CONNECTOR, OPTIMATE™, SINGLE MODE, CERAMIC, 2.5mm BAYONET, FIBER OPTIC

1. Introduction

1.1 Purpose

Testing was performed on AMP™ OPTIMATE , Single Mode, Ceramic 2.5mm Bayonet, Fiber Optic Connectors to determine its conformance to the requirements of AMP Product Specification 108-1361 Rev. O.

1.2 Scope

This report covers the optical, mechanical, and environmental performance of the OPTIMATE , Single Mode, Ceramic 2.5mm Bayonet, Fiber Optic Connector manufactured by the Optical Connector & Assemblies Division. The testing was performed between December 14, 1994 and March 22, 1995.

1.3 Conclusion

The OPTIMATE , Single Mode, Ceramic 2.5mm Bayonet, Fiber Optic Connector, listed in paragraph 1.5, meets the optical, mechanical, and environmental performance requirements of AMP Product Specification 108-1361 Rev O.

1.4 Product Description

The OPTIMATE Single Mode, Ceramic 2.5mm Bayonet Fiber Optic Connector is 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 single-mode optical fiber. The following sample quantities were used for each test group.1

Test Group	1	2
Fiber size (microns/microns)	9.5/125	9.5/125
Cable type	LDS(a)	LDS(a)
Cable part number	501530-1	501530-1
Connector kit part number	502579-1(b)	502579-1(b)
Connector kit part number	502579-2(b)	502579-2(b)
Coupling bushing part number	502750-1	502750-1
Test cable length	20m(65.6 feet)	20m(65.6 feet)
Test samples required	7	7
Control cables required	1	1

(a) Light Duty Single, 3.0mm diameter
(b) Fiber fit per IS 408-9645

1.6 Qualification Test Sequence

Test or Examination	Test Groups	
	1	2
Examination of product	1	1
Insertion loss	2	2
Reflectance	3	3
Thermal Age	4	
Humidity	5	
Thermal Cycling	6	
Coupling Mechanism Strength		4
Cable Retention		5
Cable Flexing		6
Twist		7
Durability		8

The numbers indicate sequence in which tests were performed.

Change in Transmittance was measured during and after Humidity, Temperature Cycling, and Durability. Change in Transmittance was also measured after Thermal Age, Coupling Mechanism Strength, Cable Retention, Flex, and Twist.

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 insertion loss measurements were less than the maximum allowed specification requirements at 1310nm and 1550nm .

Insertion Loss (dB)

	Requirement		Actual			
			1310nm		1550nm	
Group	**Maximum Average**	**Maximum Single Sample**	**Group Average**	**Single Sample**	**Group Average**	**Single Sample**
1	0.3	0.75	0.1	0.25	0.2	0.32
2			0.1	0.22	0.2	0.46

2.3 Reflectance - Groups 1& 2

Reflectance measurements met the maximum allowed specification requirements. Reflectance was measured at 1310nm and 1550nm wavelengths.

Reflectance (dB)

Group	Requirement (Maximum)	1310nm (Actual)	1550nm (Actual)
1	-40	-48.95	-51.63
2		-44.81	-47.80

Change in Optical Transmittance (dB) (Increase in loss)				1310 nm		1550 nm	
Group	Condition	Limits (during)	Limits (after)	Change (during)	Change (after)	Change (during)	Change (after)
1	Thermal Age	Not required	-0.2 dB group average -0.4 dB single sample	Not required	0.0 dB group average -0.1 dB single sample	Not required	0.0 dB group average -0.1 dB single sample
1	Humidity	-0.2 dB group average -0.4 dB single sample	-0.2 dB group average -0.4 dB single sample	0.0 dB group average 0.0 dB single sample	0.0 dB group average -0.1 dB single sample	0.0 dB group average 0.0 dB single sample	0.0 dB group average 0.0 dB single sample
1	Temperature Cycling	-0.3 dB group average -0.5 dB single sample	-0.2 dB group average -0.4 dB single sample	0.0 dB group average -0.5 dB single sample	0.0 dB group average -0.1 dB single sample	0.0 dB group average -0.4 dB single sample	-0.1 dB group average -0.1 dB single sample
2	Coupling Mechanism Strength	Not required	-0.2 dB group average -0.4 dB single sample	Not required	0.0 dB group average -0.1 dB single sample	Not required	0.0 dB group average -0.1 dB single sample
2	Cable Retention	Not required	-0.2 dB group average -0.4 dB single sample	Not required	0.0 dB group average -0.2 dB single sample	Not required	0.0 dB group average -0.1 dB single sample
2	Cable Flex	Not required	-0.2 dB group average -0.4 dB single sample	Not required	0.0 dB group average -0.2 dB single sample	Not required	0.0 dB group average 0.0 dB single sample
2	Twist	Not required	-0.2 dB group average -0.4 dB single sample	Not required	0.0 dB group average 0.0 dB single sample	Not required	0.0 dB group average -0.1 dB single sample
2	Durability	-0.2 dB group average -0.4 dB single sample	-0.2 dB group average -0.4 dB single sample	0.0 dB group average -0.1dB single sample	0.0 dB group average -0.1 dB single sample	0.0 dB group average -0.1 dB single sample	0.0 dB group average -0.1 dB single sample

Reflectance Maximum				1310 nm		1550 nm	
Group	Condition	Limits (during)	Limits (after)	Maximum (during)	Maximum (after)	Maximum (during)	Maximum (after)
1	Thermal Age	Not required	-40 dB	Not required	-48 dB	Not required	-50 dB
1	Humidity	-40 dB	-40 dB	-50 dB	-44 dB	-51 dB	-47 dB
1	Temperatur e Cycling	-40 dB	-40 dB	-43 dB	-46 dB	-45 dB	-49 dB
2	Coupling Mechanism Strength	Not required	-40 dB	Not required	-45 dB	Not required	-48 dB
2	Cable Retention	Not required	-40 dB	Not required	-46 dB	Not required	-49 dB
2	Cable Flex	Not required	-40 dB	Not required	-46 dB	Not required	-49 dB
2	Twist	Not required	-40 dB	Not required	-47 dB	Not required	-48 dB
2	Durability	-40 dB	-40 dB	-47 dB	-47 dB	-50 dB	-50 dB

2.4 Thermal Age - 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 thermal age. Change in optical transmittance and reflectance was measured at 1310nm and 1550nm wavelengths.

2.5 Humidity - 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 humidity. Change in optical transmittance and reflectance was measured at 1310nm and 1550nm wavelengths.

2.6 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 and reflectance was measured at 1310nm and 1550nm wavelengths.

2.7 Coupling Mechanism Strength - Group 2

There was no evidence of physical damage to the connector and no change in optical performance beyond the specified limits after coupling mechanism strength. Change in optical transmittance and reflectance was measu at 1310nm and 1550nm wavelengths.

2.8 Cable Retention - Group 2

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 and reflectance was measured at 1310nm and 1550nm wavelengths.

2.9 Cable Flexing - Group 2

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 flexing. Change in optical transmittance and reflectance was measured at 1310nm and 1550nm wavelengths.

2.10 Twist - Group 2

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 twist. Change in optical transmittance and reflectance was measured at 1310nm and 1550nm wavelengths.

2.11 Durability - Group 2

There was no evidence of physical damage to the connector and no change in optical performance beyond the specified limits after durability. Change in optical transmittance and reflectance was measured at 1310nm and 1550nm wavelengths.

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

Insertion loss is calculated using measurements of transmitted power, and a channel constant. The channel constant is based on cutback measurements that are made at the end of the test procedures. All insertion loss measurements were normalized to the average of 4 source channels.

The initial optical power (dBm) through the fiber/test sample was recorded before the test. Relative optical power (dB) through the fiber (test sample) 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.

3.3 Reflectance

For each sample, reflectance was determined from measurements of reflected power. These measurements are normalized to the value obtained from a reference reflector.

3.4 Thermal Age

After samples were placed in the test chamber, initial optical transmittance and reflectance readings were recorded. The samples were then subjected to 85°C for a period of 14 days. After returning to ambient conditions, samples were permitted to reach thermal equilibrium before final optical transmittance and reflectance readings were recorded.

3.5 Humidity, Steady State

Samples were subjected to 75°C at 95% RH for a period of 14 days. Initial optical transmittance and reflectance readings were recorded 1 hour prior to attaining 75°C at 95% RH and once every 6 hours during exposure. Samples were exercised at the completion of exposure at high humidity prior to returning to room temperature. The samples were exercised after opening the chamber by removing and reinserting one plug of the connector assembly (receive side). Final optical transmittance and reflectance readings were recorded at least two hours after humidity exposure.

3.6 Temperature Cycling

Samples were subjected to 42 cycles of temperature extremes, each cycle consisting of 8 hours, for a total of 336 hours exposure to temperature cycling. One cycle consisted of a 1 hour dwell at 23°C, 1 hour ramp up to 75°C, and a 1 hour dwell at 75°C, then a 1 hour ramp down to 23°C and a 1 hour dwell at 23°C, then a 1 hour ramp down to -40°C, and a 1 hour dwell at -40°C, and finally, a 1 hour ramp back up to 23°C. Optical transmittance and reflectance readings were recorded before and after exposure with the samples in place in the test chamber and 15 minutes before the end of each dwell during exposure. Final optical transmittance and reflectance readings were recorded at least two hours after temperature cycling exposure, after the samples were unmated, inspected, cleaned and remated.

3.7 Coupling Mechanism Strength

The connector on the detector side of the samples was mated to the coupling bushing in a fixed position then subjected to a sustained load of 111N (25 lbf) for 1 minute. Loading was applied and released at a rate of 2.54 mm/min. Final optical transmittance and reflectance readings were recorded after samples were inspected, cleaned and remated.

3.8 Cable Retention

The connector on the detector side of the samples was supported from behind the coupling nut in a fixed position and subjected to a sustained load of 178N (40 lbf) for 1 minute. Loading was applied and released at a rate of 25.4 mm/min. Final optical transmittance and reflectance readings were recorded after the samples were inspected, cleaned, and remated.

3.9 Cable Flex

Samples were subjected to 500 cycles of cable flexing. Samples were tested at a rate of 15 cycles per minute. A tensile load of 0.5kg (1.10 lbs) was applied to the cable on the detector side of the unmated samples. The flex arc was ±90° from a vertical position. Optical transmittance and reflectance readings were recorded before and after test with load removed.

3.10 Twist

Samples were subjected to 10 cycles of twist. Samples were tested at a rate of 15 cycles per minute. A tensile load of 2.5kg (5.50 lbs) was applied to the cable on the detector side of the mated samples. The twist direction was ±90° about the axis of the cable. Optical transmittance and reflectance readings were recorded before and after test with load removed.

3.11 Durability

The connector on the detector side of the mated samples was subjected to 100 cycles of durability. Samples were manually cycled at a rate not in excess of 300 cycles per hour. Optical transmittance and reflectance readings were recorded before test and after every 50 cycles. Samples were unmated, cleaned, inspected, and remated before each optical transmittance and reflectance measurement.

4. Validation

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