



OPEN

Compute Project

Open Rack V3 IT Gear Input Connector

Rev: 1.6

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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.

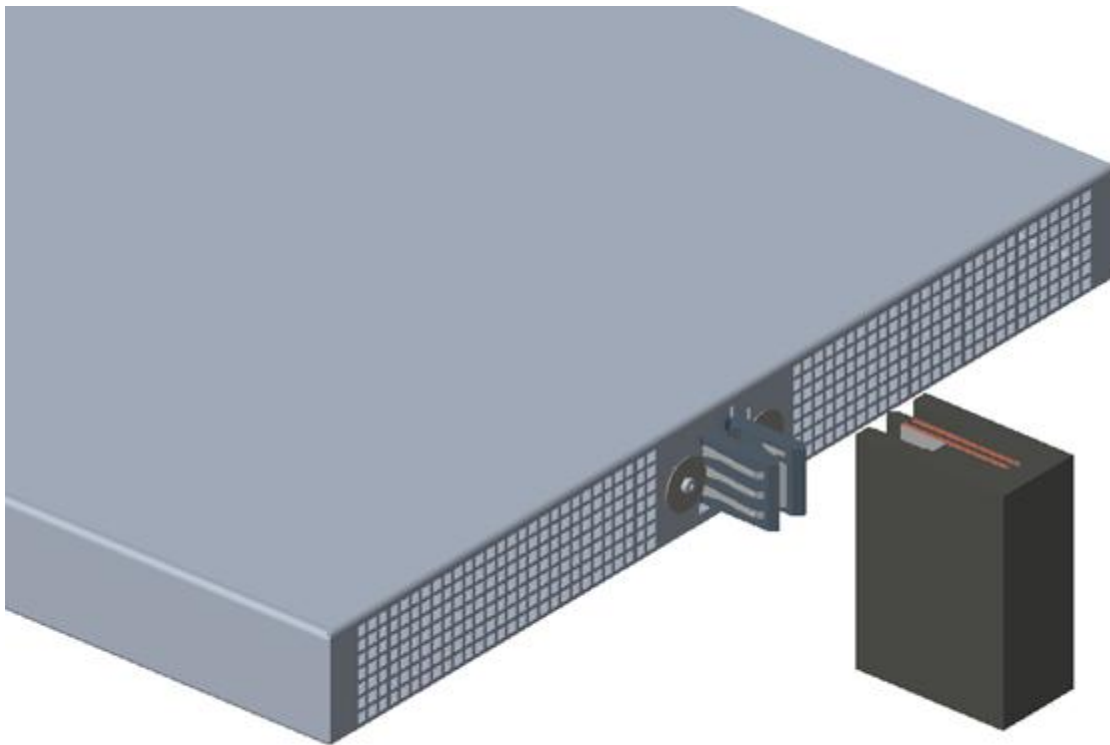


Figure 1: IT Gear Chassis and ORv3 Busbar

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.
- Power 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 7) as defined in the Open Compute Specification Revision 3.0.
- Connector power contacts to be plated with Silver over Nickel in busbar mating zone
- Connector shall support $\pm 3\text{mm}$ float horizontally and $\pm 2\text{mm}$ vertically
- 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 max AC input current of 32A.
- Connector chassis ground contact to be plated with matte tin over nickel in the busbar ground mating zone.
- Connector to have a sense contact on each side of the connector that mates 1mm after the 48V power contact mates.
- Sense contact to carry up to 1.5A current with a temperature rise of no more than 30°C
- Sense contacts to be plated with Silver over Nickel in busbar mating zone
- Connector shall support 3.5mm 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 or equal to 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 (6.0mm MAX head diameter and 2.5mm MAX head height) and (2) 20mm diameter washers, 1.0 +0.5/-0.0mm Thick. 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.

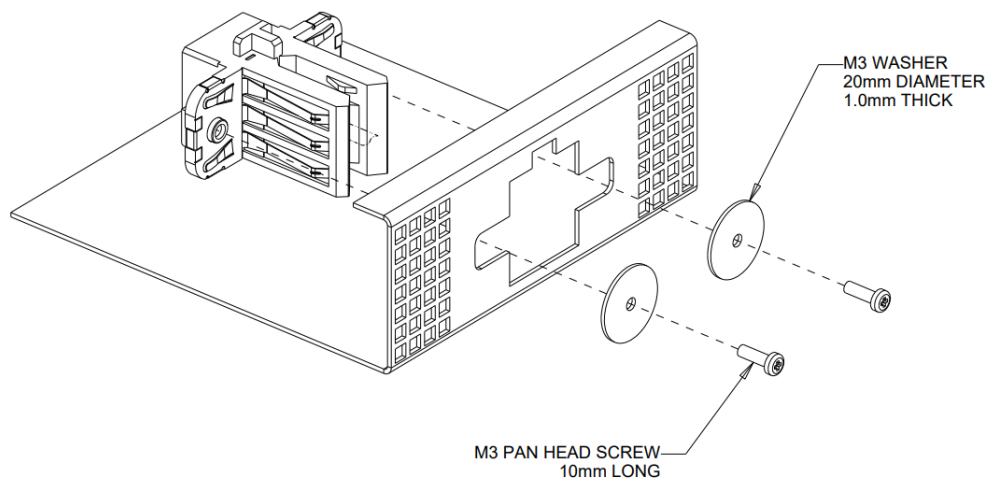


Figure 2: IT Gear Connector Installation, Screw Mounted

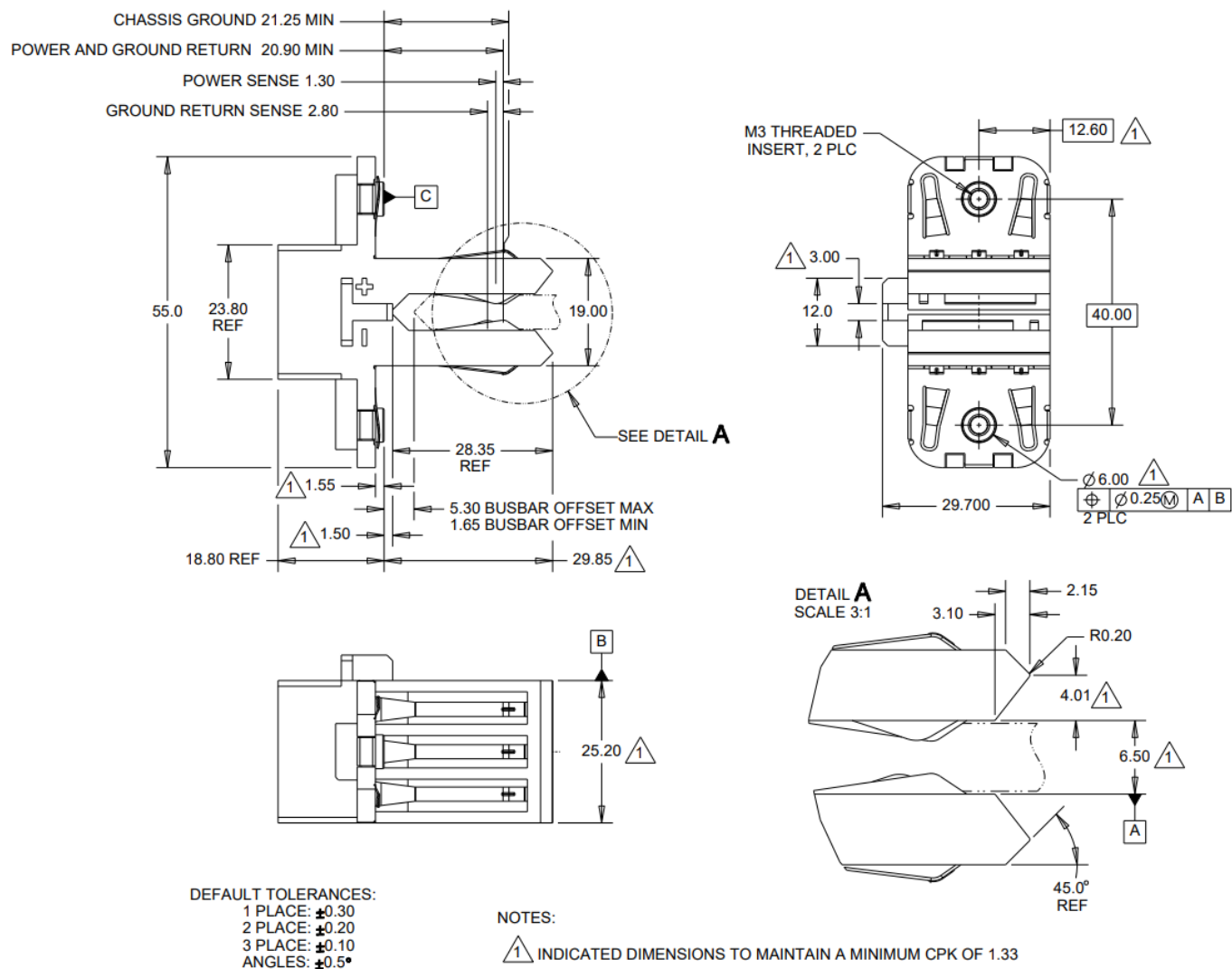
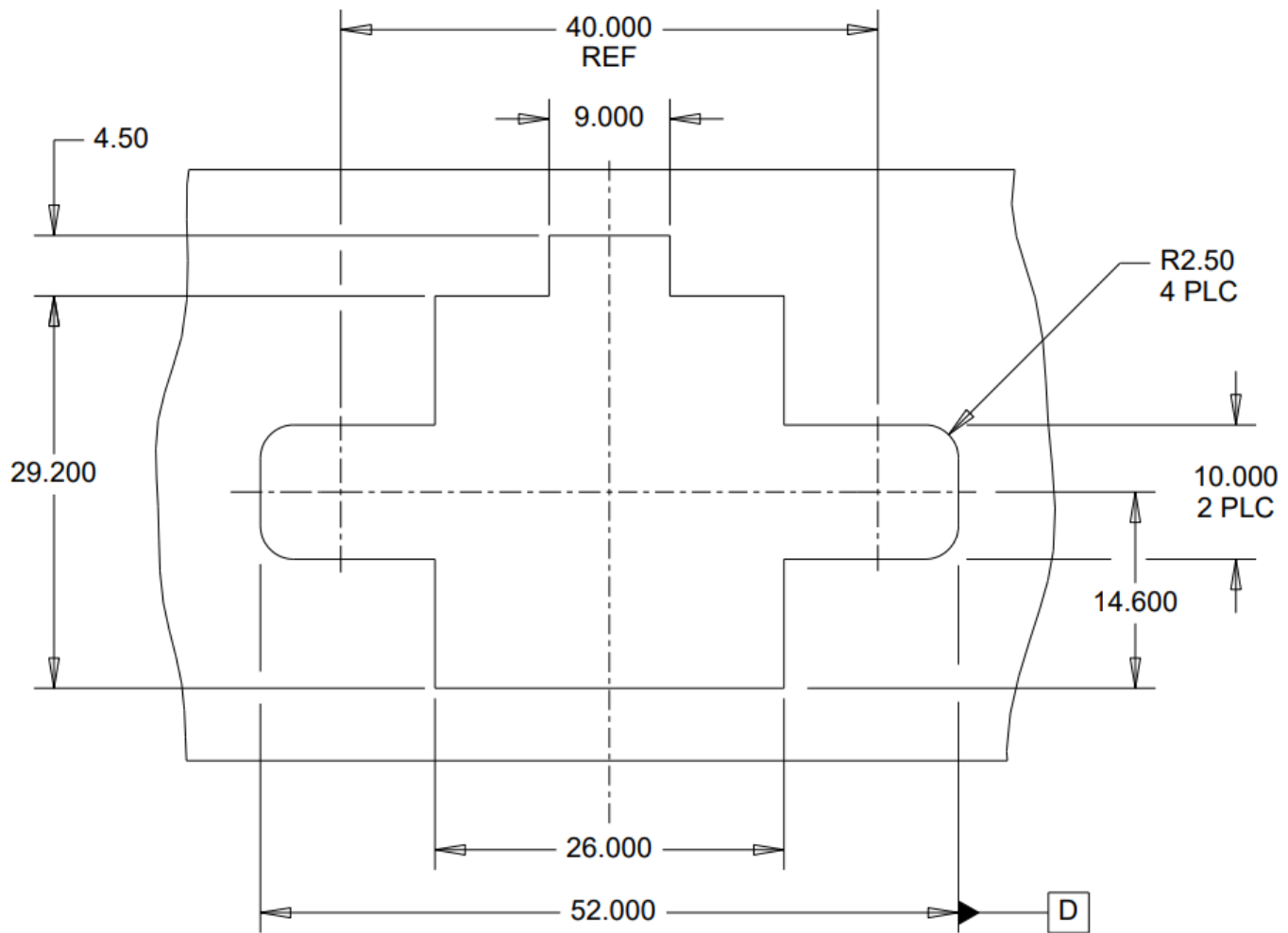


Figure 3: IT Gear Connector Detail, Screw Mounted



DEFAULT TOLERANCES:

1 PLACE: ± 0.30

2 PLACE: ± 0.20

3 PLACE: ± 0.10

ANGLES: $\pm 0.5^\circ$

NOTES:

1. DATUM D SHOWN AS A REFERENCE TO THE IT GEAR SPECIFICATION

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. To remove the connector from the panel, first dis-engage the locking tab then slide the connector to the side. Once the front tabs are aligned with the top and bottom openings, the connector can be removed from the panel.

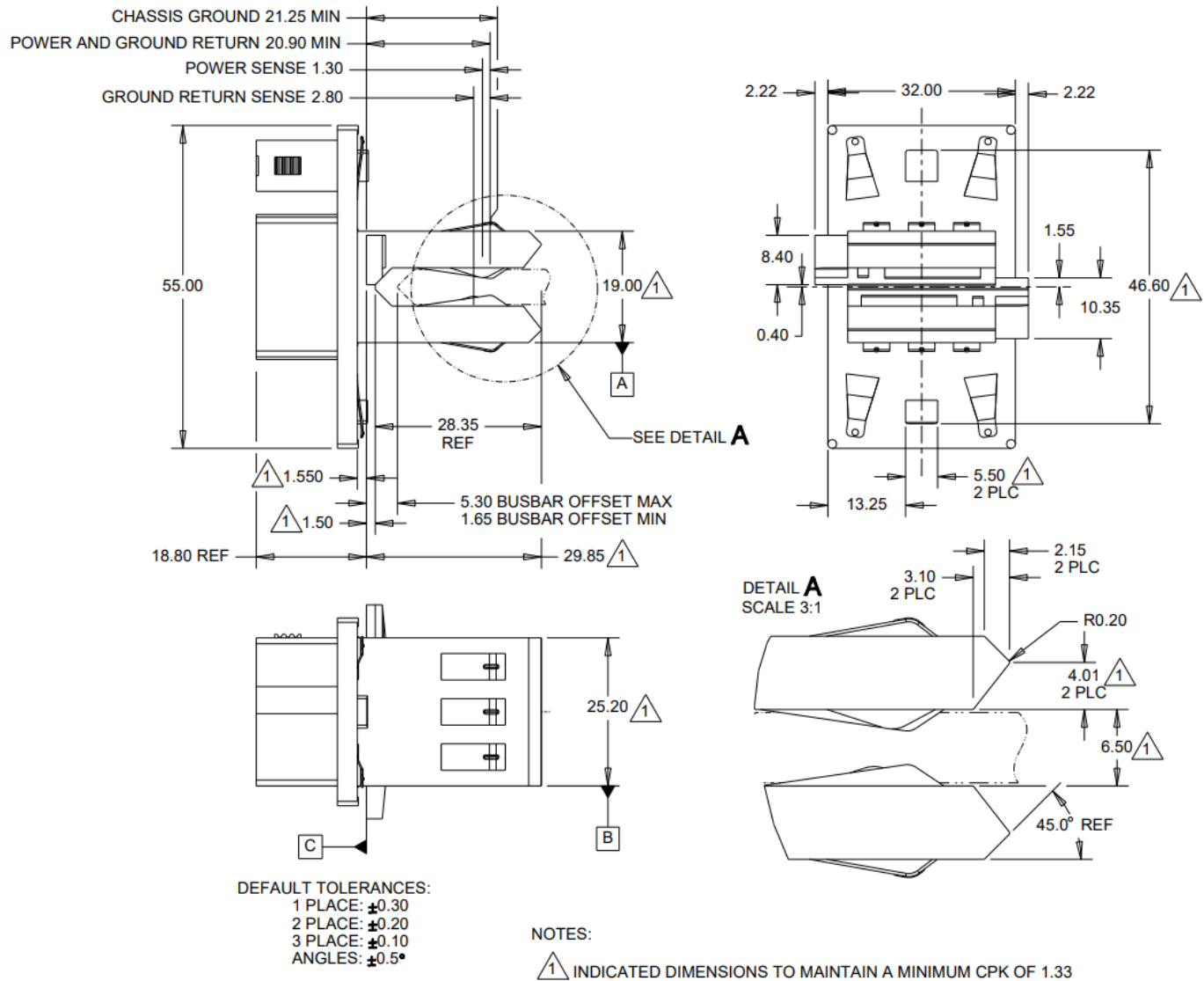
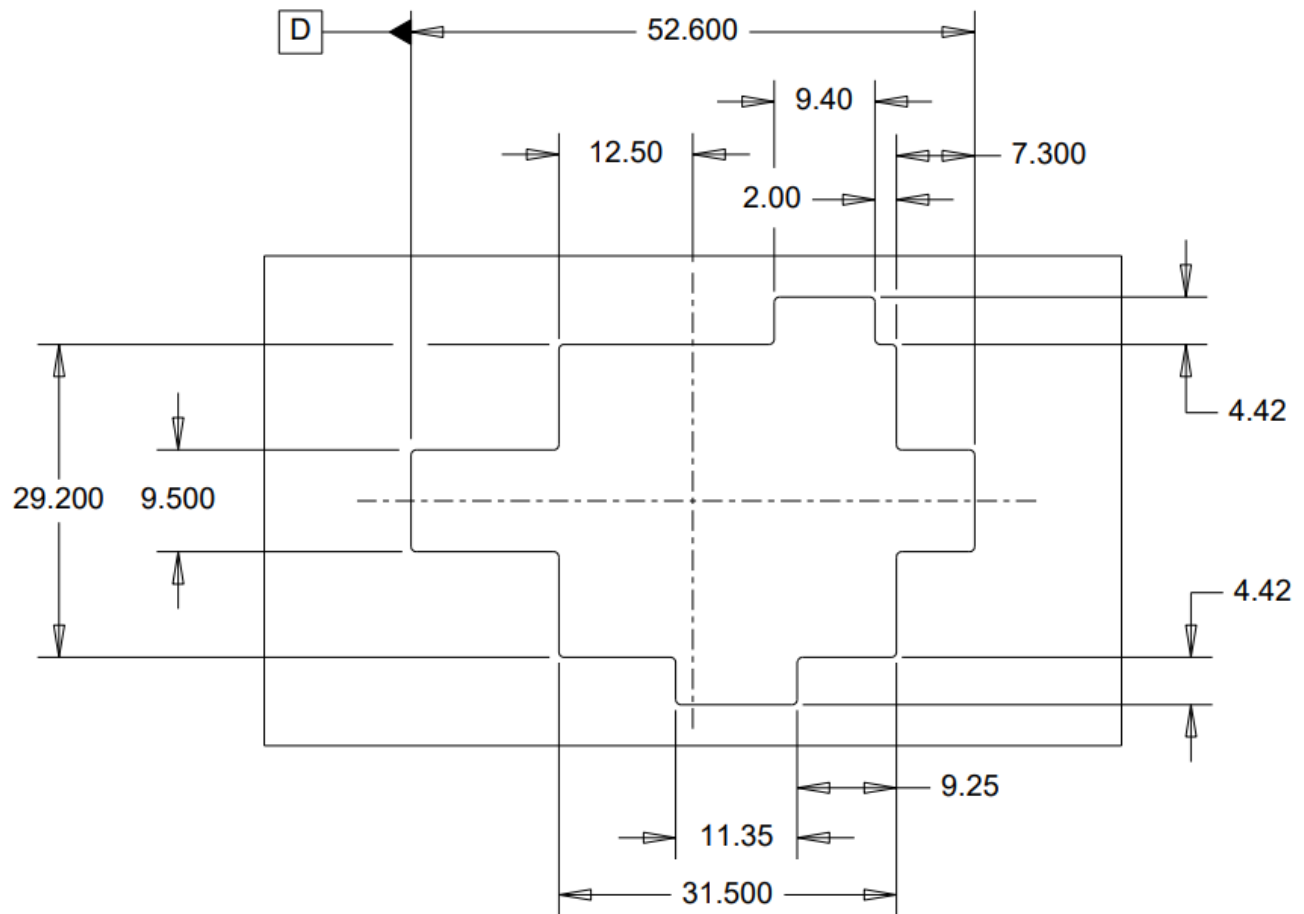


Figure 5: IT Gear Connector Detail, Toolless Mounted

The height of the top and bottom pass through openings in the panel cutout may need to be adjusted depended on the IT Gear equipment size and chassis design. For equipment designed for a 1 RU (44.45mm) spacing, the panel cutout may require that the opening height will have to extend around any sheetmetal bends. For equipment designed for a 1 OU (48.0mm) spacing, the panel cutout can be located completely in the flat section of the rear panel so no adjustment should be necessary.



DEFAULT TOLERANCES:

1 PLACE: ± 0.30

2 PLACE: ± 0.20

3 PLACE: ± 0.10

ANGLES: $\pm 0.5^\circ$

NOTES:

1. 0.8mm MINIMUM CLEARANCE BETWEEN UNITS
2. CONNECTOR PICKUP TO BE MAINTAINED WHEN TILTED AFTER BEING MOUNTED
3. DATUM D SHOWN AS A REFERENCE TO THE IT GEAR SPECIFICATION

Figure 6: Panel Cutout for Toolless Mounted Connector

DETAIL A
SCALE 4:1

DETAIL B
SCALE 4:1

NOTES:

- BUS BARS SHALL BE SILVER PLATED
- LEADING EDGES OF BUS BAR INTERFACES SHALL BE FREE OF BURRS
- BUSBAR DEPTH TO REMAIN INSIDE OF RACK

4 CONDUCTIVE SURFACE FOR CHASSIS GROUND CONTACT

48V BUS BAR

RETURN BUS BAR

BUS BAR COVER
NET 40% OPEN AREA

VOLUME RESERVED FOR BUS BAR COVERS AND HARDWARE

SEE DETAIL A

SEE DETAIL B

18.25 MINIMUM

8.80 ± 0.20

24.00 ± 0.50

10.30 ± 0.20 TO LEADING TIP OF BUSBAR INSULATOR

22.0 MIN

20.00 ± 0.35

45.0° ± 0.1°

R0.25 MAX

R0.30 MAX

6.00 ± 0.20

0.30 R

R0.25 MAX

1.50 ± 0.10 OFFSET BETWEEN BUSBAR TIPS

27.05 REF

61.76 REF

35.00 ± 0.60

2.75 ± 0.20

R2.00 ± 0.10

45.0° ± 0.1°

R1.00 ± 0.10

R0.50

2.00

2.00

P

R

Figure 7: 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 (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 703110002

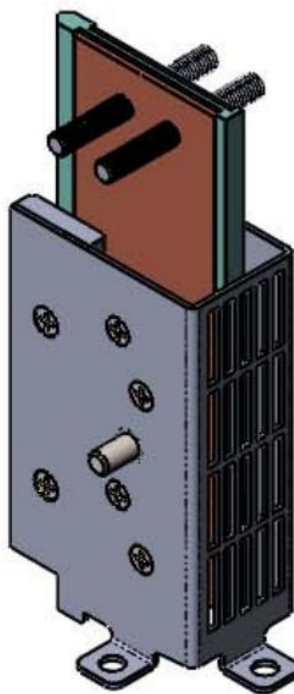


Figure 8: ORv3 Test Busbar

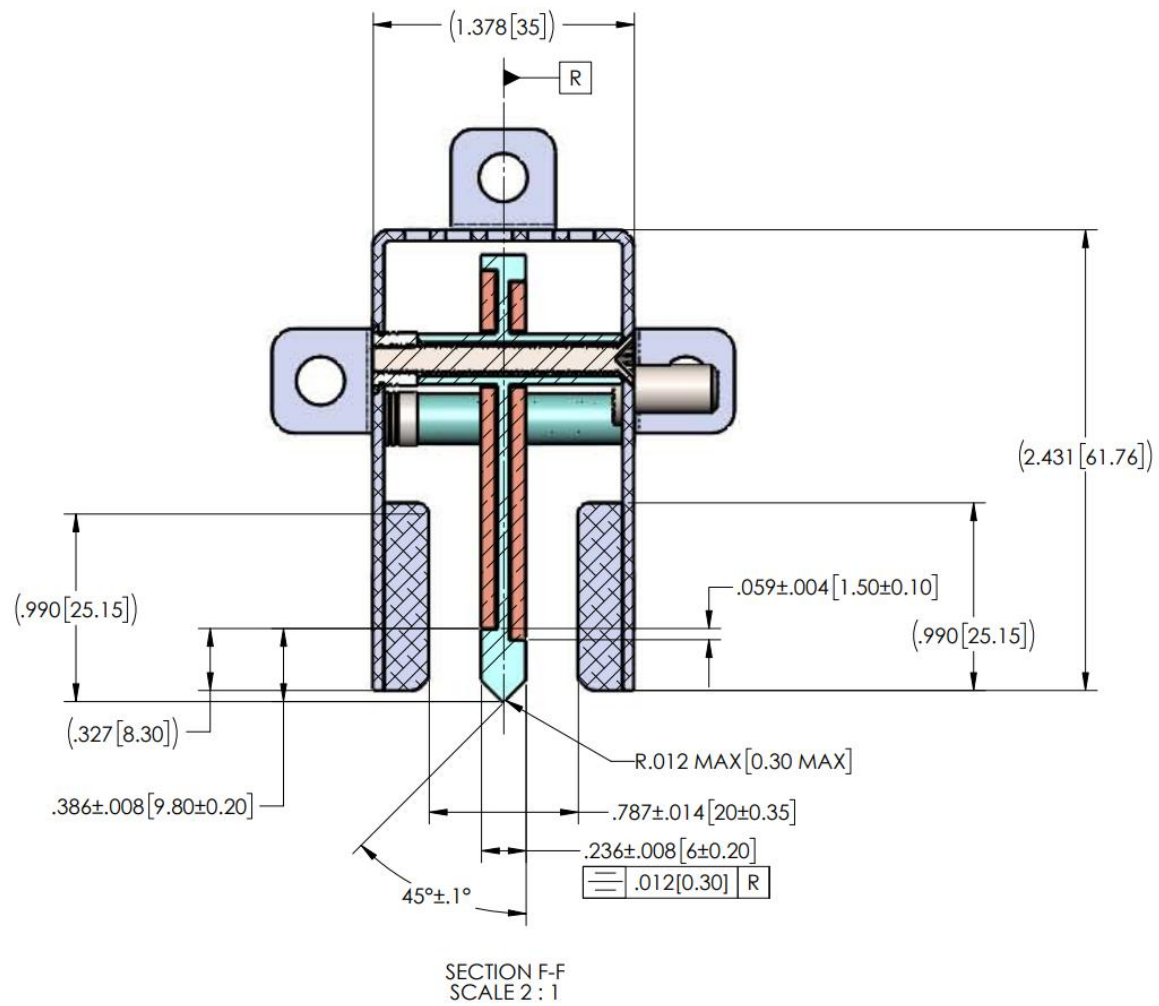


Figure 9: ORv3 Test Busbar Cross Section Detail

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
Wire Retention (Parallel to the wire direction)	UL486	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 UL486 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.	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-*

10. Revisions

Rev	Date	Author	Changes
1.00	01 Dec 2021	Brian Costello	Initial Release
1.10	22 Dec 2021	Brian Costello	Updated Figures to include Cpk on selected dimensions
1.20	24 Jan 2022	Brian Costello	Updated Figures, changed sense contact current desc.
1.30	8 Feb 2022	Brian Costello	Changed Connector Contact Dimension Scheme
1.40	25 Mar 2022	Brian Costello	Changed Toolless connector size to 55mm wide
1.50	4 April 2022	Brian Costello	Changed Locking Tab Width to 5.50mm
1.60			

11. Acknowledgements

The following individuals provided help and support in the development of this document:

Pat DiPaola, TE Connectivity

Orando Li, TE Connectivity

Steve Mills, Meta

Steve Pressel, Molex

Dmitriy Shapiro, Meta