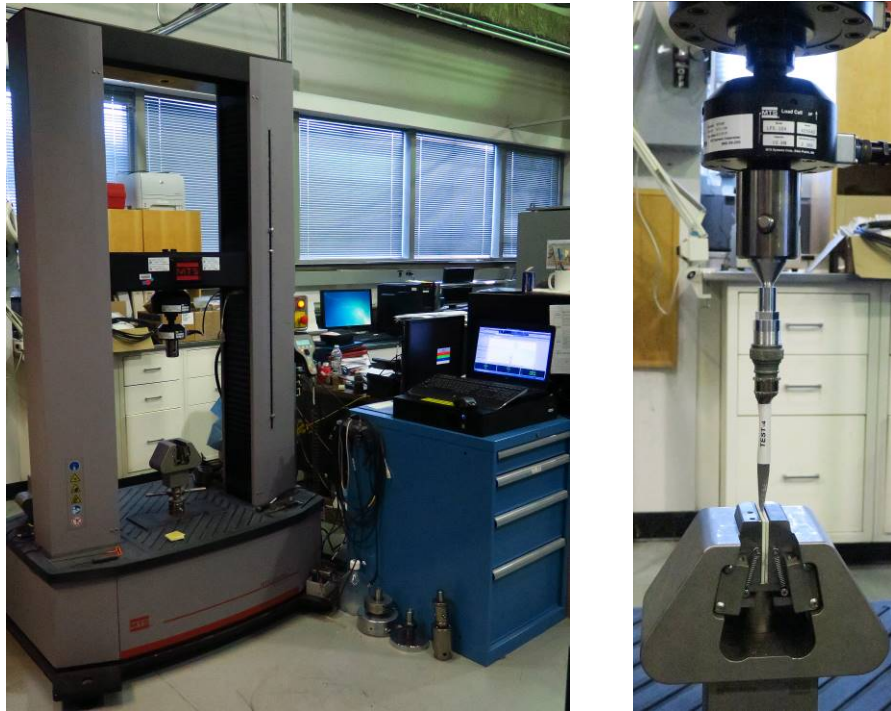


Figure 1. Test Setup



Figure 2. Test Article Before Tensile Testing (e.g. Test articles 1-8)

#### 4. Test Results

- a. The comprehensive test results are captured in table 2. Load vs. Displacement curves for test articles 1 thru 6 as seen in figure 3 were plotted for each test using the data recorded during testing. For test articles 7 and 8, the displacement curves are shown in figure 4.
- b. Figure 2 displays the assembled test articles 1 thru 8 before testing. Typical examples of test articles 1 thru 6 after testing resemble those shown in figure 5. Typical results after testing for test articles 7 and 8 is shown in figure 6.

- c. None of the test articles (1 thru 8) M32628/01-10 thru -13 bands slipped, shifted, became loose, or tore the metallic braid when subjected to the required force per SAE AS85049/128F™, para 2 and 2A. The photographic record and test data is on file and available upon request from the test sponsor/requestor.

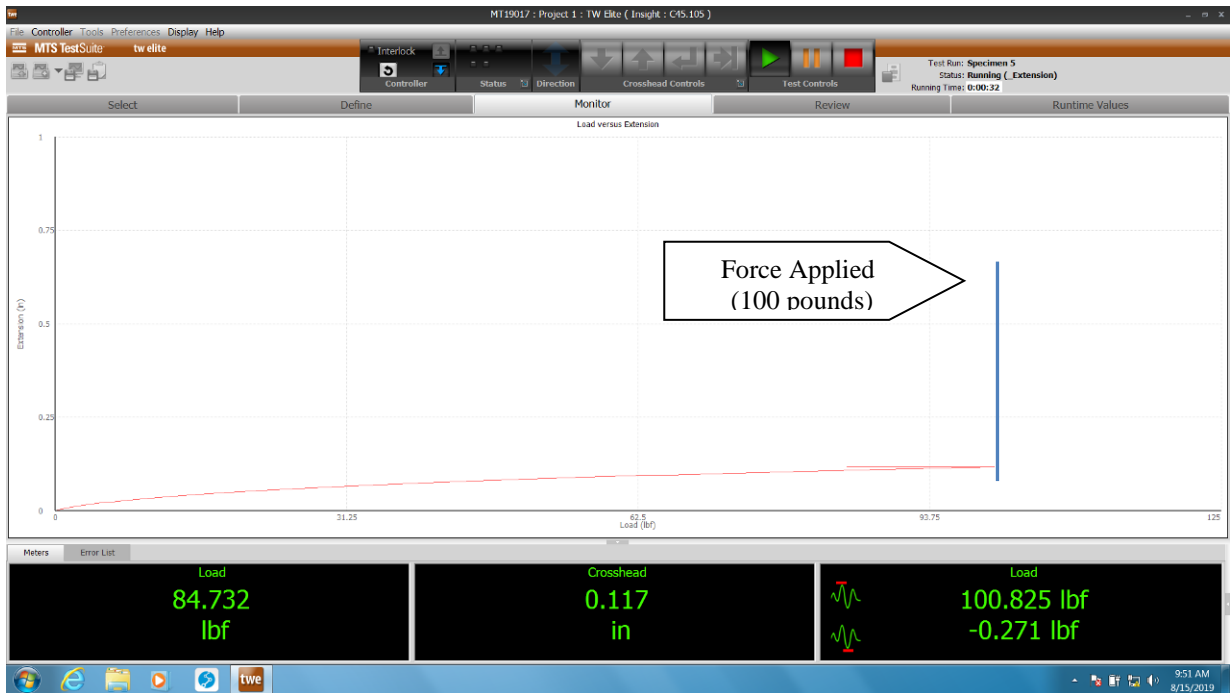


Figure 3. Typical Test Performance/Results for Test Samples 1 thru 6



Figure 4. Typical Test Performance/Results for Test Samples 7 and 8



Test IDs	Connector Plug Compatibility	Backshells Under Test	Spring Band Under Test	Force Applied	Test Results
1	JD38999/26WA35SN	M85049/88-9W	M32628/01-10	100 lbs.	Passed
2	JD38999/26WB98SN	M85049/88-11W	M32628/01-10	100 lbs.	Passed
3	JD38999/26WC8PN	M85049/8813W	M32628/01-10	100 lbs.	Passed
4	JD38999/26WD18SN	M85049/88-15W	M32628/01-11	100 lbs.	Passed
5	JD38999/26WE8PN	M85049/88-17W	M32628/01-11	100 lbs.	Passed
6	JD38999/26WF11PN	M85049/88-19W	M32628/01-12	100 lbs.	Passed
7	JD38999/26WG16SN	M85049/88-21W	M32628/01-12	150 lbs.	Passed
8	JD38999/26WH21SN	M85049/88-23W	M32628/01-13	150 lbs.	Passed

Table 2. Test Results



Figure 5. Typical Test Article 1 thru 6 Shown After Test



Figure 6. Typical Test Article 7 and 8 Shown After Test

## 5. Laboratory Equipment

MTS Criterion Model 45 Test Frame SN: 0500332  
 10 KN Load Cell SN: 425540 Cert. No. 7069-1035

## 6. Conclusion / Summary

Reusable M32628/01-10 thru -13 (ISOTDS1 thru 4) constant force spring force bands shield termination shield bands were evaluated for tensile strength performance as per SAE AS85049/128™ paragraph 2a. The shield bands are employed on shielded wire harness constructions to secure the metallic shield braid on to the connector accessory/backshell banding platform in order to protect the wires in the bundle from electromagnetic interference (EMI). The M32628/10-X shield termination bands tested were installed on shield braid A-A-59569, on eight shell sizes 9 thru 23 of M85049/88™ backshells mated to connector test fixtures. All constant force spring bands in the four sizes tested in this effort passed tensile test requirements. None of the constant force spring band configuration test articles exhibited shifting, loosening, or other damage after exposure to the prescribed linear force.

**DISTRIBUTION:**

NAVAIRSYSCOM (AIR-4.4.5.3), Bldg. 1461 (1)  
48298 Shaw Road, Patuxent River, MD 20670-1606  
[Steven.Fagan@navy.mil](mailto:Steven.Fagan@navy.mil)

NAVAIRSYSCOM (AIR-4.3.4.1), Bldg. 2188 (1)  
48066 Shaw Road, Patuxent River, MD 20670-2188  
[Matthew.stanley@navy.mil](mailto:Matthew.stanley@navy.mil)

NAVAIRSYSCOM (NAVAIR-Aircraft Wiring Systems), Bldg. 1461 (1)  
48298 Shaw Road, Patuxent River, MD 20670-1606  
[Corinne.guernsey@navy.mil](mailto:Corinne.guernsey@navy.mil)

NAVAIRSYSCOM (NAVAIR-Aircraft Wiring Systems), Bldg. 1461, Ste: 117FC (1)  
48298 Shaw Road, Patuxent River, MD 20670-1606  
[Oliviu.muja@navy.mil](mailto:Oliviu.muja@navy.mil)