Connector, OPTIMATE*, FSMA 905 & 906, Fiber Optic

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP* FSMA 905 & 906 Series fiber optic connectors to determine their conformance to the requirements of AMP Product Specification 108-45106 Rev. O.

1.2. Scope

This report covers the optical, environmental, and mechanical performance of the FSMA 905 & 906 Series Fiber Optic Connectors manufactured by the Global Optical Connectors & Assemblies Division. Testing was performed between April 18, 1996 and September 10, 1996.

1.3. Conclusion

The FSMA 905 & 906 Series Fiber Optic Connectors, listed in paragraph 1.5, meet the optical, environmental, and mechanical performance requirements of AMP Product Specification 108-45106 Rev O.

1.4. Product Description

OPTIMATE* FSMA 905 & 906 Series Fiber Optic Connectors are multimode connectors used in communication networks and equipment.

1.5. Test Samples

The test samples were taken from current production. The fiber used in the following tests was multimode optical fiber. The following sample quantities were used for each test group.

Test Group	1	2	3	4	5
Fiber size (microns/microns)	62.5/125	62.5/125	62.5/125	100/140	980/1000
Cable type	LDS(a)	LDS(a)	LDS(a)	LDS(a)	LDS(b)
Cable P/N	502083-1	502083-1	502083-1	502084-1	501232-5
Connector kit P/N 905 Style	504566-1	504569-1	504095-1	504566-2	3-504566-0
Connector kit P/N 906 Style	504014-1	504015-1	504094-1	1-504014-0	4-504014-2
Coupling bushing P/N	501049-1	501049-1	501049-1	501049-1	501049-1
Test cable length (m)	10	10	10	5	5
Test samples required	5	5	5	5	5
Control cable required	1	0	0	0	0
Source wavelength	1300	1300	1300	850	660

NOTE

(a) Light Duty Single, 3.0mm diameter
(b) Light Duty Single, 2.2mm diameter

1.6. Qualification Test Sequence

Test or Examination	Test Groups				
	1	2	3	4	5
	Test Sequence (a)				
Examination of product	1	1	1	1	1
Insertion loss	2	2	2	2	2
Temperature cycling	3				
Cable retention	4				
Durability	5				
Change in optical transmittance	6(b)				

NOTE

(a) The numbers indicate sequence in which tests were performed.
(b) Change in transmittance measured before, during, and after Temperature Cycling and Durability. Change in transmittance measured before and after Cable Retention.

2. SUMMARY OF TESTING

2.1. Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Optical Connectors and Assemblies Division.

2.2. Insertion Loss - All Groups

All insertion loss measurements were less than the maximum allowed specification requirements. Insertion loss was measured at 1300 nm for 62.5/125 micron fiber size (Groups 1-3), at 850 nm for 100/140 μm fiber (Group 4), and at 660 nm for 980/1000 μm fiber (Group 5).

Insertion Loss - Requirements (dB)

Fiber size (microns/microns)	62.5/125	100/140	980/1000
Maximum allowed average of all values per test group	2.0	1.5	1.5
Maximum allowed individual value for any single sample	3.0	2.0	2.0

Insertion Loss - Actual (dB)

Group	Cable Type	Fiber size (microns/microns)	Connector Series	Group average	Single sample maximum
1	LDS	62.5 / 125	905	1.2	2.1
			906	0.6	1.2
2	LDS	62.5 / 125	905	0.8	1.5
			906	0.6	1.5
3	LDS	62.5 / 125	905	0.9	1.7
			906	1.1	2.0
4	LDS	100 / 140	905	0.7	1.1
			906	0.5	0.8
5	LDS	980 / 1000	905	0.7	0.9
			906	0.7	1.2

2.3. Change in Optical Transmittance - Group 1

All change in optical transmittance measurements met the maximum allowed specification requirements. Change in optical transmittance was measured at 1300 nm for Group 1 samples.

Change in Optical Transmittance (dB)

Group	Condition	Requirement (during)	Requirement (after)	Connector Series	Actual (during)	Actual (after)
1	Temperature cycling	-1.0 dB group average -1.3 dB single sample	-0.5 dB group average -0.7 dB single sample	905	0.0 dB group average -0.2 dB single sample	0.0 dB group average -0.3 dB single sample
				906	-0.4 dB group average -1.1 dB single sample	-0.2 dB group average -0.3 dB single sample
1	Cable retention	Not required	-0.5 dB group average -0.7 dB single sample	905	Not required	0.0 dB group average 0.0 dB single sample
				906	Not required	0.0 dB group average -0.1 dB single sample
1	Durability	-0.7 dB group average -1.0 dB single sample	-0.7 dB group average -1.0 dB single sample	905	0.1 dB group average -0.1 dB single sample	0.1 dB group average -0.1 dB single sample
				906	-0.1 dB group average -0.2 dB single sample	0.0 dB group average -0.1 dB single sample
1	Change in optical transmittance (completion of sequence)	Not required	-1.0 dB group average -1.3 dB single sample	905	Not required	-0.1 dB group average -0.6 dB single sample
				906	Not required	0.1 dB group average -0.1 dB single sample

2.4. Temperature Cycling - Group 1

There was no evidence of physical damage to the connector or attached cable and no change in optical performance beyond the specified limits after temperature cycling. Change in optical transmittance was measured at 1300 nm.

2.5. Cable Retention - Group 1

There was no evidence of cable clamp or strain relief failure, pullout, or other damage to the connector or attached cable and no change in optical performance beyond the specified limits after cable retention. Change in optical transmittance was measured at 1300 nm.

2.6. Durability - Group 1

There was no evidence of physical damage to the connector or attached cable and no change in optical transmittance beyond the specified limits after durability. Change in optical transmittance was measured at 1300 nm.

3. TEST METHODS

3.1. Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2. Insertion Loss

For Groups 1, 2, 3, & 4 (glass fiber), a restricted launch condition was created by wrapping the test cables around a mandrel of prescribed size for the fiber used. There was no mandrel wrap on the launch for Group 5, 980/1000 μm plastic fiber. The initial optical power through the cable was measured and recorded. The cable was then cut in the middle and the test samples terminated in accordance with AMP Instruction Sheet 408-9863 for OPTIMATE FSMA Fiber Optic Connectors, Types 905 and 906. Each sample was mated and unmated a total of ten times, and optical transmittance was measured after each cycle. One element of the device or half of the connection, such as a connector plug or ferrule (not a coupling or adapter) was rotated 36 degrees (+/- 5°) between measurements. Optical power readings were compensated by changes in the source monitor cable. In cases where a control cable was also used and exceeded limits stated in the specification, the change of the control cable was also factored into the loss calculations.

3.3. Change in Optical Transmittance

The initial optical power (dBm) through the fiber was recorded before the test using an optical source and detector. Relative optical power (dB) through the fiber was measured during and after each test. Change in optical transmittance was calculated by taking the difference between the initial measurement and the during/after measurements. Optical power readings were compensated by changes in the source monitor cable. In cases where a control cable was also used and exceeded limits stated in the specification, the change in the control cable was also factored into the loss. Optical power was measured during and/or after the following tests: temperature cycling, cable retention, and durability.

3.4. Temperature Cycling

Samples were subjected to 5 cycles of temperature extremes, each cycle consisting of 12 hours, for a total of 60 hours exposure to temperature cycling. One cycle consisted of a 1.5 hour ramp down to and a 1.5 hour dwell at -40°C, then a 1.5 hour ramp up to and a 1.5 hour dwell at 25°C, then a 1.5 hour ramp up to and a 1.5 hour dwell at 85°C, and finally, a 1.5 hour ramp back down to and 1.5 hour dwell at 25°C. The maximum transition rate between temperatures was 40°C per hour. Optical transmittance was recorded before and after exposure with the samples in place in the test chamber and 5 minutes before the end of each dwell during exposure. Final optical transmittance was recorded at ambient, after the samples were unmated, inspected, cleaned and remated.

3.5. Cable Retention

The coupling bushing of a mated connector pair was secured to the test fixture. The connector on the detector side of each mated sample was subjected to a sustained load of 177.92 N (40 lb. force) for 1 minute. The tensile load was applied by wrapping the fiber optic cable around a 3-inch diameter mandrel at a point no less than 6 inches from the rear of the strain relief to the cable-to-mandrel tangent point. Loading was applied at a rate of 1 inch per minute (approximately 0.016 inch per second). Final optical transmittance was recorded after the load was removed.

3.6. Durability

The connector on the detector side of the mated samples was subjected to 200 cycles of durability, stopping every 10 cycles to clean the optical interface. Samples were manually cycled at a rate not in excess of 300 cycles per hour. Optical transmittance was measured before the test and after every 50 cycles. Samples were unmated, cleaned, inspected, and remated before each measurement.

4. VALIDATION

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