

NUMBER GS-12-1179	TYPE GENERAL PRODUCT SPECIFICATION	Amphenol ICC	
TITLE BarKlip R/A connector		PAGE 1 of 11	REVISION A
		AUTHORIZED BY Sam Wu	DATE Dec 17, 2021
		CLASSIFICATION UNRESTRICTED	

1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the BarKlip R/A connector system.

2.0 Scope

This specification is applicable to the termination characteristics of the BarKlip R/A connector system which provides a separable interface for power to Bus Bar applications, the nominal value of applicable thickness of the Bus Bar is 3.0 mm.

3.0 Ratings

3.1 Operating Voltage Rating = 480 V_{DC} (The voltage rating depends on the application)

3.2 Operating Current Rating = 170 Amperes

3.3 Operating Temperature Range = -40 °C~105 °C¹

Note 1: includes the terminal temperature rise when powered

4.0 Applicable Documents

4.1 Specifications

4.1.1 Engineering drawings: 10125600, 10125595, 10146303, 10154239, 10160399, 10161546 etc.

4.1.2 Application specification: GS-20-0396

4.2 Industry or Trade Association standards

4.2.1 Telcordia GR-1217

4.3 National or International Standards

4.3.1 Flammability: UL94V-0

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

4.3.3 EIA 364-1000: Environmental test methodology for assessing performance of electrical and sockets used in business office application.

4.3.4 EIA 364-1004: Environmental test methodology for verifying the current rating of freestanding power contacts or electrical connectors and sockets.

4.4 Laboratory Reports - Supporting Data

4.4.1 DL-2013-12-043 for Silver plating Bus Bar mating BarKlip with AGT plating type.

4.4.2 DL-2018-08-008-CR for Tin plating Bus Bar mating BarKlip with Matte Tin plating type

4.5 Safety Agency Approvals

4.5.1 UL/CSA File #: E66906 Vol. 1 Sec. 152

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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.

Power Contacts – High Conductivity Copper alloy

Clip – Stainless steel

Housing – High temperature thermoplastic, UL 94V-0 compliant

5.3 Finish

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

Contact area (options):

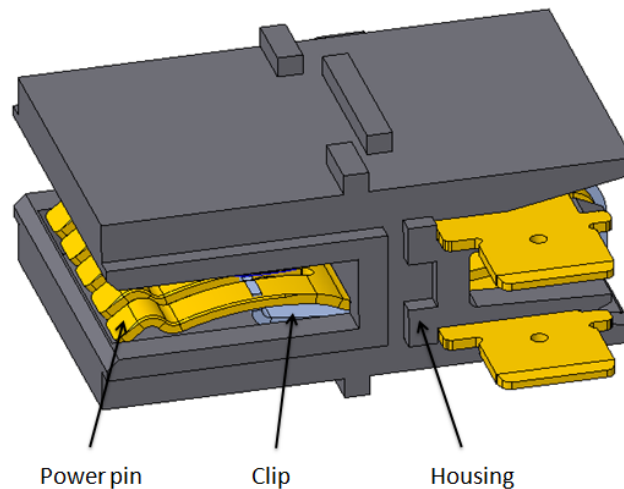
Option 1: AGT plating

Option 2: Matte Tin plating

Tail area: Tin plated over Nickel

5.4 Design and Construction

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. Visual examination of product per EIA-364-18.



BarKlip R/A connector with solder type

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6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

6.1.1 Silver plating Bus Bar mates with BarKlip connector with AGT plating

The low level contact resistance shall not exceed 0.2 milliohms initially and after any treatment or environmental exposure.

6.1.2 Tin plating Bus Bar mates with BarKlip connector with Matte Tin plating

The low level contact resistance shall not exceed 0.3 milliohms initially and after any treatment or environmental exposure.

Measurements shall be in accordance with EIA 364-23.

The following details shall apply:

- a. Test Voltage - 20 milli-volts DC max open circuit.
- b. Test Current - Not to exceed 100 milli-amperes.

6.2 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 5000 Megohms initially and 1000 Megohms after environmental exposure.

Measurements shall be in accordance with EIA 364-21.

The following details shall apply:

- a. Test Voltage – 500 volts DC.
- b. Electrification Time - 2 minutes, unless otherwise specified.
- c. Points of Measurement – The smallest pitch between 2 connectors when mounted on a PCB:
Solder type: 25 mm
Screw-mount type: 30mm.

6.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown when mated connectors are tested in accordance with EIA 364-20.

The following details shall apply:

- a. Test Voltage – 1000 volts AC.
- b. Test Duration - 60 seconds.
- c. Test Condition - 1 (760 Torr - sea level).
- d. Points of Measurement – The smallest pitch between 2 connectors when mounted on a PCB:
Solder type: 25 mm
Screw-mount type: 30mm.

6.4 Current Rating

The temperature rise above ambient shall not exceed 30 deg C at any point in the system when all contacts are powered at 170A.

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The following details shall apply:

- a. Ambient Conditions – still air at lab room ambient
- b. Test configuration (see the blew table)
- c. Reference - EIA 364-70

Application	Number of Poles(fully powered)	Test Board (Copper Pad)	Still Air	T-Rise (°C)	Current Rating per contact (Amp)
BarKlip R/A from Busbar conductors to printed circuit boards	1	2 layers, 5oz per layer	Yes	30	170
	2				

6.5 Hot insertion/extraction (155A 48V_{DC})

6.5.1 Silver plating Bus Bar mating BarKlip with AGT plating type

The low level contact resistance shall not exceed 0.2 milliohms after the test.

6.5.2 Tin plating Bus Bar mating BarKlip with Matte Tin plating type

The low level contact resistance shall not exceed 0.3 milliohms after the test.

The following details shall apply:

- a. Mating/unmating cycles: 50 cycles.
- b. Mating/unmating speed: less than 10 cycles/minute

7.0 Mechanical Characteristics

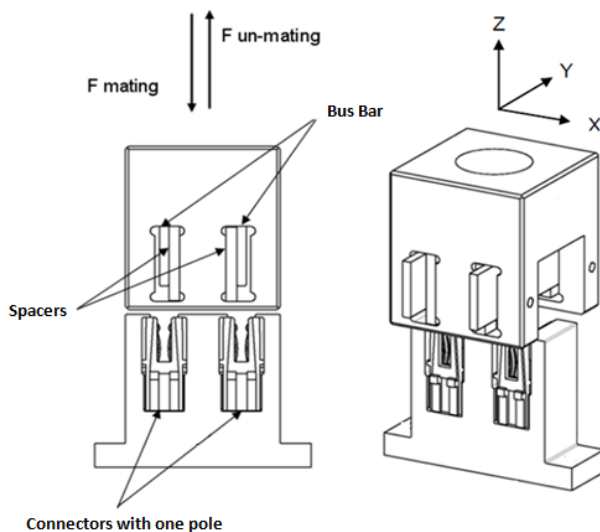
7.1 Mating/Unmating Force

- a. Cross Head Speed – 25.4 mm/minute.
- b. Utilize free floating fixtures.
- c. The Busbar thickness is 3.0+/-0.1mm.
- d. Reference – EIA 364-13, Method A.
- e. The pitch of the connectors in the test-tool is 25.0mm. The pitch of the conductors is 25±1mm and can be adjusted by using spacers.

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Configuration	Mating force(N) (Max. Allowance)				Unmating force(N) (Min. Allowance)			
	Nominal pitch		All misaligned pitch		Nominal pitch		All misaligned pitch	
	Silver Bus Bar	Tin Bus Bar	Silver Bus Bar	Tin Bus Bar	Silver Bus Bar	Tin Bus Bar	Silver Bus Bar	Tin Bus Bar
BarKlip RA one pole with Silver plating	40N	NA	60N	NA	12.5N	NA	12.5N	NA
BarKlip RA one pole with Matte Tin plating	NA	80N	NA	100N	NA	12.5N	NA	12.5N
BarKlip RA two poles with Silver plating	60N	NA	80N	NA	16N	NA	16N	NA

Note: "NA" means that there is a risk for galvanic corrosion between the Silver and Tin, and Silver(Tin) plated Bus Bar mates with BarKlip connector with Matte Tin(Silver) plating is not recommended.



7.2 Contact retention

Test condition: Per EIA-364-29, method C, a maximum rate of 25.4mm per minute

Requirement: Individual contact shall withstand an axial retention load of 10 N minimum

7.3 Reseating

Test condition: Manual mating/unmating the connector with module board.

Requirement: Perform 3 such cycles.

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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 test sequences in qualification table. Unless specified otherwise, assemblies shall be mated during exposure.

- 8.1 Thermal Shock – EIA 364-32 Method A, Test condition II
 - a. Number of Cycles –25 Cycles.
 - b. Temperature Range - Between -65 deg C and +105 deg C
 - c. Time at Each Temperature – 30 minutes minimum
 - d. Transfer Time - 5 minutes, maximum
- 8.2 Cyclic Temperature & Humidity – EIA 364-31 method IV(cyclic temperature)
 - a. Relative Humidity - 80% to 98%
 - b. Temperature - From 25 deg C to 65 deg C
 - c. Duration – 10 cycles, 24h/cycle, 240 hours total
- 8.3 High Temperature Life – EIA 364-17, Method A.
 - a. Test Temperature – 105 deg C
 - b. Test Duration - 1000 hours
 - c. Pre-condition - Perform 20 cycles of durability for product
- 8.4 High Temperature Life (Preconditioning) –EIA 364-17, Method A.
 - a. Test Temperature – 105 deg C
 - b. Test Duration - 72 hours
 - c. Pre-condition - Perform 20 cycles of durability for product
- 8.5 Mixed Flowing Gas corrosion (MFG) –EIA 364-65
 - a. Class - IIA
 - b. Duration - 14 days
 - c. ½ of samples mated for 336 hours, ½ of samples unmated for 168 hours, then mated for final 168 hours.
- 8.6 Random Vibration – EIA 364-28
 - a. Test Condition - method V, letter C
 - b. Vibration Amplitude – 9.26 rms G
 - c. Duration - 2 hours along each of three orthogonal axes (6 hours total)
 - d. Mounting - Rigidly mount assemblies
 - e. No discontinuities greater than 1.0 microsecond

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- 8.7 Mechanical Shock –EIA 364-27
 - a. Condition - Test condition A (50G, 11 milliseconds, half-sine pulse type)
 - b. Shocks - 3 shocks in both directions along each of three orthogonal axes (18 shocks total)
 - c. Mounting - Rigidly mount assemblies
 - d. No discontinuities greater than 1.0 microsecond
- 8.8 Durability - EIA 364-09
 - a. Number of Cycles - 50 cycles
 - b. Cycling Rate – 127mm per minute
 - c. Use free floating fixtures
- 8.9 Durability (Preconditioning) - EIA 364-09
 - a. Number of Cycles - 20 cycles
 - b. Cycling Rate – 127mm per minute
 - c. Use free floating fixtures
- 8.10 Thermal disturbance - EIA 364-110
 - a. The test specimens shall be mated during the test.
 - b. Temperature Range – +15°C±3°C to +85°C±3°C
 - c. Thermal Ramp – minimum of 2°C per minute.
 - d. Dwell time to ensuring that the contacts reach the temperature extremes for a minimum of 5 minutes.
 - e. Number of cycles – 10 cycles.
- 8.11 Dust - EIA 364-91
 - a. Dust Composition # 1(Benign)
 - b. Duration: 1hour
- 8.12 Solderability – GS-19-037
 - a. Test Condition 4.5
 - b. Steam or dry aging – 4 hours
 - c. Minimum solder coverage: 95 %

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.

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9.2 Inspection Conditions

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

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

9.3 Sample Quantity and Description

The sample size and description for each test are listed in test table.

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.

- 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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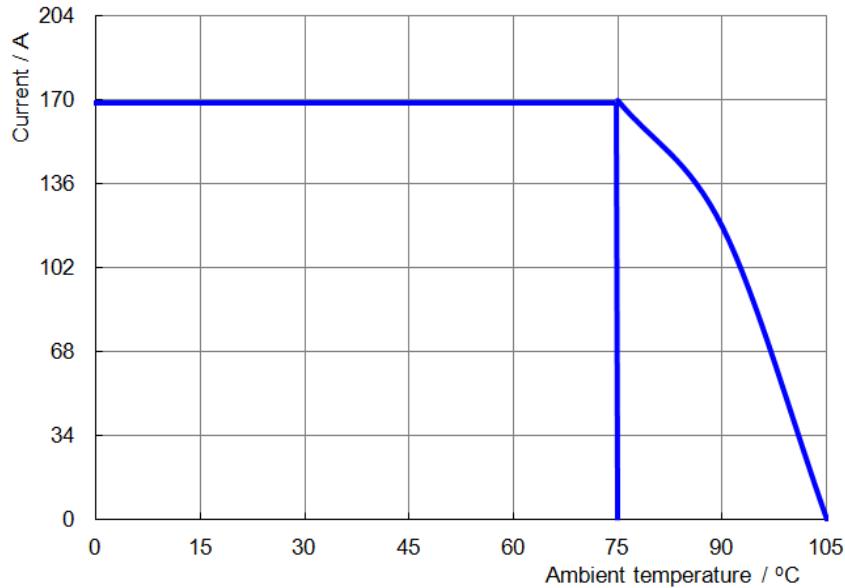
9.7 Qualification Test Table

Test Items	Section	Test Group									
		1	2	3	4	5	6	7	8	9	10
Examination of Product	5.4	1,7	1,8	1,10	1,10	1,11	1,10	1,9	1,5	1,3	1,3
Contact Resistance Low Level	6.1	2,6	2,5, 7	2,5, 7,9	2,5, 7,9	2, 5, 7 (After 7 days), 8 (After 14 days), 10	2,5, 7,9	4,6	2,4		
Insulation Resistance	6.2							2,7			
Dielectric Withstanding Voltage	6.3							3,8			
Current Rating (T-rise: 30°C Max.)	6.4									2	
Hot insertion/extraction	6.5								3		
Mating/Unmating Force	7.1	3,5									
Retention force	7.2										
Reseating	7.3		6	8		9	8				
Thermal Shock	8.1			4							
Cycling Temperature and Humidity	8.2			6							
High Temperature Life	8.3		4								
High Temperature Life (preconditioning)	8.4				4	4					
Mixed Flowing Gas	8.5					6					
Random Vibration	8.6				8						
Mechanical Shock	8.7				6						
Durability	8.8	4						5			
Durability (preconditioning)	8.9		3	3	3	3	3				
Thermal disturbance	8.10						6				
Dust	8.11						4				
Solderability	8.12										2
Samples quantity(pcs)		5	5	5	5	5	5	5	5	5	5

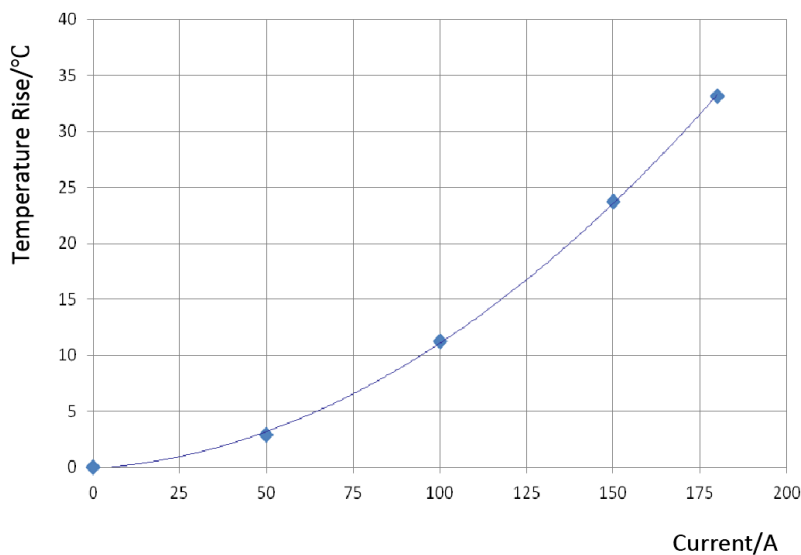
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10.0 Appendix

10.1 Current Carrying Capacity De-rating Curve



10.2 Temperature rise vs current curve



Above current rating is for reference only. Appropriate de-rating is required per ambient conditions, Bus Bar size to achieve thermal balance, gross heating from adjacent components, and other factors that influence connector performance.

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REVISION RECORD

Rev	Page	Description	EC#	Date
A	All	Initial release	N/A	12/17/2021