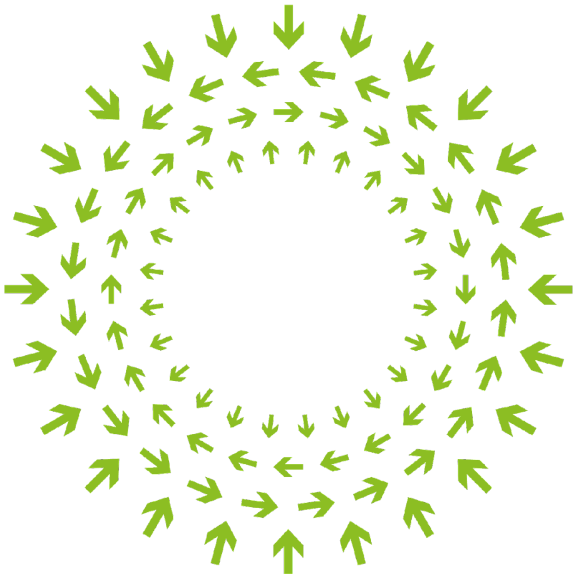

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Compute Project

Open Rack V3 High Power (60A) AC WHIP Power Cable Design Specification

Revision 1.0.0

06/12/2026

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Revision History

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06/12/2026	1.0.0	Mohammed Alisa Dmitriy Shapiro Ben Kim Chris Gieski	Initial OCP Release

2. Scope

This specification defines the technical requirements for a custom ORV3 High Power AC WHIP used for AC power delivery in Meta's Open Rack V3 HPR V2 (High Power Rack).

3. Overview

The High Power AC WHIP is designed to accept an input voltage of 3-phase WYE wiring (4 wires + ground). The WHIP assembly will feature 4 main components, with the option of having an additional junction box - if needed:

1. IEC 309 Connector
2. Type W 6AWG 5C power cord
3. Overmolded junction box (optional)
4. Type W 6AWG 1C cables
5. 5-pin input connector with custom overmolding

The assembly delivers AC power to the *Open Rack V3 HPR V2 72kW Power Shelf* [1]. The AC WHIP will have two lengths to accommodate different positions of the 72kW power shelf within the ORV3 HPR rack.

Two variants of the WYE cable assembly are defined:

1. 277/480 V_{AC}, 60A NEC cable assembly with IEC 309 series II plug for North America applications.
2. 200-240/346-415 V_{AC}, 63A IEC cable assembly with IEC 309 series I plug for IEC applications.

Figure 1: *Application of HPR 60A AC WHIP in HPR ORV3 Rack - Power Shelf View*

4. Electrical

4.1. Basic Functional Schematic

The 60A AC WHIP output uses a 5-pin power shelf connector, compatible with the AC input connector described in section 6.3.1 of the *Open Rack V3 HPR V2 72kW Power Shelf* [1] design specification. Figure 2 below provides a diagram of the WYE wiring configuration, which shows termination of the input wires at the output connector. The colors of the diagram differ depending on region (NA power cord and EU power cord).

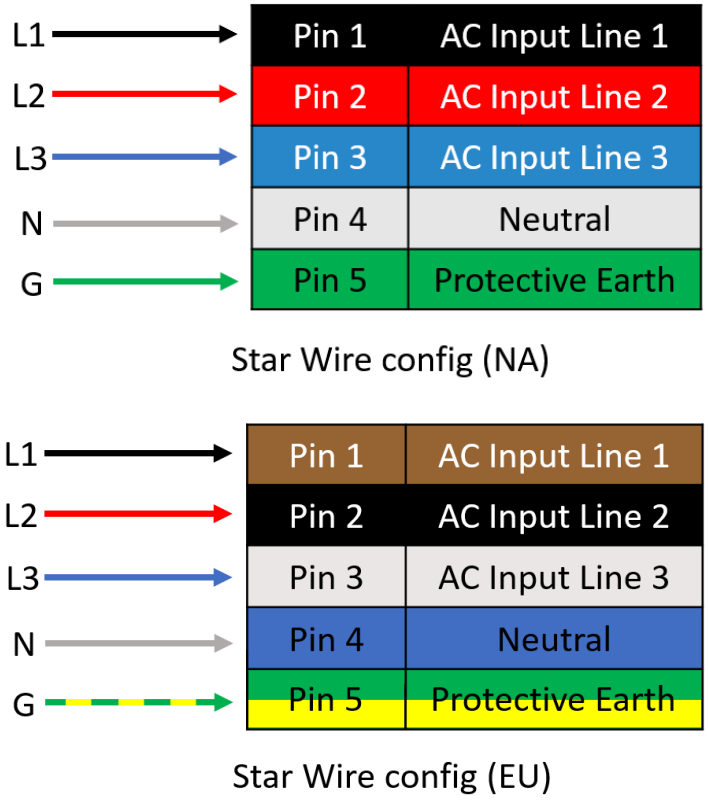


Figure 2: *WYE Wire Configuration*

4.2. Output Connection

4.2.1. Power Shelf Connector

The wires from the cable mentioned in Section 4.3.1 shall be terminated to silver-plated 5mm diameter pin & socket contacts. These contacts shall be housed in a receptacle compatible with the 72kW power shelf AC input connector, which is a board-mounted connector featuring internal threads that interface with externally threaded hardware on the receptacle for connector retention.

Receptacles meeting the required specification are listed below; critical dimensions are shown in Figure 3.

- Amphenol 10182522-001 Right Exit
- Amphenol 10182522-002 Left Exit

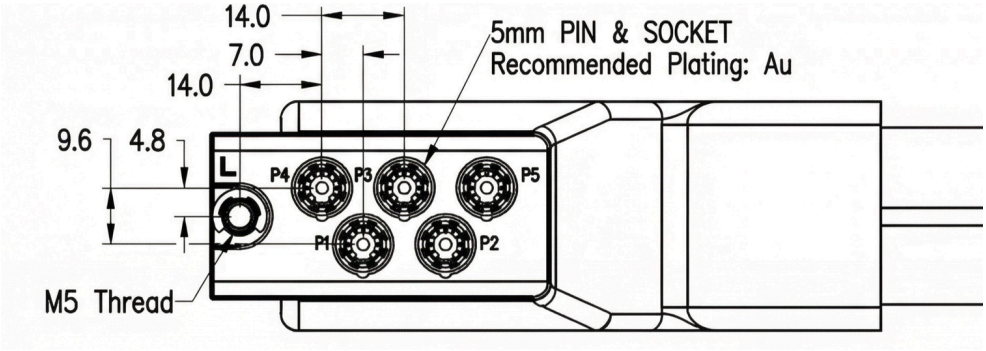


Figure 3: *Receptacle Connector with Right Angle Overmold - Critical Dimensions*

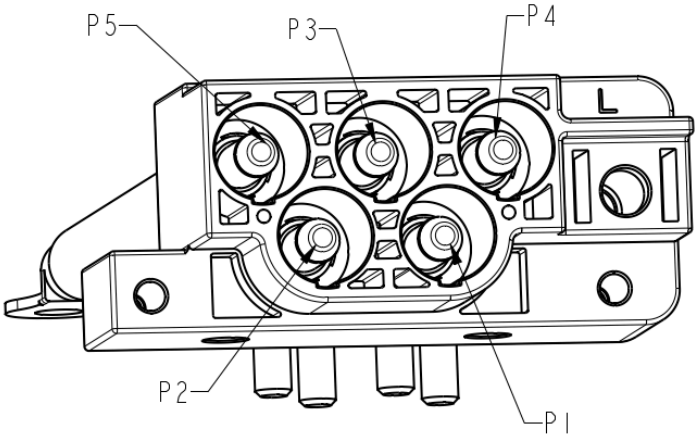


Figure 4: *AC Input connector with Pinout (Left Side)*

4.2.2. Output Polarity

The output polarity of the connector receptacle should be as shown below. Polarity of the connector is ensured with keying on both the cable-side and shelf-side connectors.

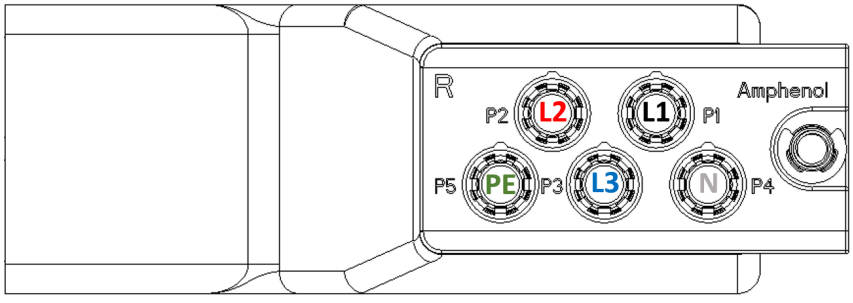


Figure 5: *Receptacle Connector with Right Angle Overmold - Pin Mapping*

4.3. Cabling

4.3.1. Individual Conductors

In order to improve the flexibility of the AC WHIP within the rack, the 5 conductors exiting the output connector shall be individually jacketed (as opposed to bundled together inside a rigid power cord). These cables shall have a temperature rating of 90C or higher.

For North America applications, these shall be Type W 6AWG 1C cords.

For EU applications, these shall be 10 mm^2 H07RN-F cords.

To help manage the routing of these cables, expandable sleeves shall be installed periodically (recommend every ~200mm) along the length of the individually jacketed section of the WHIP assembly.

The individually jacketed 6AWG cables need to be routed to their respective pins on the IEC connector. There are two recommended methods to accomplish this - via an overmolded junction box (see section 4.3.2) or via custom IEC connector (see section 4.3.3).

4.3.2. Conductor Convergence - Option 1: Overmolded Junction Box

The individually jacketed conductors may converge into an overmolded junction box. Within this junction box, the individual cables shall be terminated and connected to the corresponding cables within the power cord (see next section).
The overmolded junction box shall meet the following requirements:

- Material: Thermoplastic or thermoset overmold compound with UL 94 V-0 flammability rating
- Temperature rating: minimum 105°C
- The overmold shall fully encapsulate all conductor terminations and splices, providing strain relief at both cable entry and exit points
- The junction box shall be rated for the full current capacity of the assembly (60A continuous per phase)
- Dimensional envelope: the junction box outer dimensions shall not exceed 80 mm (W) × 50 mm (H) × 120 mm (L)

4.3.2.1. Power Cord

The power cord used for the AC WHIP (with junction box variant) depends on the input connection being utilized.

For IEC 309 Series II plug (North America), Type W 6AWG 5C (5 Conductor) power cables (with temperature rating 75C or higher) shall be used.

All cables must meet all technical requirements and UL standards as described in Section 6.

For IEC 309 Series I plug (EU), the power cord to be used is H07RN-F 5G10. This utilizes 5 conductors of 10 mm^2 cross-sectional area. 16 mm^2 is recommended. Where 16 mm^2 is infeasible, 10 mm^2 is acceptable provided all technical requirements per EN and IEC standards are met (see Section 6 for details). The cable must have a rubber jacket material.

The 5 conductors within the power cord shall be connected to the corresponding individually jacketed cables within the overmolded junction box.

Both cords should be a suitable industrial-grade power cable and conform to the proper compliance certifications as listed in Section 6. In the single cord section of the WHIP assembly, the five conductors shall be enclosed in a further insulating layer. Both cords shall be made with the smallest possible outer diameter in order to reduce bend radius.

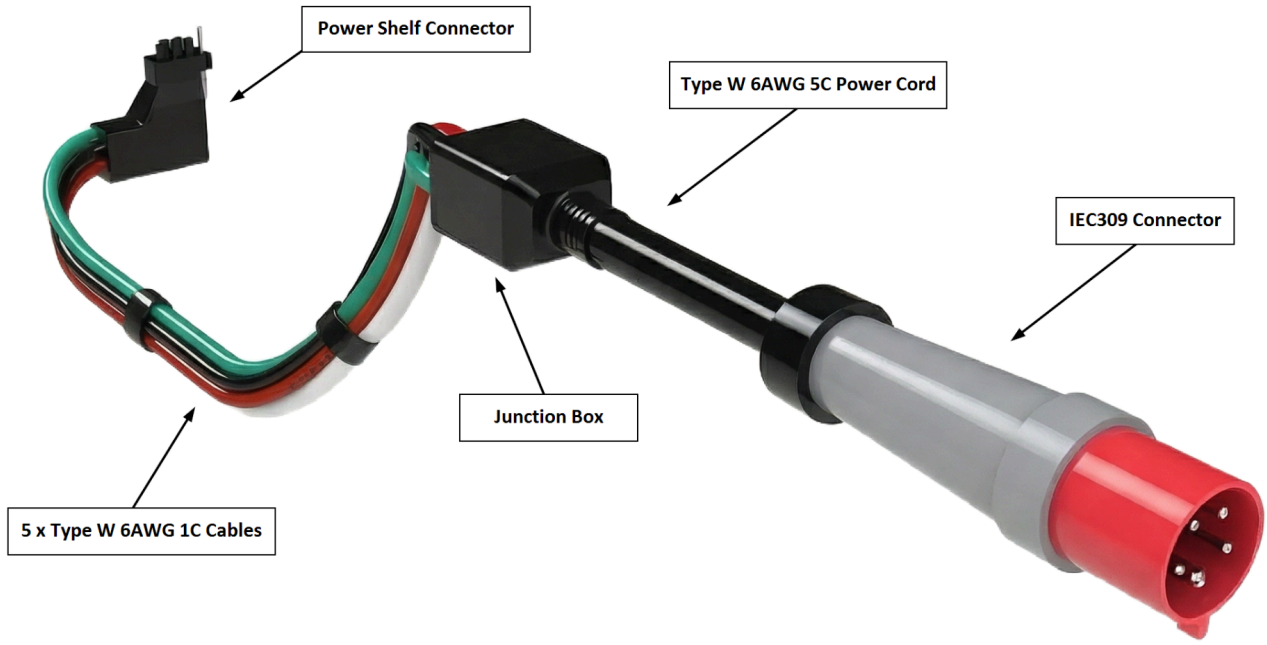


Figure 6: *60A AC WHIP - Simplified View (with Junction Box)*
Note: *Expandable protective sleeve hidden for clarity*

4.3.3. Conductor Convergence - Option 2: Direct to IEC Connector

In the direct IEC connector variant, the cables route directly into a custom IEC connector. Example shown below. This option requires a custom strain relief piece meeting the following requirements:

- The strain relief shall prevent conductor displacement per the test requirements in Section 6.2.1
- All individual conductors shall be secured within the connector housing to prevent rotation or pullout
- The strain relief material shall have a UL 94 V-0 flammability rating

- The direct-IEC variant shall meet all electrical and safety requirements defined in Sections 4 and 6.

Figure 7: *Custom IEC Connector with Added Strain Relief*

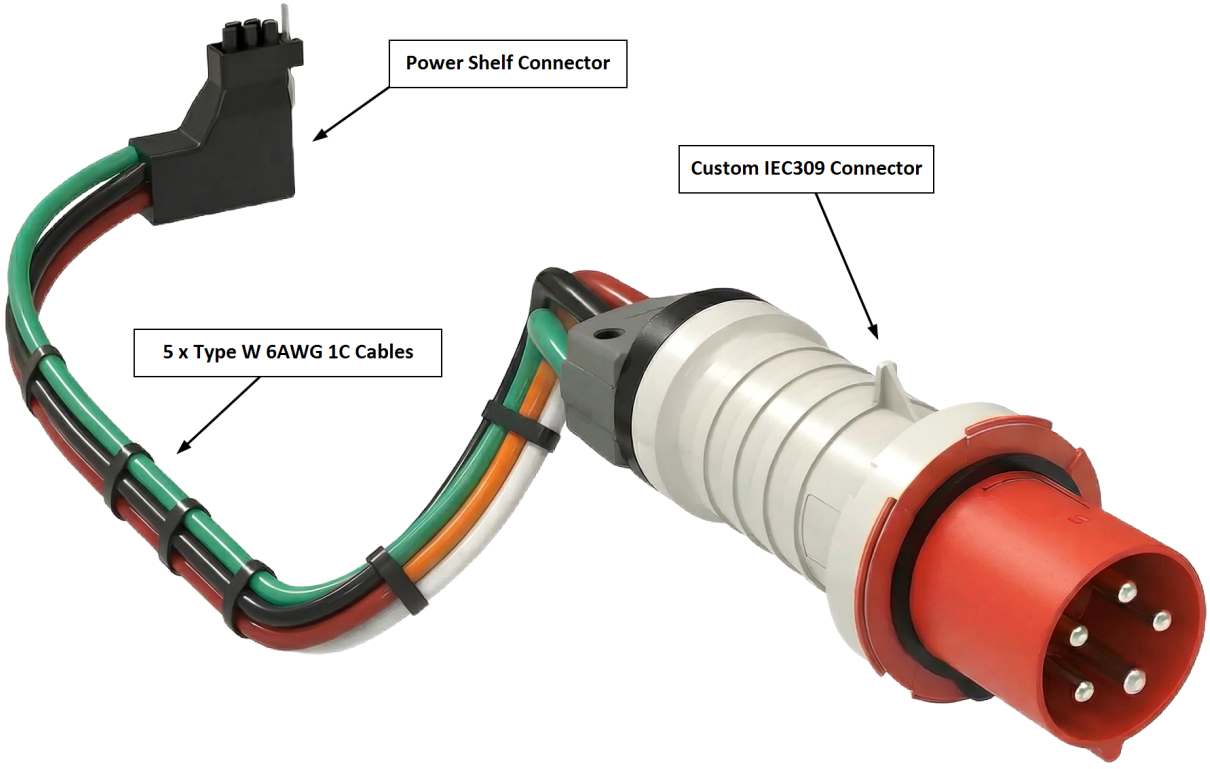


Figure 8: *60A AC WHIP - Simplified View (Without Junction Box)*
Note: *Expandable protective sleeve hidden for clarity*

4.4. Input

The Input plug can be either custom overmolded or assembled onto the cable. If the plug is overmolded, proper strain relief must be in place at the cable mating interface.

The input plug can be either an IEC 309 Series I or Series II connector, depending on the cable and its use case. Series II plugs are used for North America applications, and Series I for IEC applications.

4.4.1. IEC 309 Series II

Input for a IEC 309 Series II plug is a 3-phase WYE wiring configuration, 277/480 V_{AC} RMS, 50-60Hz. The nominal max continuous input current per phase is 60A (48A, de-rated 80%) RMS at 55°C ambient temperature.
The IEC 309 plug is to be in a 210° / 7h ground position, 5 Pole (3P+N+E) configuration. No IP67 protection cover is necessary for the IEC 309 plug.

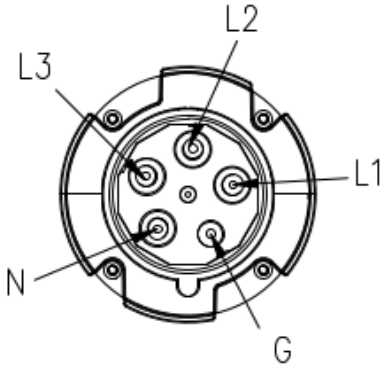


Figure 9: *IEC 309 Series II 3P+E+N (7H Earth Pin)*

4.4.2. IEC 309 Series I

Input for an IEC plug is a 3-phase WYE wiring configuration, 200-240/346-415 V_{AC} RMS, 50-60Hz. The nominal max continuous input current per phase is 63A RMS for EU at 55°C ambient temperature.
The IEC 309 plug is to be in a 180° / 6h ground position, 5 Pole (3P+N+E) configuration. No IP67 protection cover is necessary for the IEC 309 plug.

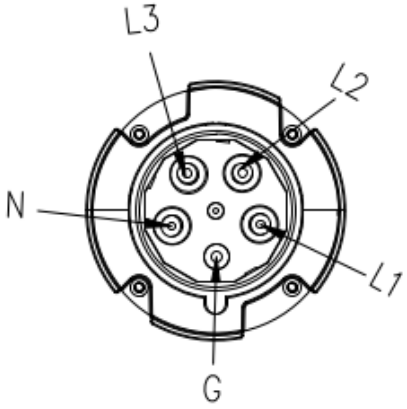


Figure 10: *IEC 309 Series I 3P+E+N (6H Earth Pin)*

5. Mechanical

5.1. Cable Lengths

There are 8 total variations for the AC WHIP, depending on location of power shelf in rack and type of cable. The dimensions shown below in Table 1 are from the output of the 5-pin power shelf connector housing to the overmolded junction box entrance. See mechanical drawings in Section 9 for reference.

Power Shelf Location	NA WHIP Length	Cable Exit	Junction Box?
Top (OU37-42)	2000mm	Left	Y
			N
		Right	Y
			N
Bottom (OU3-8)	4500mm	Left	Y
			N
		Right	Y
			N

Table 1: *NA AC WHIP Cable Length Variations*

Power Shelf Location	EU WHIP Length	Cable Exit	Junction Box?
Top (OU37-42)	2000mm	Left	Y
			N
		Right	Y
			N
Bottom (OU3-8)	4500mm	Left	Y
			N
		Right	Y
			N

Table 2: *EU AC WHIP Cable Length Variations*

- **Note:** Straight exit WHIP cables may also be used - allowing for routing directly out the back of the power shelf into the hot aisle.

For the direct IEC connector variant (without junction box), cable lengths are measured from the output of the 5-pin power shelf connector housing to the IEC 309 plug. The total assembly length shall be equivalent to the sum of the individual conductor length and power cord length specified for the junction box variant at the corresponding rack position.

5.2. Cable Exit from Housing

The cables coming out of the 5-pin power shelf connector housing shall be routed at a 90° exit angle (facing out towards the side of the rack).

- **Note:** Straight exit WHIP cables may also be used - allowing for routing directly out the back of the power shelf into the hot aisle.

5.3. Safety Warning Label

The connector shall include a label on both top and bottom sides that states “Not for current interrupting. Do not hot plug.” This statement must be visible on both sides of the housing when the cable is installed into the power shelf. Ideally, this label would be placed inside of an emboss on the connector to ensure the label does not get accidentally detached.

5.4. Assembly Label

The AC WHIP shall have a label that specifies the items listed below. See mechanical drawings in Section 9 for approximate location of label.

1. Electrical Rating
2. UL marking (North America AC whip), CE Marking (EU AC whip)
3. Manufacturer Name

In addition, the following items must be included with Code128-AUTO bar code.

1. Manufacturer PN
2. Customer PN
3. Serial Number. This shall be per customer’s serial number format, for example: “WWYYABCDEFGxxxxx”
4. “WWYY” will be date code (Work Week and Year)
5. “ABCDEFG” will be assigned by customer to supplier
6. “xxxxx” will be 00001-99999

6. Regulatory Compliance Approvals

6.1. Agency Approval

The AC WHIP must be safety certified (Listed) by UL (Underwriters Laboratories, Inc.) in accordance with UL817 standard and its parts must be safety certified in accordance with the following safety standards. The AC WHIP must also be CE certified in accordance with the applicable harmonized standards. The following additional standards are applicable to parts of the AC WHIP:

Standard	Parts
UL1682	IEC 309 AC connector to the branch circuitry
UL1977	Output connector that mates with connector in the power

	shelf
UL62/UL758, UL817, EN50525	Flexible power cord that can be used for AC wiring
UL 94 V0	All components
IEC/EN 61984	Connector safety requirements and tests
IEC60512	Connector for electrical equipment – Test and measurements
IPC/WHMA-A-620 REV D	Entire assembly

Table 3: *Agency approval list*

All regulatory certifications listed above shall apply to both the junction box variant and the direct IEC connector variant of the AC WHIP assembly. Each variant shall be independently certified and listed.

6.2. Safety Design Considerations & Testing

6.2.1. Power Cord Strain Relief

A cord pull test shall be conducted to ensure there is no significant conductor displacement. There shall not be any damage to the power cord or conductors when the cord pull test is performed on the rack. A force of 100 N shall be applied for 1 second, repeated 25 times. Subsequently, a torque of 0.25 N·m shall be applied for 1 minute. The conductor displacement shall not exceed 2mm. This test is to be done in both a straight pull as well as in the most unfavorable angled direction.

6.2.2. Power Cord Size

Power cord shall meet UL/CSA SOOW/STW/Type W and EU CENELEC <HAR> H07RN-F standards with +90C temperature rating. The power cord must be evaluated per UL62 standard for heat shock, cold bend, aging, dielectric, tensile and elongation tests, etc. The following wire size (minimum) shall be used.

North America AC whip: minimum AWG 2 (for SO,SOOW…), minimum AWG 6 (for Type-W cable)
IEC/EU AC whip: 10 mm^2 for harmonized EU power cord (H07RN)

60 Amps IEC: 16 mm^2 is recommended. If 16 mm^2 is infeasible, it may be acceptable to use 10 mm^2 as long as 10 mm^2 can meet all technical requirements in EN and IEC standards.

6.2.3. Power Cord Sheath

Power cord sheath must comply with technical requirements in UL/IEC62368-1 standard, and heat shock, cold bend, elongation and tensile tests must be additionally performed to ensure

that the power cord sheath is resistant to cracking under severe bend radius and a high temperature environment.

6.2.4. Dielectric strength

AC WHIP shall be designed to comply with the following dielectric strength requirement and the test data must be provided. The dielectric strength of power cord assembly shall not be broken down when 5,000V_{DC} is applied between lines and neutral, and lines and primary ground pins for 90 sec minimum.

6.2.5. Connector Pins

A connector enclosure shall be constructed to reduce the risk of unintentional contact with any live parts. Any pins in the female connector shall not be accessible when testing with the probe as defined by UL standard. A minimum of 3.2mm air gap should be maintained between an uninsulated live pin and any other metal part (if any) in the connector. The AC WHIP shall also conform to the following conductor color code:

3 phase pins	North America	EU (IEC)- Harmonized Power Cord
L1	Black (or Brown)	Brown
L2	Red (or Orange)	Black
L3	Blue (or Yellow)	Grey
N	White (or Grey)	Blue
PE	Green (or Green/yellow)	Green/Yellow

Table 4: *North America/IEC Cable Color Code*

6.2.6. Insertion Test

Adding to the pull test specified above in Section 6.2.1, the connection between the WHIP receptacle and the power shelf AC input connector should be subject to a maximum of 25 cycles of repeated insertion and removal. During the tests, the connector pins shall not be damaged. This is checked by visual inspection of the connector pins. After the test, there shall not be any visible damage to the pins.

6.2.7. T-Rise Test

T-rise testing shall be conducted on the pin & socket contacts to ensure contact temperature does not rise above 30°C at maximum current. Testing shall be done per IEC60512-5-1.

6.2.8. Environmental Compliance

- 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 including the restriction of PFAS substances; 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. Power cord is **exempted from** this requirement.
- AC WHIP shall not include chemical substances regulated under the EPA TSCA requirement.

6.3. Production Line Test

6.3.1. Hi-pot Test

Full production, 100%, of the AC WHIPs shall comply with the minimum Hi-Pot (High Potential) test described below. The test shall be applied between the AC input side (the three phase lines) and the earth GND.

Parameter	Setting
Voltage	1500Vac RMS or 2121Vdc (minimum)
Trip current sensitivity	10mA RMS (maximum)
Voltage ramp time	500V/S (minimum)
Dwell time	1 Second (minimum)
Breakdown arc detection	10μS (maximum)

Table 5: *Hi-pot test parameters*

6.3.2. Voltage Polarity Test

100% of assemblies shall be verified for correct polarity per Section 4.2.2.

7. Environmental Regulations & Requirements

7.1. Temperature

7.1.1. Operating Ambient Temperature

The ambient operating temperature range shall be from -5°C to +55°C.

7.1.2. Storage

The storage temperature range shall be from -40°C to 70°C.

7.1.3. Transit

The transportation temperature range shall be from -40 °C to 70 °C (short term storage, 72 hours).

7.2. Humidity

7.2.1. Operating

Operating relative humidity shall be 10% to 90% (non-condensing).

7.2.2. Non-operating

5% to 95% relative humidity, 38.7°C maximum wet bulb temperature with no cosmetic damage.

7.3. Altitude

7.3.1. Operating

The operating altitude with no de-rating shall be from 0 to 10,000 feet (0 to 3000 meters), altitude change rate between testing conditions to be at least 2000 ft/min.

7.3.2. Non-operating

0 to 49,000 feet (0 to 15,000 meters), altitude change rate between testing conditions to be at least 2000 ft/min.

8. Reliability, Quality, Miscellaneous

8.1. Spec Compliance, Quality, FA, Warranty

- The Vendor is responsible for the AC WHIP to meet the specifications as stand-alone unit as well as at System level, and for assuring that the AC WHIP shipped in production will conform to this specification, with no deviations.
- The Vendor shall maintain or exceed the production quality standards established during the pilot run.
- Failure analysis on defective RMA units shall be provided to the customer with a corrective action plan, within two weeks from when units are received at Vendor facility.
- The Vendor shall warrant the AC WHIP for defects & workmanship for a period of two years from the date of shipment, when the device is operated within specifications. The warranty is fully transferable to any end user. A standard ‘VOID’ Warranty Sticker shall be applied.

8.2. Mass Production: First Article Samples

Prior to final project release and mass production, the Vendor will submit to the customer a few production pilot run samples, including the following documentation:

- All the pertinent development docs, production docs, and reports, necessary for the customer to release the product for mass production.
- The pilot samples shall be built in the allocated facility for mass production, and use hard tooling (where applicable)
- Full specification compliance matrix, full test report, production line final test 'PASS' tickets
- Samples passed the burn-in process planned for production (if any).
- Samples are shipped using a production-approved shipping box.
- A mechanical FAI report shall be submitted that shows compliance with all of the notes and dimensions in the mechanical drawing shown in Section 9 below.
- The units are certified, and the safety label is applied (*)

(*) 'Pending Certification' sticker may be allowed until the certification process is complete.

8.3. Quality Control, Process, Burn-In

- Incoming Quality: < 0.1% rejections
- Cpk values will exceed 1.33 (Pilot Build & Production)

8.4. Packaging

The AC WHIP shall be shipped using either custom or standard packaging. Quality of the packing assembly will be such that the AC WHIP will not get damaged during transportation: units will arrive in optimum conditions and be suitable for immediate use.
A shipping box 'shock test' shall be proposed by the Vendor and submitted to the customer for audit and approval.

8.5. Documentation

The Vendor shall provide the customer the following documentation (prototypes may not include portions of these documents) if applicable:

- BOM (including AVL)
- Mechanical Drawings (PDF format. Native 3D files and/or DXFs will be provided to perform collaborative work on the design, for a seamless device integration at system level chassis)
- Hi-Pot test, ground bond test, isolation, surge test, thermal Test

NOTE: The Vendor shall propose to customer's 'Qualification Test Plan' & 'Reliability Test Plan'.

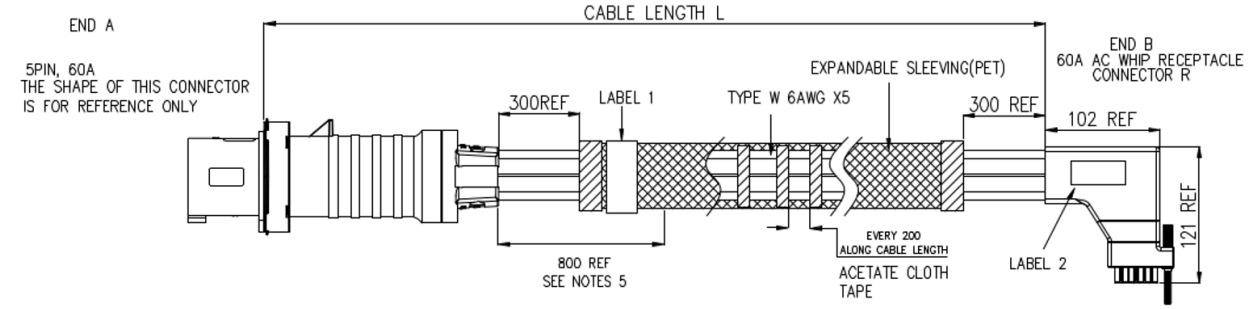
8.6. Change Authorization, Revision Control

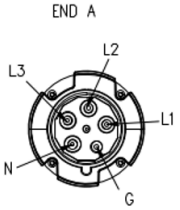
Once the project is released to mass production, no design changes, AVL changes, manufacturing process or materials changes are allowed without prior written authorization from the customer.
AVL is 'Approved Vendor List' of all the components listed in the BOM (the 'Bill of Material'). Any request for changes must be submitted to the customer with proper documentation showing the details of the changes, and reason for the changes, including changes affecting form, fit, function, safety, or serviceability of the product. Major changes in the product (or in the manufacturing process) will require re-qualification and/or re-certification to the Product. Hence a new set of first article samples may be required to complete the ECO process.

Any modifications after approval would ‘phase-in’ during production without causing any delays or shift of the current production schedule: enough ECO advance notice shall be given to the customer (and to all appropriate entities in the Supply Chain) in such occurrences.
All changes must go through a formal ECO process, starting from the pilot run and onward, and the revision (shown in the Safety Label) will increment accordingly.
Revision Control: copies of all ECOs affecting the product will be provided to the customer for sign off.

9. Mechanical Drawings (NA WHIPs Shown - Both Versions)

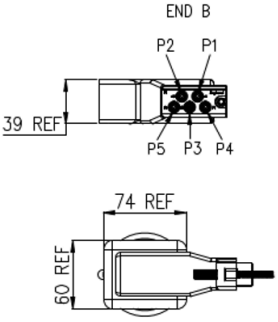
PRODUCT NUMBER	FBPN	CABLE LENGTH L
		2000±50
		3650±75
		4500±75



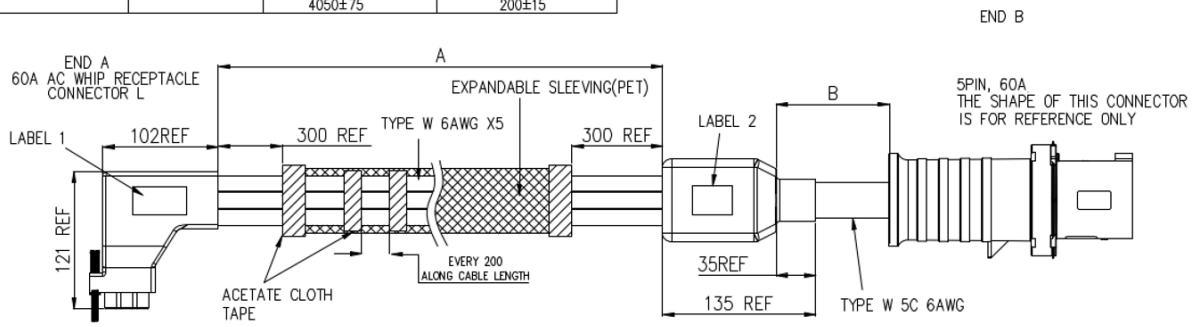


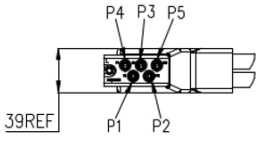
WIRING LIST

END A	END B	WIRE COLOR
L1	P1	BLACK
L2	P2	RED
L3	P3	ORANGE
N	P4	WHITE
G	P5	GREEN



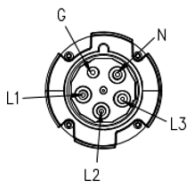
PRODUCT NUMBER	FBPN	CABLE LENGTH A	CABLE LENGTH B
		1550±30	200±15
		3200±75	200±15
		4050±75	200±15

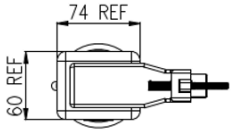




WIRING LIST

END A	END B	WIRE COLOR
P1	L1	BLACK
P2	L2	RED
P3	L3	ORANGE
P4	N	WHITE
P5	G	GREEN





10. Compliance with OCP Tenets

10.1. Openness

The design is built from industry-standard components -- IEC 309 Series I and II plugs, harmonized H07RN-F and Type W power cords -- allowing any qualified vendor to manufacture the assembly without proprietary tooling or licensing. Full mechanical drawings, dimensional envelopes, and material requirements are disclosed in this specification, and the design was developed collaboratively with supplier partners to ensure manufacturability and broad sourcing across the OCP ecosystem.

10.2. Efficiency

The 60A WHIP doubles the per-cable current capacity of the existing ORV3 30A AC WHIP, a necessary change to support high-power AI racks. The individually-jacketed conductor design and the choice of two convergence options (overmolded junction box or direct-to-IEC connector) further improve serviceability and reduce parts count at the rack level.

10.3. Impact

This WHIP enables deployment of the 72kW HPR V2 power shelf, which supports the high-density AI and ML compute platforms now being built by hyperscalers worldwide. By delivering twice the power per cable of the prior-generation 30A WHIP in a single industry-standard assembly, the design accelerates time-to-market for higher-density racks without requiring new upstream data center distribution infrastructure.

10.4. Scale

This product is defined in eight length and cable-exit variants per region -- North America (IEC 309 Series II) and EU (IEC 309 Series I) -- to support deployment across global data center markets.

10.5. Sustainability

The assembly complies with RoHS, REACH, halogen-free (IEC 61249-2-21), and EPA TSCA requirements, and excludes regulated PFAS substances at the component level. The direct-to-IEC connector variant further reduces material content and end-of-life waste by eliminating the overmolded junction box while preserving full electrical and safety performance.

11. References

Refer to the latest available revision of the following specifications:

[1] *Open Rack V3 HPR V2 72kW Power Shelf* (in progress as of May 2026)