

NUMBER <b>GS-12-1536</b>	CATEGORY <b>PRODUCT SPECIFICATION</b>	<b>Amphenol FCI</b>	
TITLE  <b>Cross-Mate™ Series Connector</b>		PAGE 1 of 10	REVISION A
		GUARDIAN (VERIFIED BY) Nick. Zhang	DATE 10/31/19
		APPROVED BY Tim Yao	
		CLASSIFICATION : <b>UNRESTRICTED</b>	

## 1.0 OBJECTIVE

This specification defines the performance, test, quality and reliability requirements of the Cross-Mate™ Series Connector.

## 2.0 SCOPE

This specification defines the detailed requirements for the Cross-Mate™ Board connectors including vertical and right angle connectors with Tin or Gold plating, and wire connector series terminated with 24 to 26AWG wires using crimp technology.

## 3.0 GENERAL

This document is composed of the following sections:

Paragraph	Title
1.0	OBJECTIVE
2.0	SCOPE
3.0	GENERAL
4.0	APPLICABLE DOCUMENTS
5.0	REQUIREMENTS
5.1	Qualification
5.2	Definitions
5.3	Material
5.4	Finish
5.5	Design and Construction
6.0	TEST METHODS AND REQUIREMENTS
6.1	ELECTRICAL CHARACTERISTICS
6.2	MECHANICAL CHARACTERISTICS
6.3	ENVIRONMENTAL CONDITIONS
7.0	QUALITY ASSURANCE PROVISIONS
7.1	Equipment Calibration
7.2	Inspection Conditions
7.3	Sample Quantity and Description
7.4	Acceptance
7.5	Qualification Testing
7.6	Requalification Testing
TABLE 1	QUALIFICATION TEST SEQUENCE MATRIX
8.0	RECORD RETENTION

## 4.0 APPLICABLE DOCUMENTS

The following documents, of the issue in effect on the date of the latest revision of this specification, shall form a part of this specification to the extent specified herein.

- 4.1** Scope: This product line performance is defined in several external industry standards as identified in this section. Only performance standards exceeding or not defined in these external standards will be covered in this document

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#### 4.2 AFCI Specifications:

- 4.2.1 Engineer Drawings
- 4.2.2 Process Drawings
- 4.2.3 Application Specification(s)
- 4.2.4 Material Specification(s)

#### 4.3 Industry Product Performance Standards

- 4.3.1 IEC 512: Electromechanical components for electronic equipment, basic testing procedures and measuring.
- 4.3.2 IEC 707: Method of test for the determination of the flammability of solid electronic insulating material exposed to an igniting source
- 4.3.3 EIC-364-04: Normal Force test procedure for electrical connectors
- 4.3.4 Bell core GR-1217-CORE: Generic Requirements for Separable Electrical Connectors Used in Telecommunications Hardware.

#### 4.4 Other Standards and Specifications

- 4.4.1 Flammability: UL94V-0 or similar applicable specification
- 4.4.2 AFCI Laboratory Reports - Supporting Data
- 4.4.3 Safety Agency Approvals

### 5.0 REQUIREMENTS

#### 5.1 Qualification U.S. Federal Specifications

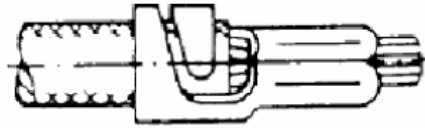
Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

#### 5.2 Definitions:

##### 5.2.1 Header Signal Contact Crimping With Wire

A floating structure male contact uses its back and forth presser foot to get connector with wire permanently

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### 5.2.2 Receptacle Signal Contact Solder to Board

Female right angle contacts with a solder tail for termination to the printed circuit board

### 5.2.3 Header Insulator Housing

The plastic modules in which the male contacts are retained

### 5.2.4 Receptacle Insulator Housing

The plastic modules in which the female contacts are retained

## 5.3 Material: Material for each part shall be specified herein, or equivalent. Substitute material shall meet the performance requirements of this specification

### 5.3.1 Header Insulator Housing:

Housing material: PPA 30% Glass Reinforced Non- Halogen or PA66 or equivalent material; UL94V-0; color: black or other

### 5.3.2 Header Insulator Cover:

Cover material: PBT or equivalent material, UL94V-0; color: black or other

### 5.3.3 Header Insulator Boot:

Boot material: PBT or equivalent material, UL94V-0; color: black or other

### 5.3.4 Receptacle Insulator Housing:

Housing material: PA9T or equivalent material, UL94V-0; color: black or other

### 5.3.5 Metallic Parts

Header Contact Body: The header contact shall be Nickel Silver C7025 TM02 or phosphor bronze alloy C5210EH, T=0.3mm.

Receptacle Contact Body: The receptacle contact shall be Nickel Silver C7025 TM02 or phosphor bronze alloy C5210EH, T=0.3mm.

Receptacle Hold Down Body: The receptacle hold down shall be brass C2680H, T=0.4mm.

## 5.4 Finish

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

Plating: Full Tin Plated over Nickel under layer or refer to the latest engineering drawing.

## 5.5 Design and Construction:

The receptacle connector shall be a 2pin to 12pin assembly having one row contacts with solder tail termination to the printed circuit board. The receptacle contacts shall interface with a 2mm pitch contacts of wire connectors.

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**5.5.1 Mating:**

The connectors shall be capable of mating and un-mating manually without the use of special tools.

**5.5.2 Workmanship:**

Connectors shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, blisters, pin holes, sharp edge, and other defects that will adversely effects life or serviceability.

**6.0 TEST METHODS AND REQUIREMENTS**

**6.0.1** Unless otherwise specified, all inspections shall be performed under the following ambient

- Temperature ----- 20°C ~ 30°C
- Humidity ----- 30% ~ 60%
- Pressure ----- Local Ambient

**6.0.2 Ratings**

(a) Voltage Rating: 100 Volts AC (or 100 Volts DC)

(b) Current and Applicable Wires

Current rating: 2A AC, DC (AWG #24)

Applicable Wire Gauges and Maximum Insulation Diameter	#26 to #24 AWG : 1.55mm MAXIMUM
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**6.1 ELECTRICAL CHARACTERISTICS**

Item	Test Description	Requirements	Test Methods
6.1.1	Visual Examination	Product shall meet the requirements of product drawings. Visual Examination performed under 10X magnification. Parts should be free from blistering, discoloration, cracks, etc	EIA-364-18 <u>Visually and functionally inspected. Under 10X magnification.</u>
6.1.2	LL Contact Resistance	10 mΩ MAXIMUM [initial] 20 mΩ MAXIMUM [After environmental testing]	SEE EIA-364-23 a) <u>Test Voltage-20 mV DC max open circuit voltage.</u> b) <u>Test Current – Not to exceed 100 mA.</u> c) <u>Wire resistance shall be removed from the measured value.</u>

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6.1.3	Insulation Resistance	1000 Megohms MINIMUM	Measured in accordance with EIA 364-21. The following details shall apply:  a. <u>Test Voltage - 500 volts DC</u> b. <u>Electrification Time - 2 minute</u> c. <u>Points of Measurement - Between adjacent contacts.</u>
6.1.4	Dielectric Withstanding Voltage	There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (> 0.5 milliampere)	Accordance with EIA 364-20. The following details shall apply:  a. <u>Test Voltage - 800 VAC.</u> b. <u>Test Duration - 60 seconds.</u> d. <u>Points of Measurement - Between adjacent contacts.</u>
6.1.5	Temperature Rise (via Current Cycling)	Temperature rise: +30°C MAXIMUM	SEE EIA-364-70 <u>Mate connectors.</u> 1. <u>Measure the temperature rise at the rated current during 96 hours.</u> 2. <u>Measure the temperature rise during current cycling (45 minutes ON and 15 minutes OFF per hour) for 240 hours.</u>

## 6.2 MECHANICAL CHARACTERISTICS

Item	Test Description	Requirements		Test Methods
6.2.1	Board Contact Retention to Housing	Contact Type	Axial Force ( Minimum)	Measured in accordance with EIA-364-29. <u>A force is applied to a contact in either direction along the axis of retention</u>
		Receptacle	10 Newton <u>There shall be no loosening of the contact or damage to the contact or damage to the connector</u>	
6.2.2	Individual Crimp Terminal Retention Force (in Housing)	25N MINIMUM retention force		Measured in accordance with EIA-364-29. <u>Axial pullout force on the terminal in the housing at a rate of 25±6mm per minute.</u>
6.2.3	Individual Crimp Terminal Insertion Force (into Housing)	15N MAXIMUM insertion force		Measured in accordance with EIA-364-35. <u>Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm.</u>

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6.2.4	Mating /Unmating Force	Mating/Unmating Force/ Per Contact		Reference – IEC 60512-13-2 or EIA- 364-13. a. <u>Cross Head Speed 25.4 mm per minute.</u> b. <u>Lubrication – No</u> c. <u>Utilize free floating fixtures.</u>
		$\leq 3$ Newton/Per Contact (mating) $\geq 0.6$ Newton/Per Contact (unmating) <u>The total force to mate a female connector with a male header shall not exceed the above values times the number of contacts and plus 2N for plastic housing interference force (Both mating and unmating force test without housing latches).</u>		
6.2.5	Durability	20 milliohms MAXIMUM after mating connectors up to 10 cycles		Standard laboratory procedure as applicable to the specific product EIA-364-09 <u>Doing durability manually.</u>
6.2.6	Wire Pullout Force From Terminal (Axial)	24 Awg: 30.0N Min. 26 Awg: 20.0N Min.		<u>Apply an axial pullout force on the wire at a rate of 25 ± 6 mm</u>
6.2.7	Latches Yield Strength(both sides)	20 N MIN.		<u>Mate loaded connectors fully.</u> <u>Pull connectors apart at a rate of 25.4+/- 6 mm per minute.</u>
6.2.8	Vibration	CLASS	CONDITIONS	Accordance with Telcordia GR-1217-CORE, Issue 2, December 2008 a. <u>Vibration Amplitude - 0.06" DA or 10g acceleration</u> b. <u>Frequency Range - 10 to 500 hertz</u> c. <u>Duration - 8 hours along each of three orthogonal axes (24 hours total)</u> d. <u>Mounting - Rigidly mount assemblies</u> e. <u>No discontinuities greater than 1u second</u>
		CLASS II	10 TO 500 Hz AND 10g	
6.2.9	Mechanical Shock	No Damage		Accordance with Telcordia GR-1217-CORE, Issue 2, December 2008 a. <u>Conditions - half-sine 30G, 11 millisecond duration</u> b. <u>Shocks - 3 shocks along each of three orthogonal axes</u> c. <u>Mounting - Rigidly mount assemblies.</u>

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### 6.3 ENVIRONMENTAL CONDITIONS

Item	Test Description	Requirements	Test Methods
6.3.1	Thermal Shock	LLCR:20 milliohms MAXIMUM; Visual: No Damage;	Measured in accordance with EIA 364-32 a. <u>Number of Cycles - 5</u> b. <u>Temperature Range - Between -25 °C +0°C/-5°C and +85° C +3°C/-5°C</u> c. <u>Time at Each Temperature - 30 minutes</u> d. <u>Transfer Time - 5 minutes, maximum</u>
6.3.2	Humidity	LLCR:20 milliohms MAXIMUM; Visual: No Damage;	Mated samples Measured in accordance with EIA-364-31, with the following exceptions. <u>Expose to a temperature of 60 ± 2°C with a relative humidity of 90-95% for 96 hours</u>
6.3.3	High Temperature Life	No Damage	Measured in accordance with EIA-364-17 Method A, Test Condition 3. Headers and receptacles shall be mated w/o any electrical load a. <u>Test Temperature - 85 degree C +/- 2 degree C</u> b. <u>Test Duration - 500 hours</u>
6.3.4	Resistance to Solder Heat	Shall meet visual requirements, show no physical damage,	Measured in accordance with EIA-364-52 Place the connector on the PCB and expose to the reflow oven. Peak Temp: 260°C for 10sec. for 3 Times for board connectors
6.3.5	Solderability	Minimum solder coverage: 95 %	IEC 60512-12-1 or EIA-364-52 or ANSI-J-STD-002 or FCI GS-19-037 a. <u>Test Condition S1 (ANSI-J-STD-002)</u> b. <u>Dry aging 4 hours</u>

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6.3.6	Salt Spray	Acceptance criteria – (visual examination requirements and/or LLCR criteria)	EIA-364-26 <u>a. Test Condition :B</u> <u>b. Duration : 48</u>
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## 7.0 QUALITY ASSURANCE PROVISIONS.

### 7.1 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.

### 7.2 Inspection Conditions

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

- a. Temperature: 25 +/- 5 degree C
- b. Relative Humidity: 30% to 60%
- c. Barometric Pressure: Local ambient

### 7.3 Sample Quantity And Description

The numbers of samples to be tested in each group shown in Qualification Testing Sequences are defined as follows: Groups 1 through 12:

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.

### 7.4 Acceptance

**7.4.1** Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.1 and 6.2 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.

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

### 7.5 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 specified in EIA-IS64.



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### 7.6 Requalification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the Test Schedule Tables in EIA-IS64.

- 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 Test Sequence Matrix

Test Table-1

Test	Para.	Test Group												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Visual Examination	6.1.1	1,8	1,9	1,5	1,3	1,8	1,5	1,4	1,4	1,3	1,3	1,5	1,4	1,7
Low Level Contact Resistance Signal contacts	6.1.2	2,5,7	2,4,6,8	2,4			2,4		2					2,6
Insulation Resistance	6.1.3					2,6								
Dielectric Withstanding Voltage	6.1.4					3,7								
Temperature Rise (via Current Cycling)	6.1.5								3					
Board Contact Retention to Housing	6.2.1												3	
Individual Crimp terminal Retention Force	6.2.2										2			
Individual Crimp terminal Insertion Force	6.2.3										2			
Mating/Unmating Force	6.2.4													3,5
Durability	6.2.5	3	3									3		4
Wire Pullout Force (Axial)	6.2.6				2									
Latches Yield Strength(both sides)	6.2.7											2,4		
Vibration	6.2.8	4												
Mechanical Shock	6.2.9	6												
Thermal Shock	6.3.1		5			4								
Humidity	6.3.2		7			5								
High Temperature Life	6.3.3			3									2	
Resistance to Solder Heat	6.3.4							2						
Solderability	6.3.5							3						
Salt Spray	6.3.6						3							

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Sample Size		5	5	5	5	5	5	5+5	5+5	5	5	5	5	5

**8.0 RECORD RETENTION**

**REVISION RECORD**

REV	PAGES	DESCRIPTION	EC #	DATE
A	ALL	New release	-	10/31/2019