Qualification and Acceptance Testing Specification for Flexible Cable Assemblies

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RF ONE is committed to providing high quality and reliable cables and cable assemblies. We perform qualification and accepting tests based on this specification.

Purpose

This specification outlines the qualification and acceptance testing for RF ONE flexible cable assemblies.

Applicable Standards

The applicable standards and documents for this specification include:

- MIL-C-17 Cables, Radio Frequency, Flexible and Semi-Rigid, General Specification
- MIL-PRF-39012 Connectors, Coaxial, Radio Frequency, General Specification
- MIL-STD-202 Test Methods for Electronic and Electrical Components Parts
- IEC 60966-1:2019 Radio frequency and coaxial cable assemblies

The relevant test details are listed hereafter.

1. Insertion Loss

Insertion loss shall be measured on an automatic network analyzer in accordance with the applicable paragraph of MIL-C-17.

2. VSWR

VSWR shall be measured on an automatic network analyzer in accordance with the applicable paragraph of MIL-C-17.

3. Cable Dimensions

Finished cable shall be dismantled layer by layer and diameters measured using a micrometer with an accuracy of 0.0025 mm minimum.

4. Minimum Static Bend Radius

Connect one end of cable to a Time Domain Reflectometer (TDR) with a rise time not greater than 150 picoseconds and observe the impedance profile. Then wrap cable around specified mandrel. The impedance profile shall not change more than the specified limit.

5. Minimum Dynamic Bend Radius

Install specified mandrels and connect one end of cable to flex (tic-toc) machine arm and hang a 100g weight on other end. Flex machine shall be capable of ± 90 degrees of movement. Flex cable for specified number of cycles and then re-measure insertion loss and VSWR. Confirm that insertion loss and VSWR are still within the specified limits.

6. Flex Life

Connect both ends of cable to flex machine. Flex cable for specified number of cycles and then re-measure insertion loss and VSWR. Confirm that insertion loss and VSWR are still within the specified limits.

7. Cable Dimensional Stability

Flush cut cable ends and verify that all cable layers are within 0.25 mm to the end of the center conductor. Thermal shock cable for 10 cycles at -55℃ to +85 ℃ in accordance with MIL-STD-202, Method 107. Then measure the recession of any of the cable layers to confirm that they are within the specified limits.

8. Connector Retention

Connect one end of cable to a fixed point and hang the specified weight on the other end for 1 minute minimum. Visually examine cable for damage and remeasure insertion loss and VSWR per respectively. Confirm that insertion loss and VSWR are still within the specified limits.

9. Coupling Mechanism Proof Torque

Using a torque wrench with a minimum accuracy of 0.22kg , tighten connector coupling mechanism to a mating connector with the specified force in accordance with MIL-PRF-39012. Examine coupling mechanism for damage, misalignment, or any signs of being dislodged from the connector body. Loosen coupling mechanism and inspect per the requirement specified.

10. Insertion Loss Versus Temperature

Place cable assembly inside of a thermal chamber that has an accuracy of ± 2℃minimum., and connect to test leads from an automatic network analyzer. The entire assembly must be inside the thermal chamber. Use standard routines for removing any test lead contribution from the measurement. Measure insertion loss at room temperature. Lower temperature to -55℃ and repeat measurement. Gradually increase temperature and measure insertion loss at -40℃, -20℃, 0℃, 25℃, 40℃, 60℃ and 85 ℃. Plot results and compare to requirement.

11. Phase Stability Versus Temperature

Place cable assembly inside of a thermal chamber that has an accuracy of ± 2 ℃, and connect to test leads from an automatic network analyzer. The entire assembly must be inside the thermal chamber. Use standard routines for removing any test lead contribution from the measurement. Phase at room temperature. Lower temperature to -55℃ and repeat measurement. Gradually increase temperature and measure insertion loss at -40℃, –20℃, 0℃, 25℃, 40℃, 60℃ and 85℃. Plot results and compare to requirement.

12. Impedance

Connect one end of cable to a Time Domain Reflectometer (TDR) and compare cable impedance to a 50 ohm air-line standard in accordance with the applicable paragraph of MIL-C-17.

13. Velocity of Propagation

Measure cable length to an accuracy of ±1.5 mm. Then connect cable assembly to an automatic network analyzer and measure group delay.

14. Phase Change Versus Bending

Using no test leads, connect both ends of the cable assembly to an automatic network analyzer. Normalize the phase using divide by memory function or equivalent. Disconnect one end of the cable assembly and wrap cable one time (360°) around the specified mandrel diameter. Reconnect loose end of the cable assembly to automatic network analyzer and observe the phase change to determine if it is within the specified limits.

15. Corona Extinction

Strip one inch of the outer shield, exposing the dielectric, from both ends of the cable to be tested. Connect one end of cable to test leads of corona test set and measure in accordance with the applicable paragraph of MIL-C-17.

16. Dielectric Withstanding Voltage

Strip one inch of the outer shield, exposing the dielectric, from both ends of the cable to be tested. Connect one end of cable to test leads of dielectric withstanding voltage test set and measure in accordance with the applicable paragraph of MIL-C-17.

17. Thermal Shock

Thermal shock cable assembly for 10 cycles at -55℃ to +85℃ in accordance with MIL-STD-202, Method 107, and then re-measure insertion loss and VSWR respectively. Confirm that insertion loss and VSWR are still within the specified limits.

18. Cold Bend

Wrap cable around a mandrel 10 times and secure the ends. Place cable inside of thermal chamber and condition at -40 ℃ for 20 hours minimum. Remove cable from chamber and visually examine jacket per the specified criteria.

19. Stress Crack Resistance

Wrap cable mandrel 10 times and secure the ends. Place cable inside of thermal chamber and condition at 230 ℃ for 96 hours minimum. Remove cable from chamber and visually examine jacket per the specified criteria.

20. Vibration Stability (Shake Test)

Place coiled cable assembly on vibration table. Coil shall be loose with no tie wraps or tie downs. Connect cable assembly to an automatic network analyzer. Vibrate cable assembly at the specified frequency and amplitude. Monitor insertion loss and phase change and compare to specified limits.

21. Humidity

Install sealed caps or equivalent to both connectors on the cable assembly and torque to the recommended value. Place cable assembly in thermal/humidity chamber per MIL-STD-202G Method 103B, a relative humidity of 90 to 95 percent for 96 hours. Then re-measure insertion loss and VSWR. Confirm that insertion loss and VSWR are still within the specified limits.

22. Salt Spray Test

Install sealed caps on the cable assembly and test per MIL-STD-202G Method 101, Condition B: 48 hours. After salt spray test, visually examine if there is evidence of corrosion or pitting. Then the same sample is remeasured in insertion loss and VSWR. Confirm that insertion loss and VSWR are still within the specified limits.

23. Jacket Spark Test

The specified voltage shall be continuously applied to the jacket in accordance with the applicable paragraph of MIL-C-17.

24. Connector Interface Dimensions

Connector interface shall be measured in accordance with the applicable paragraph of MIL-PRF-39012 and MIL-STD-348.

25. Workmanship

Visually examine cable assembly per the specified requirements.

PL series, UF series and MB series cables from RF ONE are designed to meet the above standards through testing or analysis. Our in-house test capabilities include mechanical, visual, low and high temperature, dynamic flexing, vacuum, and VNAs up to 70 GHz.

RF ONE cable assemblies have been tested and used successfully in harsh environments, when there are any other test requirements, please contact us at sales@rfone.cn.