Connector, AMP* LightCrimp* SC, Multimode, Ceramic, Fiber Optic

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP* LightCrimp* SC fiber optic connectors to determine conformance to the requirements of AMP Product Specification 108-1569 Rev. B.

1.2. Scope

This report covers re-qualification of the optical, environmental, and mechanical performance of AMP LightCrimp SC connector assemblies manufactured by the AMP Global Optical Cable & Accessories Group. Testing was performed between 08Nov96 and 31Mar97, at the Global Optical Cable & Accessories Test Laboratory.

1.3. Conclusion

The AMP LightCrimp SC connector assemblies, listed in paragraph 1.5., meet the optical, environmental, and mechanical performance requirements of AMP Product Specification 108-1569 Rev B.

1.4. Product Description

AMP LightCrimp SC connectors, while being fully compatible with AMP OPTIMATE* SC connectors and other SC-style multimode connectors, provide the advantage of not requiring epoxy during termination of the connector.

1.5. Test Samples

The test samples were randomly selected from current production lots. Test groups are described below.

Test group	1	2	3
Fiber size (microns/microns)	62.5/125	62.5/125	62.5/125
Cable type (See Note)	LDS	LDS	LDS
Cable P/N	503016-1	503016-1	503016-1
Connector kit P/N	503692-1	503692-1	503692-1
Coupling adapter P/N	1-502632-1	1-502632-1	1-502632-1
Test cable length (meters)	10	10	10
Test samples required	5	5	5
Control samples required	1	0	0

NOTE *Light Duty Single, 3.0mm diameter*

1.6. Qualification Test Sequence

Test or Examination	Test group		
	1	2	3
	Test Sequence (a)		
Examination of product	1	1	1
Insertion loss	2	2	2
Temperature cycling	3		
Humidity, steady state	4		
Coupling mechanism strength		3	
Cable flexing		4	
Twist		5	
Durability		6	
Off axial pull strength (90°)			3
Change in optical transmittance (b)	5	7	4

NOTE

(a) The numbers indicate the sequence in which tests were performed.
(b) Change in optical transmittance was measured during and after Temperature Cycling, Humidity, Cable Flexing, and Durability.

2. SUMMARY OF TESTING

2.1 Examination of Product

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Global Optical Cable & Accessories Group.

2.2. Insertion Loss

The insertion loss of the test samples met the maximum allowed specification requirements. Insertion loss was measured at 1300nm for all samples.

Insertion loss (dB)

Test group	1	2	3
Maximum allowed average per test group	0.4	0.4	0.4
Maximum allowed value for any single sample	0.7	0.7	0.7
Actual average of all values per test group	0.1	0.0	0.1
Actual maximum value for any single sample	0.2	0.1	0.1

2.3. Change in Transmittance

The change in optical transmittance of the test samples met the maximum allowed specification requirements. Change in optical transmittance was measured at 1300nm for all samples.

Group	Condition	Requirements (during)	Requirements (after)	Actual (during)	Actual (after)
1	Temperature Cycling	-0.5 dB group average -1.0 dB single sample	-0.5 dB group average -1.0 dB single sample	0.0 dB group average -0.3 dB single sample	0.0 dB group average 0.0 dB single sample
1	Humidity, steady state	-0.3 dB group average -0.6 dB single sample	-0.3 dB group average -0.6 dB single sample	-0.2 dB group average -0.5 dB single sample	0.0 dB group average 0.0 dB single sample
1	Change in optical transmittance (end of sequence)	Not required	-0.5 dB group average -0.7 dB single sample	Not required	-0.4 dB group average -0.5 dB single sample
2	Coupling Mechanism Strength	Not required	-0.4 dB group average -0.6 dB single sample	Not required	-0.4 dB group average -0.4 dB single sample
2	Cable flexing	-0.3 dB group average -0.5 dB single sample	-0.3 dB group average -0.5 dB single sample	-0.1 dB group average -0.1 dB single sample	0.0 dB group average -0.1 dB single sample
2	Twist	Not required	-0.3 dB group average -0.5 dB single sample	Not required	0.0 dB group average 0.0 dB single sample
2	Durability	-0.4 dB group average -0.7 dB single sample	-0.4 dB group average -0.7 dB single sample	0.0 dB group average 0.0 dB single sample	0.0 dB group average 0.0 dB single sample
2	Change in optical transmittance (end of sequence)	Not required	-0.5 dB group average -0.7 dB single sample	Not required	-0.4 dB group average -0.5 dB single sample
3	Off axial pull strength (90°)	Not required	-0.5 dB group average -0.7 dB single sample	Not required	-0.3 dB group average -0.6 dB single sample
3	Change in optical transmittance (end of sequence)	Not required	-0.5 dB group average -0.7 dB single sample	Not required	-0.4 dB group average -0.5 dB single sample

2.4 Temperature Cycling

There was no evidence of physical damage to the connector or attached cable and no change in optical performance beyond the specified limits during and after temperature cycling.

2.5. Humidity, Steady State

There was no evidence of physical damage to the connector or attached cable and no change in optical performance beyond the specified limits during and after humidity testing.

2.6. Coupling Mechanism Strength

There was no evidence of physical damage to the connector or attached cable and no change in optical performance beyond the specified limits after coupling mechanism strength testing.

2.7. Cable Flexing

There was no evidence of physical damage to the connector or attached cable and no change in optical performance beyond the specified limits after cable flex testing.

2.8. Twist

There was no evidence of physical damage to the connector or attached cable and no change in optical transmittance beyond the specified limits after twist testing.

2.9. Durability

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 testing.

2.10. Off Axial Pull Strength (90°)

There was no evidence of physical damage to the connector or attached cable and no change in optical transmittance beyond the specified limits after off axial pull strength testing.

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

A restricted launch condition was created by wrapping the test cables around a mandrel of prescribed size for the fiber used. The initial optical power through the cables was measured and recorded. The cables were then cut in the middle and the test samples terminated to the ends in accordance with AMP Instruction Sheet 408-4066. Each sample was mated, unmated, and cleaned a total of 10 times and the optical power was measured and recorded after each cycle. Optical power readings were compensated by any source power variations indicated by a source monitor cable.

3.3. Change in Optical Transmittance

The initial power through the connector samples was recorded before the test using an optical source and detector. Optical power through the samples was measured during, when specified, and after each test. Changes in optical transmittance were calculated by taking the difference between the initial measurements and the during/after measurements. Change in control cable power was less than the 0.05dB limit and was neglected in power and loss calculations.

3.4. Temperature Cycling

The samples were subjected to 5 cycles of temperature cycling. Each cycle lasted 10 hours for a total exposure time of 50 hours. One cycle consisted of a 1.5 hour ramp down to and a 1 hour dwell at -40°C, then a 1.5 hour ramp up to and a 1 hour dwell at 25°C, then a 1.5 hour ramp up to and a 1 hour dwell at 65°C, and finally a 1.5 hour ramp down to and a 1 hour dwell at 25°C. Optical transmittance was measured before and after exposure with the samples in place in an environmental chamber and 5 to 10 minutes before the end of each dwell during exposure. Final optical transmittance was taken after the samples were unmated, cleaned, inspected, and remated.

3.5. Humidity, Steady State

The samples were preconditioned at 50°C and 30% relative humidity for a period of 24 hours. Immediately following preconditioning, the samples were subjected to 60°C and 95% RH for a period of 96 hours. Optical transmittance was measured 1 hour after preconditioning and once every 24 hours during exposure. One to two hours after humidity exposure, the samples were unmated, cleaned, inspected, and remated and the final optical transmittance was measured.

3.6. Coupling Mechanism Strength

The samples were mated with a coupling bushing that was mounted in a fixed vertical position. The detector side of the samples was secured by wrapping the fiber optic cable around a 3-inch mandrel at a minimum distance of 8 inches behind the strain relief. A 33 N [7.5 lb.] tensile load was applied to the detector side of the sample at a rate of separation of 1 inch per minute. After a 1 minute period the load was removed. The samples were unmated, inspected, cleaned and remated. Optical measurements were taken before the load was applied, 30 seconds after the load was removed, and after cleaning and inspection.

3.7. Cable Flexing

The samples were subjected to 500 cycles of flexing at a rate of 15 cycles per minute. A tensile load of 0.5 kg [1.1 lb.] was applied to the cable on the detector side of the sample at a minimum distance of 8 inches behind the strain relief. The flex arc was ± 90° from a vertical position. Optical transmittance was measured before testing and after every 50 cycles with the load removed.

3.8. Twist

Samples were subjected to 10 cycles of twist at a rate of 30 cycles per minute. A tensile load of 2.5 kg [5.51 lb.] was applied to the cable on the source side of the mated samples. The twist direction was ± 90° about the axis of the cable. Optical transmittance was measured before and after testing with the load removed.

3.9. Durability

The connectors on the detector side of the mated samples were subjected to 500 cycles of durability. Samples were manually cycled at a rate not in excess of 300 cycles per minute. Optical transmittance was measured before the test and after every 50 cycles. Samples were unmated, cleaned, inspected and remated before each measurement.

3.10. Off Axial Pull Strength (90°)

The samples were mated with a coupling bushing that was mounted in a fixed horizontal position. The detector side of the samples was secured by wrapping the fiber optic cable around a 3-inch mandrel at a minimum distance of 8 inches behind the strain relief. A 22 N [5.0 lb.] tensile load was applied to the detector side of the sample at a rate of separation of 1 inch per minute. After a 5 second period the load was removed. The samples were unmated, inspected, cleaned and remated. Optical measurements were taken before the load was applied, 30 seconds after the load was removed, and after cleaning and inspection.

4. VALIDATION

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