

# 1000 - 2500 Watts

## VS Series

**VS1-B2-H522-00**  
1100W total



**VS3-D2-C2-20**  
1200W total



**VS6-L2-00**  
1500W total



**VS8-L9-D9-20**  
2500W total (case limit)



**VS4/9**  
2000 - 2500 W



### Special Features

- Power factor correction
- IEC 555-2 harmonic distortion compliance
- CISPR 22, EN55022 Level B conducted / radiated EMI
- EN61000 immunity standards
- European CE Mark
- Current share on all outputs
- Remote sense on all outputs
- Overload protection on all outputs
- Voltage adjustment on all outputs
- Margining on all outputs
- AC-OK-signal (logics "1" or "0")
- Global DC OK (logics "1" or "0")
- DC-OK signal and status indicator LED-on all outputs
- Global and individual module inhibits/enable
- 3 year warranty
- 2500 W with 3-phase input

### Environmental

Operating temperature: -10°C to 50°C  
(derate each output linearly to 60% at 70°C)  
40°C max. for reverse air (option #1)

Shock/Vibration: Mil-Hdbk 810E

Humidity: 95% non-condensing

Storage temperature: -55°C to +85°C

Temperature coefficient: 0.02% per °C

Cooling: Internal DC fan 24V

### Safety

|            |                          |         |
|------------|--------------------------|---------|
| <b>UL</b>  | UL60950-1                | E133211 |
| <b>CSA</b> | CSA C22.2 No. 60950-1-03 |         |
| <b>VDE</b> | EN60950                  |         |
| <b>CB</b>  | Certificate and report   |         |
| <b>CE</b>  | Mark                     |         |

## AMERICAS

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## ASIA

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## Electrical Specs

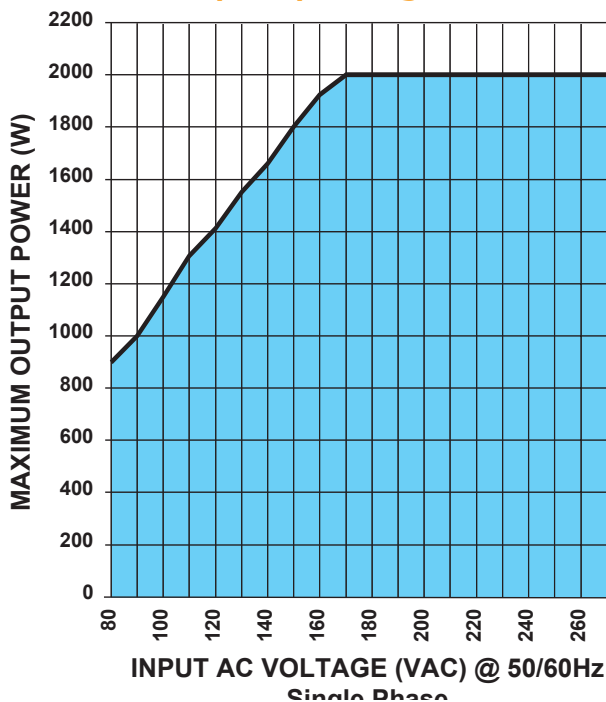
## Input

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| Fuse rating        | 600 V / 25 A (internal)1Ø<br>250 V / 20 A (internal)3Ø                                       |
| Input voltage      | 85-264 VAC 1Ø<br>VS1, VS3 & VS4<br>(See operating curve)<br>180-264 VAC 3Ø<br>VS6, VS8 & VS9 |
| Frequency          | 47 to 440 Hz                                                                                 |
| Inrush current     | 40 A peak max.                                                                               |
| Efficiency         | 75% - 82%                                                                                    |
| Power factor       | 0.99 typical<br>(0.9 on VS6, VS8 & VS9)                                                      |
| Turn-on time       | AC / 1 sec;<br>Inhibit / 100 ms max.                                                         |
| EMI-filter         | CISPR 22, EN55022 Level B<br>conducted/radiated                                              |
| Leakage current    | 2 mA max. at 240 VAC                                                                         |
| Holdover storage   | 20 ms min. / 40 ms typical<br>independent of VAC                                             |
| AC-OK warning time | >5 ms (power fail)                                                                           |
| Loss of phase      | On VS6, VS8 & VS9, unit will<br>continue to operate with loss<br>of phase                    |

## Output

|                            |                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------|
| Adjustment range           | ±10% minimum                                                                                    |
| Margining                  | ±4-6% nominal                                                                                   |
| Line/load reg              | 0.2% or 5 mV max.                                                                               |
| Ripple                     | RMS: 0.1% or 10 mV<br>P-P: 1.0% or 50 mV<br>Bandwidth limited to 20 MHz                         |
| Dynamic response           | 2% or 100 mV with 25% load step<br>(any output)                                                 |
| Recovery time              | To within 1% in <300 µsec                                                                       |
| Overvoltage protection     | 2-5 V 122% to 134% of output voltage;<br>12-48 V 110% to 120%; recycle AC                       |
| Overload protection        | Main: 105% to 120% of rated current<br>Auxiliaries: 105% to 140%                                |
| Short circuit protection   | Protected for continuous short circuit,<br>recovery automatic                                   |
| Reverse voltage protection | 100% of rated output current                                                                    |
| Thermal protection         | Each module thermally protected.<br>Input module: auto recovery. Output<br>modules; recycle AC. |
| Remote sense               | Up to 0.5 V - total drop                                                                        |
| Single wire parallel       | Current share to 2% of total rated<br>current                                                   |
| Switching frequency        | 200 KHz<br>(900-1500 W module, 400 KHz)                                                         |
| DC OK                      | -2% to -6% of nominal                                                                           |
| Output/Output isolation    | >1 Megohm                                                                                       |

Input Operating Curve

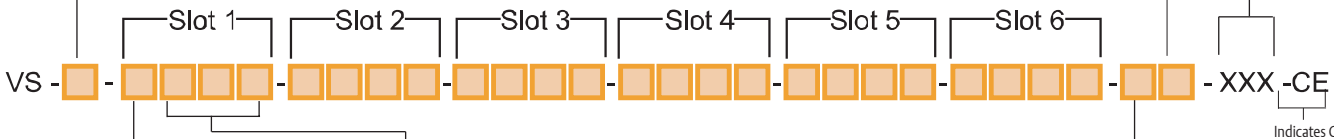


# Common Examples and Specifications

## Case size

1 = 5 inch, 2 slot, 1500 W max 1Ø  
 3 = 8 inch, 4 slot, 2000 W max 1Ø  
 4 = 11 inch, 6 slot, 2000 W max 1Ø  
 6 = 5 inch, 2 slot, 1500 W max 3Ø  
 8 = 8 inch, 4 slot, 2500 W max 3Ø  
 9 = 11 inch, 6 slot, 2500 W max 3Ø

(Same for Each Slot)



## Output Module Code

A = 300 W single 1 slot  
 B = 600 W single 1 slot  
 C = 900 W single 2 slots  
 D = 1200 W single 2 slots  
 E = 250 W dual 1 slot  
 F = 250 W triple 1 slot  
 G = 500 W dual 1 slot  
 H = 500 W triple 1 slot  
 K = 750 W single 1 slot  
 L = 1500 W single 2 slots

## Output Voltage Code

0 = 2 V  
 1 = 3.3 V  
 2 = 5 V  
 3 = 12 V  
 4 = 15 V  
 5 = 24 V  
 6 = 28 V  
 7 = 36 V  
 8 = special voltage (consult factory)  
 9 = 48 V

## Configuration Rules

- Omit digits that do not apply.
- Specify modules from lowest number of outputs to highest.
  - If number of outputs are equal, specify from highest to lowest power increments.
  - If power increments are equal, specify from highest to lowest current.
- All model configurations created using this selection guide represent standard products with standard availability and lead times.
- If slots are left empty, a blank panel will be automatically installed.

## Option Codes

0 = no options  
 1 = rear air exhaust (40°C max.)  
 3 = set unit for global enable  
 5 = options 1 & 3

USE ONLY FOR MODIFIED STANDARD, CONSULT-FACTORY

Indicates CE compliance

## Parallel Code

VS1 and VS6 available slots

VS3 and VS8 available slots

VS4 and VS9 available slots

## Parallel Codes

0 = no parallel  
 1 = 1 & 2  
 2 = 2 & 3  
 3 = 3 & 4  
 4 = 1 & 2 & 3  
 5 = 2 & 3 & 4  
 6 = 1 & 2 & 3 & 4  
 7 = 1 & 2 & 3 & 4  
 8 = 3 & 4 + 5 & 6  
 9 = 1 & 2 + 3 & 4 + 5 & 6

## Example

(more on next page):

VS1 - K2 - G33 - 00 - CE

5 inch case (2 slots available)      Slot 1: 1: 5V @ 150A      Slot 2: 2: 12V @ 21A      3: 12V @ 20A      No options      No paralleling

## Output Current

| Output Voltage Identification |                | Module Identification   |                         |                          |                           |                                       |                                       |                         |                           |
|-------------------------------|----------------|-------------------------|-------------------------|--------------------------|---------------------------|---------------------------------------|---------------------------------------|-------------------------|---------------------------|
| Output Voltage Code           | Output Voltage | A (1 slot) 300 W Single | B (1 slot) 600 W Single | C (2 slots) 900 W Single | D (2 slots) 1200 W Single | E, F (1 slot) 250 W Multi Main Output | G, H (1 slot) 500 W Multi Main Output | K (1 slot) 750 W Single | L (2 slots) 1500 W Single |
| 0                             | 2 V            | 60 A                    | 120 A                   | 180 A                    | 240 A                     | 25 A                                  | 50 A                                  | 150 A                   | 300 A                     |
| 1                             | 3.3 V          | 60 A                    | 120 A                   | 180 A                    | 240 A                     | 25 A                                  | 50 A                                  | 150 A                   | 300 A                     |
| 2                             | 5 V            | 60 A                    | 120 A                   | 180 A                    | 240 A                     | 25 A                                  | 50 A                                  | 150 A                   | 300 A                     |
| 3                             | 12 V           | 25 A                    | 50 A                    | 75 A                     | 100 A                     | 10.5 A                                | 21 A                                  | 62.5 A                  | 125 A                     |
| 4                             | 15 V           | 20 A                    | 40 A                    | 60 A                     | 80 A                      | 8.3 A                                 | 16.6 A                                | 50 A                    | 100 A                     |
| 5                             | 24 V           | 12.5 A                  | 25 A                    | 37.5 A                   | 50 A                      | 5.3 A                                 | 10.5 A                                | 31.2 A                  | 62.4 A                    |
| 6                             | 28 V           | 10.7 A                  | 21.4 A                  | 32.1 A                   | 42.8 A                    | 4.5 A                                 | 9 A                                   | 26.7 A                  | 53.4 A                    |
| 7                             | 36 V           | 8.3 A                   | 16.6 A                  | 24.9 A                   | 33.2 A                    | N/A                                   | N/A                                   | 20.8 A                  | 41.6 A                    |
| 9                             | 48 V           | 6.3 A                   | 12.5 A                  | 18.75 A                  | 25 A                      | N/A                                   | N/A                                   | 15.6 A                  | 31.2 A                    |

**Note:** Increments of current not shown can be achieved by paralleling modules (add currents of each module selected).

## Auxiliary Output Table: Output(s) 2 and/or 3 of Module

| Voltage Identification |                | Module Identification    |                            |                          |                            |
|------------------------|----------------|--------------------------|----------------------------|--------------------------|----------------------------|
| Output Voltage Code    | Output Voltage | E 250 W Dual Aux. Output | F 250 W Triple Aux. Output | G 500 W Dual Aux. Output | H 500 W Triple Aux. Output |
| 0                      | 2 V            | 10 A                     | 5 A                        | 20 A                     | 10 A                       |
| 1                      | 3.3 V          | 10 A                     | 5 A                        | 20 A                     | 10 A                       |
| 2                      | 5 V            | 10 A                     | 5 A                        | 20 A                     | 10 A                       |
| 3                      | 12 V           | 10 A                     | 5 A                        | 20 A                     | 10 A                       |
| 4                      | 15 V           | 10 A                     | 5 A                        | 20 A                     | 10 A                       |
| 5                      | 24 V           | 5 A                      | 2.5 A                      | 10 A                     | 5 A                        |
| 6                      | 28 V           | 5 A                      | 2.5 A                      | 10 A                     | 5 A                        |

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## EXAMPLES

## Examples of Model Numbers - SINGLE OUTPUTS

| Total Power | Volts / Amps  | Size (H x W x L) | Model Number   | Other Voltages Available | Voltage ID Code     |
|-------------|---------------|------------------|----------------|--------------------------|---------------------|
| 600 W       | 5 V / 120 A   | 5 x 5 x 11       | VS1-B2-00      | 2 V                      | 0                   |
| 750 W       | 12 V / 62.5 A | 5 x 5 x 11       | VS1-K3-00      | 3.3 V                    | 1                   |
| 900 W       | 5 V / 180 A   | 5 x 5 x 11       | VS1-C2-00      | 5 V                      | 2                   |
| 1200 W      | 5 V / 240 A   | 5 x 5 x 11       | VS1-D2-00      | 12 V                     | 3                   |
| 1200 W      | 2 V / 600 A   | 5 x 8 x 11       | VS3-L0-L0-20   | 15 V                     | 4                   |
| 1500 W      | 15 V / 100 A  | 5 x 5 x 11       | VS1-L4-00      | 24 V                     | 5                   |
| 2000 W      | 5 V / 400 A   | 5 x 8 x 11       | VS3-D2-C2-20*  | 28 V                     | 6                   |
| 2500 W      | 48 V / 52 A   | 5 x 8 x 11       | VS8-L9-D9-20** | 36 V                     | 7                   |
|             |               |                  |                | Special 48 V             | 8 (consult factory) |
|             |               |                  |                |                          | 9                   |

\* D2 module derated to 1100 W (2000 W max.)

\*\* D9 module derated to 1000 W (2500 W max.)

## Examples of Model Numbers - MULTIPLE OUTPUTS

| Total Power | Output 1 | Output 2  | Output 3 | Output 4  | Output 5 | Output 6 | Size       | Model Number       |
|-------------|----------|-----------|----------|-----------|----------|----------|------------|--------------------|
| 500 W       | 5 / 50   | 12 / 10   | 12 / 10  |           |          |          | 5 x 5 x 11 | VS1-H233-00        |
| 750 W       | 5 / 50   | 12 / 10   | 12 / 10  | 15 / 8.3  | 15 / 5   | 5 / 5    | 5 x 5 x 11 | VS1-H233-F442-00   |
| 800 W       | 5 / 60   | 12 / 21   | 12 / 10  | 5 / 10    |          |          | 5 x 5 x 11 | VS1-A2-H332-00     |
| 800 W       | 5 / 60   | 12 / 21   | 12 / 10  | 24 / 5    |          |          | 5 x 5 x 11 | VS1-A2-H335-00     |
| 800 W       | 5 / 60   | 15 / 16.6 | 15 / 10  | 5 / 10    |          |          | 5 x 5 x 11 | VS1-A2-H442-00     |
| 800 W       | 5 / 60   | 15 / 16.6 | 15 / 10  | 24 / 5    |          |          | 5 x 5 x 11 | VS1-A2-H445-00     |
| 990 W       | 5 / 150  | 2 / 120   |          |           |          |          | 5 x 5 x 11 | VS1-K2-B0-00       |
| 1000 W      | 5 / 50   | 12 / 10   | 12 / 10  | 15 / 16.6 | 15 / 10  | 24 / 5   | 5 x 5 x 11 | VS1-H233-H445-00   |
| 1000 W      | 5 / 50   | 12 / 10   | 12 / 10  | 15 / 16.6 | 5 / 10   | 24 / 5   | 5 x 5 x 11 | VS1-H233-H425-00   |
| 1100 W      | 5 / 120  | 12 / 21   | 12 / 20  |           |          |          | 5 x 5 x 11 | VS1-B2-G33-00      |
| 1100 W      | 5 / 120  | 12 / 21   | 12 / 10  | 5 / 10    |          |          | 5 x 5 x 11 | VS1-B2-H332-00     |
| 1100 W      | 5 / 170  | 12 / 10   | 12 / 10  |           |          |          | 5 x 5 x 11 | VS1-B2-H233-10     |
| 1100 W      | 5 / 120  | 15 / 16.6 | 15 / 10  | 5 / 10    |          |          | 5 x 5 x 11 | VS1-B2-H442-00     |
| 1100 W      | 5 / 120  | 15 / 16.6 | 15 / 10  | 24 / 5    |          |          | 5 x 5 x 11 | VS1-B2-H445-00     |
| 1400 W      | 5 / 180  | 12 / 21   | 12 / 20  |           |          |          | 5 x 8 x 11 | VS3-C2-G33-00      |
| 1400 W      | 5 / 180  | 12 / 21   | 12 / 10  | 5 / 10    |          |          | 5 x 8 x 11 | VS3-C2-H332-00     |
| 1440 W      | 5 / 240  | 2 / 120   |          |           |          |          | 5 x 8 x 11 | VS3-D2-B0-00       |
| 1600 W      | 5 / 170  | 12 / 20   | 12 / 21  | 5 / 20    |          |          | 5 x 8 x 11 | VS3-B2-G23-G32-10  |
| 1680 W      | 5 / 240  | 2 / 240   |          |           |          |          | 5 x 8 x 11 | VS3-D2-D0-00       |
| 1700 W      | 5 / 240  | 12 / 21   | 12 / 20  |           |          |          | 5 x 8 x 11 | VS3-D2-G33-00      |
| 1900 W      | 5 / 180  | 12 / 21   | 12 / 20  | 5 / 50    | 15 / 10  | 24 / 5   | 5 x 8 x 11 | VS3-C2-G33-H245-00 |
| 2000 W      | 5 / 300  | 12 / 21   | 12 / 10  | 5 / 10    |          |          | 5 x 8 x 11 | VS3-L2-H332-00     |
| 2000 W      | 5 / 240  | 12 / 21   | 12 / 20  | 5 / 60    | 15 / 10  | 24 / 5   | 5 x 8 x 11 | VS3-D2-G33-H245-00 |
| 2500 W      | 5 / 300  | 3.3 / 120 | 12 / 21  | 12 / 10   | 15 / 10  |          | 5 x 8 x 11 | VS8-L2-B1-H334-00  |

## Pin Assignments

## PFC

## J1 CONTROL CONNECTOR

| Pin No. | Function                              |
|---------|---------------------------------------|
| J1-1    | AC OK Logic 1                         |
| J1-2    | AC OK Logic 0                         |
| J1-3    | Global DC OK/Conv Run Logic 1         |
| J1-4    | Global DC OK/Conv Run Logic 0         |
| J1-5    | Global DC OK/Conv Run/AC OK Return    |
| J1-6    | Global Inhibit Logic 0*/ENA Logic '0' |
| J1-7    | Global Inhibit Logic 1*/ENA Logic '1' |
| J1-8    | Global Inhibit Return*ENA RTN         |
| J1-9    | Global Isolated Inhibit               |
| J1-10   | Global Isolated Inhibit Return        |

\* Changes to Enable with Option Code 3

## Multiple Output

## J1 CONTROL CONNECTOR

| Pin No. | Function                              |
|---------|---------------------------------------|
| J1-1    | V1 +Remote Sense                      |
| J1-2    | V1 Remote Margin / V. Program         |
| J1-3    | V1 Remote Margin Hi                   |
| J1-4    | V1 -Remote Sense / Margin Lo          |
| J1-5    | V1 DC OK / Conv Run Logic 1           |
| J1-6*   | V1 Isolated Inhibit                   |
| J1-7    | V1 DC OK / Conv Run / ISO Inh. Return |
| J1-8    | V1 Single Wire Parallel               |
| J1-9    | V2 Single Wire Parallel               |
| J1-10   | V3 Single Wire Parallel               |

\* Inhibits off all the outputs within that module.

## Single Output

## J1 CONTROL CONNECTOR

| Pin No. | Function                           |
|---------|------------------------------------|
| J1-1    | +Remote Sense                      |
| J1-2    | Remote Margin / V. Program         |
| J1-3    | Remote Margin Hi                   |
| J1-4    | -Remote Sense / Margin Lo          |
| J1-5    | DC OK / Conv Run Logic 1           |
| J1-6    | Isolated Inhibit                   |
| J1-7    | DC OK / Conv Run / ISO Inh. Return |
| J1-8    | Single Wire Parallel               |
| J1-9    | Spare Pin                          |
| J1-10   | Spare Pin                          |

## J2 CONTROL CONNECTOR

| Pin No. | Function                      |
|---------|-------------------------------|
| J2-1    | V2 +Remote Sense              |
| J2-2    | V2 Remote Margin / V. Program |
| J2-3    | V2 Remote Margin Hi           |
| J2-4    | V2 -Remote Sense / Margin Lo  |
| J2-5    | V2 DC OK / Logic 1            |
| J2-6    | V3 +Remote Sense              |
| J2-7    | V3 Remote Margin / V. Program |
| J2-8    | V3 Remote Margin Hi           |
| J2-9    | V3 -Remote Sense              |
| J2-10   | V3 DC Good / Logic 1          |

## Notes:

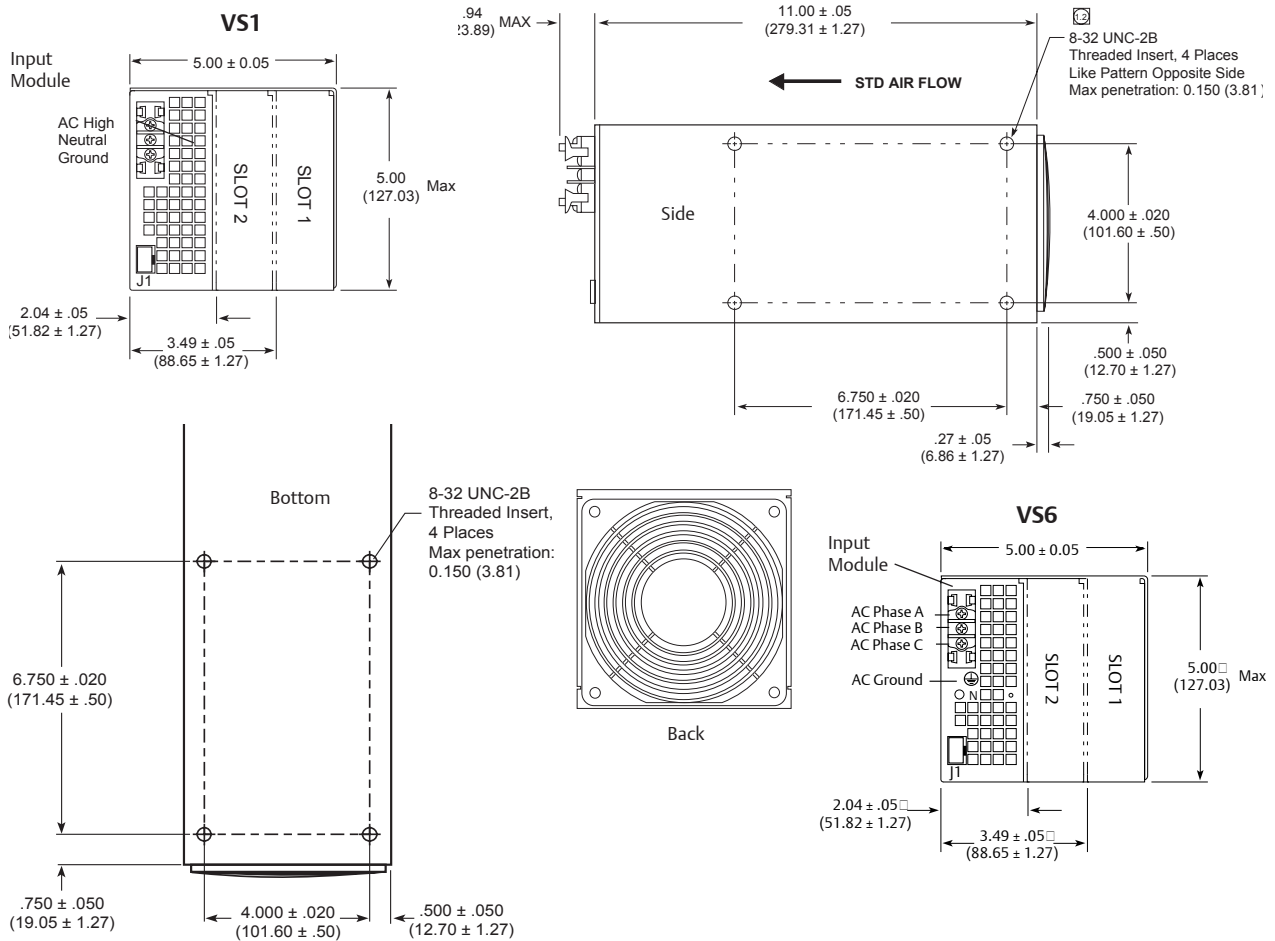
## Electrical Characteristics

- DC OK minus 2 to 6% of nominal output voltage (tracking).
- Inhibit & Enable are both TTL compatible. ISOLATED requires 2 mA source, typical.
- DC OK/Converter Run denotes output voltage is present and converters are running (Or'ed signal configuration).
- PFC LED: Red = Bulk DC bus voltage low; Green = Bulk DC OK.
- Output LED: Red = Indicated output not operating within tolerance; Green = Indicated output operating within tolerance.
- The 5 x 5 x 11 (VS1/6) case is power limited to 1500W max. See operating curve.
- The 5 x 8 x 11 case and 5 x 11 x 11 case (VS3/4) are power limited to 2000W max. The VS8/9 cases are power limited to 2500W max.
- Specifications subject to change without notice.
- Warranty: 3 yrs

# Drawings

## VS1 & VS6 • 1000-1500 WATTS

### 5-inch Case Size (5" x 5" x 11")

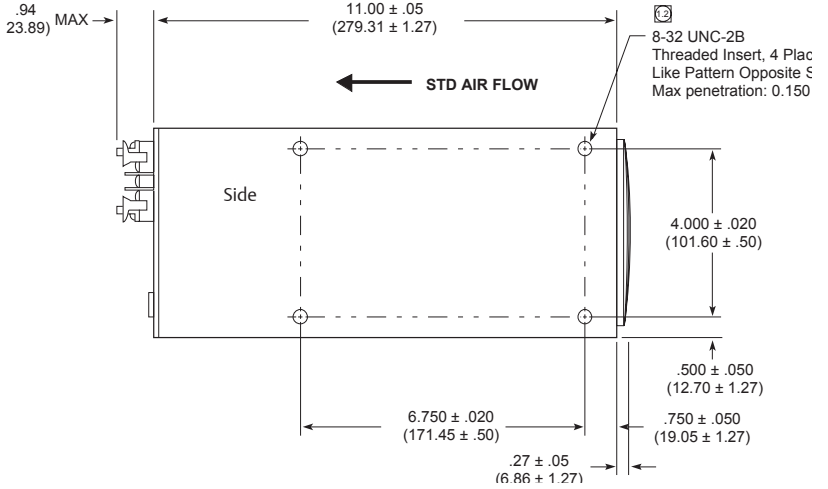
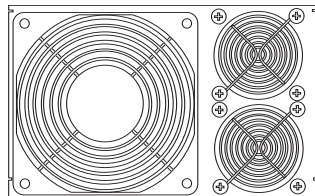
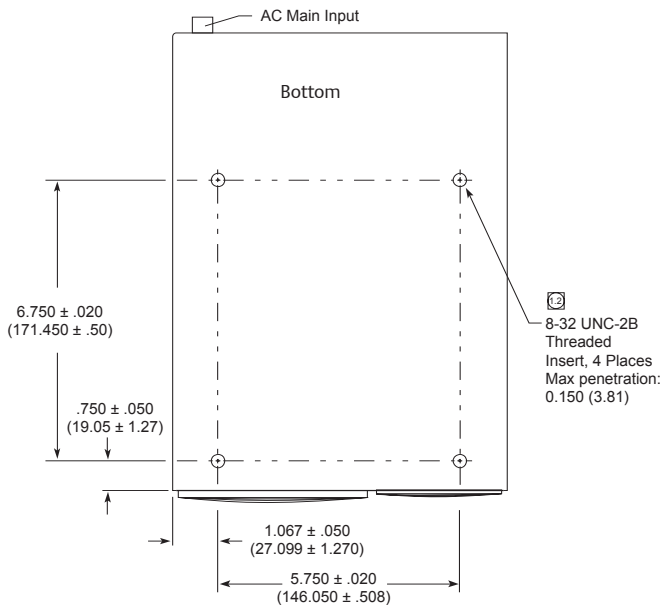
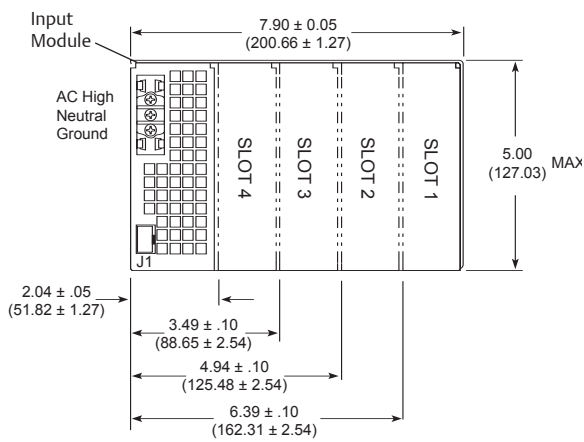


## NOTES (ALL MODELS)

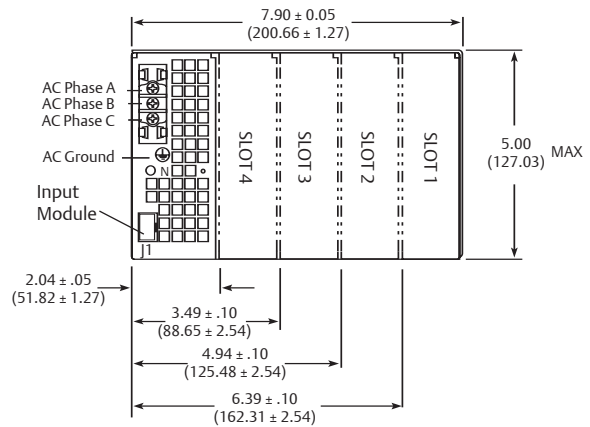
1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375" centers). For VS1, VS3 & VS4 additional GND CONN added for VS6, VS8 & VS9. Max torque: 10 in-lbs (1.1 N-m).
2. Control connectors: (J1 and J2) 10 position Molex 90130-3210 housing, gold plated contacts. Mates with Molex 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series). Connector kit includes mating connector and 10 pins, Astec part #70-841-004.
3. Output terminals (A-300 W) (B-600 W) & (K-750 W) single modules: two (2) 10-32 UNF HEX HD BOLTS. Max. torque: 25 in-lbs (2.78 N-m).
4. Output terminals (E/F-250 W) & (G/H-500 W) dual/triple modules: Primary: two (2) 10-32 UNF HEX HD BOLTS. Max. torque: 25 in-lbs (2.78 N-m). Secondary: barrier strip two (2) 6-32 UNC screws (0.375" centers) per output. Max torque: 10 in-lbs (1.1 N-m).
5. Output terminals (C-900 W) (D-1200 W) & (L-1500 W) single modules: four 5/16-18 x 5/8" hex head cap screws. Max. torque: 120 in-lbs (13.35 N-m). Captive lock washer provided.
6. Chassis material: aluminum with chemical film coating.
7. Adjustment access: voltage, power fail, and overcurrent from front panel.
8. Bar code: code 39 extended.
9. Mounting for 5-inch & 8-inch case: four (4) 8-32 clinch nuts on three (3) surfaces.  
Mounting for 11-inch case: four (4) 8-32 clinch nuts on two (2) side surfaces & six (6) 8-32 clinch nuts on bottom surface.  
Max. penetration 0.150 inch (3.81). Max. torque: 15 in-lbs (1.67 N-m).
10. Additional support is recommended when unit is mounted in a suspended configuration.  
Mounting clinch nuts are not designed to support the weight of the unit.
11. Fans: 5-inch case, (1) 4.5" dia, 112 CFM (no load), 49 dBA.  
8-inch case, (1) 4.5" dia, 112 CFM (no load), 49 dBA; (2) 2.25" dia, 23 CFM (no load), 38 dBA.  
11-inch case, (2) 4.5" dia, 112 CFM (no load), 49dBA
12. All dimensions are in inches (mm).
13. Specifications subject to change without notice.

**8-inch Case Size (5" x 8" x 11")**  
**(18 lbs. / 8.2 kg. maximum)**

DRAWINGS • VS3 &amp; VS8 • 1000-2500 WATTS

**VS3**

## VS8

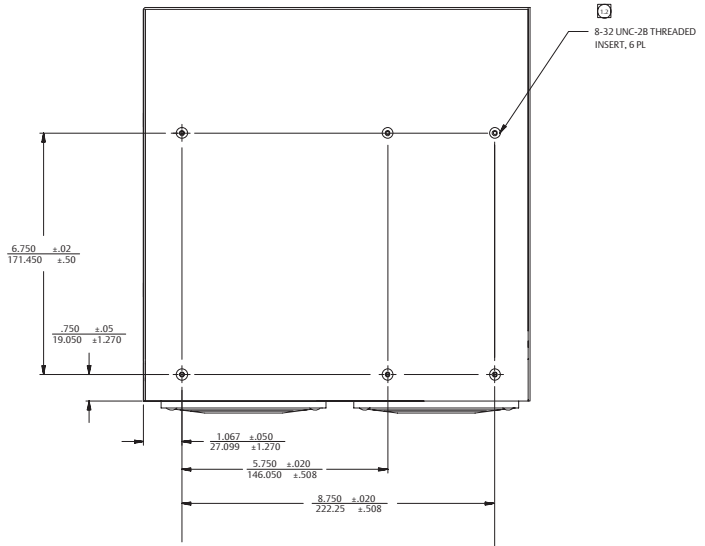
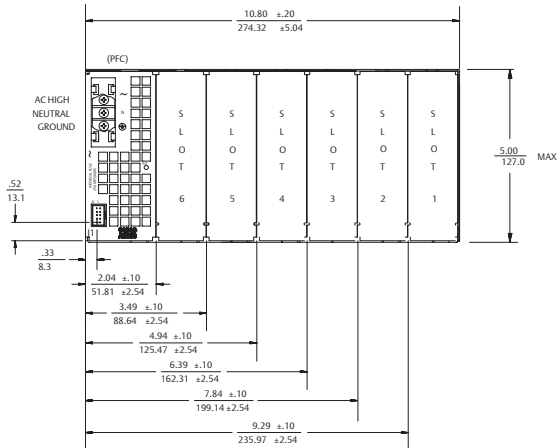


# Drawings

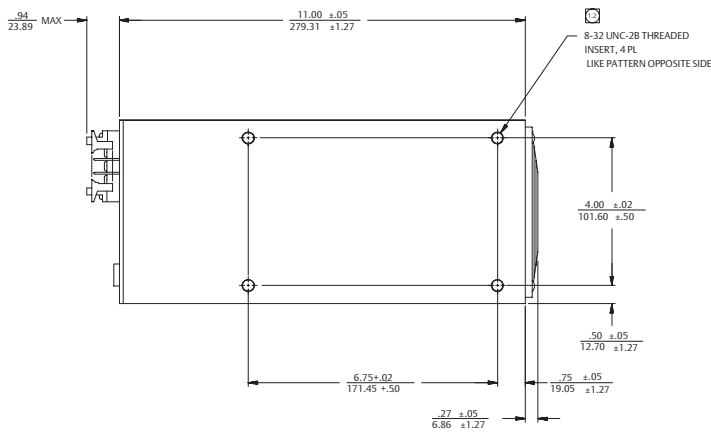
## VS4 & VS9 • 2000-2500 WATTS

### 11-inch Case Size (5" x 11" x 11")

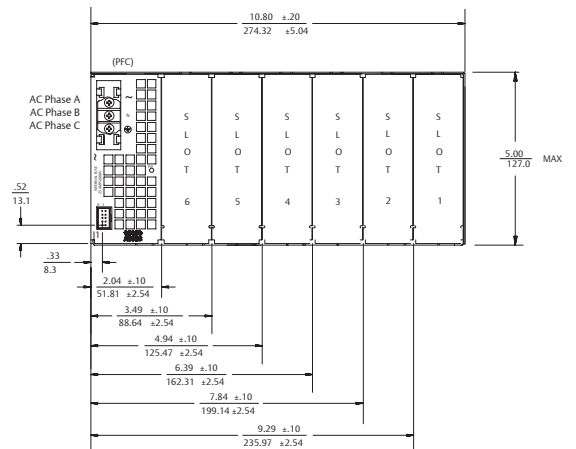
**VS4**



**VS9**



STD  
AIR FLOW  
FRONT AIR  
EXHAUST  
←  
OPTIONAL  
REAR AIR  
EXHAUST  
→



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## Module Front Panels

