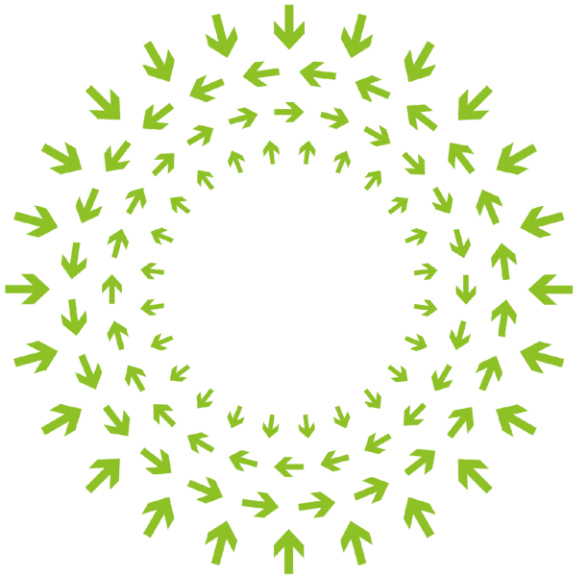

OPEN

Compute Project

Open Rack V3 Power Output Connector

Rev: 2.0

Author:

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Table of Contents

1. Scope

This document defines the technical specifications for an Open Rack V3 48V Power Output Connector used in the Open Compute Project.

2. Overview

This interconnection is the power interface between Open Rack V3 power shelves (PSU Shelf and BBU Shelf) and the Open Rack V3 48V busbar.

Figure 1: 1OU ORv3 Power Shelf

3. Electrical

- Voltage range: 46.0V to 52.0V DC
- Power Contact Max current continuous in still air: 360A
- Power Contact Max current continuous in 300LFM @ 45°C airflow: 500A
- Max temperature rise: 30°C (with busbar connected, as specified in ORv3 Busbar Spec)
- Power Contact Max voltage drop: 14mV @ 360A, 20mV @ 500A
- Chassis Ground Contact Max Current for 2-minute duration in still air: 64A total (2 contacts x 32A)
    - Chassis Ground Contacts may not be required for some applications.
- This connector is not designed for hot plug/unplug applications (no mate/break under load).

4. Environmental

- Operating Ambient Temperature at connector location: 15°C to 70°C
- Long-term Storage: -40°C to 50°C and 5 to 95% RH
- Short-term Storage: -20°C to 65°C and 10 to 80% RH
- Operating Humidity: 20 to 90%, 5°C dew point minimum
- Lifetime: 5 years

5. Mechanical

5.1 Geometry

- The connector shall fit within the maximum height of 1 Open Rack Unit (48.00 mm) including ±3.0 mm vertical connector float.
- Wires shall resist pullout from the connector of 15 kgf.
- The connector shall support a panel thickness of 1.10 to 1.32 mm.
- Mounting Hardware:
    - Fasteners: M3 screws with 6 mm MAX head diameter and 2.5 mm MAX head height.
    - Washer: 20 mm diameter and 1+0.5/-0 mm thickness
- Tools may be required to attach the connector to the shelf.
- Torque range for applicable mounting hardware shall be 0.7 to 0.9 N-m.
- The connector is not intended to control the location of the power shelf in the rack (not for use as a mechanical stop).

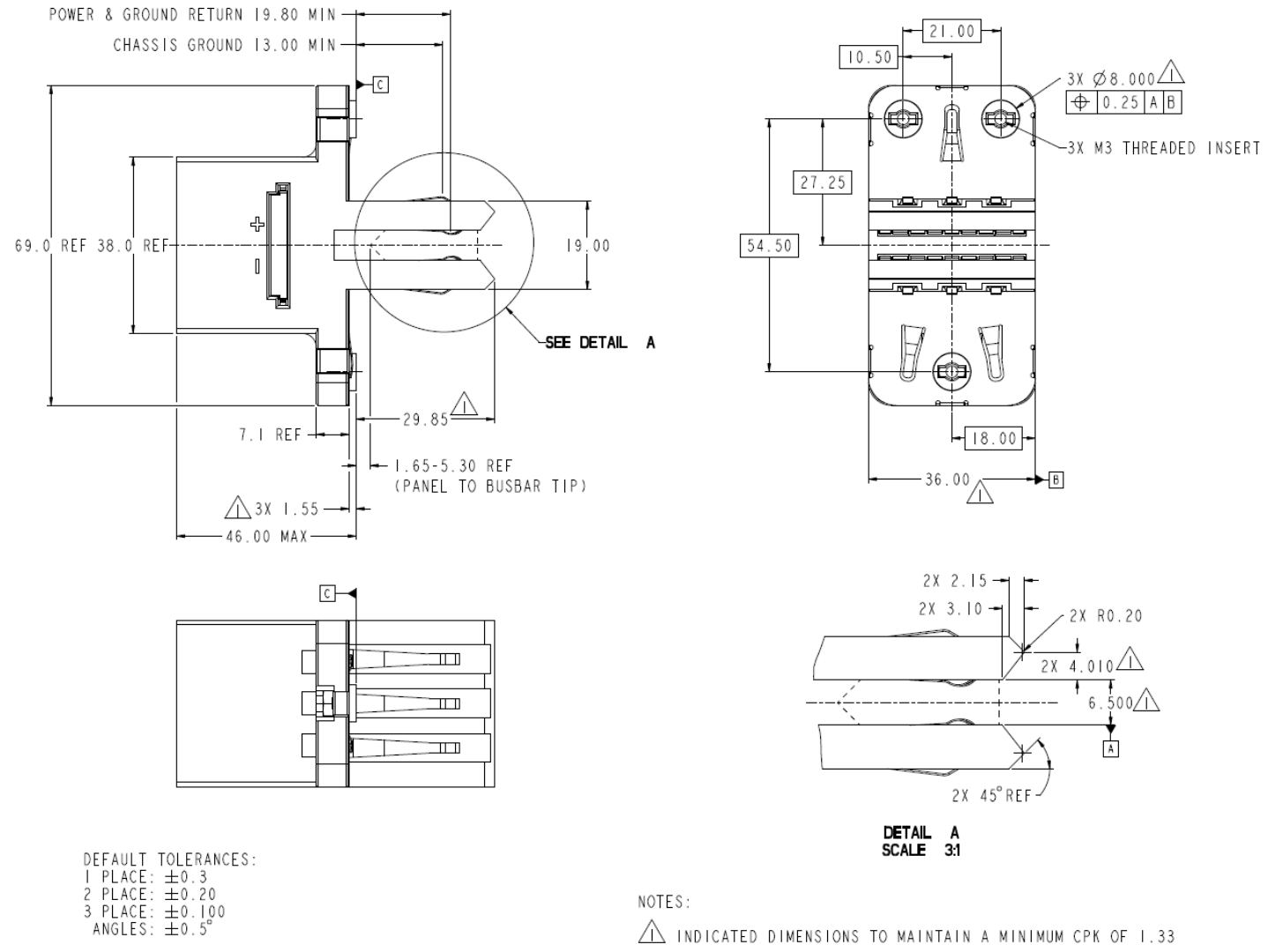
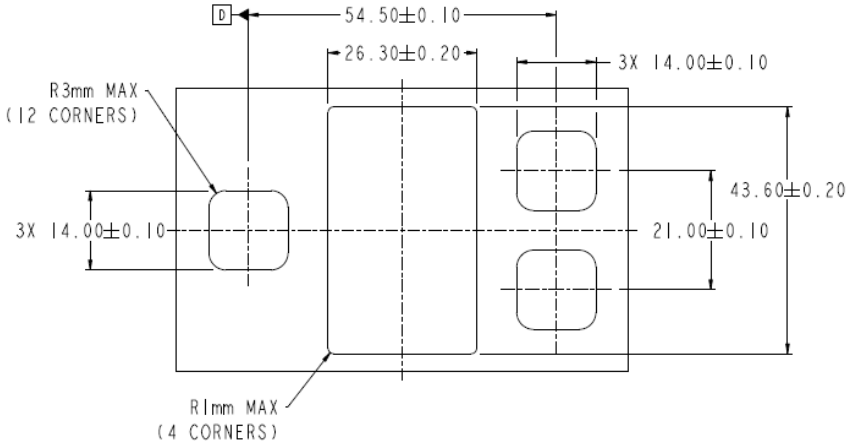


Figure 2: Power Output Connector Detail for Screw Mounted Connector



NOTE: Datum D shown as reference to IT Gear specification

Figure 3: Panel Cutout for Screw Mounted Connector

5.2 Mating to the ORv3 Busbar

- The ORv3 48V busbar is defined in the Open Rack Standard V3.0 specification. The busbar details shown below are provided for reference only.

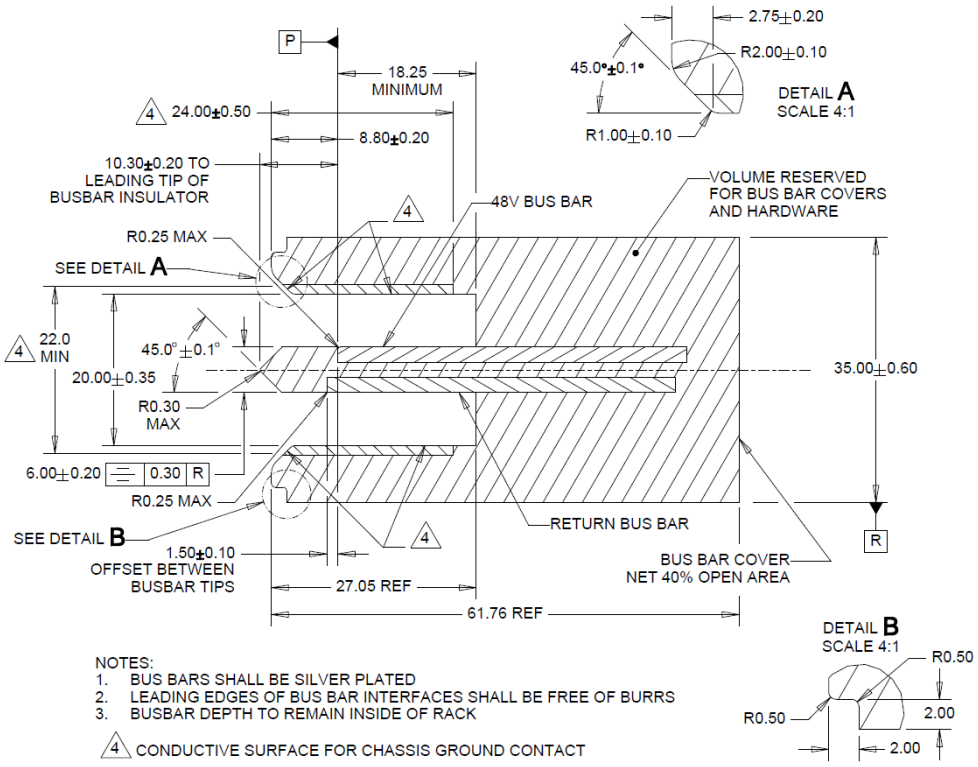


Figure 4: ORv3 Busbar Mechanical Detail (reference only)

- All busbar contact points to be plated with silver over nickel
- The connector shall support blind-mate installation of the Power Shelf connector onto the ORv3 busbar (figure 4) as defined in the Open Compute Specification Revision 3.0.
- Connector power contacts to be plated with silver over nickel in the busbar mating zone
- Connector chassis ground contacts to be plated with matte tin over nickel in the busbar ground mating zone
- Connector shall support ±3 mm float horizontally and vertically.
- Connector shall enable 6.4 mm side-to-side gatherability.
- The max rate of the power shelf insertion into the rack will be 1 m/s.
- The mating force of the connector with the busbar shall be less than 120 N.
- The power shelf will ship within the rack while connected to the rack busbar. The connector solution shall prevent damage of the power shelf and the rack busbar during the following packaged, rack-level tests (ASTM 4169 details below) while meeting the voltage drop requirements per section 6.0 and show no exposed copper of either the power shelf connector or rack busbar under SEM analysis of the interfaces.
- The rack is tested in the shipping packaging for transportation Shock and Vibration per ASTM 4169-16 Schedule E - Vehicle Vibration for 2hrs on vertical axis only for 80 minutes low level, 30 minutes medium level and 10 minutes high level.

6. Test Busbar Mechanical Requirements

- Power test busbar to enable testing of the Power Output connector
- Copper conductors (C1100 or equivalent) with silver over nickel plating in the connector mating zone (minimum)
- Steel cage with matte tin over nickel plating on the connector ground mating zone
- M6 threaded stud connections provided on the busbar and cage
- Contact Amphenol for pricing and availability. Amphenol part number 703110001

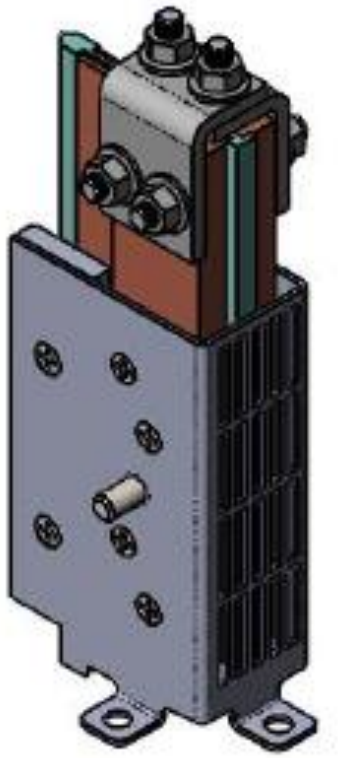


Figure 5: ORv3 Test Busbar
Amphenol part number 703110001
(Stepped conductor with shorting bar)

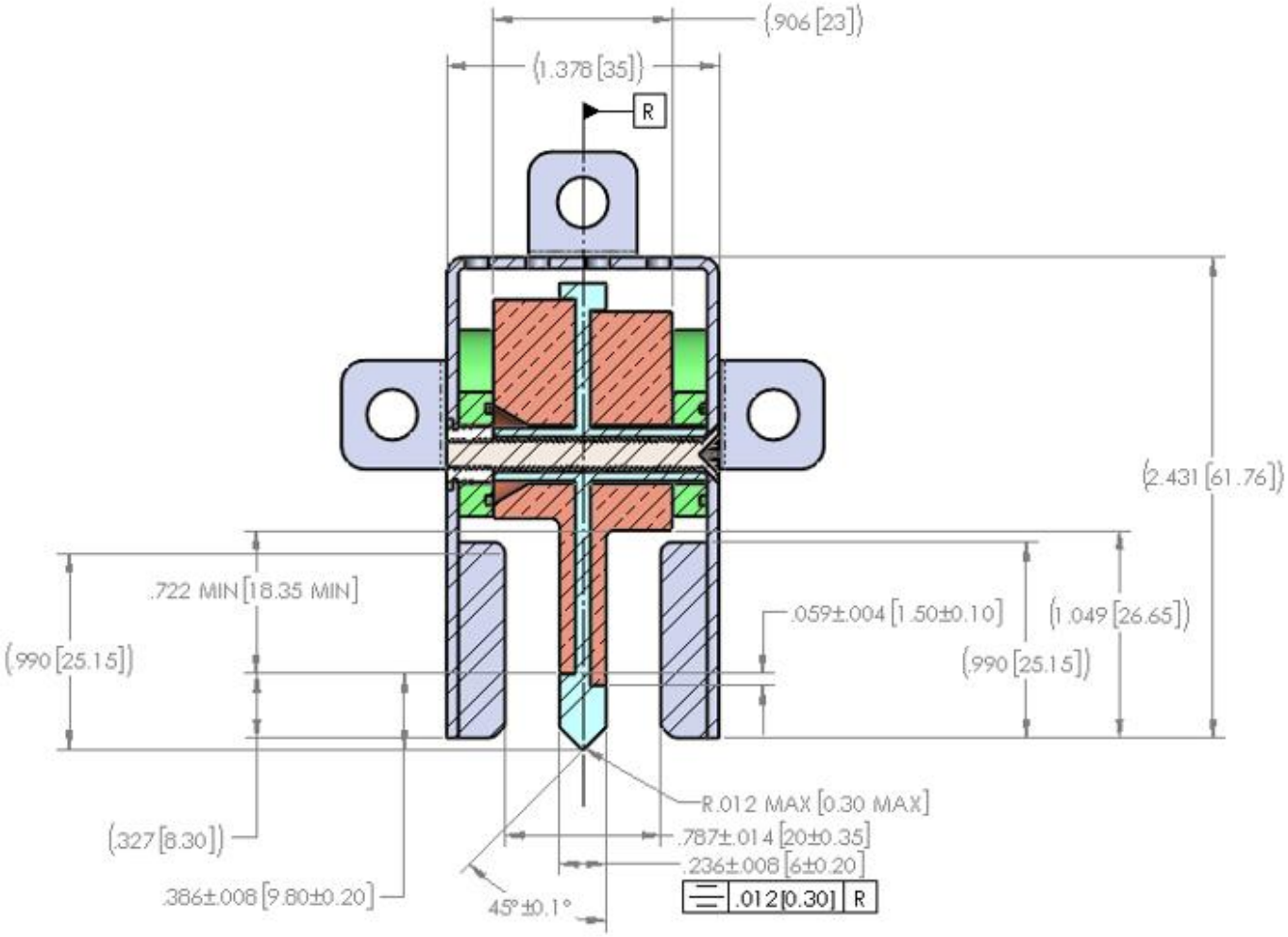


Figure 6: ORv3 Test Busbar Cross Section Detail

7. Quality

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

Table 1: Testing Detail

Test	Test Standard	Test Condition/ Method	Pass/Fail Criteria	Additional Data to Collect for Review
Low level contact resistance (LLCR)	EIA-364-23	Subject mated specimens to 100 milliamperes maximum current and 20 millivolts maximum open circuit voltage.	10 milliohms maximum (initial) 20 milliohms maximum (final)	
Contact resistance at rated current (CRRC)	EIA-364-6	Resistance should be measured after the connector has reached thermal equilibrium, after carrying Rated load at 25°C ambient temperature.	0.5 milliohms maximum (initial and final)	
Withstanding voltage	EIA-364-20, Condition I	1000 volts AC at sea level for power contacts. 1 minute duration. Test between adjacent contacts of specimens.	No breakdown or flashover	
Durability	EIA-364-09	Mate and un-mate specimens with mating cable assembly for 50 cycles at a maximum rate of 500 cycles per hour.	LLCR before and after post test surface wear examination: no exposed nickel or copper	
Contact Retention	EIA-364-29, Method A	15kgf pull force, both axial and at 45degrees, for a minimum of 6 seconds	No visible contact to housing displacement	N/A
Wire Retention (Parallel to the wire direction)	UL468	Pull force per wire gauge as defined in the specification	No visible contact to housing displacement	N/A
Wire Retention (perpendicular to the wire direction)	N/A	Half the pull force defined in UL 486 will be applied perpendicular to the wire direction	No visible reduction in contact-to-contact distance	N/A
Vibration	EIA-364-28 Test condition VII, Test condition E	15 minutes duration in each of the three mutually perpendicular direction	No discontinuities of 1 microsecond or longer duration. No plastic deformation or contact dislodging. In addition: LLCR before and after	post test contact wear optical examination, SEM/EDX optional

Shock	EIA-364-27, Method A	Subject mated specimens to 50G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.	No discontinuities of 1 microsecond or longer duration. No plastic deformation or contact dislodging.	Post test contact wear optical examination, SEM/EDX optional
Mating Force	EIA-364-13	Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute.	110 N maximum per receptacle cable assembly	
Un-mating force	EIA-364-13	Measure force necessary to un-mate specimens at a maximum rate of 12.7 mm [.5 in] per minute.	15 N minimum per receptacle cable assembly	
Temperature Life	EIA-364-17, Method A, Condition 5.	Subject mated specimens to 125°C for 500 hours.	LLCR before and after	monitor contact voltage drop during test
Thermal Shock	EIA-364-32, Method A	Test condition VII: -55C to 85C for 10 cycles with 30-minute dwell time	LLCR before and after	N/A
Humidity	EIA-364-31, Class III	Subject mated specimens to 10 cycles (10days) between 25 and 65°C at 80 to 98% RH	LLCR before and after Dielectric withstand voltage before and after	N/A
Salt Spray	EIA-364-26C	Subject mated specimens to test for 48 hours, with a 5% solution salt spray, 35 +1/-2°C	LLCR before and after	N/A
Temperature rise vs. current [1]	EIA-364-70, Method 3	Attach connector to a busbar 45mm in length and heated to 85C. Stabilize at a single current level until 3 readings at 5-minute intervals are within 1°C.	Lower than 30°C	N/A

1) Multiple test samples may be connected in a single circuit (daisy chain) for t-rise testing. However, the current capability of jumper wires/cables connecting each test sample must be less than 125% of the target connector current. Example: the current capability of jumper wires/cables must not exceed 450A@30°C when connecting 360A@30°C test samples.

8. Regulatory

The connector shall comply with the latest edition, revision, and amendment of the following Standards:

- IEC 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.)
- Halogen Free per JEDEC JS709C
- RoHS 2011/65/EU (RoHS 2)
- Material flammability: All materials shall be UL94 V-0 rated.
- Connectors shall be UL1977 recognized.

9. Ordering Part Numbers

Vendor	Description	P/N
Amphenol	BarKlip BK500 IO cable, screw mount	10156914-004LF
Staubli Electrical Connectors	Multilam ORV3 busbar connector GSR6/LA-CUD/36.4	TBD
TE Connectivity	BlackBox BB1000 OCP Rack Busbar Power Connector	2204888-1
Molex	BBC OCP ORV3 48V HARNESS ASSEMBLY	215860-XXXX

10. Contributors to Open Rack V3 Power Output Connector specification

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11. Revisions

Rev	Date	Author	Changes
1.50	17 Dec 2021	Steve Pressel	Initial Release
1.60	19 Jan 2022	Steve Pressel	Added/Inserted Section 6 “Test Busbar Mechanical Requirements”
1.70	21 Jan 2022	Steve Pressel	Added contact plating to section 5.2 Updated power & ground contact dimensions in Figure 2
1.80	03 Feb 2022	Steve Pressel	Updated power & ground contact dimensions in Figure 2
1.90	23 Mar 2022	Steve Pressel	Figure 2 – changed 19.000 to 19.00. Figure 3 – added Datum D reference. Added/Inserted Section 10 “Contributors…”
2.00	24 Mar 2022	Steve Pressel	Figure 3 – removed “CL of Datum D” note