



TEST REPORT

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GT-18-044
Revision 2
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GT-18-044

Voltage Withstand of TurboFlex and M22759/187 at Sea Level and Altitude

Revision	Description of Changes	Date	Author
1	Initial Release	3/28/2018	Sam Farhat
2	Corrected /189 to /187 on title page	4/6/2018	Sam Farhat

Test Report: 18116R10328V2
Glenair Test Report: GT-18-044
TurboFlex DWV Testing
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Version 2

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Job Name: TurboFlex DWV Testing
Job No: 18116



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1 Summary

Various cables (P/N M22759/187-01-9, 961-002-T-G-0, 961-003-T-G-0, and 961-004-T-G-0) were tested in accordance with ASTM D3032 “Standard Test Methods for Hookup Wire Insulation”, Section 5 “Dielectric Breakdown Voltage”. The intent of this testing is to determine the dielectric breakdown/withstanding voltage of several different TurboFlex cable insulations, P/N 961-002-T-G-0, 961-003-T-G-0, and 961-004-T-G-0, compared to a standard Military Specification cable, P/N M22759/187-01-9. This test was performed at both ambient pressure and temperature and at an altitude of 60,000 feet.

2 References

1. *ASTM D 3032 – Standard Test Methods for Hookup Wire Insulation*
2. *ASTM D 149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies*

3 Test Summary

Dielectric Withstanding Voltage Test Summary						
Test Name	Start Date	End Date	Pass	Fail	Rec.	Test Deviations
Dielectric Breakdown Voltage (Ambient Pressure and Temperature) Samples: 101, 102, 103 (P/N M22759/187-01-9) 201, 202, 203 (961-002-T-G-0) 301, 302, 303 (961-003-T-G-0) 401, 402, 403 (961-004-T-G-0)	3/5/2018	3/5/2018			X	N/A
Dielectric Withstanding Voltage (At 60k Feet) Samples: 104, 105, 106 (P/N M22759/187-01-9)	3/14/2018	3/27/2018		X		N/A
Dielectric Withstanding Voltage (At 60k Feet) Samples: 204, 205, 206 (961-002-T-G-0) 304, 305, 306 (961-003-T-G-0) 404, 405, 406 (961-004-T-G-0)	3/13/2018	3/23/2018	X			N/A

Table 1: Test Summary

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4 Results Summary

At Ambient Pressure and Temperature – 20,000 Volts for 10 Sec (Average)			
Part Number	Arc Failure (kV)	Seconds	Leakage Current (mA)
M22759/187-01-9	13.73	27.43	>10.0
961-002-T-G-0	19.44	.77s at 10s dwell	>10.0
961-003-T-G-0	Pass		1.90
961-004-T-G-0	19.38	39.77	>10.0
At 60,000 Feet - 10,000 Volts for 10 Sec (Average)			
M22759/187-01-9	9.84	.83s at 10s dwell	>10.0
961-002-T-G-0	Pass		1.24
961-003-T-G-0	Pass		1.59
961-004-T-G-0	Pass		2.44

Table 2: Results Summary

5 Test Plan

Material/ Part No.	Test Method	Voltage (AC/DC)	Rate of Rise	Frequency	Dwell Time	Test to (Ultimate Load/Fail)
M22759/187-01-9	ASTM D 3032-98 (Ambient Pressure and Temperature)	20,000 V Max	500 V/s	60Hz	10 Seconds	Test to Arc Failure (Record Failure Voltage)
961-002-T-G-0						
961-003-T-G-0						
961-004-T-G-0						
M22759/187-01-9	ASTM D 3032-98 (At 60k Feet)	10,000 V Max	500 V/s	60Hz	10 Seconds	Test up to 10,000V and dwell for 10 seconds (Pass/fail)
961-002-T-G-0						
961-003-T-G-0						
961-004-T-G-0						

Table 3: Test Plan

6 Test

6.1 Test Equipment List

Test Equipment List					
ID Number	Equipment Name	Manufacturer	Model Number	Calibration Date	Calibration Due Date
MA00019	Scale	Ohaus	CL 5000	5/19/2017	5/31/2018
MA00023	Scale	Brecknell	SA3N340	1/26/2018	1/31/2019
EM00019	HiPot Tester	Associated Research	7715	2/27/2018	2/28/2019
DM00001	Measuring Tape	Starrett	KTX1-25-N	5/22/2017	5/31/2018
NC00001	Vacuum Chamber	Abess Industries	N/A	N/A	N/A

Table 4: Test Equipment List

6.2 Test Set up

6.2.1 Samples

Samples tested at ambient pressure and temperature and at 60,000 feet were cut into 24” and 44” lengths respectively; P/N M22759/187-01-9, sample 105 was cut to 43.25”. Both sample types had 1” of insulation removed at each end, with the ends banded together using a Band-It (See Figure 1).



Figure 1: Test coupon Sample

6.2.2 Construction

At Ambient Pressure and Temperature (See Figure. 2): Test samples were connected to the positive terminal of the HiPot tester and submerged to within 6” of the banded ends in a water bath containing 5% sodium chloride (NaCl) and ~.075% wetting agent (Triton X-100 wetting agent). A copper electrode was placed at the opposite end of the submerged samples and connected to the negative terminal of the HiPot tester. The HiPot tester was set to the max allowable voltage of 20,000 volts and a dwell time of 10 seconds (if necessary) to determine the actual breakdown voltage of each test sample cable.

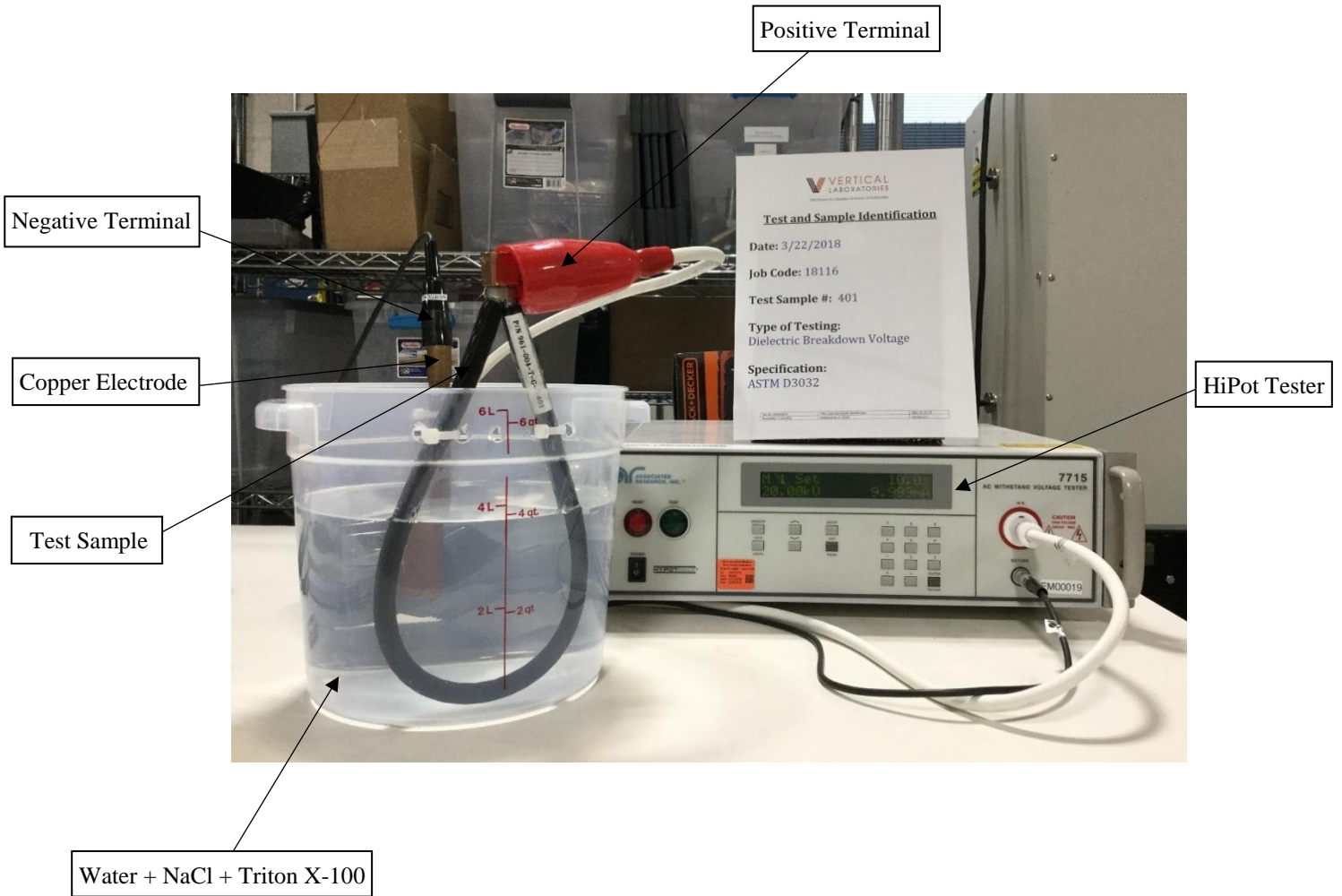


Figure 2: Test Setup for Samples Tested at Ambient Pressure and Temperature

At 60,000 ft. (See Figure. 3): Test samples were connected to the positive terminal of the HiPot tester and submerged to within 6” of the banded ends in a water bath containing 5% sodium chloride (NaCl) and ~.075% wetting agent (Triton X-100 wetting agent). Polyurethane tubing was placed over the connection of the cable sample and positive terminal to mitigate flashover issues. A copper electrode was placed at the opposite end of the submerged samples and connected to the negative terminal of the HiPot tester. The bath containing the sample and electrode were placed in a vacuum chamber and set to 54 torr (approximate pressure at 60,000 feet). The HiPot tester was set to 10,000 volts, with a dwell time of 10 seconds. If the sample withstood 10,000 volts for 10 seconds, it was determined to be a pass. Alternatively, if the sample was unable to withstand 10,000 volts for 10 seconds, it was determined to be a failure and its failure was recorded.

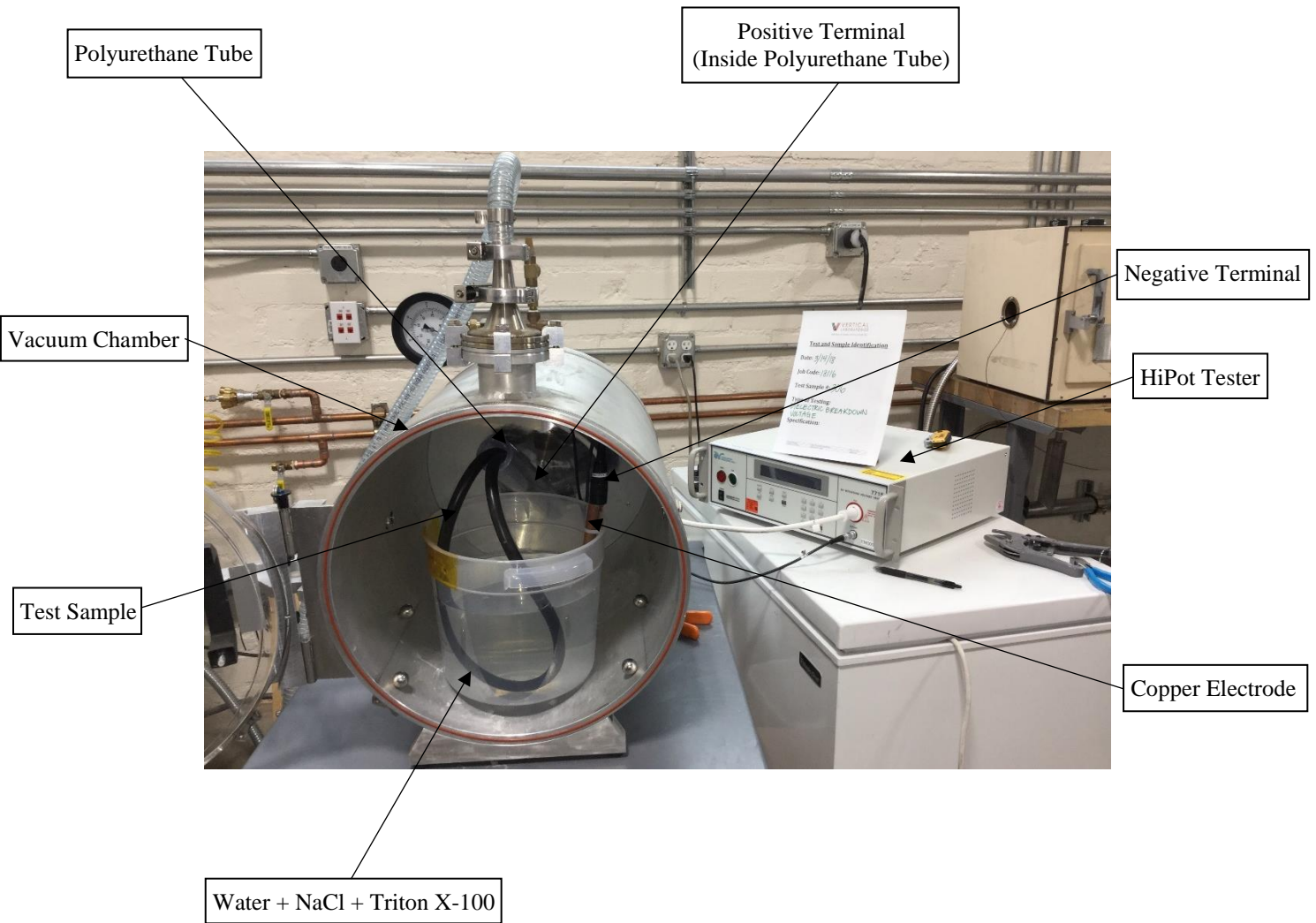


Figure 3: Test Setup for Samples Tested at 60,000 Feet

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6.3 Test Results

At Ambient Pressure and Temperature (20,000 V for 10 Sec.)				
ID Number	Part Number	Arc Failure (kV)	Seconds	Leakage Current (mA)
101	M22759/187-01-9	12.96	25.9	>10.0
102	M22759/187-01-9	15.31	30.6	>10.0
103	M22759/187-01-9	12.92	25.8	>10.0
201	961-002-T-G-0	20.02	5.6s at 10s dwell	>10.0
202	961-002-T-G-0	19.95	0s at 10s dwell	>10.0
203	961-002-T-G-0	18.36	36.7	>10.0
301	961-003-T-G-0	Pass		1.97
302	961-003-T-G-0	Pass		1.88
303	961-003-T-G-0	Pass		1.86
401	961-004-T-G-0	18.10	37.4	>10.0
402	961-004-T-G-0	20.03	.6 at 10s dwell	>10.0
403	961-004-T-G-0	20.00	1.3s at 10s dwell	>10.0

Table 5: Ambient Pressure and Temperature Test Results

At 60,000 Feet (10,000 V for 10 Sec.)				
ID Number	Part Number	Arc Failure (kV)	Seconds	Leakage Current (mA)
104	M22759/187-01-9	9.51	19	>10.0
105	M22759/187-01-9	10.0	.1s at 10s dwell	>10.0
106	M22759/187-01-9	10.01	3.4s at 10s dwell	>10.0
204	961-002-T-G-0	Pass		1.33
205	961-002-T-G-0	Pass		1.25
206	961-002-T-G-0	Pass		1.14
304	961-003-T-G-0	Pass		1.56
305	961-003-T-G-0	Pass		1.62
306	961-003-T-G-0	Pass		1.58
404	961-004-T-G-0	Pass		2.27
405	961-004-T-G-0	Pass		2.56
406	961-004-T-G-0	Pass		2.49

*Leakage current results, for samples that passed at altitude, were obtained by retesting samples

Table 6: At 60,000 Feet Test Results

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7 Conclusion

All Samples were tested in accordance with ASTM D3032 “Standard Test Methods for Hookup Wire Insulation”, Section 5 “Dielectric Breakdown Voltage”. This test to determine dielectric breakdown/withstanding voltages of Turboflex Cables (961-002-T-G-0, 961-003-T-G-0, and 961-004-T-G-0) compared to a standard Military Specification Cable (P/N M22759/187-01-9) was sufficient. All samples showed no signs of physical damage when performing post-test visual examination. Dielectric breakdown voltages were determined for all samples tested at ambient pressure and temperature except P/N 961-003-G-T-0, which passed the 10 second dwell time at 20,000 volts. All samples tested at altitude passed the 10 second dwell time at 10,000 volts, except for samples of P/N M22759/187-01-9.