

AMP SECURITY CLASSIFICATION  
Customer Release

Product Specification  
108-5233  
AMP OPTIMATE MINI-DNP Fiber Optic Connectors

1. Scope

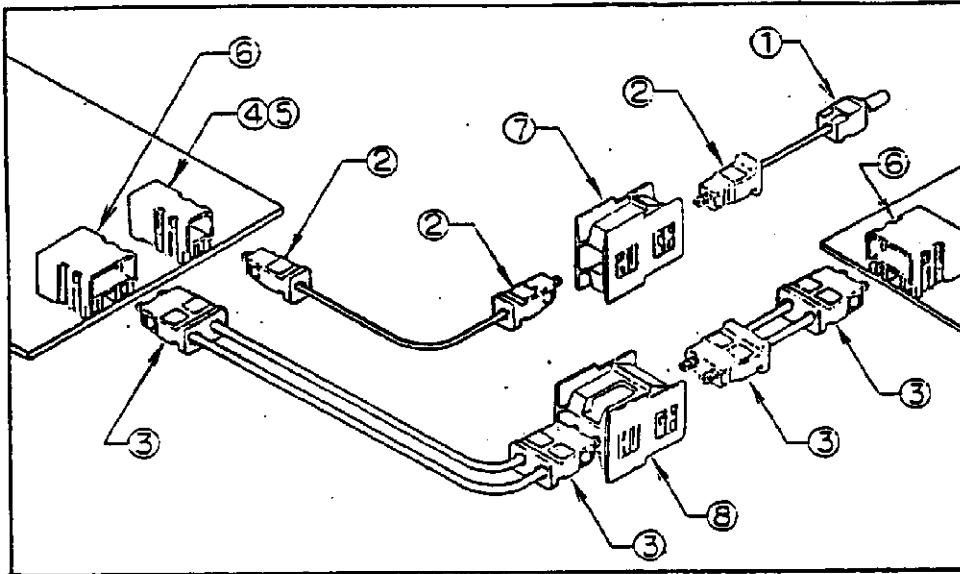
This specification covers the requirements for product specification and performance in relation with the following products, and AMP-assembled products, using these products, belonging to AMP OPTIMATE MINI-DNP fiber optic connectors.

No.	Part No.	Product Descriptions	Materials
①	174130-□	Single-position, sensor head assembly	Housing: Glass containing thermoplastic polyester (UL94V-0) Retainer: Tin-plated brass
②	174131-□	Single-position, plug assembly	
③	174132-□	2-positions, plug assembly	
④	174125-□	Single-position, ADM* for 4φ-ceramic type	Housing: Glass containing thermoplastic polyester (UL94V-0) Retainer: Solder-plated steel wire
⑤	174126-□	Single-position, ADM for side-view type	
⑥	174127-□	2-positions, ADM for side-view type	
⑦	174136-□	Single-position, splice bushing	Housing: Glass containing thermoplastic polyester (UL94V-0)
⑧	174137-□	2-position splice bushing (with panel lock)	

\* ADM stands for Active Device Mount  
(Receptacle housing of active device, to be mounted on PC board)

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				CHK	<i>Kei Takahashi</i>			LOC	NO	REV
B	Revised RFA-1368	KT	1/13	APP	<i>K. Takahashi</i>		J	A	108-5233	B
A	Revised RFA-1071	KT	1/13							
O	Released RFA-1039	KT	1/13							
LTR	REVISION RECORD	CR	CHK	DATE	SHEET		Product Specification AMP OPTIMATE MINI-DNP Fiber Optic Connectors			
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The encircled numbers correspond with those shown in the left end column of the product description listing on Sheet 1 of 10.

2. Working Conditions:

2.1 Temperature Rating:

-30°C thru 105°C (It may be limited by used fiber cables and active devices.)

2.2 Applicable Plastic Optical Fiber Cables

Fiber Diameter (Cladding Dia.) (mm)	Jacket Diameter (mm)
0.5 ± 0.03	1.5 ± 0.05
0.75 ± 0.03	1.8 ± 0.05 2.2 ± 0.07
1.0 ± 0.06	2.2 ± 0.07

2.3 Applicable Active Devices

ADM Part No.	Type of Applicable Devices
174125- <input type="checkbox"/>	Ceramic packaging in size of 4ø x 3H
174126- <input type="checkbox"/>	Side view type (molded part in size of 4.5w x (3.9~6)h x 2.1t) of vertical lead packaging Devices
174127- <input type="checkbox"/>	

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3. Product Performance and Test Methods

3.1 Product Performance

The product performance shall be conforming to the requirements specified in Fig. 1, when tested in accordance with the test methods specified in section 3.2, "Test Sequence".

	Items	Performance Requirements	Test Method												
Fundamental Performance	Appearance	No abnormalities such as cracks, blister and discoloration that are detrimental to the product functions, shall be present.	Visually and tactually inspect in accordance with the applicable inspection procedures.												
	Coupling Loss	1 dB max. in comparison with optimum condition when optical emitter/detector are connected.	Measure coupling loss when ADM optical transmitter/detector and plug(s) are connected (See Note 1).												
	Insertion Loss	2 dB max. when measured by the connector insertion method.	Measure insertion loss when plugs are connected with a splice bushing (See Note 2).												
	Insertion and Extraction Force of Plug	<table border="0"> <tr> <td></td> <td>Insertion</td> <td>Extraction</td> </tr> <tr> <td></td> <td>0.7-2.5Kg</td> <td>0.7-2.5Kg</td> </tr> <tr> <td>1-Position</td> <td>"</td> <td>"</td> </tr> <tr> <td>2-positions</td> <td>"</td> <td>"</td> </tr> </table>		Insertion	Extraction		0.7-2.5Kg	0.7-2.5Kg	1-Position	"	"	2-positions	"	"	Operate at a rate of 100 mm/min.
		Insertion	Extraction												
	0.7-2.5Kg	0.7-2.5Kg													
1-Position	"	"													
2-positions	"	"													
Cable Retention Force	Fiber Diameter (mm) 0.5 : 1.5 kg min. 0.75: 4.0 kg min. 1.0 : 5.0 kg min.	Pull at a rate of 100 mm/min.													

Fig. 1

(To be continued)

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	Items	Performance Requirements	Test Method
Durability Performance	Repeated Insertion and Extraction	Change of the coupling/ insertion loss: 0.5dB max. Connectors shall meet the performance requirements of cable retention force.	Repeated insertion/ extraction conditioning shall be applied with the frequency not exceeding 20 cycles a minute totally 50 cycles.
	Vibration		Apply sweeping vibration changing 10~2000~10Hz in 20 minutes for 2 hours with the amplitude of 1.5 mm or the magnitude of 15G's in the three dimensional directions, X, Y & Z (total 6 hours). Change of the coupling/ insertion loss shall be monitored during the test. This method conforms to JIS C 5025.
Environmental Performance	Temperature Cycling	Change of the coupling/ insertion loss: 0.5dB max.	-25 ~ 20 ~ 70°C/2H 10 cycles (See Note 3.) Change of the coupling/ insertion loss shall be monitored during the test in every 30 seconds.
	Temperature/ Humidity Cycling		90 ~ 96%, 25 ~ 65°C: 24H 10 cycles. This method conforms with JIS-C5024 (except for the vibration section g"). Recondition in the room temperature for 2 hours and measure the change of coupling/insertion loss.

Fig. 1

(To be continued)

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	Items	Performance Requirements	Test Method
Environmental Performance	Heat Resis-tivity	Change of the coupling/ insertion loss: 0.5 dB max. Connectors shall meet the performance requirements of cable retention force.	70°C: 96H This method conforms with JIS-C5022. Recondition in the room temperature for 2 hours and measure the change of the coupling/insertion loss.
	Cold Resis-tivity		-25°C: 96H This method conforms with JIS-C5021. Recondition in the room temperature for 2 hours and measure the change of the coupling/insertion loss.
	Salt Spray	Connectors shall meet the performance requirements of cable retention force.	5% salt water: 48H This method conforms with JIS-C5028.

(Note 1) Coupling Loss


(1) ADM for side-view type

1) Measuring condition

In the measurement of coupling loss and its changes, power source shall be driven at the constant current of 20±5 mA with the use of LED having 660±10 nm wave length and 0.2 square to 0.3 square in chip size. Select LED with which its light emitting portion is centrally aligned within 0.1 mm to use it for the test. Performance for detector represent its capability to above LED. Use an optical power meter or a detector which has the area being capable to receive all of the output power from the fiber for the measurement.

2) Measuring method of coupling loss

- i. Axially align the LED with the fiber for measurement with the use of the fine adjustment stage etc. without using an ADM to record the maximum value by the measurement equipment. This value is defined as Yo.
- ii. Fix this LED into the ADM to connect with the same fiber for measurement to measure emitting power. This measuring value is defined as Xo.

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iii. Calculate Coupling Loss (Lo) by using the following formulae.

For X<sub>o</sub> and Y<sub>o</sub> measured in mW or mV:

$$L_o = -10 \log_{10} (X_o/Y_o) \quad (\text{dB})$$

For X<sub>o</sub> and Y<sub>o</sub> measured in dBm or dBμ:

$$L_o = Y_o - X_o \quad (\text{dB})$$

3) Measurement of loss change

Measure emitting power from the fiber which is connected with the ADM for measurement. When any change occurs in performance of the optical fiber and the transmitter during each test, it shall be taken into consideration in the calculation of the coupling loss. The calculation shall be made with the use of the following formulae.

For X<sub>1</sub> and Y<sub>1</sub> measured in mW or mV:

$$\Delta L_1 = | 10 \log_{10} (X_o/Y_o) | - \alpha \quad (\text{dB})$$

For X<sub>1</sub> and Y<sub>1</sub> measured in dBm or dBμ:

$$\Delta L_1 = Y_1 - X_1 - \alpha \quad (\text{dB})$$

where, X<sub>1</sub>: The minimum reading during test or reading after test

Y<sub>1</sub>: The maximum reading during test or reading before test


α: Change of optical fiber and LED in performance (unit: dB)

(2) ADM for 4φ ceramic package type (applicable only to detectors)

1) Measuring condition

Select detectors with which its light detecting portion is centrally aligned within 0.1 mm to use it for the test. Use LED as the light source with wave length 560+10 nm or 660+10 nm guided by plastic fiber whose length is less than 1.0 meter.

The output power from the fiber shall be in the range of 10 to 30 μW. The optical current in the detector should be converted into voltage to read value.

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2) Measuring method of coupling loss

- i. Axially align the detector with the fiber incidented from the light source with the use of the fine adjustment stage etc. without using an ADM to record the maximum value by the measurement equipment. This value is defined as  $Y_2$ .
- ii. Fix this detector into the ADM to connect with the same fiber incidented light from the light source for measurement to measure emitting voltage. This measuring value is defined as  $X_2$ .
- iii. Calculate Coupling Loss ( $L_2$ ) by using the following formula.

$$L_2 = -10 \log_{10} (X_2/Y_2) \quad (\text{dB})$$

3) Measurement of changes of coupling loss

Measure light incident power in voltage from the fiber which is connected with the ADM for the measurement. When any change occurs in performance of optical fiber and detector during each test, it shall be taken into consideration in the calculation of coupling loss. The calculation shall be made with the use of the following formula.


$$\Delta L_3 = | 10 \log_{10} (X_3/Y_3) | - \alpha \quad (\text{dB})$$

- where,  $X_3$ : The minimum reading during test or reading after test
- $Y_3$ : The maximum reading during test or reading before test
- $\alpha$ : Change of optical fiber and detector in performance (unit: dB)

(Note 2) Insertion Loss

1) Measurement condition

Use LED having  $660 \pm 10$  nm wave length as a light source of the test. Use an optical power meter or a detector which has the area being capable to receive all of the output power from the fiber for the measurement.

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2) Measuring method of insertion loss

- i. Connect the light source with the measurement equipment using plastic fiber within 2 meter in length and read the emitting power. This value is defined as  $Y_4$ .
- ii. Cut middle area of the plastic fiber and attach MINI-DNP connector plugs on the both ends. And they should be reconnected using a splice bushing to read emitting power. This value is defined as  $X_4$ .
- iii. Calculate insertion loss ( $L_4$ ) by using the following formulae.

For  $X_4$  and  $Y_4$  measured in mW or mV:

$$L_4 = -10 \log_{10} (X_4/Y_4) \quad (\text{dB})$$

For  $X_4$  and  $Y_4$  measured in dBm or dBμ:

$$L_4 = Y_4 - X_4 \quad (\text{dB})$$

3) Measurement of insertion loss change

Measure emitting power from the fiber which plugs are connected with the splice bushing. When any change occurs in performance of optical fiber during each test, it shall be taken into consideration in the calculation of insertion loss. The calculation shall be made with the use of the following formulae.

For  $X_5$  and  $Y_5$  measured in mW or mV:

$$\Delta L_5 = |10 \log_{10} (X_5/Y_5)| - \alpha \quad (\text{dB})$$


For  $X_5$  and  $Y_5$  measured in dBm or dBμ:

$$\Delta L_5 = Y_5 - X_5 - \alpha \quad (\text{dB})$$

here,  $X_5$ : The minimum reading during test or reading after test

$Y_5$ : The maximum reading during test or reading before test

$\alpha$ : Change of optical fiber in performance  
(unit: dB)

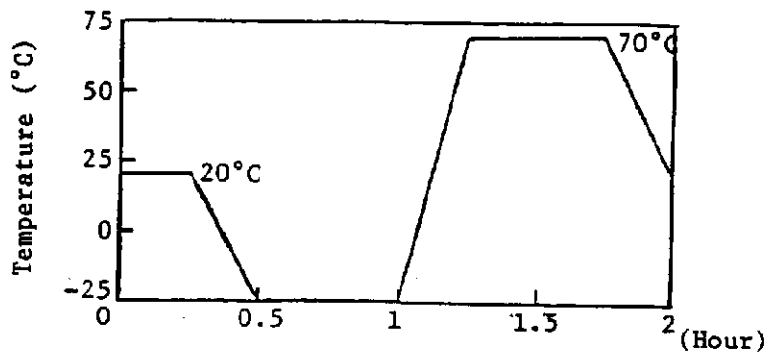
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(Note 3)

Temperature cycle  
1 cycle  
-25°C ~ 70°C 2H



### 3.2 Test Sequence

The test should be performed in the order which varies with test groups as shown in Fig.2.

Test Item	Test Group					
	I	II	III	IV	V	VI
Appearance	① ⑦	①④	①④	①④	①④	①③
Coupling loss Insertion loss	②⑤⑧	②⑤	②⑤	②⑤	②⑤	
Connector insertion and extraction force	③					
Cable retention force		⑨		⑥	⑥	④
Repeated insertion and extraction	④					
Vibration	⑥					
Temperature cycling		③				
Temperature-humidity cycling			③			
Heat resistivity				③		
Cold Resistivity					③	
Salt spray						②

Fig. 2

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## 4. Quality Assurance Provisions

## 4.1 Test Conditions

Performance testing shall be performed under any combination of the following test conditions, unless otherwise specified.

Temperature : 15°C - 35°C  
 Humidity : 45% - 75%  
 Atmospheric pressure: 650 mmHg - 800 mmHg

## 4.2 Test

## 4.2.1 Test Specimens


- (1) Test specimens used for the tests, shall meet the requirements specified in the applicable product drawings.
- (2)  $\varnothing$  ceramic type device shall be fixed to an ADM by using epoxy type bonding agent. For side-view type device, it shall be press-fitted without using bonding agent. However, perform positional adjustment in longitudinal direction of the leads of center tip for side-view device.
- (3) ADM and emitter/detector device shall be soldered onto PC board.
- (4) A connector shall be capable to accomplish assured connection with LED light source or proper measuring equipment having reproducibility of launched power.
- (5) Avoid giving any tensile force or bend less than 20R (mm) to the fiber. Keep out of dust from both ends of the fiber.

## 4.2.2 Number of Specimens

Subject each group consisting of six specimens to performance test.

## 4.3 Acceptance

- (1) All specimens tested in accordance with this specification shall meet the stated tolerance limit.
- (2) Failures attributed to equipment, test setup, or operators' deficiencies shall not disqualify the product. When product failure occurs caused under these circumstances, corrective action shall be taken and then restart selection of specimens and testing.

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