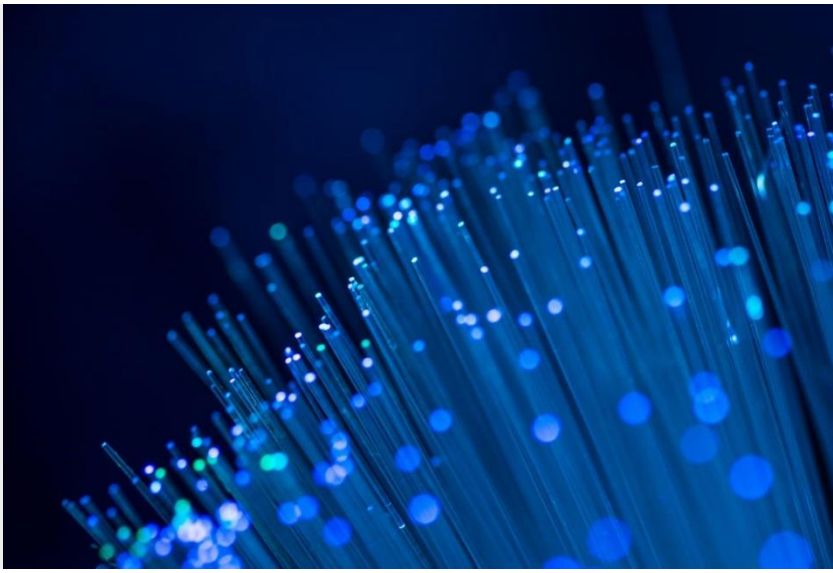
ENGINEERED FIBER OPTIC SOLUTIONS

QLink MT Durability Test Report



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QLink MT Connector Mating Durability Testing

Scope:

QPC's QLink Product Line features the option to use MT Ferrules, with 12 or 24 Fibers each, to maximize channel density. QPC uses US Conec brand SM MT Elite Ferrules and MM MT Elite Ferrules. Depending on shell size, QLink Connectors can hold up to six of these ferrules resulting in a maximum channel count of 144 Fibers (6 x 24F).

US Conec specifies the maximum insertion loss on these MT Ferrules at 0.35dB. Based on the tolerance stack up in multi-ferrule circular connectors, and the "real world" conditions that the QLink connectors are likely to be subjected to, QPC buffers this specification to a maximum of 1.0dB.

Mating Durability is always a primary concern for designers using MT technology for systems that require frequent mates and demates. These ferrules were originally developed for use in MPO/MTP connectors, which hold a single ferrule, used to connect high channel count switch gear in temperature-controlled environments. In these applications, high mating cycles are not common, with the exception of product testing. US Conec's MT Ferrules are rated to 500 mates / demates as specified in TIA-568.3. QPC specifies mating durability of QLink MT Connectors to the same rating as the MT ferrules.

This document outlines the test method and results for testing Mating Durability to 1,000 mating cycles (2x the specified limit) on QPC QLink MT, Hermaphroditic Plug and Receptacle, Shell Size 19 Connectors equipped with 4x 12 Channel MT ferrules (Insert Configuration 19A6).

Equipment:

Connectors:

Part Number:	QLINK-PGHN-19A6-S00
Description:	QLink Connector; Plug; Hermaphroditic; with Hermaphroditic Dustcover; Shell Size 19; 4Ch Hermaphroditic Insert; 2 x Pin MT; 2 x Socket MT; Aluminum; Hard Anodize; Black; No Backshell; No Crimps

Part Number:	QLINK-RFHN-19A6-S00
Description:	QLink Connector; Receptacle; Flange Mount; Hermaphroditic; with Hermaphroditic Dustcover; Shell Size 19; 4Ch Hermaphroditic Insert; 2 x Pin MT; 2 x Socket MT; Aluminum; Hard Anodize; Black; No Backshell; No Crimps

Test Cables:

Male:	4 x 12F QLink MT Ferrule, Male (with Pins) to 12 x ST Connectors, Singlemode
Female:	4 x 12F QLink MT Ferrule, Female (without Pins) to 12 x ST Singlemode

Test Equipment:

Light Source:	Exfo FLS-300 (S/N 266561)
Power Meter:	Exfo FPM-600 (S/N 381658)

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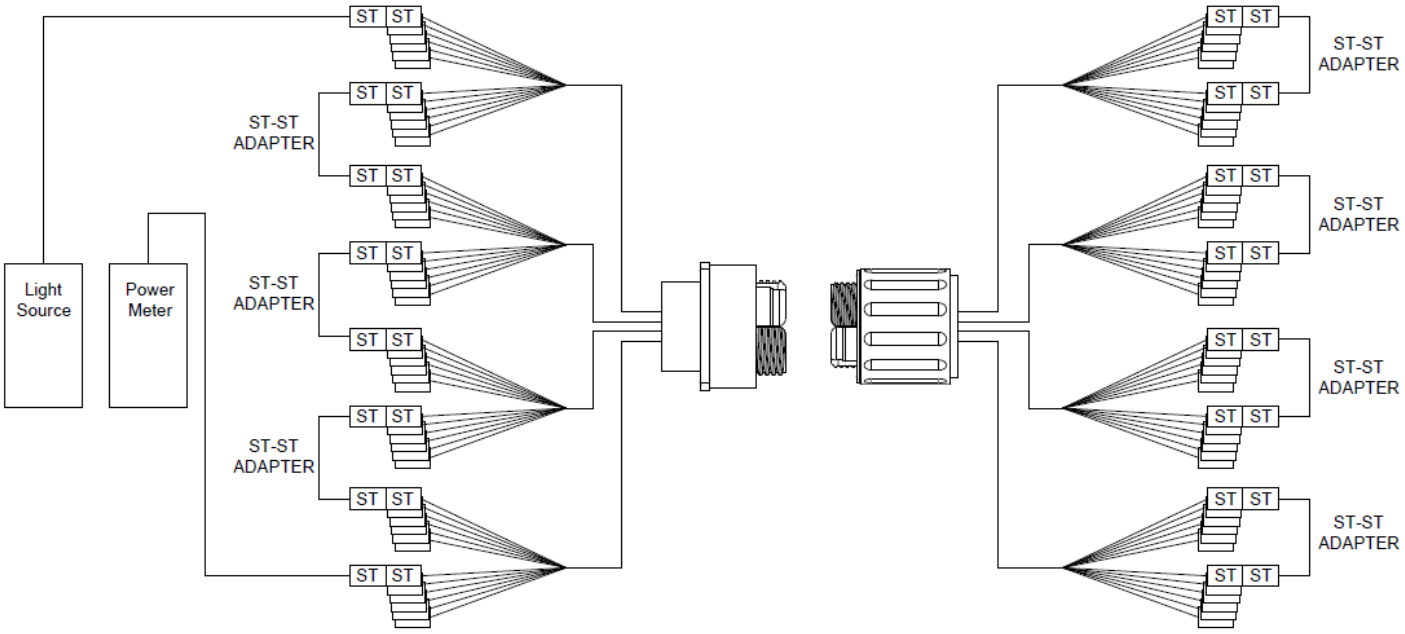
Test Setup:

The Light Source and Power Meter were referenced using a single jumper (ST-ST) reference. This zeros out the loss due to the connection to the Light Source, and nothing else.

All channels in each of the Test Cables (12F MT to ST) were tested individually to ensure that the insertion losses were acceptable for testing. The insertion loss for each channel included 2 x ST-ST Connector Pairs (Max: 0.75dB each) and 1 x MT Connector Pair (Max 1.0dB). The maximum loss is calculated at 2.5dB per channel. The measured range of the individual channels in the test cables was 0.69dB – 1.73dB, with average insertion loss across all 48 channels of 1.42dB.

To allow for testing with a single test set without adding the complexity of an optical switch, and to easily monitor for any discontinuities, the fibers were daisy chained so that 2 randomly selected channels from each ferrule were monitored. The ST connectors were connected with standard ST adapters. This setup (diagram below) included a total of 8 x MT connector pairs and 9 x ST connector pairs, including the connections to the test jumpers. During testing, the 9 x ST connectors were static, and the 8 x MT connector pairs were subject to change based on the mates / demates.

The QLink Receptacle was mounted to a stationary panel to allow for easy mating / demating with the loose QLink Plug Connector.



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Test Method:

1. Clean the end faces of the ferrules using standard cleaning methods (Alcohol and cotton swabs).
2. Connect the QLink connectors, fully threading the QLink Plug onto the QLink Receptacle, note the Insertion Loss Reading.
3. Disconnect the QLink Plug fully. The disconnect must completely separate the QLink Plug and QLink Receptacle.
4. Clean the end faces if the reading changes more than 20%. No disassembly permitted, only standard cleaning.
5. Repeat the Connect / Disconnect cycle for a total of 1,000 cycles. Record the insertion loss measurement every 10 cycles and capture images of the ferrules every 50 cycles.
6. In the case of failure (insertion loss increases more than 20% and standard cleaning will not bring the reading back into range), record the current cycle number and end the test.

Results and Observations:

The 1,000 cycles were completed without failure. The Insertion Loss, through a total of 17 connections (8 x MT connector pairs and 9 x ST connector pairs) averaged 9.05 dB (0.53 dB per connector pair).

Insertion Loss Summary

Average:	9.05dB	Std. Dev:	0.317dB
Maximum:	9.63dB	Minimum:	8.38dB

The complete Insertion Loss Data is listed in the following section in table form and in a chart.

Physical examination of the end faces before, during, and after the test did not show significant physical damage or elongation of the alignment holes. See End Face Images in the following section for details.

NOTE: Cleaning was performed every 65 cycles on average, 16 times during the test. The frequency of cleaning increased as the test progressed with the majority of cleaning being needed during the final 300 cycles. Examination of the contamination showed that the hard anodize plating was beginning to wear on the connector threads and was deposited on the MT endfaces when the connectors were disconnected.

Conclusion:

The overall stability of the loss readings were better than expected, considering that 8 x MT channels were being monitored in series. A small variation on each channel could have a compounding effect on the overall measurement, causing it to fluctuate. The readings were well under the calculated maximum loss budget and were stable within 1.25dB.

Based on these results, QPC is confident that the QLink MT Connector System will meet or exceed the 500-cycle mating durability specification.

To collect a more complete data set, QPC plans to perform a more detailed test in the future where a larger number of individual channels are monitored in parallel to determine the performance of an individual channel in the QLink MT Product Line.

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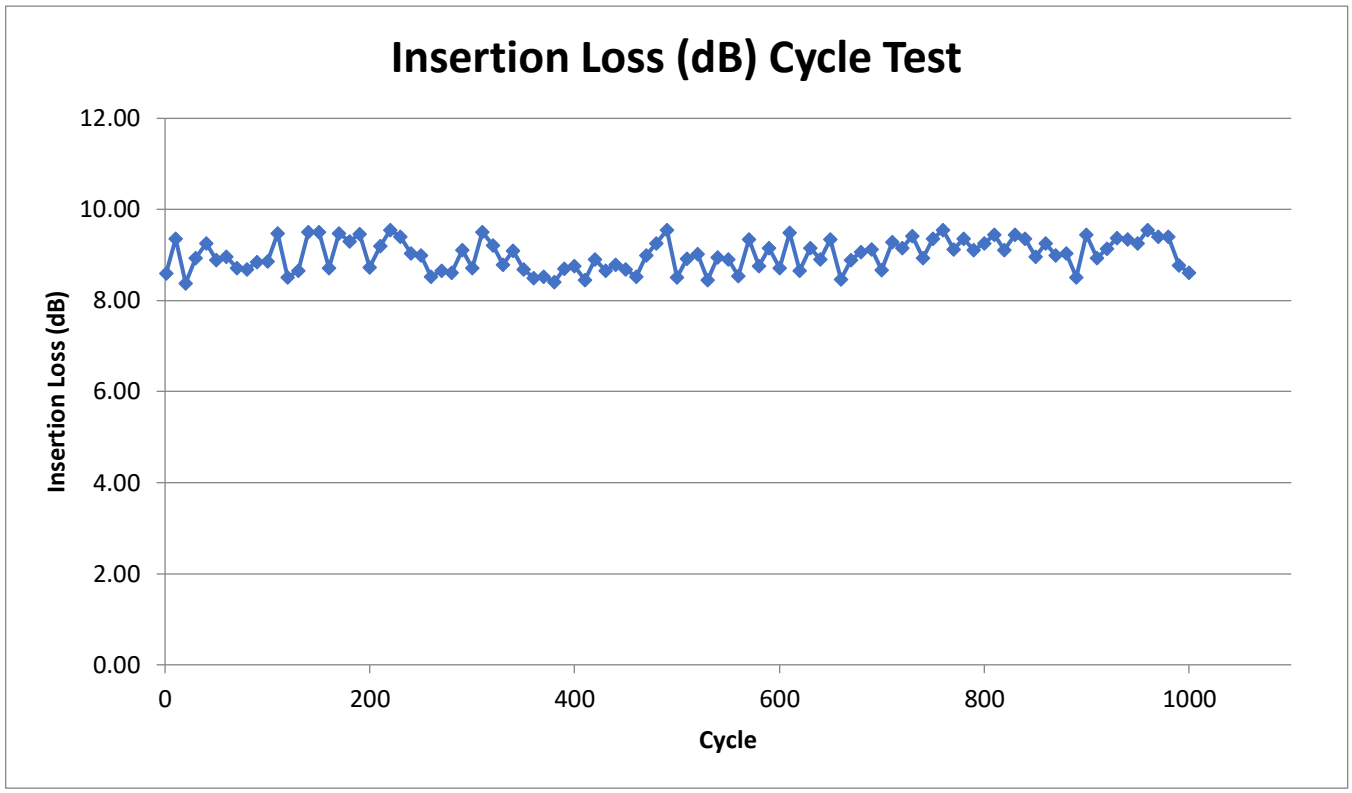
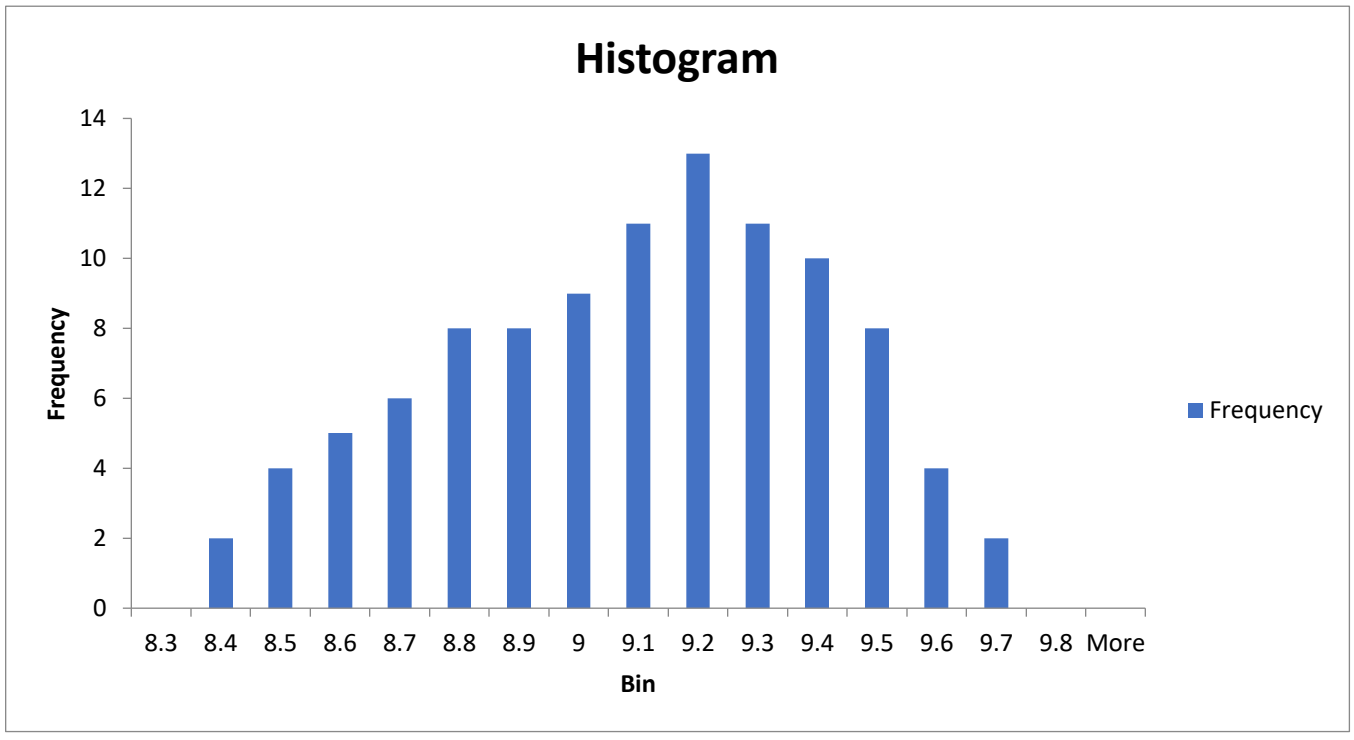
Test Data Table:

Cycles	Loss (dB)	Cycles	Loss (dB)	Cycles	Loss (dB)	Cycles	Loss (dB)	Cycles	Loss (dB)
1	8.60	200	8.73	400	8.76	600	8.72	800	9.26
10	9.36	210	9.19	410	8.45	610	9.49	810	9.45
20	8.38	220	9.55	420	8.91	620	8.66	820	9.11
30	8.94	230	9.40	430	8.66	630	9.15	830	9.44
40	9.26	240	9.03	440	8.78	640	8.90	840	9.36
50	8.89	250	8.99	450	8.68	650	9.34	850	8.96
60	8.96	260	8.53	460	8.52	660	8.47	860	9.25
70	8.71	270	8.66	470	8.99	670	8.89	870	8.99
80	8.69	280	8.61	480	9.25	680	9.07	880	9.03
90	8.85	290	9.11	490	9.55	690	9.12	890	8.51
100	8.86	300	8.72	500	8.51	700	8.67	900	9.45
110	9.47	310	9.50	510	8.92	710	9.28	910	8.93
120	8.51	320	9.21	520	9.02	720	9.15	920	9.14
130	8.65	330	8.78	530	8.45	730	9.41	930	9.38
140	9.50	340	9.10	540	8.95	740	8.93	940	9.35
150	9.50	350	8.68	550	8.91	750	9.36	950	9.25
160	8.72	360	8.49	560	8.54	760	9.55	960	9.55
170	9.47	370	8.52	570	9.35	770	9.12	970	9.40
180	9.30	380	8.40	580	8.76	780	9.36	980	9.40
190	9.46	390	8.70	590	9.16	790	9.11	990	8.77
								1000	8.61

Test Data Chart / Histogram:





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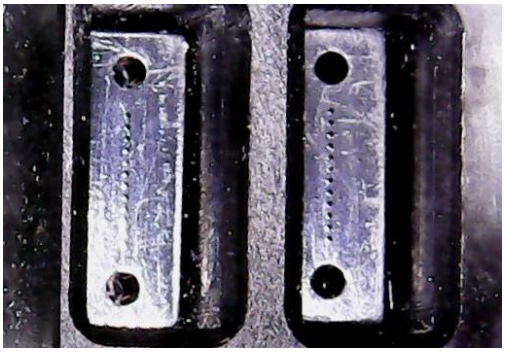
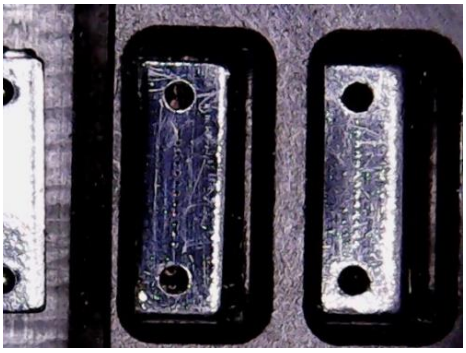
End Face Images:

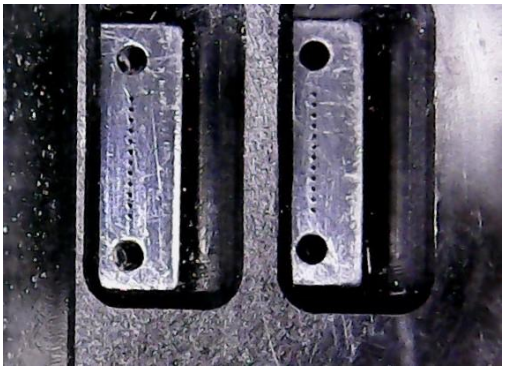
Pre Test



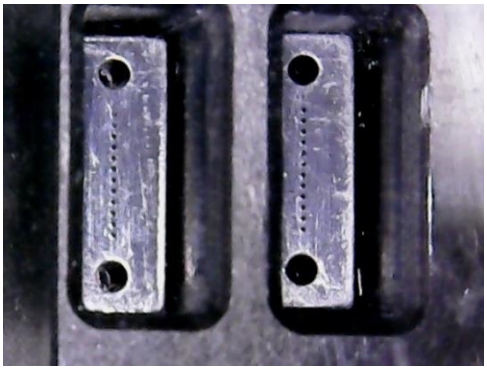
250 Cycles



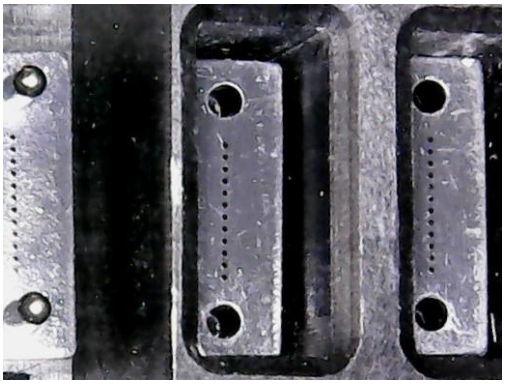
500 Cycles



750 Cycles



Post Test



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