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|---------------------------------------|--|---------------------------------------|---------------------------|
| NUMBER GS-12-1751 | TYPE GENERAL PRODUCT SPECIFICATION | Amphenol ICC | |
| BarKlip® BK600 Cable Connector | | PAGE 1 of 8 | REVISION B |
| | | AUTHORIZED BY Yong Zhang | DATE May,9,2023 |
| | | CLASSIFICATION UNRESTRICTED | |

1.0 Objective

This specification defines performance, test, quality and reliability requirements of the BarKlip BK600 I/O system.

2.0 Scope

This specification applies to the termination characteristics of the BarKlip BK600 I/O system, which is primarily intended to provide the power interface between power shelves and bus bar.

3.0 Ratings

3.1 Operating Voltage Rating: 480V DC (The voltage rating is also dependent on the application)

3.2 Operating Current Rating:

| Air condition | Current rating Power/Return | Wiring (Power/Return) | Ambient temperature | Maximum temperature rise |
|------------------|--------------------------------|--------------------------|---------------------|-----------------------------|
| Still air | 420A/420A | 4AWG x6/ 4AWG x6 | Room temperature | 30°C |
| Still air | 700A/700A | 4AWG x6/ 4AWG x6 | Room Temperature | 95°C |
| Air flow 300 LFM | 600A/600A | 4AWG x6/ 4AWG x6 | 60°C | 35°C |
| Air flow 300 LFM | 700A/700A | 4AWG x6/ 4AWG x6 | 60°C | 45°C |

Chassis Ground Contacts: 2x 32A total maximum for 2-minute duration

3.3 Operating Temperature Range: -40 to +105 °C ¹

Operating temperature is tested in accordance with EIA-364-17 Method A for 1008 hours at 105°C per EIA-364-1000 Table 8 to meet field temperature of 75°C for 10 years field life.

Note 1: includes the terminal temperature rise when powered

4.0 Applicable Documents

4.1 Amphenol Specifications

4.1.1 Engineering drawing: 10164745

4.1.2 Application specification: GS-20-0745

4.2 National or International Standards

4.3.1 Flammability: UL-94V-0

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

4.3 Laboratory Reports - Supporting Data

UL test report: E66906

5.0 Requirements

5.1 Qualification

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

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5.2 Material

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

Power Contacts – High Conductivity Copper alloy

Housing &TPA – Thermoplastic, UL 94V-0, Halogen Free

5.3 Finish

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

Contact area: Silver

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.

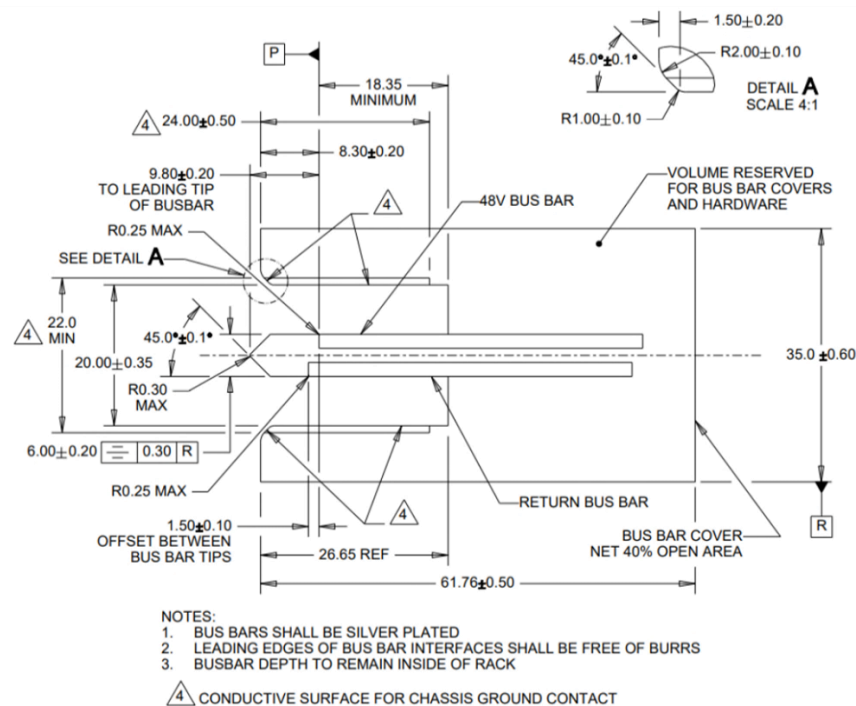
5.5 Connectors Mating Part (Busbar Recommendations)

Material: Copper, two-pieces laminated with insulator, 6.0 ± 0.20 mm total thickness

Surface roughness in contact area: Ra 1.6 μ m maximum

Plating in contact area: 2.54 μ m min Silver over 2.0 μ m min Nickel

The Busbar dimensions are as shown below:



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6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

- 6.1.1 The low-level contact resistance shall not exceed 10 milliohms initially and 20 milliohms after any treatment and/or environmental exposure when measured per EIA 364-23.

The following details shall apply:

- Test Voltage - 20 mV DC max open circuit.
- Test Current - Not to exceed 100 mA.

- 6.1.2 Power contacts tested at specified current level depending on the wire used:
The contact resistance at a specified current shall not exceed 0.5 milliohms with silver plated Busbar initially and after test when measured per EIA 364-06.

6.2 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 5000 Megohms initially and 1000 Megohms after environmental exposure when measured in accordance with EIA 364-21.

The following details shall apply:

- Test Voltage – 500 volts DC.
- Electrification Time - 1 minutes, unless otherwise specified.
- Points of Measurement - Between adjacent contacts.

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, Method B, Condition 1.

The following details shall apply:

- Voltage application ramp rate: 500 V/sec.
- Test Voltage - 1960 Volts DC.
- Test Duration - 60 seconds.
- Unless otherwise specified, the leakage current shall not exceed 1 mA

6.4 Current Rating

Refer to 3.1, power contacts only.

Reference - EIA 364-70/UL1977.

7.0 Mechanical Characteristics

7.1 Mating/Un-mating Force

The force to mate a receptacle connector and compatible busbar shall not exceed 120 N. The un-mating force shall not be less than 15 N. The following details shall apply:

- Cross Head Speed – 12.7mm per minute.
- Lubrication – No additional lubricant shall be added to production test samples.
- Utilize free floating fixtures.
- The Bus bar thickness is 6.00+/-0.20mm
- Reference – EIA 364-13, Method A.

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7.2 Reseating

Manually un-mate/mate the interconnect system once.

- Sample Size – Dependent upon current test group, refer to specific sample sizes in Table 1: note c.
- Failure Criteria - No evidence of physical damage.
- Requirement - Perform 1 cycle, no lubrication to be used during cycling.

7.3 Contact retention force

- Apply 147N pull force to cable in axial and 45° directions for a minimum of 6 seconds each.
- Cross Head Speed – 12.7mm per minute
- Requirement – No visible contact-to-housing displacement.
- Reference EIA 364-29, Method A

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.

8.1 Thermal Shock – EIA 364-32 Method A, Test condition II.

- Number of Cycles - 25
- Temperature Range - Between -65°C and +105°C
- Time at Each Temperature - 30 minutes
- Transfer Time - 5 minutes, maximum

8.2 Cyclic Temperature & Humidity – EIA 364-31, method IV, Duration B

- Temperature and Relative Humidity - between 25°C at 80% to 98% relative humidity, and 65°C at 90% to 98% relative humidity, with step 7a cold shock.
- Duration – 10 days
- Omitting 7b vibration test

8.3 High Temperature Life – EIA 364-17, Method A, Test condition 4.

- Test Temperature - 105± 2°C for 1008 hours (or 115± 2°C for 265 hours)
- Pre-condition - Perform 20 cycles of durability for product

8.4 High Temperature Life (preconditioning)

- Test Temperature - 105± 2°C
- Test Duration - 75 hours

8.5 Mixed Flowing Gas corrosion (MFG) – EIA 364-65

- Class - IIA
- Duration - 14 days
- Half of samples mated for 336 hours, half of samples unmated for 168 hours, then mated for final 168 hours.

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- d. Record LLCR measurements after 7 and 14 days duration.

8.6 Vibration (Random) –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
- d. Mounting – Rigidly mount mated assemblies
- e. No discontinuities greater than 1 microseconds

8.7 Mechanical Shock – EIA 364-27

- a. Condition - Test condition A (50G, 11 millisecond, half-sine pulse type)
- b. Shocks - 3 shocks in both directions along each of three orthogonal axes (18 shocks total)
- c. Mounting - Rigidly mount mated assemblies
- d. No discontinuities greater than 1 microseconds.

8.8 Durability - EIA 364-09

- a. Number Cycles - 50 cycles
- b. Cycling Rate – 127mm per minute maximum
- c. Use free floating fixtures

8.9 Durability (preconditioning) - EIA 364-09

- a. Number Cycles - 20 cycles
- b. Cycling Rate - 127mm per minute maximum
- c. Use free floating fixtures

8.10 Dust - EIA 364-91

- a. Dust Composition #1 (benign)
- b. Duration: 1.0 hour
- c. Unmated connector to be placed in the chamber

8.11 Disturbance - Ref. GR-1217-CORE

De-mate the fully seated connector from the busbar approximately 0.10mm (0.004 in) and reseal.

8.12 Salt-Spray – EIA 364-26C

Subject specimens (unmated samples) to 5% salt solution spray at 35°C +1/-2°C for 48 hours.

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:

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- 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 is listed for each test in the appropriate section of this document.

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 Sequence Table 1

| TEST GROUP ID: | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---------|-----------|---------------------------------------|------------------------|------------------------------------|-------------------|------------|----------------|
| TEST DESCRIPTION | SECTION | Temp Life | Thermal Shock & Humidity (Dielectric) | Vibration & Mech Shock | Mixed Flowing Gas (Mated/Un-Mated) | Contact Retention | Salt Spray | Current Rating |
| VISUAL EXAMINATION | 5.4 | 1,12 | 1,22 | 1,16 | 1,16 | 1,3 | 1,6 | 1,3 |
| ELECTRICAL: | | | | | | | | |
| LOW-LEVEL CONTACT RESISTANCE | 6.1 | 2,6,8,10 | 2,8,10,14,16,20 | 2,4,8,10,12,14 | 2,6,8,10,12,14 | | 2,4 | |
| CONTACT RESISTANCE AT SPECIFIED CURRENT | 6.1 | 11 | 21 | 15 | 15 | | 5 | |
| INSULATION RESISTANCE | 6.2 | | 3,11,17 | | | | | |
| DIELECTRIC WITHSTANDING VOLTAGE | 6.3 | | 4,12,18 | | | | | |
| CURRENT RATING | 6.4 | | | | | | | 2 |
| MECHANICAL: | | | | | | | | |
| MATING / UNMATING FORCE | 7.1 | 3,5 | 5,7 | 5,7 | 3,5 | | | |
| RESEATING | 7.2 | 9 | 19 | | 13 | | | |
| CONTACT RETENTION FORCE | 7.3 | | | | | 2 ^(a) | | |
| ENVIRONMENTAL: | | | | | | | | |
| THERMAL SHOCK | 8.1 | | 9 | | | | | |
| CYCLICAL HUMIDITY & TEMP. | 8.2 | | 15 | | | | | |
| TEMPERATURE LIFE | 8.3 | 7 | | | | | | |
| TEMP LIFE PRECONDITON | 8.4 | | | 3 | 7 | | | |
| MIXED FLOWING GAS | 8.5 | | | | 9 | | | |
| VIBRATION | 8.6 | | | 11 | | | | |
| MECHANICAL SHOCK | 8.7 | | | 13 | | | | |
| DURABILITY, 50 CYCLES | 8.8 | | | 6 | | | | |
| DURABILITY, 20 CYCLES | 8.9 | 4 | 6 | | 4 | | | |
| DUST CONT | 8.10 | | 13 | 9 | | | | |
| DISTURB | 8.11 | | | | 11 | | | |
| SALT SPRAY | 8.12 | | | | | | 3 | |
| SAMPLES QUANTITY (PCS) | | 3 | 3 | 3 | 4 | 3 | 3 | 3 |

Notes:

- a. 1pcs sample for each pull direction, 3pcs samples total.

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REVISION RECORD

| <u>Rev</u> | <u>Page</u> | <u>Description</u> | <u>EC#</u> | <u>Date</u> |
|------------|-------------|---|---------------|-------------|
| A | ALL | INITIAL RELEASE | NA | 03/22/2023 |
| B | 1/3 | ADD CURRENT RATING TABLE WITH DIFFERENT CONDITION | ELX-N-48157-1 | 05/09/2023 |
| | | | | |