

Amphenol	The Product Specification For Connector M.2 series	Product Spec. # S-MDT-005		Date : Aug.27,2020
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# Product Specification For M.2 series connector

REVISION RECORD

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### 1.0 OBJECTIVE

This specification defines the performance, test, quality and reliability requirements of Amphenol M.2 series connector (Hereinafter referred to as for the connector).

### 2.0 SCOPE

This Specification includes the Materials/Finishing, Mechanical Characteristics, Electrical Characteristics and Environmental requirements of the connector.

### 3.0 APPLICABLE DOCUMENTS

#### 3.1 Application

3.1.1 Engineering drawings

#### 3.2 Military Standards

3.2.1 MIL-STD-202: Test Methods for Electronic Components Parts

3.2.2 MIL-C-45662 : Equipment Calibration

#### 3.3 Other Standards and Specifications

3.3.1 UL94 V-0 : Flammability

3.3.2 EIA 364 : Electrical Connector/Socket Test Procedures Including Environmental Classifications

3.3.3 PCI Express M.2 Specification

### 4.0 REQUIREMENTS

#### 4.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein. Unless otherwise specified, all measurements shall be performed within the following lab conditions:

Temperature : 15 to 35°C

Relative Humidity : 20% to 80%

Atmospheric Pressure : 650mm to 800mm of Hg (86 ~106Kpa)

#### 4.2 Material

Material for each part shall be specified herein, or equivalent. Substitute material shall meet the Performance requirements of this specification. Material should be fulfilled Amphenol Spec SSN002, for halogen free material, need meet Amphenol spec SSN004.

4.2.1 Housing: LCP, Black, UL94 V-0;

4.2.2 Contact: C5210 Copper alloy

Solder tabs: C2680 Copper alloy.

#### 4.3 Finish

Plated finished for qualification components shall be as specified herein or equivalent.

1.27 micron minimum nickel underplating with gold plated at the contact area and the solder area for the contacts. 1.27 micron minimum nickel underplating with 2.54 micron~5.08 micron pure matte Tin overall for solder tabs. No plating at cut-off point.

#### 4.4 Workmanship

The connector shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, blisters, pin holes, sharp edges, and other defects that will adversely affect product's life or serviceability.

### 5.0 ELECTRICAL CHARACTERISTIC

#### 5.1 Low Level Contact Resistance (LLCR)

The low-level contact resistance of the connector shall not exceed a change of 20m ohm after environmental exposure when measured in accordance with EIA 364-23B. The maximum initial signal contact resistance is 55m ohm. The following details shall apply:

- a) Test Voltage: 20mV DC maximum at open circuit.
- b) Test Current: not to exceed 100mA.

#### 5.2 Insulation Resistance

The insulation resistance shall not be less than 500M ohm when measured in accordance with EIA 364-21C. The following details shall apply:

- a) Test Voltage: 300V DC.
- b) Preparation: The connectors shall be unmated but not soldered to a PC board
- c) Electrification Time: 1 minute.
- d) Point of Measurement: Between adjacent contacts.

#### 5.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (1mA max) when the connectors are tested in accordance with EIA 364-20C, method B. The following details shall apply:

- a) Test Voltage: 300VAC (RMS).
- b) Test Duration : 1 minute
- c) Preparation : The connectors shall be unmated but not soldered to a PC board
- d) Test Condition : 1 (760Torr, or sea level)
- e) Points of measurement : Between adjacent contacts

#### 5.4 Current Rating

The temperature rise above ambient shall not exceed 30°C at any point in the system when contact positions specified are powered at the power levels specified herein:

- a) Reference : EIA 364-70, Method 2
- b) Ambient Conditions: still air at 25°C
- c) Current Rating : 1A per power contact (continuous)

### 6.0 MECHANICAL CHARACTERISTIC

#### 6.1 Insertion Force/Remove Force

The following details shall apply:

- a) Reference: EIA-364-13, Method A
- b) Insertion force: 25N Max, Remove Force: 25N Max

#### 6.2 Durability.

- a) Reference: EIA 364-09
- b) Number of Cycles: 60 cycles
- c) Cycling Rates: Maximum 200 cycles/hour
- d) No physical damage shall be observed

#### 6.3 Contact Retention

Individual contacts in the housing shall withstand an axial load of 100 grams minimum applied at a rate of 5.08mm/minute without dislodging from the housing cavity.

- a) Reference: EIA 364-29

### 7.0 ENVIRONMENTAL CHARACTERISTIC

After exposure to the following environmental conditions in accordance with the specified test procedures and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 5.0 and 6.0 as specified in Table 1 test sequence. Product subjected to these environmental tests must be applied to printed circuit boards. Unless otherwise specified, the assemblies shall be mated during exposure.

#### 7.1 Thermal Shock

- a) Reference: EIA 364-32, Test Condition I
- b) Number of cycles: 10
- c) Temperature range: Between -55°C and +85°C
- d) Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and shall meet requirements of additional tests as specified in the test sequence.

#### 7.2 Humidity

- a) Reference: EIA 364-31B, Method A, Test Condition A
- b) Duration of Cycles : 96 hours
- c) Relative Humidity : 90% ~ 95%
- d) Temperature Range : +40°C ± 2°C
- e) Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and shall meet requirements of additional tests as specified in the test sequence.

#### 7.3 Temperature Life

- a) Reference: EIA 364-17, Method A
- b) Test Duration : 135 hours
- c) Temperature : +115°C ± 2°C
- d) Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and shall meet requirements of additional tests as specified in the test sequence.

#### 7.4 Physical Shock

- a) Reference: EIA 364 - 27
- a) Condition: H ( 294 m/s 285G, 2msec, half-sine)
- b) Shocks: 3 shocks in each direction applied along three mutually perpendicular planes for a total of 18 shocks.
- c) Mounting: Rigidly mount assemblies
- d) No discontinuities greater than 1 µs and no physical damage observed.
- e) Free from any defect such as break, deformation, loosening and falling off etc. on each portion of the connector.

#### 7.5 Vibration (Random Vibration)

- a) Reference: EIA 364-1000 test group 3, EIA 364 - 28, test Condition VII, Test Letter D
- b) Duration : 15 minutes in each of 3 mutually perpendicular directions. Both mating halves should be rigidly fixed so as not to contribute to the relative motion of one contact against another. The method of fixturing should be detailed in the test report.
- c) No discontinuities of 1 µs longer duration.

## 7.6 Mix Flowing Gas (MFG)

- a) Reference: EIA 364-65, Class IIA, 5 days to simulate 3 years field life. EIA-364-1000 Option #2.
- b) Temperature: 30+/-1°C;
- c) Gas Concentration: Cl<sub>2</sub> 10+/-3ppb, NO<sub>2</sub> 200+/-50ppb, H<sub>2</sub>S 10+/-5ppb, SO<sub>2</sub> 100+/-20ppb
- d) Humidity: 70+/-2% RH
- e) Duration: 120 hours

## 7.7 Thermal disturbance

Cycle the connector or socket between 15 °C ± 3 °C and 85 °C ± 3 °C, as measured on the part. Ramps should be a minimum of 2 °C per minute, and dwell times should insure that the contacts reach the temperature extremes (a minimum of 5 minutes). Humidity is not controlled. Perform 10 such cycles.

## 7.8 Solderability (Lead-Free).

The termination is at least 95% covered by a cont In accordance with MIL-STD-202 Method 208.

The following details shall apply:

- a) Solder Time: 5 seconds
- b) Solder Temperature: 245±5°C

## 7.9 Salt Spray.

- a) Reference: EIA 364-26, Test Condition B.
- b) Temperature: 35+1/-2°C;
- c) Concentration: 5%;
- d) Humidity: 95~98% RH
- e) Duration: 48 hour

## 7.10 Resistance to soldering heat (Lead-Free).

- a) Reference: EIA 364-56
- a) Pre-heating: +150°C ~ 200°C, 60 ~ 180 sec
- b) Soldering: 230°C min. 60 sec max.
- c) Peak Temperature : 260°C max, 10 max
- d) Number of times : 2 times

## 8.0 QUALITY ASSUANCE PROVISIONS

### 8.1 Equipment Calibration.

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with MIL-C-45662 and ISO 9000.

### 8.2 Inspection Condition.

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a) Temperature :  $25 \pm 5^{\circ}\text{C}$
- b) Relative Humidity : 30% ~ 60%
- c) Barometric Pressure: Local ambient

### 8.3 Sample Quantity and Description

The numbers of samples to be tested in each group shown in Qualification Testing Sequences are defined as follows: Groups A through J:

5 samples in each group: All samples must be free of defects that would impair normal connector operation. All samples must meet dimensional requirements of connector.

### 8.4 Acceptance

8.4.1 Electrical and mechanical requirements placed on test samples as indicated in Paragraphs 5.0 and 6.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

8.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective actions shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

### 8.5 Qualification Testing.

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequence shall be as shown in Qualification Testing Sequences

Visual Examination : EIA 364-18

### 8.6 Re-qualification Testing.

If any of the following conditions occur, the responsible product engineer shall initiate re-qualification testing consisting of all applicable parts of the qualification test matrix Table 1.

- a) A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.
- b) A significant change is made to the manufacturing process, which impacts the product form, fit or function.
- c) A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

### Qualification Testing Sequences

TEST OR EXAMINATION		TEST GROUP								
		A	B	C	D	E	F	G	H	I
	item									
Examination of connector(s)	4.4	1,8	1,10	1,9	1,12	1,9	1,7	1,5	1	1
Low Level Contact Resistance	5.1	2,5,7	2,5,7,9	2,5,8	2,5,7,9,11	4,6	2,6	2,4		
Insulation Resistance	5.2					3,8				
Dielectric Withstanding Voltage	5.3					2,7				
Current Rating	5.4						4			
Insertion/Remove Force	6.1						3 <sup>(2)</sup> ,5 <sup>(2)</sup>			
Durability	6.2	3 <sup>(1)</sup>	3 <sup>(1)</sup>	3 <sup>(1)</sup>	3 <sup>(1)</sup>	5 <sup>(2)</sup>				
Contact Retention	6.3									3
Thermal Shock	7.1		4							
Humidity	7.2		6							
Temperature Life	7.3	4		4 <sup>(1)</sup>	4 <sup>(1)</sup>					
Physical Shock	7.4			7						
Vibration	7.5			6						
Mixed Flowing Gas	7.6				6					
Thermal disturbance	7.7				8					
Solderability (Lead-free)	7.8								2	
Salt Spray	7.9							3		
Resistance to soldering heat (Lead-free)	7.10									2
Reseating(manually unplug/plug three times)		6	8		10					

Remark

1. 5pcs samples in each group