



Nickel Plated DIAMOND GRIP* Heat Resistant STRATO-THERM*

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity Nickel Plated DIAMOND GRIP Heat Resistant STRATO-THERM terminals and butt splices to determine its conformance to the requirements of Product Specification 108-121200 and SAE AS7928B.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Nickel Plated DIAMOND GRIP Heat Resistant STRATO-THERM terminals and butt splices. Testing was performed by the Harrisburg Electrical Components Test Laboratory between May 17, 2016 and August 16, 2016 and also between September 29th, 2017 and December 8th, 2017. Documentation is on file and maintained at the TE Harrisburg Electrical Components Test Laboratory under EA20160252T and EA20170439T.

1.3 Conclusion

All TE Nickel Plated DIAMOND GRIP Heat Resistant STRATO-THERM Ring Tongue Terminals and Butt Splices as listed in paragraph 1.5, conformed to the electrical and environmental performance requirements of Product Specification 108-121200.

1.4 Product Description

STRATO-THERM DIAMOND GRIP terminals and splices provide optimum corrosion and vibration resistance plus outstanding tensile characteristics. All types employ the famous “W” crimp which creates the precise electromechanical properties necessary for solid and/or stranded conductor combinations. A proper crimp will provide a uniform attachment. When mechanical pressure is applied to the terminal barrel, the wire inside is forced into the serrations or dimples of the barrel.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test (See table 1).

Table 1 – Test Specimens

Test Set	Test Group	Quantity	Part Number	Description
1	1	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 26 AWG SAE AS22759/12 wire, 3 FT, with 48070 tool
2	1	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 24 AWG SAE AS22759/12 wire, 3 FT, with 48070 tool
3	1	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 22 AWG SAE AS22759/12 wire, 3 FT, with 48070 tool
4	2	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 26 AWG SAE AS22759/12 wire, 20", with 48070 tool
5	2	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 24 AWG SAE AS22759/12 wire, 20", with 48070 tool
6	2	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 22 AWG SAE AS22759/12 wire, 20", with 48070 tool
7	3	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 26 AWG SAE AS22759/12 wire, 20", with 48070 tool
8	3	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 24 AWG SAE AS22759/12 wire, 20", with 48070 tool
9	3	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 22 AWG SAE AS22759/12 wire, 20", with 48070 tool
10	4	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 26 AWG SAE AS22759/12 wire, 20", with 48070 tool
11	4	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 24 AWG SAE AS22759/12 wire, 20", with 48070 tool
12	4	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 22 AWG SAE AS22759/12 wire, 20", with 48070 tool

Table 1 – Test Specimens (Continued)

13	5	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 26 AWG SAE AS22759/12 wire, 12", with 48070 tool
14	5	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 24 AWG SAE AS22759/12 wire, 12", with 48070 tool
15	5	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud, 22 AWG SAE AS22759/12 wire, 12", with 48070 tool
16	5	10	1958414-1 (Rev. A)	26-22 AWG Ring, DG, HR, #4 Stud
17	1	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 22 AWG SAE AS22759/12 wire, 3 FT, with 46673-1 tool
18	1	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 20 AWG SAE AS22759/12 wire, 3 FT, with 46673-1 tool
19	1	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 18 AWG SAE AS22759/12 wire, 3 FT, with 46673-1 tool
20	1	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 16 AWG SAE AS22759/12 wire, 3 FT, with 46673-1 tool
21	2	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 22 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
22	2	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 20 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
23	2	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 18 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
24	2	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 16 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
25	3	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 22 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
26	3	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 20 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
27	3	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 18 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
28	3	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 16 AWG SAE AS22759/12 wire, 20", with 46673-1 tool
29	5	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 22 AWG SAE AS22759/12 wire, 12", with 46673-1 tool,
30	5	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 20 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
31	5	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 18 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
32	5	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud, 16 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
33	5	10	323151 (Rev. K)	22-16 AWG Ring, DG, HR, #6 Stud
34	1	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 22 AWG SAE AS22759/12 wire, 18", with 46673-1 tool
35	1	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 20 AWG SAE AS22759/12 wire, 18", with 46673-1 tool
36	1	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 18 AWG SAE AS22759/12 wire, 18", with 46673-1 tool
37	1	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 18", with 46673-1 tool
38	2	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 22 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
39	2	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 20 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
40	2	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 18 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
41	2	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
42	3	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 22 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
43	3	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 20 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
44	3	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 18 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
45	3	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 10", with 46673-1 tool
46	5	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 22 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
47	5	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 20 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
48	5	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 18 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
49	5	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 12", with 46673-1 tool
50	5	10	322823 (Rev. F)	22-16 AWG Butt Splice, DG, HR
51	1	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 16 AWG SAE AS22759/12 wire, 3 FT, with 46988 tool
52	1	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 14 AWG SAE AS22759/12 wire, 3 FT, with 46988 tool
53	2	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 16 AWG SAE AS22759/12 wire, 20", with 46988 tool
54	2	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 14 AWG SAE AS22759/12 wire, 20", with 46988 tool
55	3	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 16 AWG SAE AS22759/12 wire, 20", with 46988 tool
56	3	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 14 AWG SAE AS22759/12 wire, 20", with 46988 tool
57	5	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 16 AWG SAE AS22759/12 wire, 12", with 46988 tool
58	5	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud, 14 AWG SAE AS22759/12 wire, 12", with 46988 tool
59	5	10	322375 (Rev. S)	16-14 AWG Ring, DG, HR, #10 Stud
60	1	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 18", with 46988 tool
61	1	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 14 AWG SAE AS22759/12 wire, 18", with 46988 tool
62	2	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 10", with 46988 tool
63	2	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 14 AWG SAE AS22759/12 wire, 10", with 46988 tool
64	3	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 10", with 46988 tool
65	3	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 14 AWG SAE AS22759/12 wire, 10", with 46988 tool
66	5	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 16 AWG SAE AS22759/12 wire, 12", with 46988 tool
67	5	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR, 14 AWG SAE AS22759/12 wire, 12", with 46988 tool
68	5	10	322825 (Rev. H)	16-14 AWG Butt Splice, DG, HR
69	1	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 12 AWG SAE AS22759/12 wire, 3 FT, with 59461 tool
70	1	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 10 AWG SAE AS22759/12 wire, 3 FT, with 59461 tool
71	2	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 12 AWG SAE AS22759/12 wire, 20", with 59461 tool
72	2	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 10 AWG SAE AS22759/12 wire, 20", with 59461 tool
73	3	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 12 AWG SAE AS22759/12 wire, 20", with 59461 tool
74	3	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 10 AWG SAE AS22759/12 wire, 20", with 59461 tool
75	5	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 10 AWG SAE AS22759/12 wire, 12", with 59461 tool
76	5	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud, 12 AWG SAE AS22759/12 wire, 12", with 59461 tool
77	5	10	323069 (Rev. H)	12-10 AWG Ring, DG, HR, 1/4 Stud
78	1	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 12 AWG SAE AS22759/12 wire, 18", with 59461 tool

Table 1 – Test Specimens (Continued)

79	1	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 10 AWG SAE AS22759/12 wire, 18", with 59461 tool
80	2	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 12 AWG SAE AS22759/12 wire, 10", with 59461 tool
81	2	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 10 AWG SAE AS22759/12 wire, 10", with 59461 tool
82	3	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 12 AWG SAE AS22759/12 wire, 10", with 59461 tool
83	3	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 10 AWG SAE AS22759/12 wire, 10", with 59461 tool
84	5	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 12 AWG SAE AS22759/12 wire, 12", with 59461 tool
85	5	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR, 10 AWG SAE AS22759/12 wire, 12", with 59461 tool
86	5	10	323757 (Rev. H)	12-10 AWG Butt Splice, DG, HR
87	4	10	323151 (Rev. K)	22-16 AWG Ring, #6 Stud, HR, 22 AWG, SAE AS22759/12 wire, with tool # 46673-1
88	4	10	322823 (Rev. F)	22-16 AWG Butt Splices, HR, 22 AWG, SAE AS22759/12 wire, with tool # 46673-1
89	4	10	323151 (Rev. K)	22-16 AWG Ring, #6 Stud, HR, 20 AWG, SAE AS22759/12 wire, with tool # 46673-1
90	4	10	322823 (Rev. F)	22-16 AWG Butt Splices, HR, 20 AWG, SAE AS22759/12 wire, with tool # 46673-1
91	4	10	323151 (Rev. K)	22-16 AWG Ring, #6 Stud, HR, 18 AWG, SAE AS22759/12 wire, with tool # 46673-1
92	4	10	322823 (Rev. F)	22-16 AWG Butt Splices, HR, 18 AWG, SAE AS22759/12 wire, with tool # 46673-1
93	4	10	323151 (Rev. K)	22-16 AWG Ring, #6 Stud, HR, 16 AWG, SAE AS22759/12 wire, with tool # 46673-1
94	4	10	322823 (Rev. F)	22-16 AWG Butt Splices, HR, 16 AWG, SAE AS22759/12 wire, with tool # 46673-1
95	4	10	322375 (Rev. R)	16-14 AWG Ring, #10 Stud, HR, 16 AWG, SAE AS22759/12 wire with tool # 46988
96	4	10	322825 (Rev. H)	16-14 AWG Butt Splices, HR, 16 AWG, SAE AS22759/12 wire, with tool # 46988
97	4	10	322375 (Rev. R)	16-14 AWG Ring, #10 Stud, HR, 14 AWG, SAE AS22759/12 wire, with tool # 46988
98	4	10	322825 (Rev. H)	16-14 AWG Butt Splices, HR, 14 AWG, SAE AS22759/12 wire, with tool # 46988
99	4	10	323069 (Rev. H)	12-10 AWG Ring, 1/4 Stud, HR, 12 AWG, SAE AS22759/12 wire, with tool # 59461
100	4	10	323757 (Rev. H)	12-10 AWG Butt Splices, HR, 12 AWG, SAE AS22759/12 wire, with tool # 59461
101	4	10	323069 (Rev. H)	12-10 AWG Ring, 1/4 Stud, HR, 10 AWG, SAE AS22759/12 wire, with tool # 59461
102	4	10	323757 (Rev. H)	12-10 AWG Butt Splices, HR, 10 AWG, SAE AS22759/12 wire, with tool # 59461

1.6 Qualification Test Sequence

Table 2 - Test Sequence

Test or Examination	Test Group				
	1	2	3	4	5
	Test Sequence (a)				
Initial examination of product	1	1	1	1	1
Voltage drop	2,4	2,4	2,4	2,4	
Current cycling	3				
Vibration		3			
Termination tensile strength		6	6		
Axial Load					2
Salt spray			3		
Temperature cycling				3	
Final examination of product	5	5	5	5	3

Note: (a) Numbers indicate sequence which tests were performed.

1.7 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C
 Relative Humidity 20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Examination of Product – All Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Voltage Drop – Test Groups 1 through 4

All specimens had voltage drop measurements that were less than the maximum millivolt drop values of an equivalent length of wire plus the appropriate value, as specified in SAE AS7928B and the Product Specification. Refer to Tables 3 through 6 for summary data.

Table 3 – Test Group 1 Voltage Drop Summary Data in Millivolts

	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts
Test Set ID	Test Set 1		Test Set 2		Test Set 3		Test Set 17	
Min	3.64	2.92	2.87	2.80	4.43	4.30	4.46	4.40
Max	5.96	6.90	4.77	4.96	5.95	6.46	4.95	5.00
Average	4.98	5.30	3.76	3.97	5.19	5.07	4.70	4.66
St. Dev	0.86	1.25	0.63	0.61	0.50	0.69	0.20	0.18
Test Set ID	Test Set 18		Test Set 19		Test Set 20		Test Set 34	
Min	3.24	3.25	3.00	3.16	3.63	3.77	4.52	4.56
Max	3.83	3.65	3.27	3.62	3.94	3.99	6.02	6.08
Average	3.47	3.50	3.14	3.37	3.78	3.91	4.98	5.01
St. Dev	0.16	0.12	0.08	0.14	0.11	0.07	0.45	0.46
Test Set ID	Test Set 35		Test Set 36		Test Set 37		Test Set 51	
Min	3.66	3.73	3.40	3.24	3.68	3.72	3.83	3.91
Max	4.28	4.49	3.76	3.59	4.20	4.13	4.46	4.45
Average	4.03	4.13	3.53	3.43	3.97	3.89	4.13	4.12
St. Dev	0.21	0.25	0.12	0.11	0.16	0.11	0.22	0.17
Test Set ID	Test Set 52		Test Set 60		Test Set 61		Test Set 69	
Min	3.95	4.11	4.04	4.29	4.13	4.30	4.34	4.54
Max	4.31	4.92	4.87	5.23	4.57	4.72	4.83	5.34
Average	4.11	4.36	4.48	4.73	4.34	4.50	4.65	4.82
St. Dev	0.11	0.27	0.30	0.30	0.16	0.14	0.15	0.24
Test Set ID	Test Set 70		Test Set 78		Test Set 79			
Min	4.05	4.02	3.94	3.57	3.65	3.97		
Max	4.54	4.56	4.74	5.03	4.69	4.65		
Average	4.33	4.40	4.35	4.30	4.15	4.43		
St. Dev	0.15	0.17	0.28	0.54	0.27	0.20		

Table 4 – Test Group 2 Voltage Drop Summary Data in Millivolts

	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts
Test Set ID	Test Set 4		Test Set 5		Test Set 6		Test Set 21	
Min	4.00	3.91	2.81	3.50	3.78	4.75	4.50	4.61
Max	6.53	7.66	3.82	5.59	4.83	6.97	4.98	6.27
Average	4.88	5.52	3.34	4.45	4.25	5.80	4.73	5.24
St. Dev	0.78	1.23	0.29	0.77	0.35	0.72	0.16	0.52
Test Set ID	Test Set 22		Test Set 23		Test Set 24		Test Set 38	
Min	3.38	3.51	3.04	3.30	3.49	3.73	4.52	4.93
Max	3.94	4.08	3.49	3.65	3.70	3.97	5.47	6.63
Average	3.63	3.78	3.22	3.48	3.58	3.88	4.84	5.53
St. Dev	0.16	0.18	0.13	0.11	0.06	0.08	0.34	0.62
Test Set ID	Test Set 39		Test Set 40		Test Set 41		Test Set 53	
Min	3.55	3.62	3.19	3.49	3.67	4.09	3.57	4.28
Max	4.04	4.45	3.54	4.04	4.00	4.58	4.07	5.54
Average	3.77	3.95	3.39	3.87	3.80	4.28	3.76	4.90
St. Dev	0.17	0.26	0.10	0.16	0.10	0.15	0.18	0.47
Test Set ID	Test Set 54		Test Set 62		Test Set 63		Test Set 71	
Min	3.43	4.24	3.52	4.35	3.98	4.07	3.82	4.39
Max	3.90	5.08	4.16	5.57	4.36	4.97	4.45	5.43
Average	3.62	4.51	3.90	4.91	4.16	4.57	4.15	4.71
St. Dev	0.14	0.24	0.20	0.37	0.14	0.28	0.18	0.30
Test Set ID	Test Set 72		Test Set 80		Test Set 81			
Min	4.01	4.21	3.13	3.98	3.13	4.44		
Max	4.52	4.85	4.10	6.58	4.14	5.14		
Average	4.32	4.56	3.68	5.00	3.66	4.67		
St. Dev	0.16	0.22	0.28	0.76	0.30	0.21		

Table 5 – Test Group 3 Voltage Drop Summary Data in Millivolts

	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts
Test Set ID	Test Set 7		Test Set 8		Test Set 9		Test Set 25	
Min	3.50	2.34	2.73	2.66	4.08	5.18	4.10	4.10
Max	4.73	5.66	3.94	10.45	5.70	8.11	4.97	5.35
Average	4.30	3.82	3.41	5.94	4.78	6.33	4.44	4.72
St. Dev	0.41	1.37	0.42	2.22	0.55	0.90	0.27	0.47
Test Set ID	Test Set 26		Test Set 27		Test Set 28		Test Set 42	
Min	3.20	3.43	3.00	3.12	2.45	2.31	4.62	4.49
Max	3.64	4.00	3.29	3.46	2.58	2.55	6.14	7.38
Average	3.42	3.61	3.18	3.27	2.52	2.41	5.02	5.29
St. Dev	0.15	0.16	0.09	0.11	0.05	0.07	0.45	0.82
Test Set ID	Test Set 43		Test Set 44		Test Set 45		Test Set 55	
Min	3.17	3.33	3.64	3.22	3.80	3.42	3.44	3.81
Max	4.43	4.40	4.17	3.83	4.52	4.10	4.04	5.17
Average	3.58	3.81	3.88	3.61	4.13	3.69	3.84	4.29
St. Dev	0.40	0.35	0.15	0.19	0.24	0.23	0.18	0.40
Test Set ID	Test Set 56		Test Set 64		Test Set 65		Test Set 73	
Min	3.99	3.72	3.84	5.07	3.19	4.44	3.93	4.21
Max	5.34	4.89	4.69	10.58	3.91	5.23	4.71	4.81
Average	4.37	4.34	4.26	7.51	3.59	4.79	4.35	4.56
St. Dev	0.43	0.42	0.24	1.70	0.26	0.27	0.23	0.18
Test Set ID	Test Set 74		Test Set 82		Test Set 83			
Min	4.08	3.91	3.37	4.15	2.74	4.00		
Max	4.43	4.33	3.92	6.73	3.78	4.74		
Average	4.21	4.05	3.60	5.23	3.41	4.45		
St. Dev	0.11	0.13	0.19	0.79	0.38	0.23		

Table 6 – Test Group 4 Voltage Drop Summary Data in Millivolts

	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts	Millivolts
Test Set ID	Test Set 10		Test Set 11		Test Set 12		Test Set 87	
Min	3.21	2.19	2.98	2.18	3.92	3.68	4.07	4.04
Max	4.60	5.83	3.94	7.29	5.38	5.49	4.97	4.62
Average	3.98	3.48	3.49	5.38	4.56	4.38	4.37	4.33
St. Dev	0.51	1.13	0.32	1.62	0.42	0.53	0.29	0.18
Test Set ID	Test Set 88		Test Set 89		Test Set 90		Test Set 91	
Min	8.74	8.31	3.12	3.26	6.52	6.26	2.89	3.02
Max	10.1	13.58	3.46	3.48	6.73	6.55	3.10	3.43
Average	9.29	10.04	3.26	3.39	6.62	6.45	2.97	3.17
St. Dev	0.49	2.14	0.10	0.07	0.07	0.09	0.08	0.13
Test Set ID	Test Set 92		Test Set 93		Test Set 94		Test Set 95	
Min	6.07	5.78	3.19	3.39	6.99	6.71	3.63	3.53
Max	6.33	6.60	3.47	3.92	7.24	10.6	4.09	5.43
Average	6.17	6.05	3.34	3.68	7.14	6.84	3.91	4.05
St. Dev	0.08	0.24	0.09	0.16	0.10	1.11	0.15	0.54
Test Set ID	Test Set 96		Test Set 97		Test Set 98		Test Set 99	
Min	8.05	7.28	3.46	3.44	8.24	7.41	3.99	4.00
Max	8.61	9.06	3.77	5.95	8.46	9.26	4.19	4.61
Average	8.34	8.34	3.61	4.15	8.34	7.82	4.08	4.32
St. Dev	0.15	0.61	0.09	0.70	0.07	0.59	0.08	0.19
Test Set ID	Test Set 100		Test Set 101		Test Set 102			
Min	7.94	8.04	3.58	3.56	7.57	7.38		
Max	8.20	8.91	3.88	4.30	7.95	8.76		
Average	8.08	8.47	3.74	3.94	7.73	7.86		
St. Dev	0.10	0.27	0.10	0.22	0.10	0.37		

2.3 Current Cycling – Test Group 1

Following current cycling, all specimens met the subsequent testing criteria as specified in SAE AS7928B and the Product Specification.

2.4 Vibration – Test Group 2

None of the test specimens exhibited evidence of cracking, breaking or loosening of parts during vibration testing.

2.5 Termination Tensile Strength – Test Group 2 & 3

All specimens met the minimum tensile strength requirement as specified in SAE AS7928B and the Product Specification prior to breaking the terminal, breaking the conductor or the terminal separating from the conductor. Refer to Table 7 and Table 8 for summary termination tensile strength data.

Table 7 – Test Group 2 Termination Tensile Strength Summary Data in Pounds Force

Test Set ID	Termination Tensile Strength						
	lb _f	lb _f	lb _f	lb _f	lb _f	lb _f	lb _f
Test Set ID	Test Set 4	Test Set 5	Test Set 6	Test Set 21	Test Set 22	Test Set 23	Test Set 24
Min	5.98	12.39	20.06	17.28	31.91	52.64	63.97
Max	10.71	15.89	24.32	22.42	36.38	54.71	65.96
Average	8.72	13.67	21.84	19.89	34.32	53.77	65.11
St. Dev	1.5	1.22	1.42	1.5	1.64	0.65	0.67
Test Set ID	Test Set 38	Test Set 39	Test Set 40	Test Set 41	Test Set 53	Test Set 54	Test Set 62
Min	19.87	32.73	49.48	58.37	67.64	90.01	67.42
Max	22.54	36.48	53.48	65.15	69.04	103.39	69.66
Average	21.17	35.37	51.26	60.86	68.22	99.71	69.01
St. Dev	0.98	1.13	1.35	2.00	0.40	3.94	0.69
Test Set ID	Test Set 63	Test Set 71	Test Set 72	Test Set 80	Test Set 81		
Min	99.30	174.12	249.45	170.97	218.71		
Max	106.41	178.67	259.69	173.07	252.74		
Average	101.87	176.60	256.48	172.51	238.76		
St. Dev	2.34	1.31	3.05	0.62	12.98		

Table 8 – Test Group 3 Termination Tensile Strength Summary Data in Pounds Force

Test Set ID	Termination Tensile Strength						
	lb _f	lb _f	lb _f	lb _f	lb _f	lb _f	lb _f
Test Set ID	Test Set 7	Test Set 8	Test Set 9	Test Set 25	Test Set 26	Test Set 27	Test Set 28
Min	5.94	10.68	20.08	19.87	32.77	48.39	58.35
Max	8.61	14.44	23.22	22.54	36.66	52.83	65.57
Average	7.47	13.14	21.46	21.17	34.86	49.87	62.98
St. Dev	0.97	1.11	1.15	0.98	1.57	1.32	2.38
Test Set ID	Test Set 42	Test Set 43	Test Set 44	Test Set 45	Test Set 55	Test Set 56	Test Set 64
Min	17.00	26.66	46.79	57.83	63.34	95.97	63.96
Max	22.90	35.19	52.23	65.34	68.65	102.02	68.86
Average	19.41	29.69	49.86	61.52	66.59	98.82	67.00
St. Dev	1.66	2.53	1.59	2.35	1.65	2.17	1.54
Test Set ID	Test Set 65	Test Set 73	Test Set 74	Test Set 82	Test Set 83		
Min	97.02	174.49	245.69	170.74	231.46		
Max	105.10	178.40	258.55	176.39	256.85		
Average	101.21	176.44	254.62	174.07	244.59		
St. Dev	3.00	1.47	3.83	1.49	6.92		

2.6 Axial Load – Test Group 5

Specimen with metal sleeves withstood a force of 8 pounds for crimped samples and 4 pounds for uncrimped samples. The metal sleeve did not move more than 1/32 when the specified force was applied.

2.7 Salt Spray – Test Group 3

Specimens were visually examined after exposure to salt spray and no evidence of physical damage detrimental to product performance was observed.

2.8 Temperature Cycling – Test Group 4

Observations in table 9 were made following temperature cycling, no other observations were made on the remaining samples.

Table 9 - Test Results Summary Following Temperature Cycling

Test Sets	Observation	Test Sets	Observation
87	Oxidation on lugs	95	Slight jacket discoloration and shrinkage at lugs. Oxidation on lugs.
88	Oxidation on lugs	96	Slight jacket discoloration, shrinkage at crimps. Oxidation at crimps
89	Oxidation on lugs	97	Slight jacket discoloration and jacket breaks at lugs. Oxidation on lugs.
90	Slight jacket discoloration. Oxidation at crimps.	98	Shrinkage at crimps. Oxidation at crimps
91	Slight jacket discoloration and shrinkage at lugs. Oxidation on lugs.	99	Slight jacket discoloration, jacket shrinkage near lugs. Oxidation on lugs
92	Slight jacket discoloration, shrinkage at crimps. Oxidation at crimps	100	Slight jacket discoloration, shrinkage at crimps. Oxidation at crimps
93	Slight jacket discoloration and shrinkage at lugs. Oxidation on lugs	101	Jacket shrinkage near lugs. Oxidation on lugs
94	Slight jacket discoloration, shrinkage at crimps. Oxidation at crimps	102	Slight jacket discoloration, shrinkage at crimps. Oxidation at crimps

2.9 Final Examination of Product - All Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A C of C was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2 Voltage Drop

The terminals were securely bolted back-to-back in a test chain with a minimum clearance in free air of 18 inches in all directions. The test chain was connected in series with a calibrated shunt and connected to a DC power supply as shown in Figure 1. The test chain was energized at the specified test current until thermal stability was achieved. Thermal stability is defined as three consecutive readings within $\pm 1^\circ\text{C}$ at intervals of three minutes each. As shown in Figure 1, the specimen's voltage drop measurements were taken 1/16" from the back of the wire-receiving end of the terminal to the intersection of the tongue and barrel, recording the distance between the probe points. Four voltage drop measurements of the current-carrying conductor were made at the same probe distance as that of the test specimens. These four measurements were averaged, and recorded as the equivalent length of wire (EWL) voltage drop. These EWL's were then added to the appropriate value specified in the Product Specification and SAE AS7928B to determine the maximum allowable voltage drop requirement. The specimens were tested as specified in the Product Specification and SAE AS7928B.

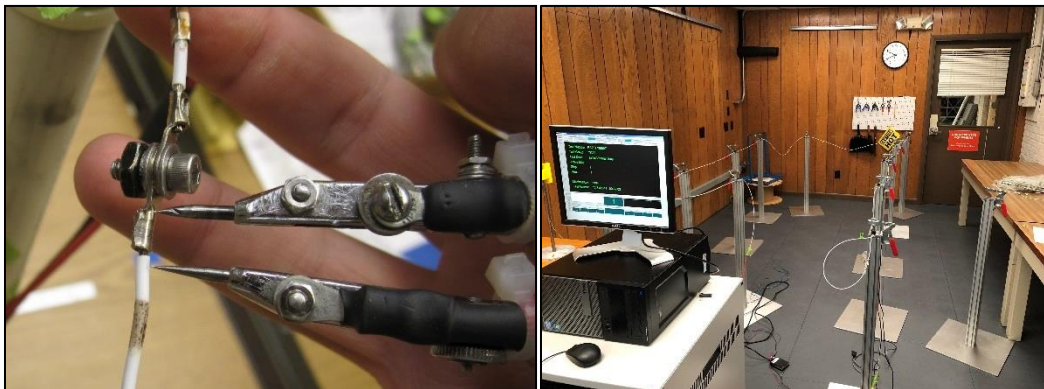


Figure 1 – Typical Voltage Drop and Current Cycling Test Setup

3.3 Current Cycling

The terminals were securely bolted back-to-back in a test chain with a minimum clearance in free air of 18 inches in all directions. The test chain was connected in series with a calibrated shunt and connected to a DC power supply as shown in Figure 1. The test chain was then subjected to 50 current cycles. Each current cycle consisted of 30 minutes at 125% of the test current specified in SAE AS7928B, followed by 15 minutes at no load. The specimens were tested as specified in the Product Specification and SAE AS7928B.

3.4 Vibration

The test specimens were subjected to a sinusoidal vibration test as stated in paragraphs 3.5.6 and 4.7.7.1 of specification SAE AS7928B, in accordance with specification MIL-STD-202H, Method 201. Refer to Figures 2 through 4 below for vibration setup photographs and test specimen mounting diagram. The test specimens were subjected to a simple harmonic motion having an amplitude of 0.06-inch double amplitude (maximum total excursion). The vibration frequency was varied uniformly between the approximate limits of 10 to 55 Hertz (Hz). The entire frequency range of 10 to 55 Hz and return to 10 Hz was traversed in approximately 1 minute. This motion was applied for a period of 18 hours in two of the three mutually perpendicular axes, the axis which would force the wire back upon itself was not run. The motion was applied for a total period of approximately 36 hours per test specimen. The splice and terminal test specimens were secured in the wire clamps with only enough tension to remove all the slack from the wire.

The test specimens were not monitored for discontinuities during testing

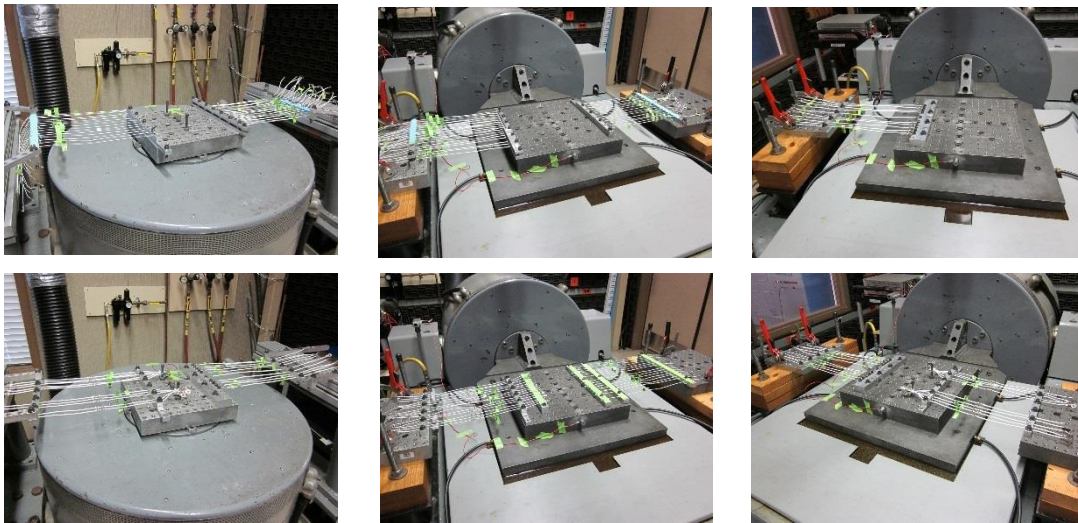


Figure 2 – Vibration Setup

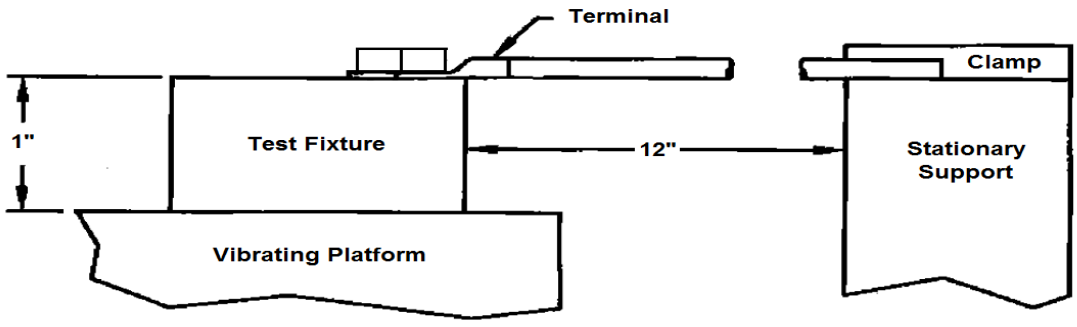


Figure 3 – Vibration Terminal Mounting Setup

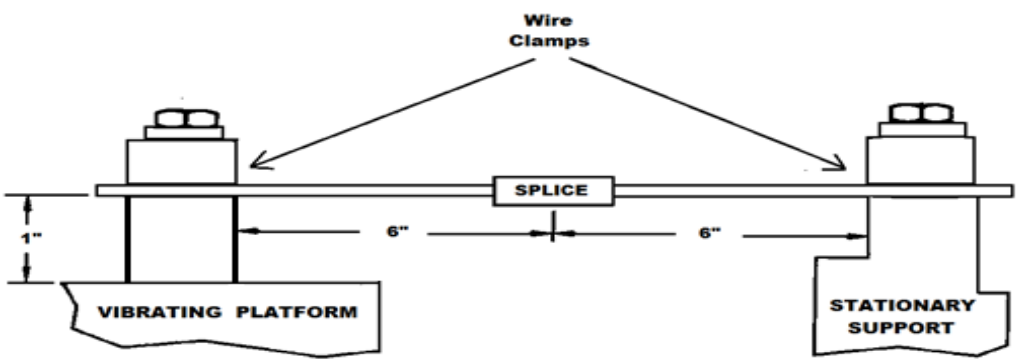


Figure 4 – Vibration Splice Mounting Setup

3.5 Termination Tensile Strength

The specimen terminals were secured to a fixture bolted an air powered table bolted down to the tensile/compression machine base. The other end of the specimen was held in an air powered clamp mounted to the load cell of the tensile/compression machine crosshead. For specimens that were smaller than 12 gauge and did not have a butt splice a floating table was used. For specimen with gauge greater than and equal to 12 AWG the fixture was bolted down to the base of the tensile/compression machine. The air powered clamp was attached to a universal joint when the floating table was not used to insure axial pull. For butt splices a slotted plate fixture was used to hold the specimen in place. Refer to Figure 5 for an image of the test set up. The crosshead was moved in an upwards direction at a rate of 1 inch per minute until failure occurred. The maximum force required to remove the conductor from the terminal, break the terminal or break the conductor was recorded as the crimp tensile strength. The specimens were tested as specified in the Product Specification and SAE AS7928B.

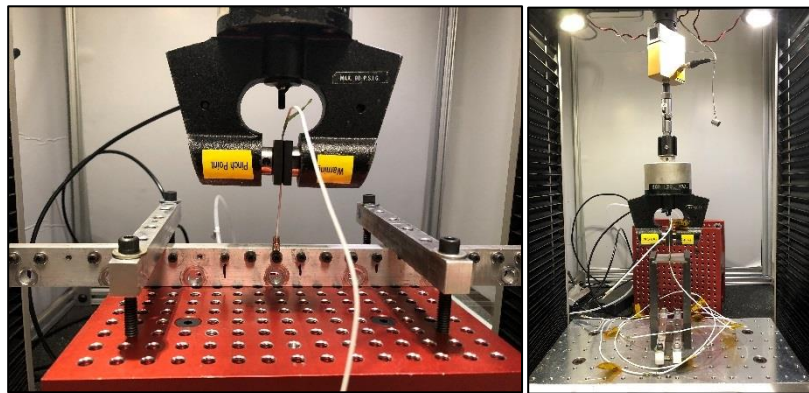


Figure 5 – Typical Termination Tensile Strength Test Setup

3.6 Axial Load

All specimen had a mark to identify the initial position of the metal sleeve. The specimen terminals were secured in a collet fixture to an air powered table bolted down to the tensile/compression machine base. The other end of the specimen was held in an air powered clamp mounted to the load cell of the tensile/compression machine crosshead. The crosshead was moved in an upwards direction at a rate of 0.5 inch per minute until the required force was met. Refer to Figure 6 for an image of the test set up. The specimens were tested as specified in the Product Specification and SAE AS7928B.

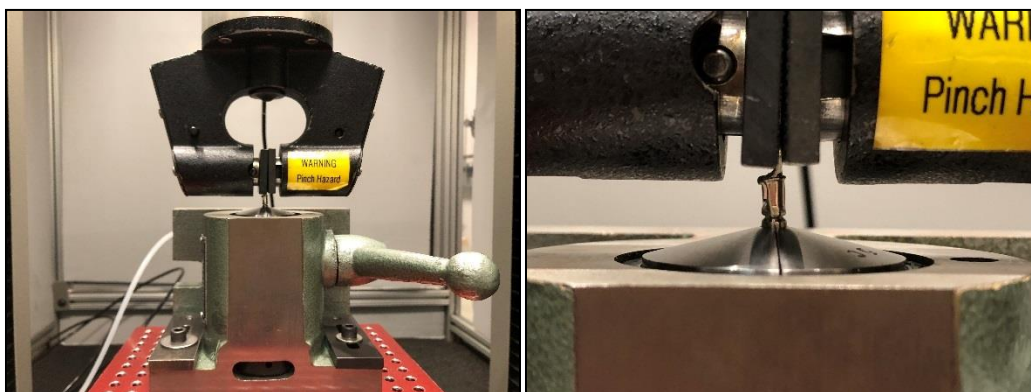


Figure 6 – Typical Axial Load Test Setup

3.7 Salt Spray

The specimens were placed in the chamber on horizontal racks. The chamber was operated for a total of 48hrs. Refer to Table 10 for chamber run intervals. Upon completion of the test the specimens were thoroughly rinsed with DI water while still on the racks in the chamber. The specimens were allowed to dry at room ambient conditions on the chamber racks with the lid open. Refer to Figure 7 for salt spray test setup. The specimens were tested as specified in the Product Specification and SAE AS7928B. The chamber operating parameters were as follows:

Salt Fog Chamber Operating Parameters:

- Chamber Temperature: 35°C.
- Aeration Tower temperature: 48°C.
- 5% Brine Solution Purity: Sodium Chloride with no more than .3% impurities.
- Aeration Tower Pressure: 15 PSI.
- Brine Solution pH Range: 6.5 to 7.2.
- Specific Gravity Range: 1.031 to 1.037.
- Collection rate: .5 to 3ml per hour.

Table 10 – Salt Spray Chamber Run Intervals

DATE	TECHNICIAN	TOTAL HOURS	AIR PRESSURE	COLLECTION								PH				SPECIFIC GRAVITY				SOLUTION TEMP (°C)				COMMENTS
				TOTAL (ml)				RATE (ml/hr)				LF	LR	RF	RR	LF	LR	RF	RR	LF	LR	RF	RR	
				LF	LR	RF	RR	LF	LR	RF	RR	0.79	6.7	6.8	6.79	6.74	1.036	1.035	1.035	1.036	21.3	21.3	21.4	
11/14/2017	Zuvch	48	15	69	59	50	38	1.44	1.23	1.04	0.79	6.7	6.8	6.79	6.74	1.036	1.035	1.035	1.036	21.3	21.3	21.4	21.3	11/8/17 to 11/10/17



Figure 7 – Salt Spray Test Setup

3.8 Temperature Cycling

The test specimens were subjected to a temperature cycling test as stated in specification IEC 60512-11-4, First Edition 2002-02, in accordance with specification IEC 60068-2-14, Rapid Change of Temperature. Per the Product Specification, the specimens were subjected to 50 cycles of temperature cycles as follows:

- 30 minutes at -55°C
- 30 minutes at room temperature
- 30 minutes at 343°C
- 30 minutes at room temperature
- Tolerances: +/-5 minutes; +/-5°C

3.9 Final Examination of Product

All specimens were visually examined by eye corrected to normal vision without magnification, in accordance with EIA-364-18 Rev B.