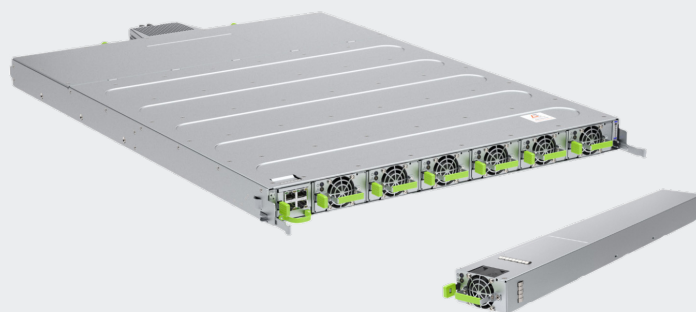


50 V, 18 KW, 10U OPEN RACK POWER SHELVES

15 kW (N + 1) and 9 kW (N + N)



Advanced Energy introduces a 10U, ORV3 compliant shelf that utilizes single or dual cords.

Converting incoming supply voltage into a 50 VDC output with a total power capability of 18 kW. It accommodates 6x3 kW hot-swappable single phase PSU modules. Power Shelf input(s) are universal 7 pin connector which can be configured as star, delta or single phase. It includes a hot-pluggable Shelf Controller for monitoring and control over Ethernet (DMTF Redfish® compatible) management networks. This power shelf is typically used for compute and storage applications which require reliable power and optional battery backup.

KEY FEATURES

- 15 kW at 50 V with N + 1 redundancy or 9 kW at 50 V with N + N redundancy (dual feed shelf)
- Highly accurate droop + active current sharing
- Houses 6 x 3000 W power modules and a removable shelf controller
- Very high efficiency
- Accepts 3 types of input configurations (3P Delta 4 W, 3P Wye 5 W, 3 x of 1P)

COMPLIANCE

- EN 61000-4-2 Cat-A for surges
- EN 61000-3-2 Class-A for harmonics
- EN55022, FCC Part 15, CISPR 22, Class-A for EMC

SAFETY

- UL 60950
- IEC 60950
- EN 62368-1
- UL 62368-1
- IEC 62368-1
- SEMI F47 Compliance

AT A GLANCE

Total Output Power

Single Whip Shelf: 18 kW,
15 kW (N + 1)
Dual Whip Shelf: 18 kW,
15 kW (N + 1) or 9 kW (N + N)

Input Voltage

Nominal Ranges:
346 to 480 VAC 3 phase 5 wire
Wye (3ph + N + E)
200 to 277 VAC 3 phase 4 wire
Delta (3ph + E)

Output Voltage

50.5 VDC

Mechanical Dimensions

720 x 537 x 46 mm (L x W x H)

Operating Temperature

-5°C to +45°C

50 V 18 kW 10U ORV3 POWER SHELVES

ELECTRICAL SPECIFICATIONS

INPUT				
	MIN	NOM	MAX	UNIT
Input Voltage (3 phase Delta 4 wire)	180	200/277	305	VAC
Input Voltage (3 phase Wye 5 wire)	360	380/480	528	VAC
Input Voltage (3 x of 1 phase)	180	200/277	305	VAC
OUTPUT				
	MIN	NOM	MAX	UNIT
Set Point VDC (50% Load)	50.625	50.750	50.875	VDC
Output Current	-	-	300	A
Ripple & Noise (@ 20 MHz BW) ¹	-	-	500	mVpp

Note 1: Measured with a 0.1 mF capacitor connected to the probe tip

POWER SHELF OPTION

The following power shelves are introduced on this specsheet according to the following application:

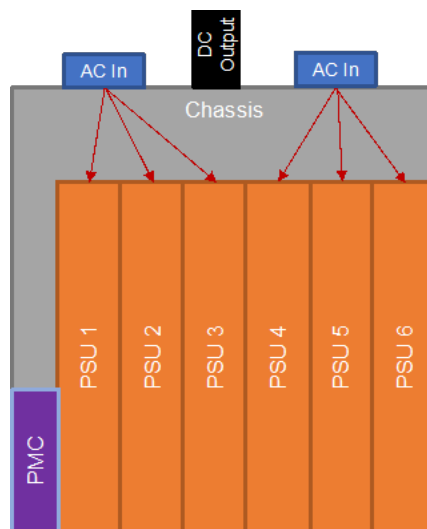
Power Shelf Option 1 - 6 x 3 kW PSU with dual cord (2 x 20 A NEC breaker upstream) - 700-015235-0100

10U shelf with two AC power input

6 x 3 kW rectifier slots

Output power: 15 kW with N + 1 and dual cords or 9 kW N + N

Direct connect to tap-boxes/facility – no intermediate PDU.



TOP VIEW

Power Shelf Option 2 - 6 x 3 kW PSU with single cord (32 A IEC breaker upstream) - 700-015746-0100

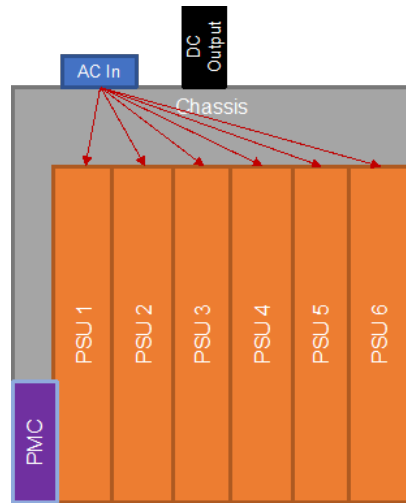
10U shelf with one AC power input

6 x 3 kW rectifier slots

Output power: 15 kW with N + 1 and single cord

Direct connect to tap-box / facility - no intermediate PDU

POWER SHELF OPTION



TOP VIEW

Monitoring & Control Interface

The power shelf includes a slot for a power shelf management controller (PMC) to monitor and control various rectifier parameters. The PMC is connected to rack management controller or facility level monitoring through a monitoring & control interface.

If the PMC fails or is not provided, the power system is able to operate normally. The PMC is powered from the 48 V bus directly.

FRU

FRU data is stored in an EEPROM on the power shelf PCB and can be accessed from an I2C line by the PMC. The FRU format follows "IPMI Platform Management FRU Information Storage Definition 1.0, Version 1.3". FRU will support two-byte address and FRU content will start from 0x0000. The FRU template is listed in table below. The detailed FRU information will be made available prior to the build for approval data.

Organization	String	Example
Board Info Area		
Language Code	19h (English)	
Board Mfg Date	[Generate build time]	
Board Mfg	Defined by vendor	
Board Product	Project Code Name	'ORv3 Shelf'
Board Serial Number	Defined by vendor	
Board Part Number	Defined by vendor	
Custom Field 1		
Custom Field 2		
Product Info Area		
Language Code	19h (English)	
Product Manufacturer	Defined by vendor	
Product Name	Defined by vendor	
Part/Model Number	Defined by vendor	-
Product Version	Defined by vendor	
Product Serial Number	Defined by vendor	
Product Asset Tag	Defined by vendor	
Product Build	EVT (or DVT, PVT)	

MECHANICAL

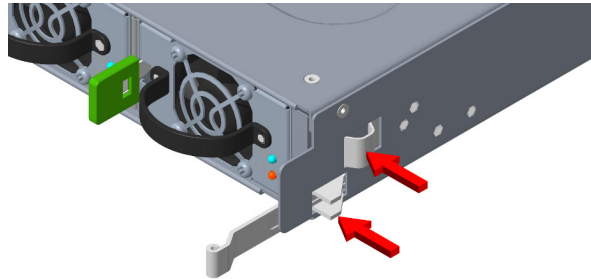
ORV3 Rack Mounting Features

These power shelves are designed for front mounting into Open Rack V3 racks on OU pitch rails (please refer to the Open Rack V3 specifications on more details for the design of these). The design of the 48 V output connector allows it to be placed in any location in the rack.

Rack mounting features are of particular importance in the power shelf design since they assist in constraining the power shelf in X, Y, and Z directions and promote solid electrical contact with the 48 V busbar.

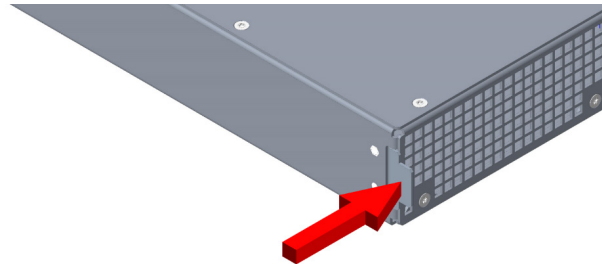
■ Front Latch & Bumper

Please refer to the mechanical CAD for the locations of the front latch and bumper. Note that these serve separate functions and should not be a single part.



■ Rear Stop

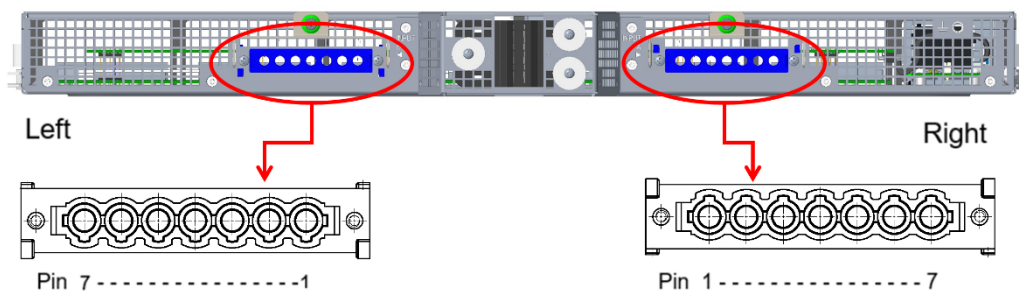
Please refer to the mechanical CAD for the geometry of the rear stop. This is required to interface properly with the ORV3 rack



Connector Details

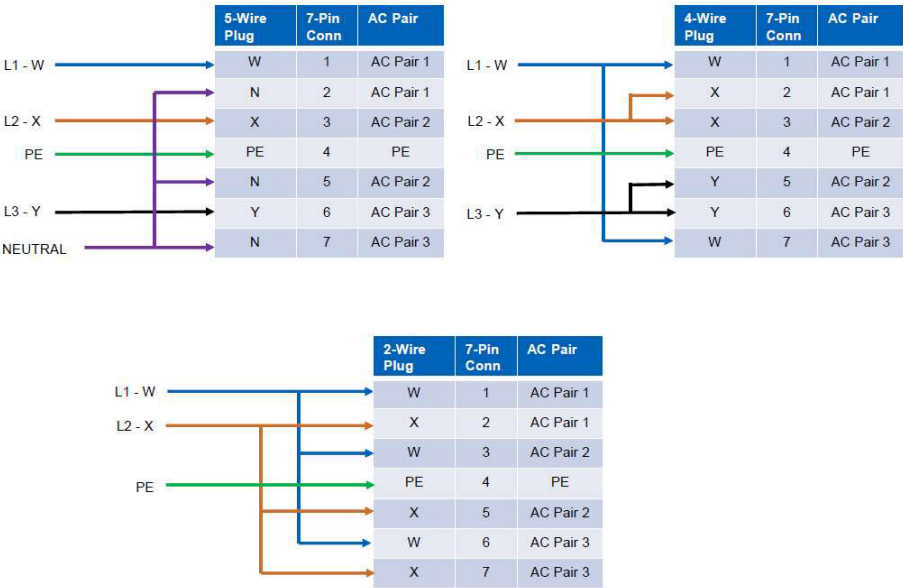
■ AC Input Connector

The power shelf has either one or two AC input connectors right only in the case of the single whip shelf PN. 700-015746-0100, or left and right in the case of the dual whip shelf PN. 700-015235-0100.



MECHANICAL

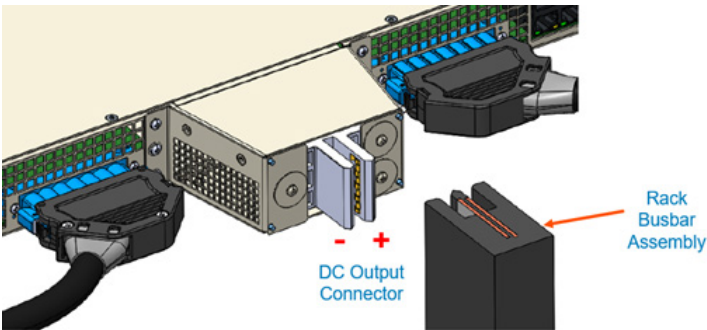
AC Input Connector Wiring



■ DC Output Connector

The shelf DC output connector is a floating blind mate connector that mates with ORV3 busbars in an ORV3 rack. This gives the flexibility for:

- Placing power and battery shelves any desirable location on the rack
- Increasing power and energy by adding more power and/or battery shelves in the rack



■ Power Supply Connector

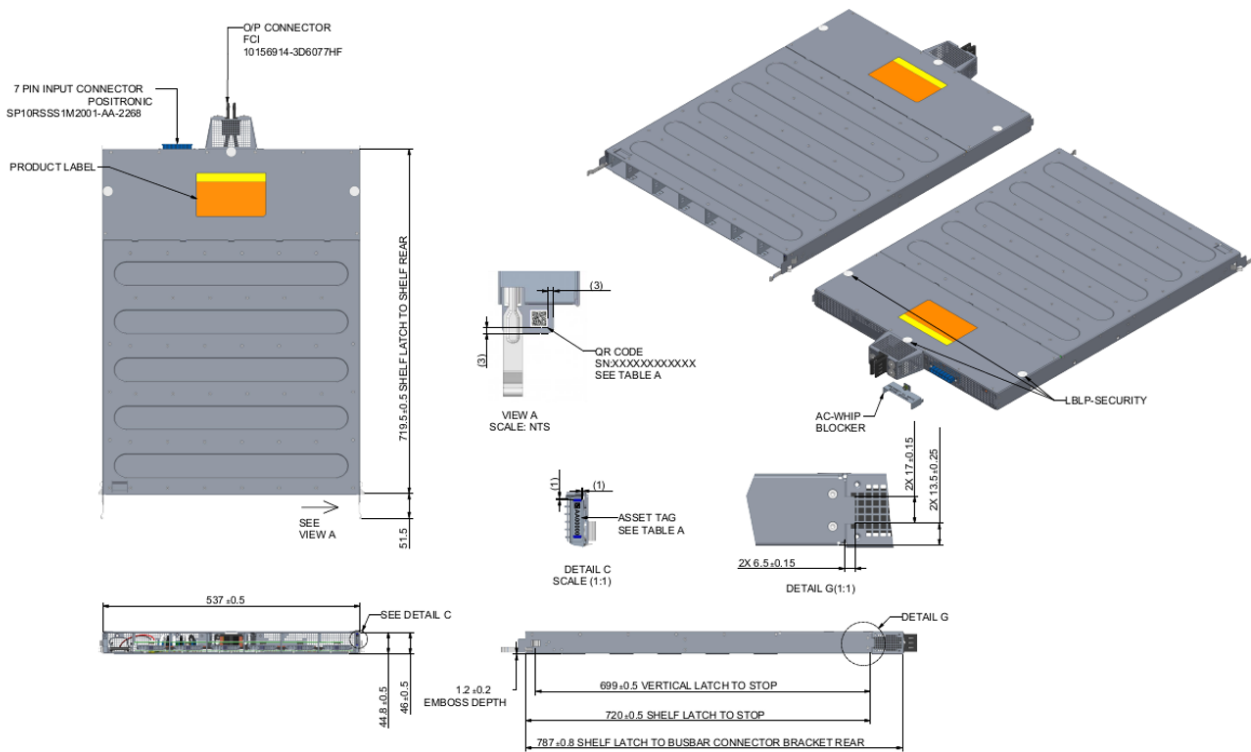
The shelf contains the 6 blind mate mating connectors for the 6 ORV3 PSUs. Amphenol 10127400-01U1520LF or equivalent. This is a R/A receptacle, PwrBlade ULTRA HD connector with 3 low power pins, 25 signal pins, and 4 high power pins. Rectifiers plug into the power shelf directly, and they are hot swappable while the rack is powered. Please refer to "50 V 3 kW OPEN RACK V3 PSU" datasheet for pinout details.

■ PMC/PMI Connector

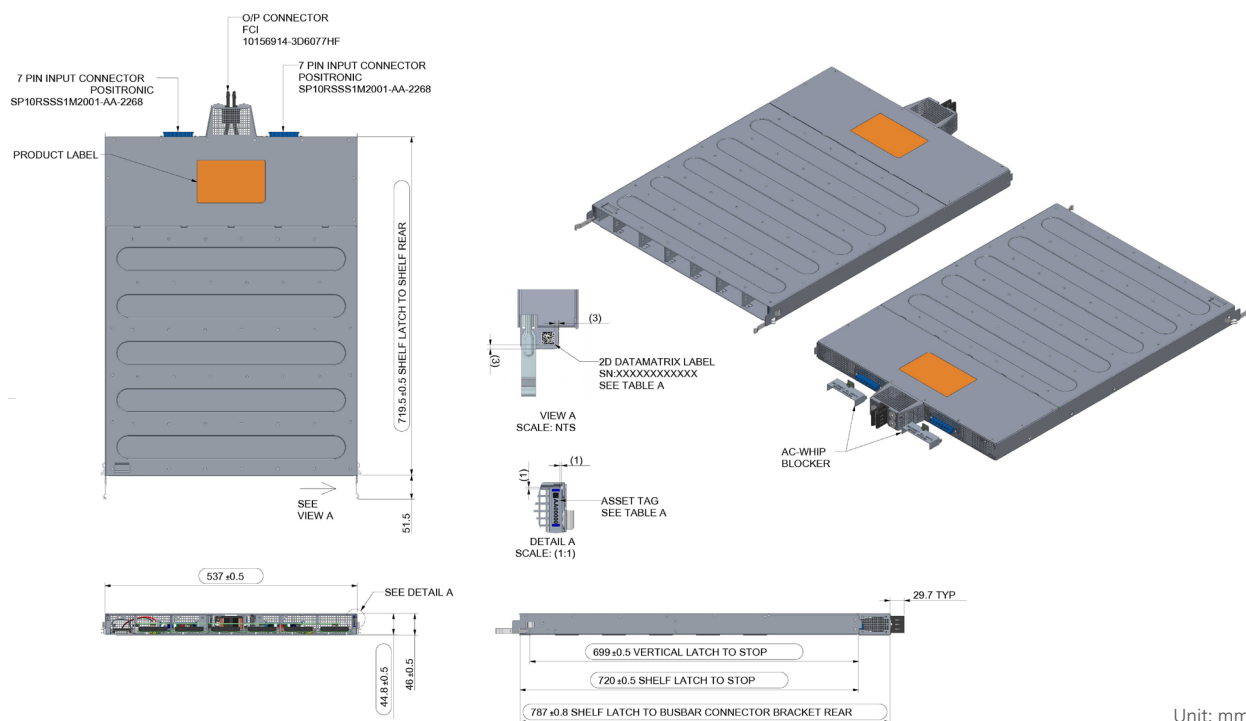
The PMC is a blind-mate module with a 2C card edge connector. The PMC plugs into the power shelf directly, and is hot swappable while the rack is powered. Please refer to "ORV3 STANDARD PMC" datasheet for pinout details.
Note 1: Measured with a 0.1 mF capacitor connected to the probe tip

POWER SHELF MECHANICAL OUTLINE

Single Whip Shelf



Dual Whip Shelf



Unit: mm

MATING CONNECTOR INFORMATION

DEVICE	CONNECTOR	MATING CONNECTOR
Shelf	Input Connector: POSITRONIC SP10RSSS48RM220A1-AA-2269 SP10RSSS48M220A1-AA-2269	POSITRONIC SP10RSSS1F0W01/AA-2268
	Output Connector: FCI BarKlip BK500 Cable 10156914-3D6077HF	ORV3 Busbars

THERMAL DESIGN

- Sensor accuracy: For discrete and critical sensors (such as ambient temperature) have an accuracy of $\pm 2^{\circ}\text{C}$
- Back-pressure: The shelf is designed to accommodate compliance requirements while ensuring reasonable impact to upstream components. A back-pressure of ≤ 0.15 inches of water is targeted.
- Bus-bar power or DC output connection assembly: Cables external to the shelf as well as the clip/connector (to the rack bus-bar) mounting at the rear panel are designed to ensure adequate cooling for compliance requirements (temperature difference as a function of current draw).
- Surface temperature: To make the shelf safe for handling in-operation, accessible surfaces should not exceed a temperature of 70°C .

ENVIRONMENTAL COMPLIANCE

- Gaseous contamination: Severity Level G1 per ANSI/ISA 71.04-1985
- Ambient operating temperature range: -5°C to $+45^{\circ}\text{C}$
- Operating and storage relative humidity: 10% to 90% (non-condensing)
- Storage temperature range: -40°C to $+70^{\circ}\text{C}$
- Transportation temperature range: -55°C to $+85^{\circ}\text{C}$ (short-term storage)
- Operating altitude with no de-ratings: 3,050 m (10,000 feet)
- Acoustic noise: Target sound pressure should not exceed 85 dBA when fan modules are running at full speed and operating within the defined environmental envelope

Vibration and Shock (Non-packaged)

The “power shelf with PSUs inside” meet vibration and shock test per EN 60068-2-6 and 60068-2-27, respectively, for both non-operating and operating condition, with the specifications listed below.

During operating vibration and shock tests, the PSU will exhibit full compliance to the specification without any electrical discontinuities.

During the non-operating tests, no damages of any kinds (included physical damages) should occur and they should not corrupt the functionalities of the PSU per the specifications.

Vibration Non-Operating:

Excitation Mode:	Sinusoidal
Test Frequency:	5 to 500 Hz (5 to 9 Hz) 6 mm peak to peak (9 to 500 Hz) 1 g
Amplitude:	1 g
Frequency Change Rate:	1 octave / min
Test Directions:	3 directions in space (x, y, z)
Duration:	10 sweep cycles for each direction (2 hours 13 minutes)
Test Temperature:	Room temperature
Electrical Work:	None

ENVIRONMENTAL COMPLIANCE

Shock Non-Operating:

Shock Pulse:	Half sinusoidal
Shock Duration:	11 ms
Shock Amplitude:	12 g
Test Directions:	6 directions
Number of Shocks:	60 (10 per each direction)
Test Temperature:	Room temperature
Electrical Work:	None

Vibration Operating:

Excitation Mode:	Sinusoidal
Test Frequency:	5 to 500 Hz (5 to 9 Hz) 6 mm peak to peak (9 to 500 Hz) 1 g
Amplitude:	0.5 g
Frequency Change Rate:	1 octave / min
Test Directions:	3 directions in space (x, y, z)
Duration:	10 sweep cycles for each direction (2 hours 13 minutes)
Test Temperature:	Room temperature
Electrical Work:	Power supply in operation

Shock Operating:

Shock Pulse:	Half sinusoidal
Shock duration:	11 ms
Shock Amplitude:	6 g
Test Directions:	6 directions
Number of Shocks:	30 (5 per each direction)
Test Temperature:	Room temperature
Electrical Work:	Power supply in operation

Package Vibration, Drop and Compression

The power shelves (without PSUs) in their shipping package meet the following requirements:

Package Vibration:	1.146 g, 2 to 200 to 2 Hz, all three axes, random vibe	ISTA 3E 06-06
Package Drop:	8-inch drop	ISTA 3E 06-06
Package Compression:	Maximum compression loading on a bulk pack	ASTM D 642-94

EMC, SAFETY AND ENVIRONMENTAL COMPLIANCE

The power supply shelf is designed for compliance to allow worldwide deployment.

Safety Standards

The product is to be designed to comply with the latest edition, revision, and amendment of the following standards. The product is designed such that the end user could obtain the safety certifications: UL 62368-1, IEC 62368-1 and EN 62368-1; hazard-based performance standard for Audio video, IT & Communication Technology Equipment

- UL or an equivalent NRTL for the US with follow-up service (e.g. UL or CSA)
- CB certificate and test report issued by CSA, UL, VDE, TUV or DEMKO
- CE marking for EU

Component Safety requirements

Following are the safety compliances for major components:

- All fans have the minimum certifications: UL and TUV or VDE.
- All current limiting devices have UL and TUV or VDE certifications and are suitable rated for the application where the device in its application complies with IEC/UL 62368-1.
- All printed wiring boards are rated UL94V-0 and sourced from a UL approved printed wiring board manufacturer.
- All connectors are UL recognized and have a UL flame rating of UL94V-0.
- All wiring harnesses are sourced from a UL approved wiring harness manufacturer. SELV cable to be rated minimum 80 V, 130°C.
- Product safety label will be printed on UL approved label stock and printer ribbon. Alternatively, labels can be purchased from a UL approved label manufacturer.
- The product will be marked with the correct regulatory markings to support the certifications that are specified in this document.

EMC Requirements

The power shelf meets the following requirements in the latest edition of standards when operating under typical load conditions and with all ports fully loaded.

The Power supply integrated into the shelf is called the component power supply.

The power shelf will have minimum 6dB margin from the Class A limit for the radiated and conducted emissions.

The following EMC Standards (the latest version) are applicable to the product:

- FCC /ICES-003
- CISPR 32/EN55032
- CISPR 35/EN55035 - Immunity
- EN61000-3-2 - Harmonics
- EN61000-3-3 - Voltage flicker
- VCCI
- KN 32 and KN35

Each individual basic standard for immunity test has the following minimum passing requirement. Higher level of passing criteria may be applied depending on the system manufacturer's design goals and business needs.

- EN61000-4-2 Electrostatic Discharge immunity
 - Contact discharge: > 5.6 kV
 - Air discharge: > 11.2 kV
- EN61000-4-3 Radiated immunity
 - > 3 V/m
- EN61000-4-4 Electrical Fast Transient immunity
 - AC power line: > 1 kV
 - Signal line: > 0.5 kV
- EN61000-4-5 Surge
 - AC power line: > 2 kV (Line-to-line), > 4 kV (Line-to-earth)
 - Signal port: > 1 kV

EMC, SAFETY AND ENVIRONMENTAL COMPLIANCE

- EN61000-4-6 Immunity to conducted disturbances
DC power line: > 3 Vrms
- EN61000-4-8 Power frequency magnetic field immunity, when applicable
> 1 A/m
- EN61000-4-11 Voltage dip and sag

Environmental Compliance

The power shelf (including all components inside) complies with the following minimum environmental requirements:

- RoHS Directive (2011/65/EU and 2015/863/EU)
- REACH Regulation (EC) No 1907/2006;
- Halogen Free: IEC 61249-2-21, Definition of Halogen Free, 900 ppm for Br or Cl, or 1500ppm combined
- US SEC conflict mineral regulation to source mineral materials from socially responsible countries, if applicable
- Waste Electrical and Electronic Equipment ("WEEE") Directive (2012/19/EU) if applicable;
- Product does not contain any substances regulated by EPA 40 CFR751

ORDERING INFORMATION

Model	Description
700-015746-0100	Standard ORV3 Power Shelf - Single Whip
700-015235-0100	Standard ORV3 Power Shelf - Dual Whip

Model	Description
700-015234-0100	Standard ORV3 PSU
700-015798-0200	Standard ORV3 Management Controller
700-015718-0000	Standard ORV3 PMI



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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

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