Open Rack V3 Power Shelf Universal Input Connector

Rev: 0.3

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1. Scope

This document defines the technical specifications for an Open Rack V3 Power Shelf Universal Input Connector used in Open Compute Project.

2. Overview

This power from the data center enters the power shelf through this connector set. The set is designed to allow the shelf to adjust to a wide range of input power types while allowing the cabling to the data center to adapt to regional regulatory needs.

3. Electrical

- Seven pin connector with three inputs, three returns, and one Ground (Earth).
- Nominal Voltage (rms) rating:
  - Pin to pin 480V AC
  - 380V DC
  - Frequency: DC, 50 Hz, 60 Hz
- Current Rating: 32A @ 30C temperature rise in still air
- Inrush current:
  - 10X for 100 micro sec
  - two times rated current for 5mS.

Figure 1. Layout of open rack power shelf in the rack assembly
3.1 Connector wiring

Connector shall take the following input wiring:

- 3 phase, 5 wire in Star configuration.
- 3 phase, 4 wire in Delta configuration.
- 1 phase, 3 wire configuration.
- High-voltage DC, 3 wire configuration

The following diagrams show the wiring of different configurations the connector shall support:
4. Mechanical

Height must fit within the envelope of a 1 RU EIA chassis (44.45mm). And pass within the cable trough of 23.8 mm minimum.

Height and width of the connector shall be sized so that a connector and a whip wire bundle of max diameter (7 X 8 AWG) high strand count) will fit into the Open Rack channel at the same time. This will allow the whip cable to be replaced without moving the rack.

The distance from the back surface of the power shelf chassis to the tip of the tangent of the <of the bend radius of the worst-case cable bundle supported> entering the cable side connector shall be less than 65mm so the whip cable will always remain inside the rack frame.

The cable hood shall be reversible so the cable can exit the hood towards either side of the rack.

Wire AWG: 12

Date: 3 December 2019
5. Dimensions:

Receptacle:
For details of the PCB Pin-out for each individual connector configurations:
Right angle PCB contact with threaded insert screw mount:
  - For Right connector, refer to Figure 5.3 (SP10RSSS48M220A1/AA-2269)
  - For Left connector, refer to Figure 5.7 (SP10RSSS48RM220A1/AA-2269)

Right angle PCB contact with angle bracket board lock mount:
  - For Right connector, refer to Figure 5.5 (SP10RSSS48M2LN0A1/AA-2269)
  - For Left connector, refer to Figure 5.9 (SP10RSSS48RM2LN0A1/AA-2269)

Straight PCB contact with self-tapping screw mount:
  - For Right connector, refer to Figure 5.11 (SP10RSSS38M200A1/AA-2269)
  - For Left connector, refer to Figure 5.15 (SP10RSSS38RM200A1/AA-2269)

Straight PCB contact with push-on fastener mount:
  - For Right connector, refer to Figure 5.13 (SP10RSSS38M2N0A1/AA-2269)
  - For Left connector, refer to Figure 5.17 (SP10RSSS38RM2N0A1/AA-2269)

Detail of the Panel cut out for the chassis connector
  1> Cabled internal with strain relief to the chassis
  2> PCB version with strain relief
Please refer to individual connector drawings for detail panel cut out dimensions.

Date: 3 December 2019
Receptacle Types:
- PCB straight pin
- PCB Right angle
- Panel mount with wire mount

PCB Thickness: 1.60mm to 2.00mm
Note: Connectors can be customized for different PCB thickness.

Ground pin should be first mate/last break under all entry angles.
- First mate / Last break at center position as shown in Figure 5.1 for left and right connector

![Diagram of connectors showing first mate/last break contact](image)

Figure 5.1 Left side and Right side connector
Female Cable Connector – Reversible for Right side and Left side (SP10RSSS1F0W01/AA-2268)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE (HALOGEN-FREE).
   HOOD: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLACK (HALOGEN-FREE). KIT SEPARATELY.
   LATCH: PPO, UL 94V-0. COLOR: BLACK (HALOGEN-FREE).
   SCREWS: STEEL, ZINC PLATE WITH CHROMATE SEAL KIT SEPARATELY.
   CONTACTS: ORDER CONTACTS SEPARATELY.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MDS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   MODULE WHICH ALLOWS FOR TOUCH SAFE AND NOT PLUGGABLE FEATURES. THIS
   MDS ALSO ALLOWS FOR SPECIAL HOOD WHICH HAS 45° CABLE OPENING.
Figure 5.2 SP10RSSS1F0W01/AA-2268
Male right angle PCB Connector with threaded insert mount – Right side (SP10RSSS48M220A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE. (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER NICKEL PLATE.
   THREADED INSERT: COPPER ALLOY.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MOS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS MOS ALSO ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION OF THE CONNECTOR.
Figure 5.3 SP10RSSS48M220A1/AA-2269

Figure 5.4
Mating Connector – Female cable to Male right angle PCB contacts with threaded insert mount – Right side
Male right angle PCB Connector with angle bracket board lock mount – Right side.

(SP10RSSS48M2LN0A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR : GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE. (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER NICKEL PLATE.
   THREADED INSERTS: COPPER ALLOY.
   ANGLE BRACKETS: BRASS WITH TIN PLATE.
   SCREWS: STEEL, ZINC PLATE WITH CHROMATE SEAL.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MOS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS MOS ALSO ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION OF THE CONNECTOR.
Figure 5.5 SP10RSSS48M2LN0A1/AA-2269

Figure 5.6
Mating Connector – Female cable to Male right angle PCB contacts with angle bracket board lock mount – Right side
Male right angle PCB contacts Connector with threaded insert mount – Left side  
(SP10RSS48RM220A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
INSULATOR : GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE (HALOGEN-FREE)  
POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER  
NICKEL PLATE.  
THREADED INSERT: COPPER ALLOY.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS CMS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS  
WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS CMS ALSO  
ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION  
OF THE CONNECTOR.
Figure 5.7 SP10RSSS48RM220A1/AA-2269

Figure 5.8
Mating Connector – Female cable to Male right angle PCB contacts with threaded insert mount – Left side
Male right angle PCB contacts Connector with angle bracket board lock mount – Left side

(SP10RSSS48RM2LN0A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE. (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER
   NICKEL PLATE.
   THREADED INSERT: COPPER ALLOY.
   ANGLE BRACKET: BRASS WITH TIN PLATE.
   SCREWS: STEEL, ZINC PLATE WITH CHROMATE SEAL.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS M2S ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   WHICH ALLOWS FOR TOUCH SAFE AND NOT PLUGGABLE FEATURES. THIS M2S ALSO
   ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION
   OF THE CONNECTOR.
Figure 5.9 SP10RSSS48RM2LN0A1/AA-2269

Figure 5.10
Mating Connector – Female cable to Male right angle PCB with angle bracket board lock mount – Left side
Male straight PCB contacts Connector with screw mount – Right (SP10RSSS38M200A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE. (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER
   NICKEL PLATE
   THREADED INSERTS: COPPER ALLOY
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MODAL ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS MODAL ALSO
   ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION
   OF THE CONNECTOR.
Figure 5.11 SP10RSSS38M200A1/AA-2269

Mating Connector – Female cable to Male straight PCB with screw mount – Right side

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Male straight PCB contacts Connector with push-on fasteners –Right (SP10RSSS38M2N0A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE. (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER
   NICKEL PLATE
   THREADED INSERTS: COPPER ALLOY.
   PUSH-ON FASTENERS: COPPER ALLOY WITH TIN PLATE.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MOS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS MOS ALSO
   ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION
   OF THE CONNECTOR.

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**Figure 5.13 SP10RSSS38M2N0A1/AA-2269**

**Figure 5.14**
Mating Connector – Female cable to Male straight PCB with push-on fasteners – Right side

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Male straight PCB contacts Connector with screw mount – Left (SP10RSSS38RM200A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER NICKEL PLATE.
   THREADED INSERTS: COPPER ALLOY.
2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE.
3) THIS MOS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS WHICH ALLOWS FOR TOUCH RAPE AND HOT PLUGGABLE FEATURES. THIS ALSO ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION OF THE CONNECTOR.
Figure 5.15 SP10RSS38RM200A1-AA-2269

Figure 5.16
Mating Connector – Female cable to Male straight PCB with screw mount – Left side
Male straight PCB contacts Connector with push-on fasteners –Left (SP10RSSS38RM2N0A1/AA-2269)

NOTES:
1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0; COLOR: BLUE (HALOGEN-FREE)
   POWER CONTACTS: HIGH CONDUCTIVITY COPPER ALLOY WITH GOLD FLASH OVER
   NICKEL PLATE.
   THREADED INSERTS: COPPER ALLOY.
   PUSH-ON FASTENERS: COPPER ALLOY WITH TIN PLATE.
2) COMPLIANT TO THE CURRENT RoHS DIRECTIVE.
3) THIS MOS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   WHICH ALLOWS FOR TOUCH SAFE AND HOT PLUGGABLE FEATURES. THIS MOS ALSO
   ALLOWS FOR FIRST MATE CONTACT TO BE LOADED IN THE CENTRE CONTACT POSITION
   OF THE CONNECTOR.
Figure 5.17 SP10RSSS38RM2N0A1/AA-2269

Figure 5.18 Mating Connector – Female cable to Male straight PCB contacts with push-on fasteners – Left side
Male crimp contacts Connector – Right side

**Notes:**

1. **Materials and finishes:**
   - Insulator: Glass-filled polyester, UL 94V-0. Color: blue (halogen-free).
   - Contacts: Order contacts separately.
   - Threaded inserts: copper alloy.

2. **Compliant to the current RoHS directive.**

3. **This MOS allows for the connector to be supplied with special contacts modules which allows for touch safe and hot pluggable features.**

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Figure 5.19 SP10RSSS1M2001/AA-2268

Figure 5.20
Mating Connector – Female cable to Male crimp contacts
Male crimp contacts Connector – Left side
(SP10RSSS1RM2001/AA-2268)

**NOTES:**

1) MATERIALS AND FINISHES:
   INSULATOR: GLASS-FILLED POLYESTER, UL 94V-0. COLOR: BLUE (HALOGEN-FREE).
   CONTACTS: ORDER CONTACTS SEPARATELY.
   THREADED INSERTS: COPPER ALLOY.

2) COMPLIANT TO THE CURRENT ROHS DIRECTIVE

3) THIS MDS ALLOWS FOR THE CONNECTOR TO BE SUPPLIED WITH SPECIAL CONTACTS
   MODULES WHICH ALLOWS FOR TOUGH SAFE AND HOT PLUGGABLE FEATURES.
Figure 5.21 SP10RSSS1RM2001/AA-2268
6. Contacts

Female Crimp Size 8 contact for 12 AWG wire
(FC4012DS/AA-14-2272)

For other contacts using different wire sizes, the female crimp contacts ordering part numbers as follows:
For 8 AWG wire: FC4008DS/AA-2272
For 10 AWG wire: FC4010DS/AA-2272
For 16 AWG wire: FC4016DS/AA-2272
7. Ordering Part number

### Ordering Information - Code Numbering System

Specify complete connector by selecting a code from each option.

#### Example:

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<thead>
<tr>
<th>SERIES</th>
<th>SP</th>
<th>RSSS</th>
<th>48</th>
<th>M</th>
<th>2</th>
<th>2</th>
<th>0</th>
<th>A1</th>
<th>/AA</th>
<th>-</th>
<th>2269</th>
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<td><strong>SERIES</strong></td>
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<td><strong>BODY STYLE</strong></td>
<td>10 : Special Locking Latch System, for female cable to male panel/board connectors only</td>
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<td><strong>LAYOUT</strong></td>
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</tr>
</tbody>
</table>

**TERMINATION**
- 1 : Crimp contacts, order separately
- 1R : Crimp contacts, order separately, (Molding Inverted)
- 3 : Solder, straight PCB mount, Standard conductivity power contacts
- 3O : Solder, straight PCB mount, High conductivity power contacts
- 38 : Solder, Inverted straight PCB mount, Standard conductivity power contacts
- 4 : Solder, right angle (90°) PCB mount, Standard conductivity power contacts
- 48 : Solder, right angle (90°) PCB mount, High conductivity power contacts
- 4R : Solder, Inverted right angle (90°) PCB mount, High conductivity power contacts

**CONTACT GENDER**
- M : Male Pin
- F : Female socket

**PANEL MOUNT**
- 0 : None (for female connector only)
- 2 : 4-40 threaded insert

**MOUNTING OPTIONS & LOCKING SYSTEMS**
- 0 : None
- 2 : 4-40 threaded insert (for right angle PCB mount)
- N : Boardlocks
- LN : Angle brackets, boardlocks (for right angle PCB mount)
- W* : Backshell

**OPTIONAL FEATURES**
- O : Not Vented
- 9 : Vented for improved cooling

**CONTACT PLATING**
- A1 : Gold flash over 1.2 μm Ni (nominal) over Cu
- C1 : 0.76 μm Au (min) over 1.27 μm Ni (nominal) over Cu

**ENVIRONMENTAL COMPLIANCE**
- 1AA : RoHS 5/6 (< 4%) lead

**SPECIAL OPTIONS**
- 22688 : For code 1/1R in “Termination” (connector supplied with special contact modules which allows Touch Safe and Hot Pluggable. Hood Opening 45° if ordered with hood)
- 2269 : For code 22688R1/4/48/48R in “Termination” (connector supplied with special contact modules which allows Touch Safe and Hot Pluggable)
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<th>Amphenol P/N</th>
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<tr>
<td>SP10RSSS38RM200A1/AA-2269</td>
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</tr>
<tr>
<td>FC4012DS/AA-2272</td>
<td>xxx</td>
<td></td>
</tr>
</tbody>
</table>

The connector shall have a positive retention latch that can be unlatched with a finger release force less than 15 N.

The insertion force of the cable connector shall be less than 156 N.

Field replaceable terminals are not required.

Connector set shall be polarized.

Connector system shall provide for a ground pin that will make first mate/last break.

Provision for an optional protective cover for the connector when the cable is removed. Cover should provide a warning ISO 7010-W012 (shock warning).

The finger latches on the whip side connector need to be protected when the cable is extracted through the rack cable trough.

8. Environmental Requirements:

Connectors to be stored in their original shipping cartons in a humidity controlled environment where the relative humidity remains below 75% and the ambient temperature is between 10°C and 27°C. With the above conditions, the products will have a minimum shelf life of five (5) years from date of manufacture.
9. Quality

The following tests will be conducted with three samples each per Table 1.

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Standard</th>
<th>Test Condition/ Method</th>
<th>Pass/Fail Criteria</th>
<th>Additional Data to Collect for Review</th>
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<td>Durability</td>
<td>EIA-364-09</td>
<td>100 mating/un-mating cycles 30~60mm per second travel speed</td>
<td>contact resistance before and after post test surface wear examination: no exposed nickel or copper</td>
<td>N/A</td>
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<tr>
<td>Contact Retention</td>
<td>EIA-364-29</td>
<td>Method A With minimum 15lbs axial load for minimum 6 seconds</td>
<td>no visible contact to housing displacement</td>
<td>N/A</td>
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<td>Vibration</td>
<td>EIA-364-28</td>
<td>Test condition VII Test condition letter E 15 minutes duration in each of the three mutually perpendicular direction</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EIA-364-28F</td>
<td>EIA-364-28F Condition II</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>EIA-364-27</td>
<td>half-sine pulse test condition A 3 shocks * 3 perpendicular planes * 2 directions = 18 shocks</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EIA-364-27C</td>
<td>Condition H</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td>Temperature Life</td>
<td>EIA-364-17</td>
<td>Method C Test condition 1: 125±/-2C Test duration: 168hrs</td>
<td>per standard, section 4.4 in addition: contact resistance before and after monitor contact voltage drop during test</td>
<td></td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>EIA-364-32</td>
<td>Method A Test condition VII: -55C to 105C Test duration: 10cycles</td>
<td>per standard, section 4.6</td>
<td>N/A</td>
</tr>
<tr>
<td>Humidity</td>
<td>EIA-364-31</td>
<td>Method IV</td>
<td>contact resistance before and after dielectric withstand voltage before and after insulation resistance before and after</td>
<td>N/A</td>
</tr>
<tr>
<td>Temperature rise</td>
<td>EIA-364-70</td>
<td>Method I Run at 32A through connector without exceeding 30°C above ambient temperature</td>
<td>Lower than 30C</td>
<td>N/A</td>
</tr>
<tr>
<td>Temperature rise</td>
<td>EIA-364-70</td>
<td>Method 2</td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Whip Connector wire cable pull test

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Configuration</th>
<th>Force (N)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial</td>
<td>489 N min.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Whip Side Connector drop test

<table>
<thead>
<tr>
<th>UL/IEC/EN 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements (applicable to meet anticipated effective date of December 20, 2020 for North America and Europe.)</th>
</tr>
</thead>
</table>

### Voltage Proof Test

<table>
<thead>
<tr>
<th>Voltage Proof Test</th>
<th>Per standard</th>
<th>2200 V r.m.s. typical</th>
<th>N/A</th>
</tr>
</thead>
</table>

### Insertion and Withdrawal Force Test

<table>
<thead>
<tr>
<th>Insertion and Withdrawal Force Test</th>
<th>Per standard</th>
<th>Insertion force: 156 N max.</th>
<th>Withdrawal force: 9.73 N min.</th>
<th>N/A</th>
</tr>
</thead>
</table>

### Insulation Resistance Test

<table>
<thead>
<tr>
<th>Insulation Resistance Test</th>
<th>Per standard</th>
<th>5G ohms minimum</th>
<th>N/A</th>
</tr>
</thead>
</table>

10. Compliance requirements for the connector

Connector shall be UL approved under UL1977, and it shall not cause any non-compliance issue with the latest amendment of the following Standards when it is integrated into the ORV3 rack.

- UL/IEC/EN 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements (applicable to meet anticipated effective date of December 20, 2020 for North America and Europe.)
- RoHS Directive (2011/65/EU, including proof by Declaration of Conformity and any other supporting documentation required for Deliverables, Components and Products, unless there are legal exemptions allowed); including aims to reduce the environmental impact of EEE by restricting the use of certain substances during manufacture.
- REACH Regulation (EC) No 1907/2006; registration with the European Chemicals Agency (ECHA), evaluation, authorization and restriction of chemicals.
- Halogen Free: IEC 61249-2-21, Definition of halogen free: 900ppm for Br or Cl, or 1500ppm combined requires companies using tin, tantalum, tungsten, and gold (“3TG”) in their products to verify and disclose the mineral source.

Connector shall be designed to meet the following additional safety requirements

- A connector enclosure shall be constructed to reduce the risk of unintentional contact with any live parts. Live pins in the connector shall not be assessable when testing with the following pin as defined at UL standard.
• If the above requirement cannot be met, the plastic cap must be provided for use with the unused connector, so that unintentional contact to pins cannot happen.

• A connector enclosure shall be constructed not to be easily accessible by user without using special tool. User has no access to the internal wiring for AC power configurations.

• Connector shall be keyed, in such a way that prevent from mating in wrong direction.

• Cord strain relief shall be provided, and it shall have a retention latch that shall not be damaged when minimum 100N force is applied in the most unfavorable direction.

• Connector shall be designed to have a minimum of 3.2mm air-spacing between an uninsulated live and any other metal part (if any) in the connector construction.

• Any exposed non-current carrying metal part of a device that are likely to become energized shall be conductively connected to the ground.

• The following caution label should be placed near the connector.

  **CAUTION – Risk of Electric Shock. Do Not Disconnect Under Load**

• Connector must survive 50 cycles of insertion/removal at 150% of the maximum rated current and voltage. There shall not be any electrical and mechanical failure or burning of the contacts. *In case any insulation material is used inside the connector and the insulator is exposed to the arcing*, total 250 cycles shall be performed.

• Dielectric voltage-withstand tests (1000Volts + 2x rated voltage) must be performed after insertion/removal tests. There shall not be any indication of electrical or mechanical failure, electrical tracking, formation of a permanent carbon path, or ignition of material.

• Trise on the wiring terminals in the connector should not exceed 30°C when the device is carrying its maximum rated current.

• Connector plastic housing shall meet 94V0 flammability requirements.
Appendix 1 – Compliance requirements for the cable assembly for reference

- Parts used in the cable assembly shall be UL recognized or listed under the following standards.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1682</td>
<td>IEC 309 AC connector to the branch circuitry</td>
</tr>
<tr>
<td>UL498</td>
<td>NEMA AC connector to the branch circuitry</td>
</tr>
<tr>
<td>UL1977</td>
<td>Output connector that mates with connector in the power shelf</td>
</tr>
<tr>
<td>UL62 and UL817</td>
<td>Flexible power cord that can be used for AC wiring</td>
</tr>
</tbody>
</table>

- Power cord shall meet UL/CSA SOOW and EU CENELEC <HAR> H07RN-F with +75C temperature rating. Halogen free cord (including internal wires) must be evaluate to the 150 degree C of Heat-shock test. And the following wire size (minimum) shall be used.

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>50Amps</td>
<td>6AWG</td>
</tr>
<tr>
<td>32Amps</td>
<td>8AWG</td>
</tr>
<tr>
<td>30Amps</td>
<td>8AWG</td>
</tr>
<tr>
<td>20Amps</td>
<td>10AWG</td>
</tr>
</tbody>
</table>

11. Revisions

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Author</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>5 JUL 19</td>
<td>SM and HK</td>
<td>Initial Release</td>
</tr>
<tr>
<td>0.2</td>
<td>12 JUL 19</td>
<td>Steve Mills</td>
<td>Extensive updates from the JDA group</td>
</tr>
<tr>
<td>0.3</td>
<td>1 AUG 19</td>
<td>Ben Kim</td>
<td>Added detail to section 7 and created Appendix 1</td>
</tr>
</tbody>
</table>