



OPEN

Compute Project

Open Rack V3 IT Gear Input Connector

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TE Connectivity

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1. Scope

This document defines the technical specifications for an Open Rack V3 IT Gear 48V Input Connector used in the Open Compute Project.

2. Overview

This interconnection is the power interface between Open Rack V3 IT Gear equipment and the Open Rack V3 48V bus bar.

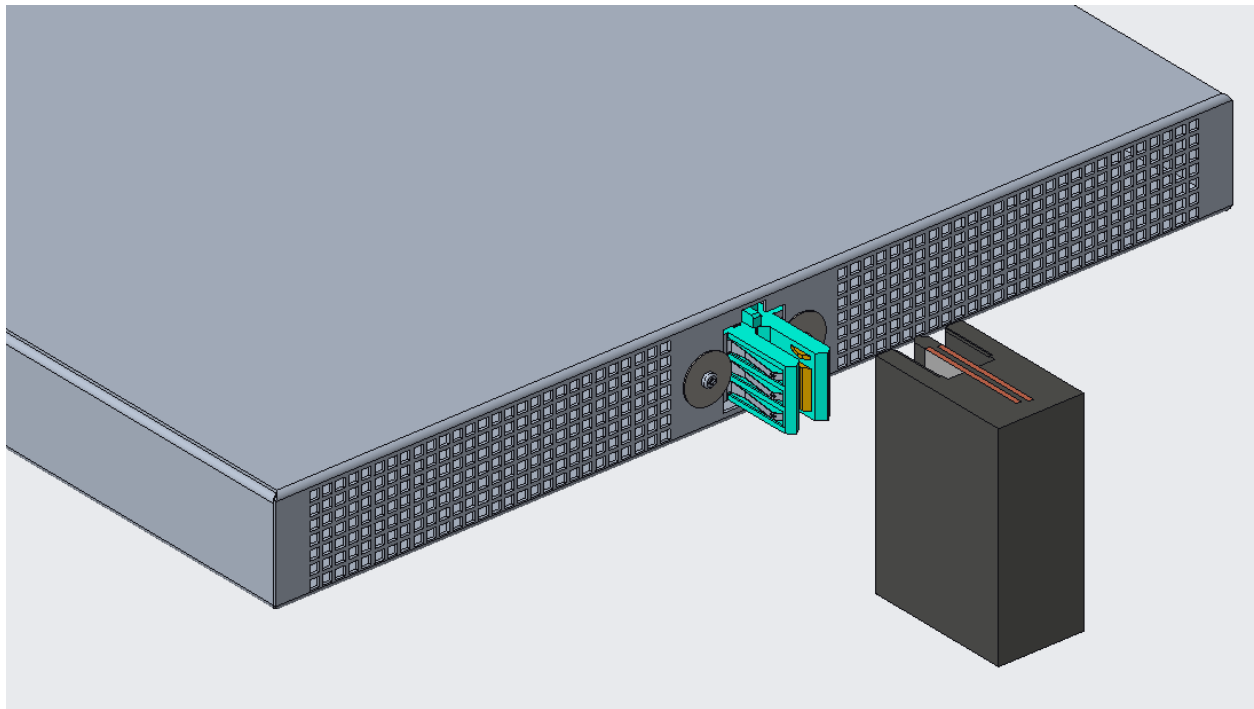


Figure 1: IT Gear Chassis and ORv3 Busbar

3. Electrical

- Voltage range: 46.0V – 52.0V DC
- Power Contact Max current continuous: 100A DC
- Chassis Ground Contact Max Current for 2 min duration: 64A total
- Max temperature rise: 30°C (with busbar connected, as specified on ORv3 busbar Spec)
- Max voltage drop: 55mV @ 100A

4. Mechanical

4.1 Geometry

The connector shall fit within the maximum height of a 1 Rack Unit (44.45mm) including vertical connector float (as defined in section 4.2).

The connector shall support a panel thickness of 0.90 to 1.32 mm.

The connector MAY use tools to attach the connector to the IT Gear equipment or shelf.

Torque range for applicable mounting hardware shall be 0.4-0.6 N-m.

Wires shall resist pullout from the connector of 15kgf.

4.2 Mating to the Busbar

The connector shall support blind-mate installation of the IT Gear onto the 48V busbar (figure 4) as defined in the Open Compute Specification Revision 3.0.

Connector shall support +/-3mm float horizontally and vertically with the exception for a toolless connector mounted in a 1RU (44.45mm) chassis which shall support 2.0mm float vertically and 3.0mm float horizontally.

Connector shall enable 6.4mm side to side gather ability

Connector chassis ground contacts shall provide a connection to the busbar cage and carry 64A current for a maximum duration of 2 minutes which is 2 times the rated AC current input of 32A.

Connector to have a sense contact on each side of the connector that mates a minimum of 1mm after the 48V power contact mates.

Sense contact to carry a minimum of 1.5A current with a temperature rise of no more than 30°C

Connector shall support 4.7mm of wipe for the sense contact at worst case chassis tolerance.

The max rate of the IT Gear insertion into the rack will be 1 m/s.

The mating force of the connector onto the busbar shall be less than 100N.

4.3 Transport Requirements

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.

4.4 Screw Mount Connector Detail

The screw mounted connector is mounted to the IT Gear rear panel from the inside of the IT Gear equipment. It is fastened to the panel using 2 M3 screws and 2 20mm diameter washers. The washers are applied from the outside of the IT Gear thus capturing the panel between the connector body on the inside and the washers on the outside.

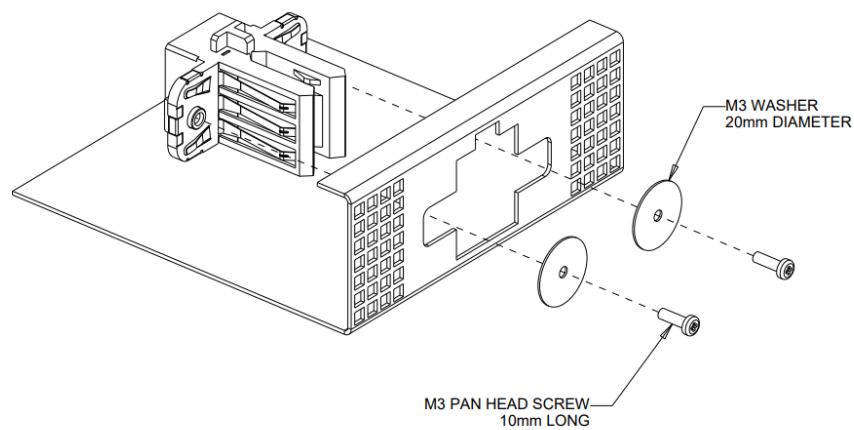


Figure 2: IT Gear Connector Installation, Screw Mounted

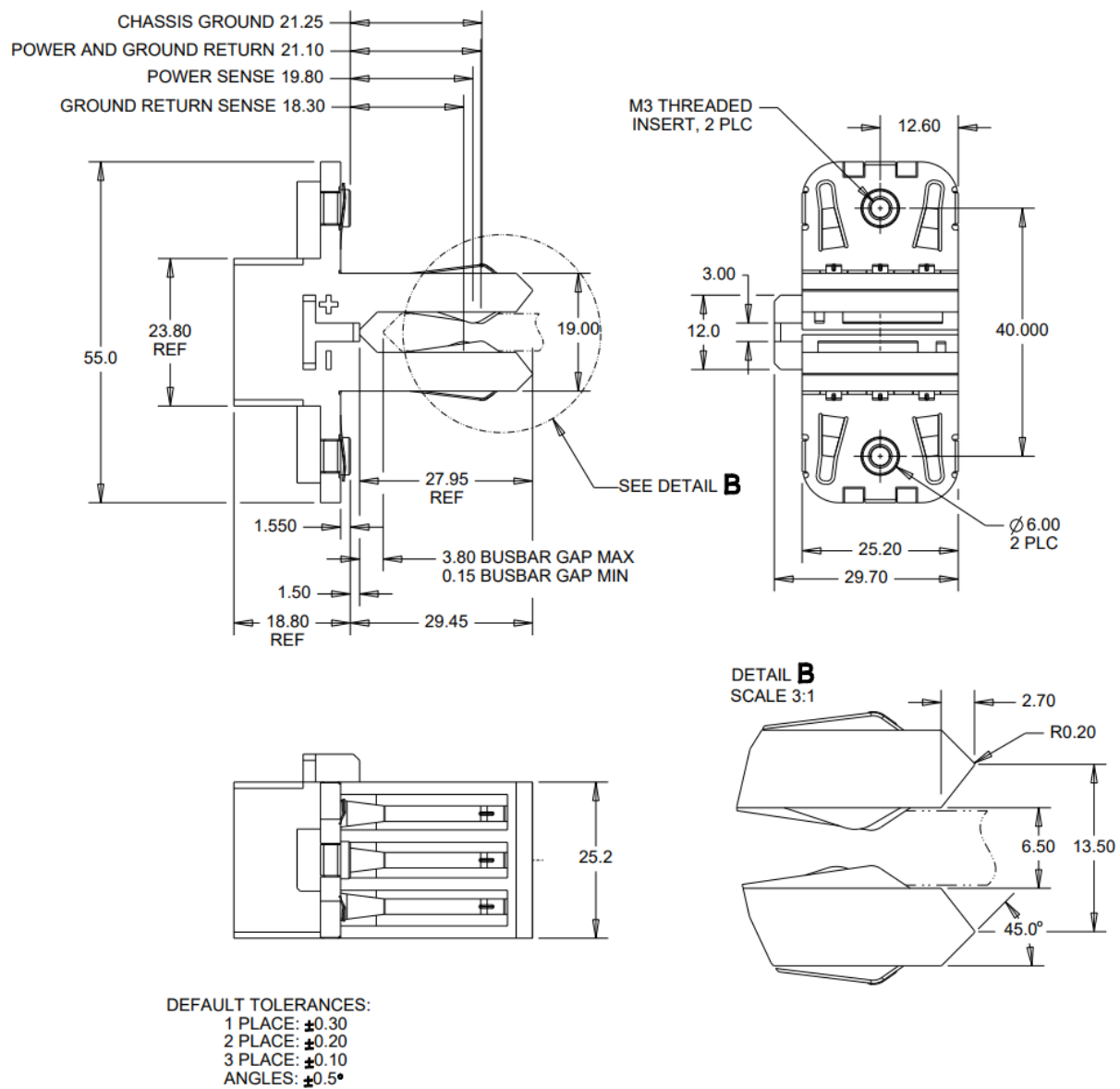
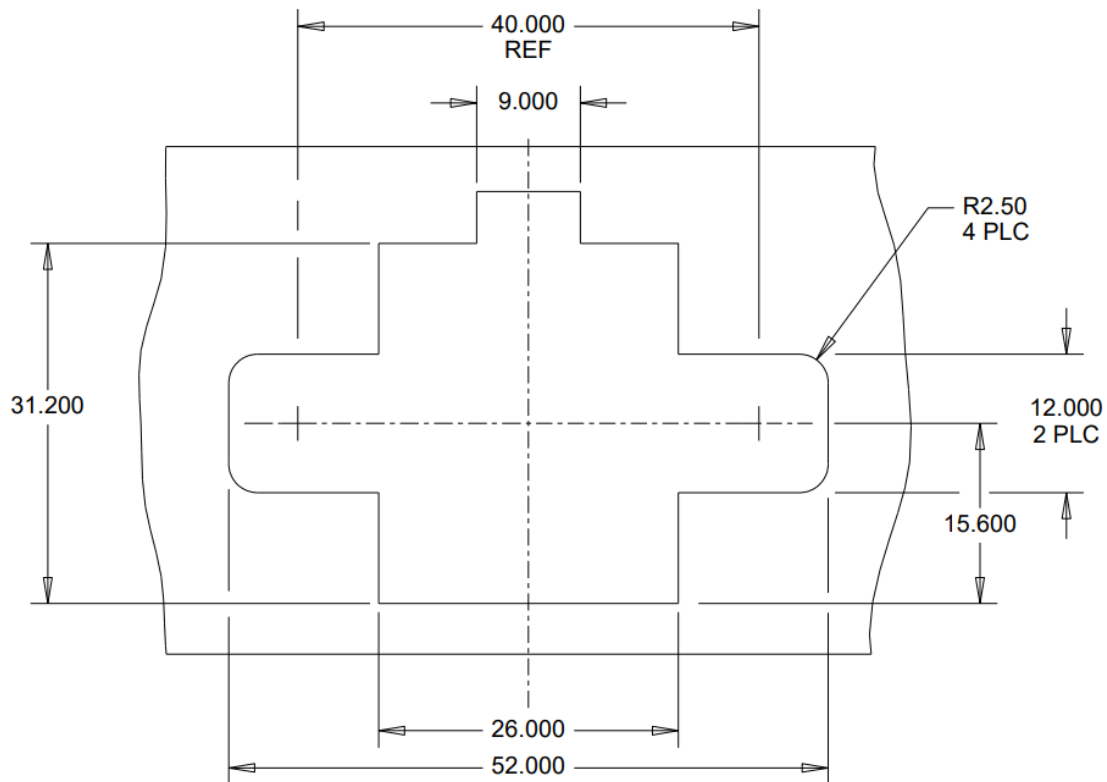


Figure 3: IT Gear Connector Detail, Screw Mounted



DEFAULT TOLERANCES:
 1 PLACE: ± 0.30
 2 PLACE: ± 0.20
 3 PLACE: ± 0.10
 ANGLES: $\pm 0.5^\circ$

Figure 4: Panel Cutout for Screw Mounted Connector

4.5 Toolless Mounted Connector Detail

The toolless mounted connector is attached to the IT Gear rear panel from the inside of the IT Gear equipment. It is inserted through the panel on one side of the panel opening and moved to the center of the opening. Once in that position, the locking feature is to be engaged thus preventing the connector from being able to be moved back to the position in which it was inserted through the panel opening.

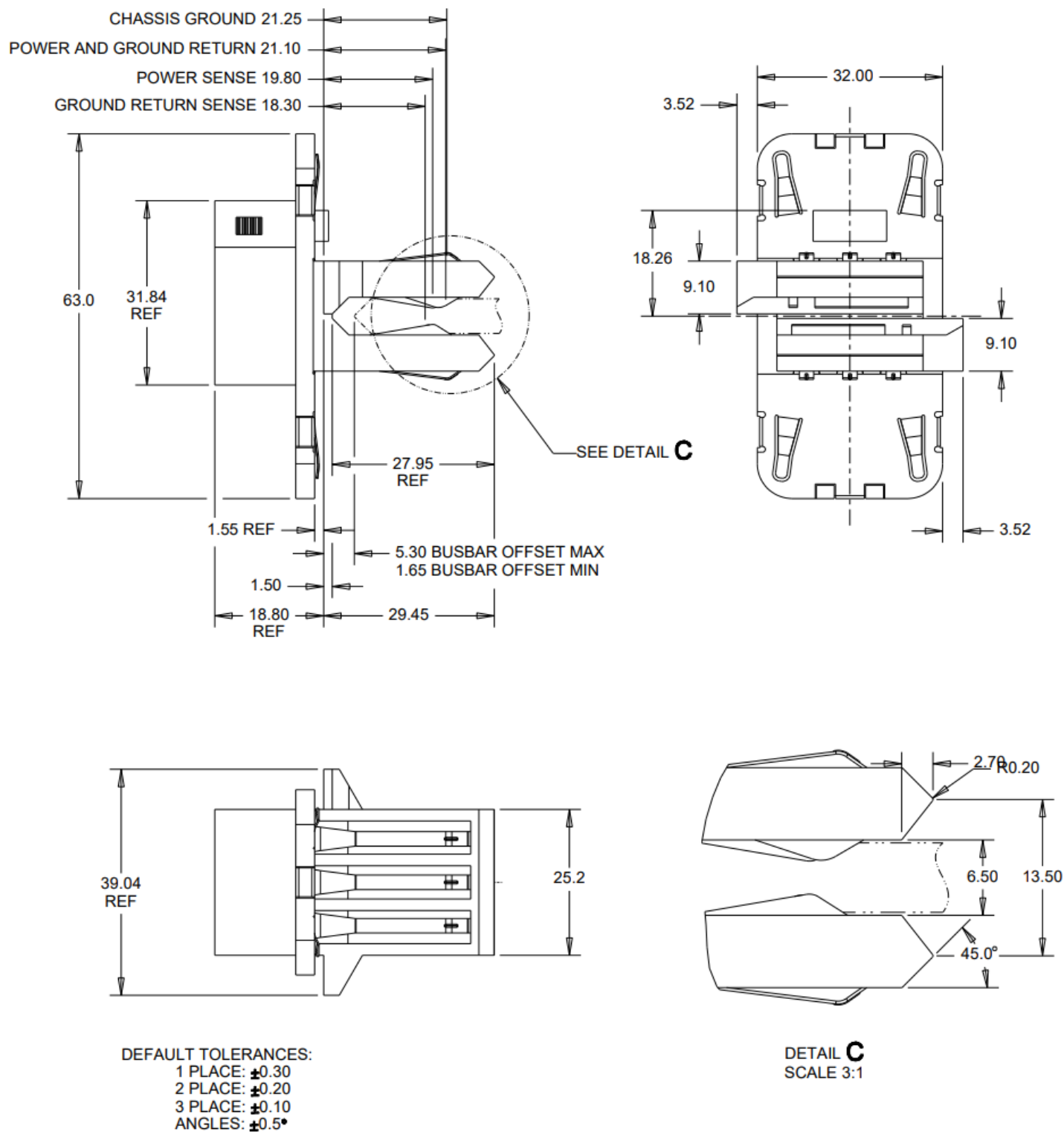


Figure 5: IT Gear Connector Detail, Toolless Mounted

The panel cutout for the toolless connector depends on the IT Gear equipment size. For equipment designed for a 1 RU (44.45mm) spacing, the panel cutout allows for a $\pm 2.0\text{mm}$ vertical float. For

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equipment designed for a 1 OU (48.0mm) spacing or larger, the panel cutout allows for a $\pm 3.0\text{mm}$ vertical float.

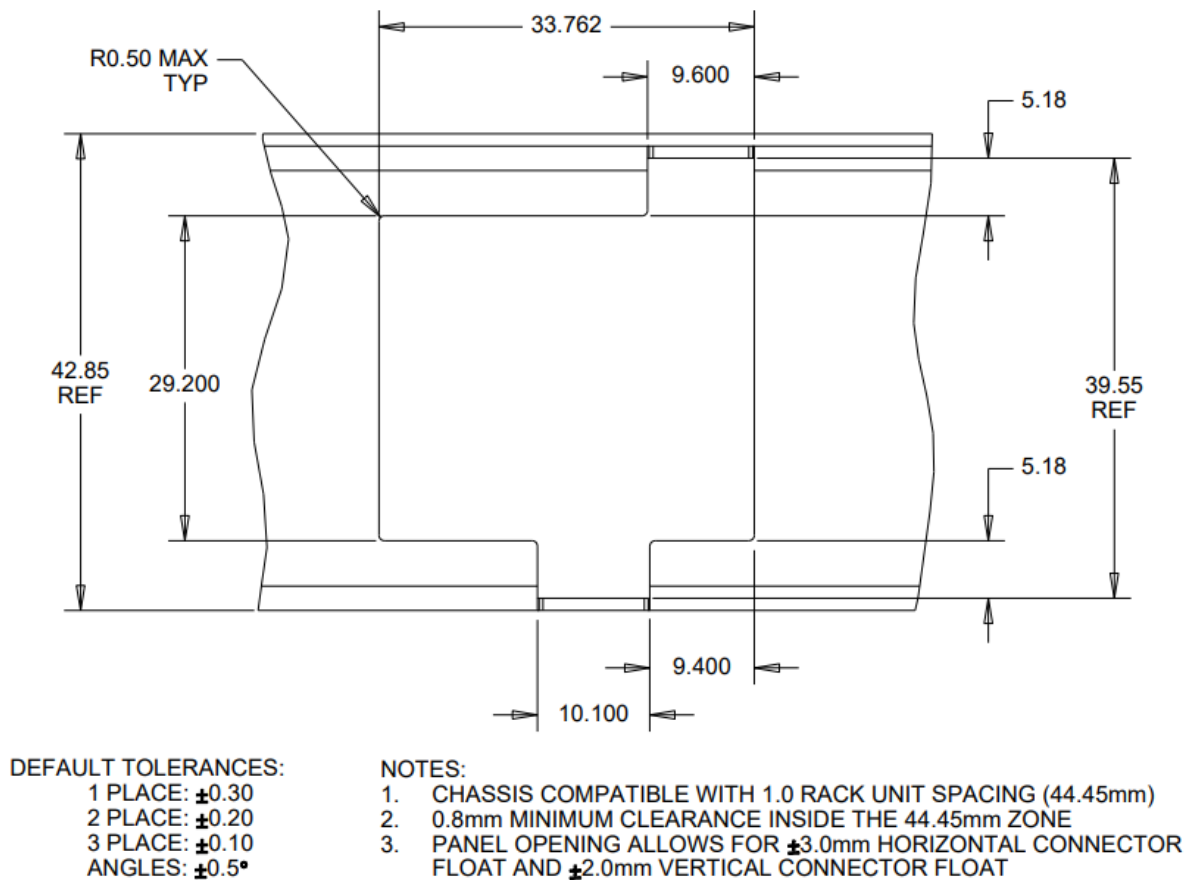
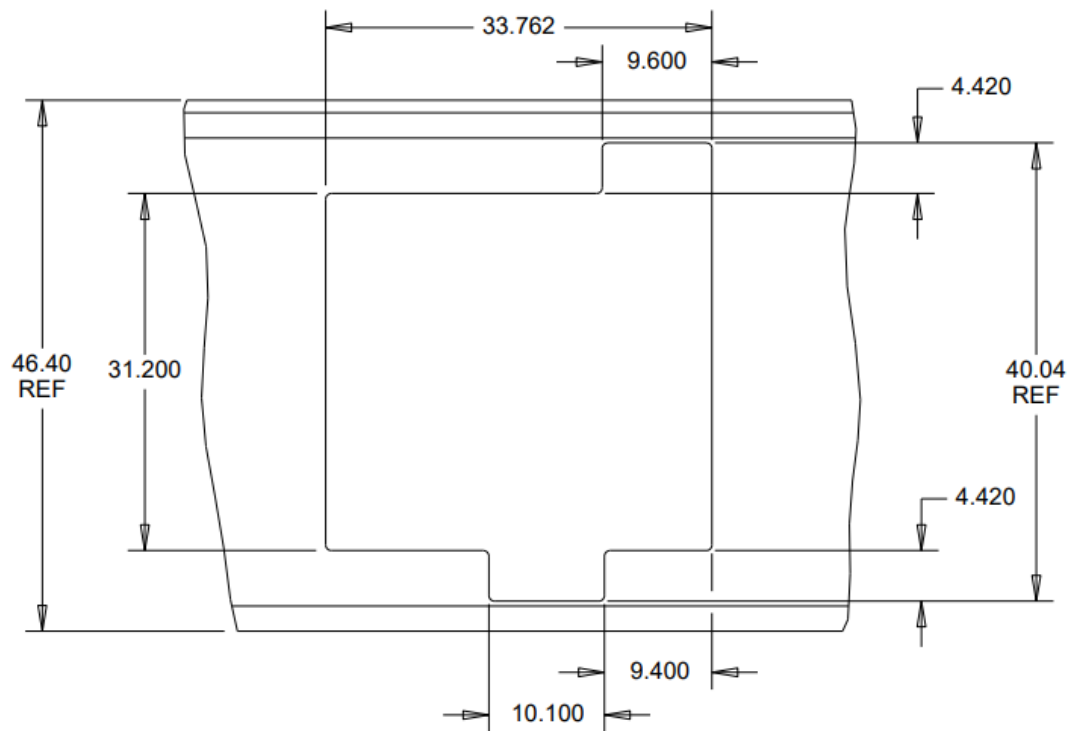


Figure 6: Panel Cutout for Toolless Mounted Connector for 1RU Spacing



DEFAULT TOLERANCES:

1 PLACE: ± 0.30

2 PLACE: ± 0.20

3 PLACE: ± 0.10

ANGLES: $\pm 0.5^\circ$

NOTES:

1. CHASSIS COMPATIBLE WITH 1.0 OPEN UNIT SPACING (48.00mm)

2. 0.8mm MINIMUM CLEARANCE INSIDE THE 48.00mm ZONE

3. PANEL OPENING ALLOWS FOR ± 3.0 mm HORIZONTAL CONNECTOR FLOAT AND ± 3.0 mm VERTICAL CONNECTOR FLOAT

Figure 7: Panel Cutout for Toolless Mounted Connector for 10U Spacing

4.6 48V 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.

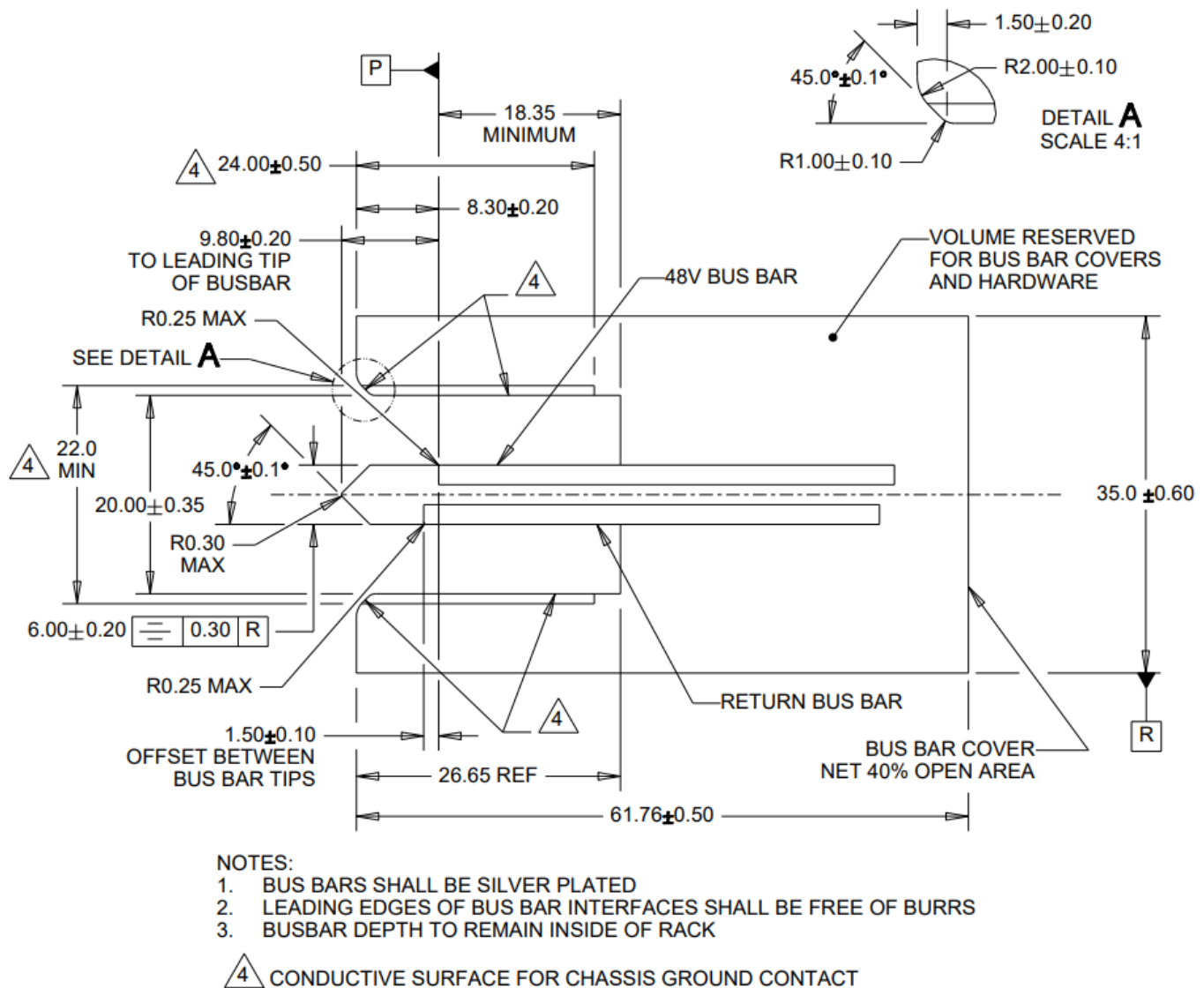


Figure 8: ORv3 Busbar Mechanical Detail

5. Environmental Requirements:

- Connector shall be rated for continuous current in still air (no airflow).
- Operating Ambient Temperature at connector location: 15°C to 70°C
- Long-term Storage: -40C to 50C and 5-95% RH
- Short-term Storage: -20C to 65C and 10-80% RH
- Operating Humidity: 20-90%, 5C dew point minimum
- Lifetime: 5 years

6. Test Busbar Mechanical Requirements

- IT Gear test busbar to enable testing of the IT Gear connector
- Copper conductors (C11000 or equivalent) with silver plating in the connector mating zone
- Steel cage with conductive finish on connector mating zone.
- M6 Screw lug connections provided on busbars and cage
- Contact Amphenol for pricing and availability, Amphenol part number 703110002

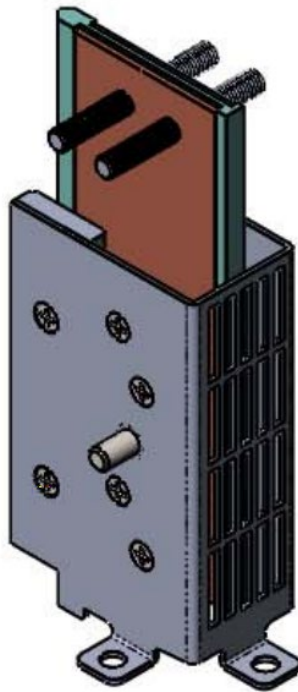


Figure 9: ORv3 Test Busbar

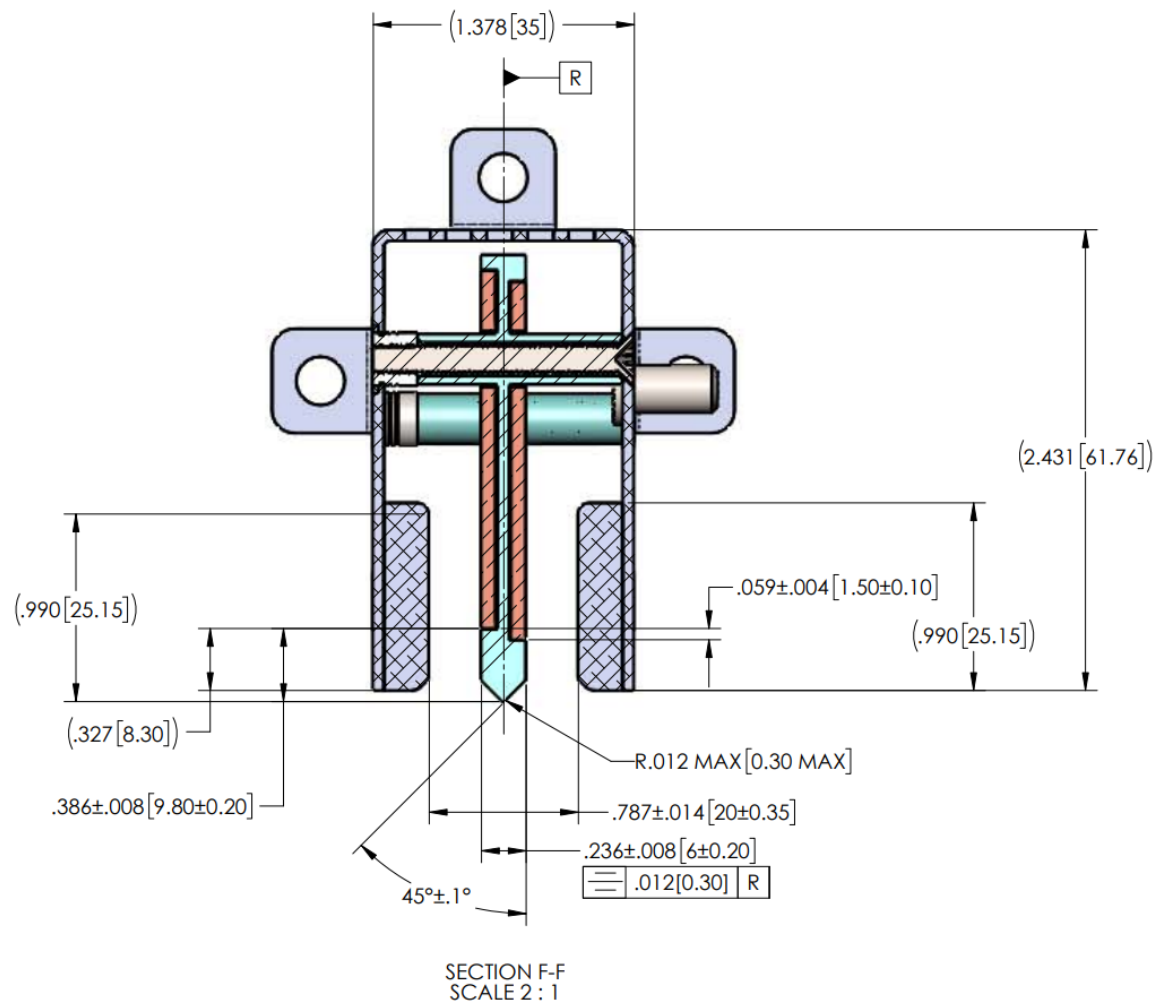


Figure 10: ORv3 Test Busbar Cross Section Detail

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 clip has reached thermal equilibrium, after carrying Rated load at 25°C ambient temperature.	0.55 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
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.	100 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.	12 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 (Power Contact) ¹	EIA-364-70, Method II	Attach connector to test busbar according to section 6. 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 125A@30°C when connecting 100A@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. Commercial Part Numbers

Vendor	Description	P/N
TE Connectivity	ORv3 100A 48V BB Cable, No Sense Contacts	2389779-1
TE Connectivity	ORv3 100A 48V BB Cable, 48V Sense Contacts	2389779-2
TE Connectivity	ORv3 100A 48V BB Cable, Ground Sense Contacts	2389779-3
TE Connectivity	ORv3 100A 48V BB Cable, 48V & Ground Sense Contacts	2389779-4
Amphenol	BarKlip BK150 IO cable	10162876-*
Molex	ORV3 100A IT Gear Cable, 48V & Ground Sense Contact	218194-0001

10. Revisions

Rev	Date	Author	Changes
0.00	12 Feb 2021	Brian Costello	Preliminary Draft 0
0.01	1 Mar 2021	Brian Costello	Preliminary Draft 1
0.02	9 Mar 2021	Brian Costello	Preliminary Draft 2
0.03	11 Mar 2021	Brian Costello	Preliminary Draft 3
0.04	15 Mar 2021	Brian Costello	Preliminary Draft 4
0.05	21 April 2021	Brian Costello	Preliminary Draft 5, Added Toolless Design
0.06	11 June 2021	Brian Costello	Preliminary Draft 6, Added Test Busbar, Updated Panel
0.07	23 June 2021	Brian Costello	Preliminary Draft 7, Updated Figures, Added Vendor P/N's