Accelerated Life Testing

A simulation of real-time product lifespan and ageing

By using elevated temperatures, ingress protection (IP) testing, electrical and salt spray testing we can artificially speed up the aging process.

GCT RF Accelerated Life Testing

Tested and then some

Making sure GCT products go through **rigorous testing** means we are committed to producing connectors and cable assemblies of the highest quality that perform flawlessly in any application.

GCT's range of IP rated coaxial connectors and assemblies **already provide an excellent level of environmental protection,** but how do they perform over an extended period in the field?

Working closely with independent test labs, GCT's engineering team has developed a test plan to **simulate prolonged use in demanding environments.** The aim is to demonstrate SMA cable assemblies **can maintain optimal performance throughout its life** when subject to various environmental conditions. The tests are designed with the aim of replicating five years usage in the field based on accelerated life testing.

The 4 core areas of testing

Electrical Performance

Thermal Shock

Salt Spray

IPX7 Tests

All tests are **cycled five times** to replicate a total of five years in the field. All conducted to **industry test standard specifications.**

For more information, please contact sales@gct.co | Released: Oct 2024 Rev 1.00

1 Electrical Performance

Four key parameters were tested at frequencies 1GHz, 2GHz and 3GHz and passed all requirements well within specification:

Insertion loss - Testing ensures that the loss of signal power as it travels through a component or system is <0.8dB

Impedance - To avoid signal reflections, an impedance of at least 45.55 Ohm is required. It retained between 51.6-52.3 Ohms from the tests

VSWR (Voltage Standing Wave Ratio) - Damage to equipment and distortions may occur if VSWR is not <1.5

Return Loss - Ensure the reflected/returned signal power to the source, must be >15dB

2 Thermal Shock

Test Standard: BS EN 60068-2-14:2009

Thermal shock tests ensure SMA connectors and cable assemblies still operate effectively when subject to rapid fluctuations in temperature.

Ideal for devices deployed in the field or product operation in extreme temperatures.

Samples are placed in a thermal shock test chamber subject to alternating temperatures of -40°C to 85°C for 30 minute periods each. Temperature transfer time took ≤10 seconds for 100 cycles.

The test results showed no significant change in performance.

4 IPX7 Testing

Test Standard: IEC 60529:2013

A connector mounted on an enclosure was tested to IPX7 up to 1 meter under water for 30 minutes.

IPX7 testing was successful as there was no water intrusion within the sample and enclosure.

3 Salt Spray testing

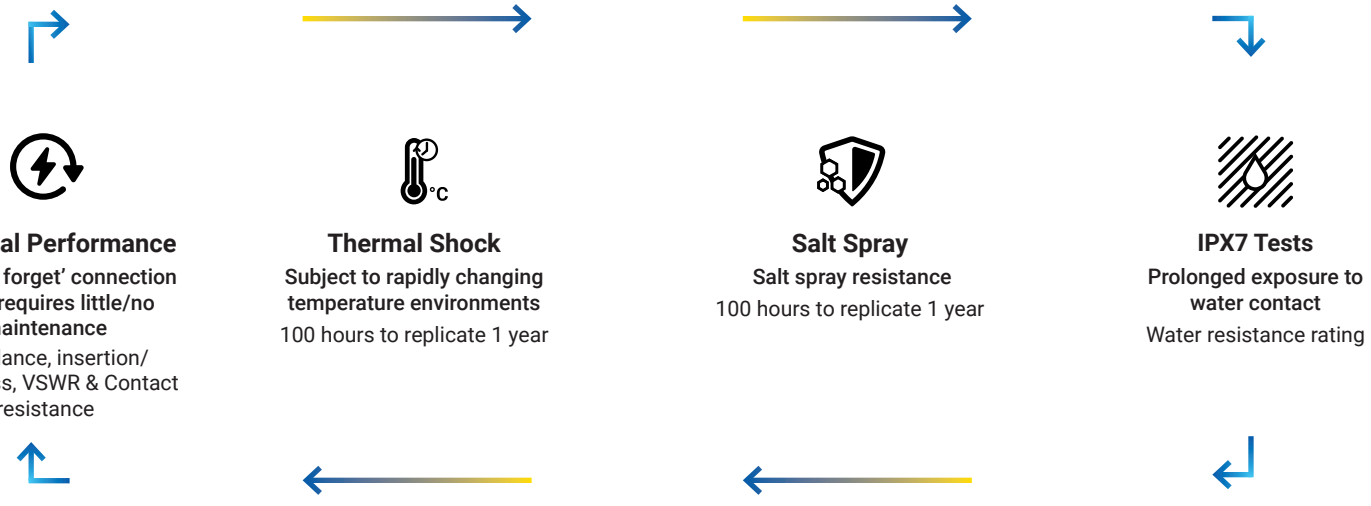
Test Standard: BS EN 60068-2-11:1999

There are potential applications that may subject products to salt spray.

Samples were placed in a test chamber and subjected to a salt solution of 5%NaCl and ph 6.5-7.2, applied for 100 hours.

Results from the test exhibited salt deposits formed on the connector surface as expected, but this did not interfere with the electrical performance of the connector, as it was still within specification.

x5 All tests cycled five times to simulate five years



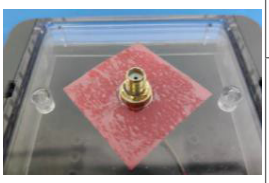
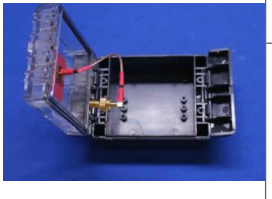
GCT RF Accelerated Life Testing

The benefits of Assemblies

The range of connectors and assemblies already provide an excellent level of environmental protection for RF applications. By completing a series of accelerated life tests, you can be confident that the SMA variants can also operate effectively over prolonged periods with little/no impact from the environment on the performance.

If your applications require at least one of the following features, you may wish to consider our SMA and cable assembly options.

Accelerated Life Testing Detail

<table>
<tr><th>Test Type</th><th>Test Standard</th><th>Methodology</th><th>Example Device under Test Equipment Images</th><th colspan="5">Parameters & Results from Cycle 5
(Full test reports available on requests)</th></tr>
<tr><td rowspan="5">Electrical Performance</td><td rowspan="5">GCT Standard Electrical Performance Specification</td><td rowspan="5">Implement 2-port full calibration of the device under test (DUT) with a Vector Network Analyser (VNA), firmly locking the SMA connectors into both sides of the DUT. Activate measurement function and select response menu for all S-Parameters</td><td rowspan="5">  </td><td>Parameters</td><td>1GHz</td><td>2GHz</td><td>3GHz</td><td>Reqs</td></tr>
<tr><td>Insertion Loss (dB)</td><td>0.385</td><td>0.392</td><td>0.478</td><td><0.8dB</td></tr>
<tr><td>Impedance (Ohm)</td><td>47.717</td><td>51.914</td><td>51.193</td><td>45-55</td></tr>
<tr><td>VSWR</td><td>1.039</td><td>1.045</td><td>1.085</td><td><1.5</td></tr>
<tr><td>Return Loss (dB)</td><td>32.886</td><td>32.066</td><td>27.796</td><td><1.5dB</td></tr>
<tr><td rowspan="2">Salt Spray</td><td rowspan="2">BS EN 60068-2-11-1999</td><td rowspan="2">Device under test consisting of a mounted connector on an enclosure is placed within a salt spray chamber. Test conditions as follows:
1) Temperature of the chamber 35°C
2) Temperature of the saturation 47°C
3) Salt Solution: 5%NaCl (by weight)
4) Volume of salt solution collected 1~2ml/h*80cm2
5) Test duration: 100 hours</td><td rowspan="2">  </td><td colspan="3">Criterion</td><td colspan="2">Test Result (Visual Inspection)</td></tr>
<tr><td colspan="3">No corrosion should be found sample surface after test</td><td colspan="2">No obvious corrosion was found on the metal terminals of the sample surface after test</td></tr>
<tr><td rowspan="2">Thermal Shock</td><td rowspan="2">BS EN 60068-2-14-2009</td><td rowspan="2">Device under test consisting of a mounted connector on an enclosure is placed within a Thermal shock test chamber. Test conditions as follows:
1) Low temperature -40°C, dwell time 30mins
2) High temperature 85°C dwell time 30mins
3) Transfer time ≤10 seconds between temperatures
4) Number of cycles: 100</td><td rowspan="2">  </td><td colspan="3">Criterion</td><td colspan="2">Test Result (Visual Inspection)</td></tr>
<tr><td colspan="3">No significant change should be found on sample surface after test</td><td colspan="2">No significant change was found on the metal terminals of the sample surface after test</td></tr>
<tr><td rowspan="2">IPX7</td><td rowspan="2">IEC 60529:2013</td><td rowspan="2">Device under test consisting of a mounted connector on an enclosure is placed within a waterproof grade testing machine.
The sample is submerged 1 meter below the surface of the water at its lowest point for 30 minutes</td><td rowspan="2">  </td><td colspan="3">Criterion</td><td colspan="2">Test Result (Visual Inspection)</td></tr>
<tr><td colspan="3">No water intrusion</td><td colspan="2">No water invaded the inside of the sample</td></tr>
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