

NUMBER <b>GS-12-1607</b>	TYPE <b>PRODUCT SPECIFICATION</b>	<b>Amphenol FCI</b>	
TITLE <b>BergStak® Secure connector</b>		PAGE <b>1 of 12</b>	REVISION <b>A</b>
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		CLASSIFICATION <b>UNRESTRICTED</b>	

## 1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the BergStak Secure product.

## 2.0 Scope

This specification is applicable to the termination characteristics of the Microspeed family of products which provides PCB header-to-PCB receptacle interconnecting

## 3.0 Ratings

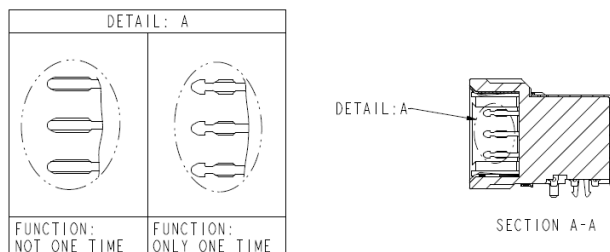
- 3.1 Operating Voltage Rating = 100 V<sub>DC</sub>
- 3.2 Operating Current Rating = 1 A signal contacts or 10 A per Shell
- 3.3 Operating Temperature Range = -55 °C ~105 °C

## 4.0 Applicable Documents

### 4.1 AFCI Specifications

Engineering drawings

- 10156697 – 1111X0XXLF RA Header 111 Pin, not one time function
- 10156697 – 1111X1XXLF RA Header 111 Pin, one time function
- 10160298 – 1111X0XXLF RA Header 111 Pin, not one time function
- 10160298 – 1111X1XXLF RA Header 111 Pin, one time function



- 10156698 – 111X00XLF Vertical Receptacle 111 Pin, 4H
- 10160299 – 111X00XLF Vertical Receptacle 111 Pin, 4H
- 10160593 – 148X0XXLF RA Header 148 Pin, not one time function
- 10160595 – 148X0XXLF Vertical Header 148 Pin, not one time function
- 10160594 – 148X00XLF Vertical Receptacle 148 Pin, 4H

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10160931– 148X00XLF Vertical Receptacle 148 Pin, 10H

#### 4.2 Industry or Trade Association standards

N/A

#### 4.3 National or International Standards

4.3.1 Flammability: UL94V-0 or similar applicable specification;

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

4.3.3 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement;

4.3.4 SAE/USCAR-2 : Automotive Electrical Connector Systems

4.3.5 IPCECA J-STD-002: Solderability Test.

#### 4.4 AFCE Laboratory Reports - Supporting Data

NA

#### 4.5 Safety Agency Approvals

NA

### 5.0 Requirements

#### 5.1 Qualification

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

#### 5.2 Material

The material for each component shall be as specified herein or equivalent.

##### 5.2.1 Housing material:

Insulation body: LCP

UL flame rating: UL 94 V-0

UL file plastic material: E83005

MSL JEDEC J-STD-020: Level 1

##### 5.2.2 Contact and Shield Material:

Contact material: Cu alloy

Shield material: Cu alloy

Friction Pin: Stainless steel

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### 5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

5.3.1 Mating area: Gold or gold and PdNi over Nickel Plating with Lubrication

5.3.2 Termination area: Tin or Gold flash plating over Nickel

### 5.4 Appearance and Construction (JIS C 54024.14.3)

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.

## 6.0 Electrical Characteristics

### 6.1 Contact Resistance

The low level contact resistance shall be in accordance with EIA 364-23.

The following details shall apply

Item	Initial	After treatment or environmental
Contact	Nominal: $\leq 30 \text{ m}\Omega$	Nominal: $\leq 40 \text{ m}\Omega$
Shield	Nominal: $\leq 5 \text{ m}\Omega$	Nominal: $\leq 5 \text{ m}\Omega$

a. Test Voltage - 20 milli-volts DC max open circuit.

b. Test Current - Not to exceed 100 milli-amperes.

### 6.2 Insulation Resistance

Measurements shall be in accordance with EIA 364-21

The insulation resistance of mated connectors shall not be less than  $1 \times 10^{10}$  ohms initially and shall not be less than  $1 \times 10^9$  after environmental exposure.

The following details shall apply:

a. Test Voltage - 500 volts DC.

b. Electrification Time - 1 minutes.

c. Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

### 6.3 Voltage proof

Measurements shall be in accordance with EIA 364-20.

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current  $> 2\text{mA}$  when mated/Unmated)

The following details shall apply:

a. Test Voltage - 500 volts ( AC RMS, 60Hz).

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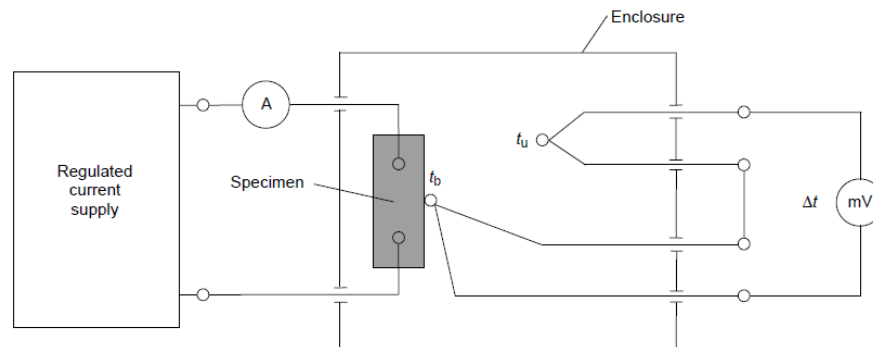
- b. Test Duration - 60 seconds.
- c. Test Condition - 1 (760 Torr - sea level).
- d. Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

#### 6.4 Derating curve

Measurements shall be in accordance with IEC 60 512 test 5b

The following details shall apply:

- a. Upper temperature limit: 105 °C
- b. Method of measurement reference below figure



## 7.0 Mechanical Characteristics

### 7.1 Total Insertion and Withdrawal force

Measurements shall be in accordance with EIA 364-13

Applicable to no one-time use product

Product position	Insertion Force :	withdrawal Force :
111 pin	150 N Max	100 N Max
148 pin	190 N Max	130 N Max

The following details shall apply:

- a. Cross Head Speed – 25.4 mm per minute.
- c. Utilize free floating fixtures.

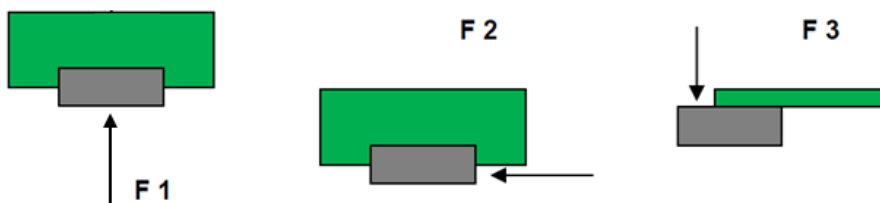
### 7.2 Shearing force (Unit: N) with SMD connectors

F 1 Shearing force in transverse direction

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F 2 Shearing force in longitudinal direction

F3 - Shear force vertically against the soldering surface (For R/A type)



Direction	F1 Force :	F2 Force	F3 Force
Spec	≥650 N	≥300 N	≥95 N

- Cross Head Speed – 20mm/min.
- Require 5 test samples
- Test Board FR4/ 2 mm thickness

### 7.3 Durability (Mechanical operation)

Measurements shall be in accordance with EIA-364-09  
Applicable to no one-time use product

- Number Cycles -200 cycles
- Cycling Rate – 10mm/s max
- Latches disabled (If applicable)
- Use free floating fixtures

### 7.4 Secure function

Function	Withdrawal Situation:
Request	Functional failure

Request: When the product is forcibly removed, product may fall off the PCB board/ damage or Electrical failure after extraction,

- Cycling Rate – 25.4/minute
- Use free floating fixtures

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- 7.5 Pre-Durability  
Measurements shall be in accordance with EIA-364-09

Number Cycles -3 cycles

- a. Cycling Rate – 10mm/s max
- b. Use free floating fixtures

- 7.6 Contact retention  
Measurements shall be in accordance with EIA 364-29  
Apply to right angle product, Test force  $\geq 2$  N
- a. Cross Head Speed – 25.4mm per minute.
  - b. Hold 10s than removed
  - c. Require 6 contacts/specimen

## 8.0 Environmental Conditions

After exposure to the following environmental conditions in accordance with the specified test procedure and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in the Table 1 test sequences. Unless specified otherwise, assemblies shall be mated during exposure.

*Use recommended details or select others as appropriate*

- 8.1 Thermal Shock  
Measurements shall be in accordance with EIA 364-32.
- a. Number of Cycles - 5
  - b. Temperature Range - Between -55 and +125 deg C
  - c. Time at Each Temperature - 30 minutes
  - d. Transfer Time - 5 minutes, maximum
- 8.2 Mixed Flowing Gas corrosion (MFG)  
Measurements shall be in accordance with IEC 60512-11-7 or EIA 364-65
- a. Class -IIA
  - b. Duration : 7 days
    - 1) Not one-time use : unmated for 2/3 the duration and mated the remaining 1/3 duration
    - 2) one-time use : full mated duration
  - d. Mechanical operation: 1 time between unmated duration and mated duration
- 8.3 Vibration Random  
Measurements shall be in accordance with SAE/USCAR-2,5.4.6.3
- a. Class: V2
  - b. Accelerated speed– 12.1 G.rms

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- c. Frequency Range -60 to 1200 Hz,
- d. Sweep Time and Duration – 8 Hours per axis, Total 24 hours
- e. Mounting - Rigidly mount assemblies; specify cable length and mounting location if appropriate.
- f. No discontinuities greater than 1 microsecond

#### 8.4 Mechanical Shock

Measurements shall be in accordance with SAE/USCAR-2,5.4.6.3

- a. Class: V2
- b. 35G, 10 millisecond, half-sine pulse type
- b. Shocks - 10 shocks in both directions along each of three orthogonal axes (30 shocks total)
- c. Mounting - Rigidly mount assemblies; specify cable length and mounting location if appropriate.
- d. No discontinuities greater than 1 microsecond

#### 8.5 Temperature life

Measurements shall be in accordance with EIA-364-17

- a. Temperature: 105 °C
- b. Duration : 250 hours

#### 8.6 Temperature life (preconditioning)- EIA364-1000, Table 9

- a. Mated/Unmated: Mated
- b. Test Temperature: 105 °C ± 2°C
- c. Test Duration: 150 hours

#### 8.7 Humidity

Measurements shall be in accordance with EIA-364-31 method IV, performance of step 7a

- a. Temperature: 25 °C ± 3 °C to 65 °C ± 3 °C;
- b. Relative Humidity: 90~96%
- c. Duration: Perform 10 cycles

#### 8.8 Thermal disturbance

Measurements shall be in accordance with EIA-364-110

- a. Temperature: 15 °C ± 3 °C to 85 °C ± 3 °C;
- b. Duration: Ramps: 2°C per minute, reach the temperature extremes (a minimum of 5 minutes) perform 10 cycles

#### 8.9 Cold Temperature Life

Measurements shall be in accordance with IEC 60512-9-2 or EIA 364-59

- a. Test Temperature: -55 °C
- b. Test Duration: 96 hours

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#### 8.10 Solderability

Measurements shall be in accordance with IPCECA J-STD-002

- Test condition:S1
- Steam or dry aging 4 hours
- Minimum solder coverage: 95 %

**Pb-free Reflow Parameter Requirements**

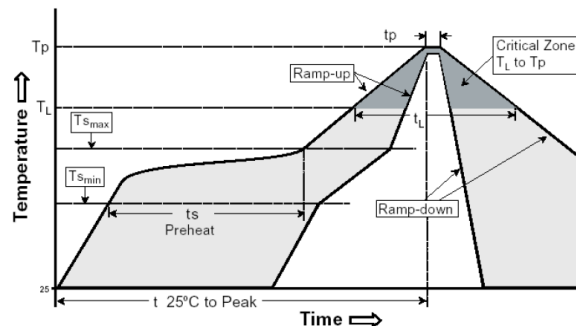
	Temperature	Time
Vapor Phase Reflow	217-240°C [423-464°F]	45-90 seconds dwell at reflow
IR/Convection Reflow	150-180°C [302-356°F] Preheat	60-120 seconds
	230-250°C [446-482°F] Reflow	30-60 seconds
Oven	230-250°C [446-482°F]	2-5 minutes (until reflow is assured)

#### 8.11 Heat resistance

Measurements shall be in accordance with EIA-364-56

- Test Number of cycles: 3 cycle
  - 1<sup>st</sup> Product on PCB,
  - 2<sup>nd</sup> and 3<sup>rd</sup> product reverse placement
- There shall be no evidence of physical or mechanical damage
- No deformation of case or excessive Looseness of the terminal.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (Ts <sub>max</sub> to Tp)	3°C/ second max.
<b>Preheat</b>	
- Temperature Min (Ts <sub>min</sub> )	150°C
- Temperature Max (Ts <sub>max</sub> )	200°C
- Time (ts <sub>min</sub> to ts <sub>max</sub> )	60-180 seconds
Time maintained above:	
- Temperature (T <sub>L</sub> )	217°C
- Time (t <sub>L</sub> )	60-150 seconds
Peak/Classification Temperature (Tp)	260°C (+0/-5°C)
Time within 5 °C of actual Peak Temperature (tp)	20-40 seconds
Ramp-Down Rate	6°C/second max.
Time 25 °C to Peak Temperature	8 minutes max





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## 9.0 QUALITY ASSURANCE PROVISIONS

### 9.1 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 ANSI Z-540 and ISO 9000.

### 9.2 Inspection Conditions

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

- Temperature: 25 +/- 5 deg C
- Relative Humidity: 30% to 60%
- Barometric Pressure: Local ambient

### 9.3 Sample Quantity And Description

Use this paragraph to describe the test samples required for the specific Test Groups in the qualification test table. Include information such as: number and size of plug and receptacle connectors and/or mated pairs, terminated or not terminated, printed wiring board conditions, wire size, crimp conditions, lubrication conditions, etc. Attach and reference drawings if necessary to clarify the description.

Unless otherwise specified in the application specification, sample quantities for each test group shall be specified in this section and/or the qualification test table. Refer to GS-01-029 section 5.9 for sample quantity recommendations.

### 9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 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.

9.4.2 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.

### 9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to print revision \_\_\_, verification of plating composition and thickness, etc.

### 9.6 Re-Qualification Testing

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

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- 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.

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### 9.7 Qualification Test Table

Test	Par a.	Test Sequences											
		Group A	Group B	Group C	Group D	Group E1	Group E2	Group F	Group G	Group H	Group J	Group K	Group L
Visual Examination	5.4	1,6	1,12	1,7	1,10	1,11	1,6	1,5	1,3		1,3	1,5	1
Contact Resistance	6.1	2,5	2,7,9	2,,6	2,5,7, 9	2,8	2	2,4				2,4	
Insulation Resistance	6.2		3,10			3,9	3						
Voltage proof	6.3		4,11			4,10	4						
Derating curve	6.4								2				
Insertion and Withdrawal force	7.1					5,7							
Shearing force	7.2										2		
Durability	7.3					6							
Secure function	7.4						5						
Pre-Durability	7.5	3	5	3	3								
Contact retention	7.6												2
Thermal Shock	8.1		6										
MFG	8.2				6								
Vibration Random	8.3			5									
Mechanical Shock	8.4			4									
High Temperature Life	8.5	4											
Temperature life (preconditioning)	8.6				4								
Humidity	8.7		8										
Thermal disturbance	8.8				8								
Cold Temperature Life	8.9							3					
Solderability	8.10									1			
Heat resistance	8.11											3	
Sample size		3	3	3	3	3	3	3	3	3	3	3	3
Remark	1. Durability / Pre-Durability just applicable to no one-time use product, 2. Group E1 used for no One time use product, E2 used for One time use product												

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**REVISION RECORD**

<b>Rev</b>	<b>Page</b>	<b><u>Description</u></b>	<b><u>EC#</u></b>	<b><u>Date</u></b>
A	All	Initial release	/	Dec12 2020