EMC® VMAX®
Best Practices Guide
for AC Power Connections

For: VMAX3™ Family and VMAX All Flash

REVISION 06
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<td>35</td>
</tr>
</tbody>
</table>
Preface

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

Note

This document was accurate at publication time. Go to EMC Online Support (https://support.emc.com) to ensure that you are using the latest version of this document.

Purpose
This document describes best practices for connecting AC power to the following VMAX arrays:

- VMAX3 Family: VMAX 100K, VMAX 200K, VMAX 400K
- VMAX All Flash: VMAX 250F, VMAX 450F, VMAX 850F, VMAX 950F

Audience
This document is intended for customers who are installing a VMAX3 Family or VMAX All Flash array and must assure that fault tolerant AC power is supplied to the arrays from independent, customer-supplied, power distribution units (PDUs).

Related documentation
The following EMC publications provide additional information:

EMC VMAX3 Family Product Guide for VMAX 100K, VMAX 200K, VMAX 400K with HYPERMAX OS
Provides product information regarding the purchase of a VMAX3 Family 100K, 200K, 400K.

EMC VMAX All Flash Product Guide for VMAX 250F, 450F, 850F, 950F with HYPERMAX OS
Provides product information regarding the purchase of a VMAX 250F, 450F, 850F, 950F with HYPERMAX OS.

EMC VMAX3 Family Site Planning Guide for VMAX 100K, VMAX 200K, VMAX 400K with HYPERMAX OS
Provides planning information regarding the purchase and installation of a VMAX3 Family 100K, 200K, 400K.

EMC VMAX All Flash Site Planning Guide for VMAX 250F, 450F, 850F, 950F with HYPERMAX OS
Provides planning information regarding the purchase and installation of a VMAX 250F, 450F, 850F, 950F with HYPERMAX OS.

EMC VMAX Securing Kit Installation Guide
Describes how to install the securing kit on a VMAX3 Family array or VMAX All Flash array.

EMC VMAX Power-down/Power-up Procedure
Describes how to power-down and power-up a VMAX3 Family array or VMAX All Flash array.
**Special notice conventions used in this document**

EMC uses the following conventions for special notices:

### DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

### NOTICE

Addresses practices not related to personal injury.

### Note

Presents information that is important, but not hazard-related.

**Typographical conventions**

EMC uses the following type style conventions in this document:

<table>
<thead>
<tr>
<th><strong>Bold</strong></th>
<th>Used for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Italic</strong></td>
<td>Used for full titles of publications referenced in text</td>
</tr>
</tbody>
</table>
| **Monospace** | Used for:  
  - System code  
  - System output, such as an error message or script  
  - Pathnames, filenames, prompts, and syntax  
  - Commands and options |
| **Monospace italic** | Used for variables |
| **Monospace bold** | Used for user input |
| [ ] | Square brackets enclose optional values |
| | Vertical bar indicates alternate selections - the bar means “or” |
| {} | Braces enclose content that the user must specify, such as x or y or z |
| ... | Ellipses indicate nonessential information omitted from the example |
Where to get help
EMC support, product, and licensing information can be obtained as follows:

Product information
EMC technical support, documentation, release notes, software updates, or information about EMC products can be obtained on the https://support.emc.com site (registration required).

Technical support
To open a service request through the https://support.emc.com site, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

eLicensing support
To activate your entitlements and obtain your VMAX license files, visit the Service Center on https://support.EMC.com, as directed on your License Authorization Code (LAC) letter emailed to you.

- For help with missing or incorrect entitlements after activation (that is, expected functionality remains unavailable because it is not licensed), contact your EMC Account Representative or Authorized Reseller.
- For help with any errors applying license files through Solutions Enabler, contact the EMC Customer Support Center.
- If you are missing a LAC letter, or require further instructions on activating your licenses through the Online Support site, contact EMC's worldwide Licensing team at licensing@emc.com or call:
  - North America, Latin America, APJK, Australia, New Zealand: SVC4EMC (800-782-4362) and follow the voice prompts.
  - EMEA: +353 (0) 21 4879862 and follow the voice prompts.

Your comments
Your suggestions help us improve the accuracy, organization, and overall quality of the documentation. Send your comments and feedback to:
VMAXContentFeedback@emc.com
### Revision history

The following table presents the revision history of this document:

<table>
<thead>
<tr>
<th>Revision</th>
<th>Description and/or Change</th>
<th>Date</th>
</tr>
</thead>
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<tr>
<td>06</td>
<td>- Updated for VMAX 950F.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Added instructions on how to ground the cabinet.</td>
<td>May, 2017</td>
</tr>
<tr>
<td>05</td>
<td>Formatting edits for readability.</td>
<td>September, 2016</td>
</tr>
<tr>
<td>04</td>
<td>Updated for VMAX 250F.</td>
<td>August, 2016</td>
</tr>
<tr>
<td>03</td>
<td>Updated name and doc references. Minor edits for readability. Modified front matter.</td>
<td>February, 2016</td>
</tr>
<tr>
<td>02</td>
<td>Format change. No change in content.</td>
<td>August, 2015</td>
</tr>
<tr>
<td>01</td>
<td>Initial release.</td>
<td>September, 2014</td>
</tr>
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</table>
CHAPTER 1

Best Practices Guide for AC Power Connections

Topics include:

- Best practices overview for AC power connections.................................14
- Selecting the proper AC power connection procedure.............................15
- Procedure A: Working with the customer's electrician onsite......................16
- Procedure B: Verify and connect.................................................................27
- Procedure C: Obtain customer verification..................................................28
- PDU labels.................................................................................................28
- Ground the cabinet....................................................................................33
- AC power specifications.............................................................................34
Best practices overview for AC power connections

To assure fault tolerant power, external AC power must be supplied from independent, customer-supplied, power distribution units (PDUs) as shown in Figure 1 on page 14.

**NOTICE**

For systems operating from three phase AC power, two independent and isolated AC power sources are recommended for the two individual power zones in each rack of the system. This provides for the highest level of redundancy and system availability. If independent AC power is not available, there is a higher risk of data unavailability should a power failure occur, including individual phase loss occurring in both power zones.

**NOTICE**

Before connecting external AC power to EMC bays, verify that the bays have been placed in their final position as explained in the installation guide.
Selecting the proper AC power connection procedure

The EMC Customer Engineer must select the proper AC power connection procedure

There are three possible scenarios at the installation site regarding the connection of customer AC power to the EMC array. The EMC Customer Engineer (CE) must select the proper AC power connection procedure for the scenario.

1. Refer to table below which summarizes the three possible scenarios at the installation site when you are about to connect external AC power to the EMC array.

2. Select the procedure that applies to your situation and follow the instructions for that procedure.

Table 2 Procedure options for AC power connection

<table>
<thead>
<tr>
<th>If the scenario is...</th>
<th>then use this procedure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The customer’s electrician is available at the installation site.</td>
<td>A, See: Procedure A: Working with the customer’s electrician onsite on page 16</td>
</tr>
<tr>
<td>Access to customer-supplied, labeled, power cables (beneath raised floor or overhead). (And the customer’s electrician is NOT available at the installation site.)</td>
<td>B, See: Procedure B: Verify and connect on page 27</td>
</tr>
<tr>
<td>Customer-supplied PDU source cables are already plugged into the EMC PDU (or VMAX 250F PDP) and you have no access to the customer-supplied, labeled, power cables (beneath raised floor or overhead). (And the customer’s electrician is NOT available at the installation site.)</td>
<td>C, See: Procedure C: Obtain customer verification on page 28</td>
</tr>
</tbody>
</table>

a. Procedure A assures fault tolerant power in the EMC array.
Procedure A: Working with the customer's electrician onsite

Use this procedure if the customer’s electrician is available at the installation site. This procedure requires three basic tasks that alternate between the customer's electrician, the EMC CE and back to the customer's electrician.

- Task 1: Customer's electrician
- Task 2: EMC Customer Engineer (CE)
- Task 3: Customer's electrician
Procedure A, Task 1: Customer's electrician

**NOTICE**

This task is performed by the customer's electrician.

**Procedure**

1. Verify that the customer-supplied AC source voltage output on each customer-supplied PDU is within the AC power specification shown in AC power specifications on page 34. Measure the voltage output of each power cable as shown in Figure 2 on page 17.

2. Turn OFF all the relevant circuit breakers in customer-supplied PDU 1 and customer-supplied PDU 2.

3. Verify that the customer-supplied power cables connected to PDU 1 and PDU 2 have no power as shown in Figure 3 on page 17.

**Figure 2** Circuit breakers ON — AC power within specification

**Figure 3** Circuit breakers OFF — No AC power
Procedure A, Task 2: EMC Customer Engineer

Before you begin

Before connecting power to the system, make sure that the power for both zone A and zone B are turned OFF. This task is performed by the EMC Customer Engineer.

Figure 4 System bay power tee breakers (OFF = pulled out)

System Bay (rear view)

Procedure

1. Confirm that the customer-supplied power cables are labeled and that each label contains the relevant customer-supplied PDU and circuit breaker numbers. If power cables are not equipped with labels, alert the customer.

2. Compare the numbers on the customer-supplied power cables for each EMC bay to verify that power zone A and power zone B are powered by a different customer-supplied PDU.

3. Do one of the following to connect power zone A and power zone B in each bay. If necessary, use the 15ft extension cords provided by EMC.

   - For single-phase power: Connect customer-supplied PDU power cables to the EMC bay by connecting to the bay's AC input cables for power zone A and power zone B as shown below.
For three-phase power: Connect customer-supplied PDU power cables to the EMC bay by connecting to the bay’s AC input cables for power zone A and power zone B as shown below.
Figure 6 Connecting AC power, three-phase

Rear view
System bay

<table>
<thead>
<tr>
<th>Zone B PDU</th>
<th>Zone A PDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Left)</td>
<td>(Right)</td>
</tr>
</tbody>
</table>

EMC-supplied power cable and connector from the PDU

Cable connectors are shown as they exit the bottom rear of the bay.

- Zone B
  - AC input cable B
  - 15 ft. extension cord options
  - Mating connector or customer-supplied cable

- Zone A
  - AC input cable A
  - 15 ft. extension cord options
  - Mating connector or customer-supplied cable

Customer’s PDU 1
Customer’s PDU 2

NOTICE

Do not connect EMC bay power zone A and power zone B to the same customer-supplied PDU. The customer will lose power redundancy and risk Data Unavailability (DU) if the PDU fails or is turned off during a maintenance procedure.
Figure 7 Power zone connections
Procedure A, Task 2: EMC Customer Engineer (VMAX 250F)

Before you begin
Before connecting power to the system, make sure that the power for both zone A and zone B are turned OFF. This task is performed by the EMC Customer Engineer.

Figure 8 PDP power switches for Zone A and B

Example shown:
2 V-Bricks

Procedure
1. Confirm that the customer-supplied power cables are labeled and that each label contains the relevant customer-supplied PDU and circuit breaker numbers. If power cables are not equipped with labels, alert the customer.

2. Compare the numbers on the customer-supplied power cables for each EMC bay to verify that power zone A and power zone B are powered by a different customer-supplied PDU.

3. Do the following to connect power zone A and power zone B in each bay. You must use the 15ft extension cords provided by EMC. To ensure serviceability, make sure there is 2ft (61cm) of cable slack directly under the bay floor-egress. See VMAX 250F customer AC power feed cabling on page 25 for more details.
   - For both single-phase and three-phase, connect customer-supplied PDU power cables to the EMC bay by connecting to the bay's AC input cables for power zone A and power zone B as shown below:
Figure 9 Connecting AC power

Rear view
VMAX 250F bay

PDP
(Power zone B, left)

EMC-supplied power cable and connector from the PDP

Zone B
AC input
cable B

15 ft. extension
cord mandatory with 2ft slack

Mating connector or
customer-supplied cable

Customer’s PDU 1

PDP
(Power zone A, right)

EMC-supplied power cable and connector from the PDP

Zone A
AC input
cable A

15 ft. extension
cord mandatory with 2ft slack

Mating connector or
customer-supplied cable

Customer’s PDU 2

NOTICE

Do not connect EMC bay power zone A and power zone B to the same customer-supplied PDU. The customer will lose power redundancy and risk Data Unavailability (DU) if the PDU fails or is turned off during a maintenance procedure.
Figure 10 Power zone connections
VMAX 250F customer AC power feed cabling

When connecting customer input power to a VMAX 250F, the EMC-supplied 15ft (4.57m) extension cords must be used and approximately 24in (61cm) of slack must be left directly under the bay floor egress.

**Note**

For power zone-A, use the extension cord with gray sleeves at the ends.

---

**Figure 11** Customer input power cabling for VMAX 250F

Example shown:
2 V-Bricks

Power feed 1

Power zone B (left, black)
PDPs (Power zone B)

Customer’s PDU 1

Customer's PDU 2

Data center floor

Customer power feed

40U rack

Power zone A (right, gray)
PDP (Power zone A)
PDU (Power zone A)

Customer’s PDU 1

Power zone A

EMC 15ft (4.57m) Extension Cord with 24in (61cm) slack under floor egress

Data center sub-floor
Procedure A, Task 3: Customer's electrician

**NOTICE**

This task is performed by the customer's electrician.

**Procedure**

1. Working with the EMC Customer Engineer, turn ON all the relevant circuit breakers in customer-supplied PDU 2.
   Verify that only power supply and/or SPS LEDs in power zone A are ON or flashing green in every bay in the array.
   
   **Note**
   
   If all power supply and/or SPS LEDs in a bay are ON or flashing green, the bay is incorrectly wired because the AC power to both EMC power zones is supplied by a single PDU, that is, customer-supplied PDU 2. Wiring must be corrected before moving on to the next step.

2. Turn OFF the relevant circuit breakers in customer-supplied PDU 2.
   Verify that the power supply and/or SPS LEDs that turned green in the previous step changed from green to OFF and/or flashing yellow. The yellow SPS lights flash for a maximum of 5 minutes.
   
   **Note**
   
   Note that power supplies connected to an SPS continue to have green lights ON while the SPS yellow light continues to flash indicating the SPS is providing on-battery power.

3. Repeat step 1 and step 2 for power zone B and customer-supplied PDU 1.

4. Turn ON all the relevant circuit breakers in customer-supplied PDU 1 and customer-supplied PDU 2.

5. Label the PDUs as described in PDU labels on page 28.
Procedure B: Verify and connect

Perform this procedure if the two conditions listed below are true:

- Access to customer-supplied, labeled, power cables (beneath raised floor or overhead).
- The customer's electrician is not available at the installation site.

This procedure requires the EMC Customer Engineer to verify that the customer's electrician has complied with power specifications. Once verified, the EMC Customer Engineer makes the required power connections overhead or under the floor.

Procedure

1. Have the customer verify that their electrician has complied with power specifications for voltage levels and redundancy. If the customer cannot verify this, provide them with a copy of Procedure A. Inform the customer that their array may prematurely shut down in the event of a site power issue.

2. Access the labeled, power cables (beneath raised floor or overhead) to verify that the customer-supplied power cables are properly labeled as shown in Figure 3 on page 17 and described in Procedure A, Task 2.

3. Compare the numbers on the customer-supplied power cables for each EMC bay to verify that power zone A and power zone B are powered by a different customer-supplied PDU.

4. If power extension cables are required, connect them to power zone A and power zone B in each bay.

5. Connect the customer-supplied power cables to EMC power zones as described in Procedure A, Task 2.

6. Record the customer-supplied PDU information as described in Procedure A, Task 2.

7. Label the PDUs as described in PDU labels on page 28.
**Procedure C: Obtain customer verification**

Perform this procedure if the three conditions listed below are true:

- The customer-supplied PDU source cables are already plugged into the EMC PDU.
- You have no access to the area below the raised floor.
- The customer's electrician is not available at the installation site.

**Procedure**

1. Have the customer verify that their electrician has complied with power specifications for voltage levels and redundancy. If the customer cannot verify this, provide them with a copy of Procedure A. Inform the customer that their array may prematurely shut down in the event of a site power issue.

2. Record the customer-supplied PDU information (AC source voltage) as described in step 1 of Procedure A, Task 1: Customer's electrician on page 17 and label the PDUs as described in PDU labels on page 28.

**PDU labels**

Before applying labels to the PDUs, one of the following procedures must have been completed:

- Procedure A: Working with the customer's electrician onsite on page 16
- Procedure B: Verify and connect on page 27
- Procedure C: Obtain customer verification on page 28

If necessary, see Selecting the proper AC power connection procedure on page 15 to select the correct procedure.

**PDU label part numbers**

**VMAX 250F**

*Table 3 VMAX 250F label part numbers*

<table>
<thead>
<tr>
<th>PN</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN 046-003-593</td>
<td>LABEL: CUSTOMER PDU INFORMATION</td>
<td>OPEN ME FIRST KIT, PN 106-887-093</td>
</tr>
</tbody>
</table>

**VMAX 450F, VMAX 850F, VMAX 950F**

*Table 4 VMAX 450F, VMAX 850F, VMAX 950F label part numbers, EMC racks*

<table>
<thead>
<tr>
<th>For...</th>
<th>Use PN</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>All bays</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>OPEN ME FIRST, KIT, PN 106-887-026</td>
</tr>
</tbody>
</table>
### Table 5  VMAX 450F, VMAX 850F, VMAX 950F label part numbers, 3rd party racks

<table>
<thead>
<tr>
<th>For...</th>
<th>Use PN</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>System bay 1</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>VMAX AFA EVEREST SB-1 KIT 3RD PARTY, 106-887-171</td>
</tr>
<tr>
<td></td>
<td>PN 046-001-749</td>
<td>PDU Connection Tag</td>
<td></td>
</tr>
<tr>
<td>System bays 2-8</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>VMAX AFA EVEREST SB-1 KIT 3RD PARTY, 106-887-175</td>
</tr>
<tr>
<td></td>
<td>PN 046-001-749</td>
<td>PDU Connection Tag</td>
<td></td>
</tr>
</tbody>
</table>

### VMAX3 Family

#### Table 6  VMAX3 Family label part numbers, EMC racks

<table>
<thead>
<tr>
<th>For...</th>
<th>Use PN</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>All bays</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>OPEN ME FIRST, KIT, PN 106-887-026</td>
</tr>
</tbody>
</table>

#### Table 7  VMAX3 Family label part numbers, 3rd party racks

<table>
<thead>
<tr>
<th>For...</th>
<th>Use PN</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>System bay 1</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>Sys Bay 1 Kit, 106-887-149</td>
</tr>
<tr>
<td></td>
<td>PN 046-001-749</td>
<td>PDU Connection Tag</td>
<td></td>
</tr>
<tr>
<td>System bays 2-8</td>
<td>PN 046-001-750</td>
<td>LABEL: CUSTOMER 1P 3P PDU INFO WRITEABLE</td>
<td>Sys Bay 2-8 Kit, 106-887-150</td>
</tr>
<tr>
<td></td>
<td>PN 046-001-749</td>
<td>PDU Connection Tag</td>
<td></td>
</tr>
</tbody>
</table>
Applying PDU labels, VMAX 250F

Procedure

1. Locate and complete the PDU label.

2. Place the label on the bottom, inner surface of the PDU enclosure for side A and B.

![Diagram of PDU labels](image)

Example shown:
2 V-Bricks

Rear view

40U rack

Customer PDU Information

<table>
<thead>
<tr>
<th>Power Zone B</th>
<th>Power Zone A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDU</td>
<td>PDU</td>
</tr>
<tr>
<td>Panel</td>
<td>Panel</td>
</tr>
<tr>
<td>CB's</td>
<td>CB's</td>
</tr>
</tbody>
</table>

PDU label (not to scale)
Applying PDU labels, VMAX3 Family, VMAX 450F, VMAX 850F, VMAX 950F

Procedure

1. For each bay, locate and complete the PDU label.

   Note

   For three-phase power, enter data only in the P1 column.

2. Place the label on the top surface of the PDU enclosure for side A and B.

   Figure 13 PDU label, single-phase and three-phase

   Customer PDU Information

   | Power Zone B | Power Zone A |
   | PDU          | PDU          |
   | Panel        | Panel        |
   | CB(s)        | CB(s)        |
   | P1           | P1           |
   | P2           | P2           |
   | P3           | P3           |

   Figure 14 Label placement—Customer PDU Information

   Zone B PDU label  Zone A PDU label

   Rear View

3. For 3rd party racks, do one of the following:

   - For three-phase power: Using plastic ties, attach the PDU connection tag to the main AC power cable connected to zone A and B. Place the label close to the plug but on the side of the rack where it will not interfere with any rails.
For single-phase power: Using plastic ties, attach the PDU connection tag to the P1 AC power cable connected to zone A and B. Place the label close to the plug but on the side of the rack where it will not interfere with any rails.
Ground the cabinet

Equipment correctly installed within the cabinet is grounded through the AC power cables and connectors. In general, supplemental grounding is not required.

If your site requires external grounding (for example, to a common grounding network beneath the site floor), you can use the grounding lugs provided on each of the cabinet’s bottom supports.
## AC power specifications

**Table 8 Input power requirements - single-phase, North American, International, Australian**

<table>
<thead>
<tr>
<th>Specification</th>
<th>North American 3-wire connection (2 L &amp; 1 G)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>International and Australian 3-wire connection (1 L &amp; 1 N &amp; 1 G)&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input nominal voltage</td>
<td>200–240 VAC ± 10% L- L nom</td>
<td>220–240 VAC ± 10% L- N nom</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Circuit breakers</td>
<td>30 A</td>
<td>32 A</td>
</tr>
<tr>
<td>Power zones</td>
<td>Two</td>
<td>Two</td>
</tr>
<tr>
<td>Minimum power requirements at customer site (VMAX3)</td>
<td>• Three 30 A, single-phase drops per zone.</td>
<td>• One 30 A, single phase drop per zone.</td>
</tr>
<tr>
<td></td>
<td>• Two power zones require 6 drops, each drop rated for 30 A.</td>
<td>• Two power zones require 2 drops, each drop rated for 30 A.</td>
</tr>
<tr>
<td></td>
<td>• PDU A and PDU B require three separate single-phase 30 A drops for each PDU.</td>
<td>• Two systems in an EMC rack require 4 drops, each drop rated for 30 A.</td>
</tr>
<tr>
<td>Minimum power requirements at customer site (VMAX 250F)</td>
<td>• Three 30 A, single-phase drops per zone.</td>
<td>• Three 30 A, single-phase drops per zone.</td>
</tr>
<tr>
<td></td>
<td>• Two power zones require 6 drops, each drop rated for 30 A.</td>
<td>• Two power zones require 6 drops, each drop rated for 30 A.</td>
</tr>
<tr>
<td></td>
<td>• PDU A and PDU B require three separate single-phase 30 A drops for each.</td>
<td>• PDU A and PDU B require three separate single-phase 30 A drops for each.</td>
</tr>
</tbody>
</table>

<sup>a</sup> L = line or phase, N = neutral, G = ground
### Table 9 Input power requirements - three-phase, North American, International, Australian

<table>
<thead>
<tr>
<th>Specification</th>
<th>North American 4-wire connection (3 L &amp; 1 G)(^a)</th>
<th>International 5-wire connection (3 L &amp; 1 N &amp; 1 G)(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage(^b)</td>
<td>200–240 VAC ± 10% L- L nom</td>
<td>220–240 VAC ± 10% L- N nom</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Circuit breakers</td>
<td>50 A</td>
<td>32 A</td>
</tr>
<tr>
<td>Power zones</td>
<td>Two</td>
<td>Two</td>
</tr>
<tr>
<td>Minimum power requirements at customer site</td>
<td>• Two 50 A, three-phase drops per bay.</td>
<td>Two 32 A, three-phase drops per bay.</td>
</tr>
<tr>
<td></td>
<td>• PDU A and PDU B require one separate three-phase Delta 50 A drops for each.</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) L = line or phase, N = neutral, G = ground
\(^b\) An imbalance of AC input currents may exist on the three-phase power source feeding the array, depending on the configuration. The customer’s electrician must be alerted to this possible condition to balance the phase-by-phase loading conditions within the customer’s data center.
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