

### 90 Watts

- Energy Efficiency Level VI
- European CoC Tier 2
- High Power Density
- Single Outputs from 12 V to 48 V
- <0.15 W Standby Power
- China Compulsory Certification (CCC) Qualified
- 0 °C to 60 °C Operation
- Optional Output Connector
- Low Cost



#### Dimensions:

##### VES90:

5.47 x 2.28 x 1.22" (139.0 x 58.0 x 31.0 mm)

### Models & Ratings

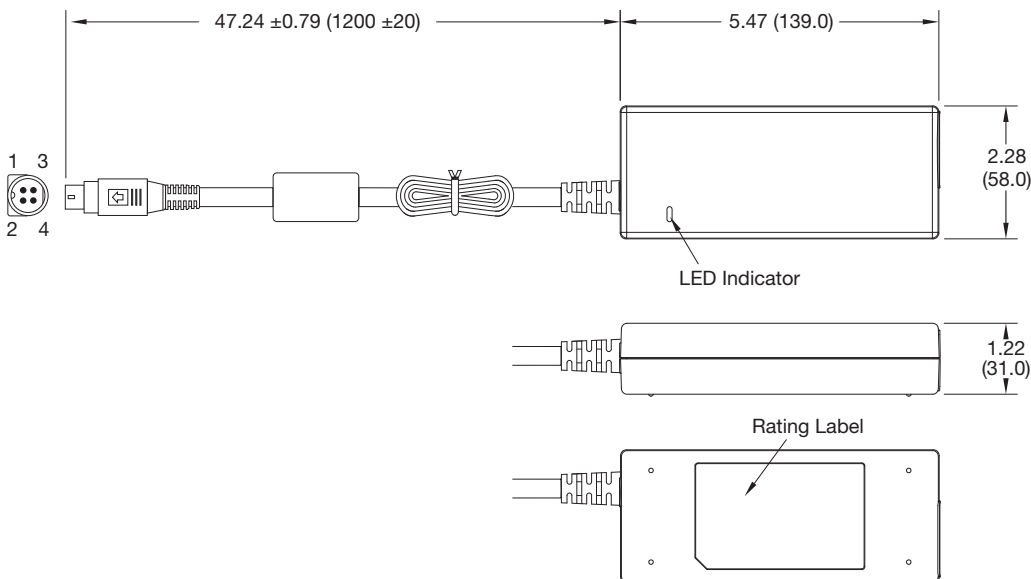
| Output Power | Output Voltage | Output Current | Total Regulation | Efficiency <sup>(1)</sup> | Model Number <sup>(2)</sup> |
|--------------|----------------|----------------|------------------|---------------------------|-----------------------------|
| 90 W         | 12.0V          | 7.50 A         | ±5%              | 89%                       | VES90PS12                   |
|              | 19.0V          | 4.74 A         |                  | 89%                       | VES90PS19                   |
|              | 24.0V          | 3.75 A         |                  | 89%                       | VES90PS24                   |
|              | 48.0V          | 1.875 A        |                  | 89%                       | VES90PS48                   |

#### Notes

1. Typical average of efficiencies measured at 25%, 50%, 75% and 100% load and 230 VAC input.

2. For optional Barrel Jack Connector, 2.5 mm inner positive, 5.5 mm outer negative, 11 mm length add suffix '-B' e.g. VES90US24-B.

### Mechanical Details



| Pin   | Function                                    |
|-------|---------------------------------------------|
| 1     | Output +                                    |
| 2     | Output +                                    |
| 3     | Return                                      |
| 4     | Return                                      |
| Shell | Connected to output return and input ground |

#### Notes

1. All dimensions shown in inches (mm). Tolerance is 0.02 (0.5) maximum, except output cable length.
2. Output connector: Power Mini DIN, mates with Kycon KPJ-4S or equivalent.

3. Weight: 0.82 lbs (370 g) approx.

### Input

| Characteristic        | Minimum                              | Typical | Maximum | Units | Notes & Conditions           |
|-----------------------|--------------------------------------|---------|---------|-------|------------------------------|
| Input Voltage         | 90                                   |         | 264     | VAC   |                              |
| Input Frequency       | 47                                   |         | 63      | Hz    |                              |
| Input Current         |                                      | 1.5/0.6 |         | A     | Measured at 115/230 VAC      |
| Inrush Current        |                                      |         | 130     | A     | 230 VAC, cold start at 25 °C |
| Power Factor          |                                      |         |         |       | EN61000-3-2 Class A          |
| Earth Leakage Current |                                      |         | 3.5     | mA    | 264 VAC, 60 Hz               |
| No Load Input Power   |                                      |         | 0.15    | W     |                              |
| Input Protection      | T3.15A/250 VAC internal fuse in line |         |         |       |                              |

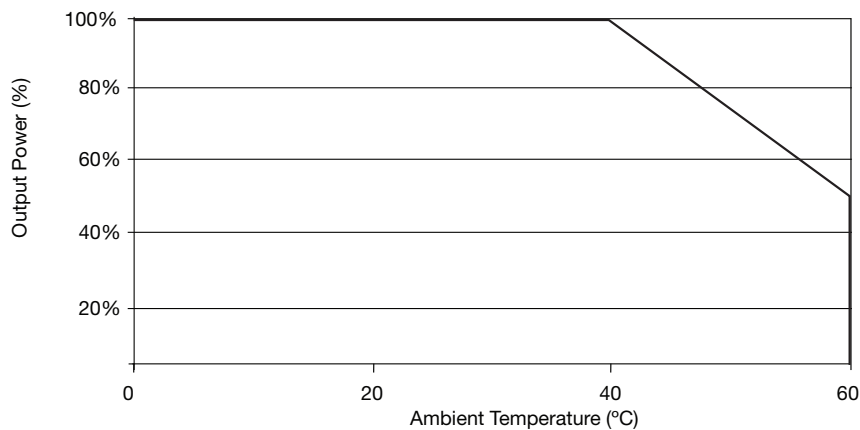
### Output

| Characteristic           | Min.                                      | Typ. | Max. | Units   | Notes & Conditions                                                                                                                                 |
|--------------------------|-------------------------------------------|------|------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage           | 12                                        |      | 48   | VDC     | See Models and Ratings table                                                                                                                       |
| Initial Set Accuracy     |                                           |      | ±2   | %       | At 50% load                                                                                                                                        |
| Minimum Load             |                                           |      |      |         | No minimum load required                                                                                                                           |
| Start Up Delay           |                                           |      | 3    | s       |                                                                                                                                                    |
| Start Up Rise Time       |                                           |      | 50   | ms      |                                                                                                                                                    |
| Hold Up Time             | 8/16                                      |      |      | ms      | Full load and 115 VAC/230 VAC                                                                                                                      |
| Line Regulation          |                                           |      | ±0.5 | %       |                                                                                                                                                    |
| Total Regulation         |                                           |      | ±5   | %       |                                                                                                                                                    |
| Transient Response       |                                           |      | 10   | %       | Maximum deviation, recovering to less than 1% within 500 µs for 50% step load                                                                      |
| Ripple and Noise         |                                           |      | 2/1  | % pk-pk | 2% for 12/19/24 V, 1% for 48 V, 20 MHz bandwidth, measured with 20 MHz Bandwidth and 10 µF electrolytic in parallel with 0.1 µF ceramic capacitor. |
| Overshoot                |                                           | 5    |      | %       | At turn on / turn off                                                                                                                              |
| Overload Protection      | 120                                       |      | 200  | %       |                                                                                                                                                    |
| Overvoltage Protection   |                                           |      | 180  | %       | Recycle mains to reset                                                                                                                             |
| Short Circuit Protection | Trip and restart (hiccup), auto resetting |      |      |         |                                                                                                                                                    |
| Temperature Coefficient  |                                           | 0.04 |      | %/°C    |                                                                                                                                                    |

### Environmental

| Characteristic        | Minimum                                                                | Typical | Maximum | Units | Notes & Conditions                                  |
|-----------------------|------------------------------------------------------------------------|---------|---------|-------|-----------------------------------------------------|
| Operating Temperature | 0                                                                      |         | +60     | °C    | Derate from 100% load at 40 °C to 50% load at 60 °C |
| Cooling               | Natural convection                                                     |         |         |       |                                                     |
| Operating Humidity    | 10                                                                     |         | 90      | %RH   | Non-condensing                                      |
| Storage Temperature   | -40                                                                    |         | +70     | °C    |                                                     |
| Operating Altitude    |                                                                        |         | 5000    | m     |                                                     |
| Shock                 | IEC68-2-27, 30 g, 30 ms half sine, 3 times in each of 6 axes           |         |         |       |                                                     |
| Vibration             | IEC68-2-6, 10-500 Hz, 0.25 g 10 mins/sweep, 60 mins for each of 3 axes |         |         |       |                                                     |

### Derating Curve

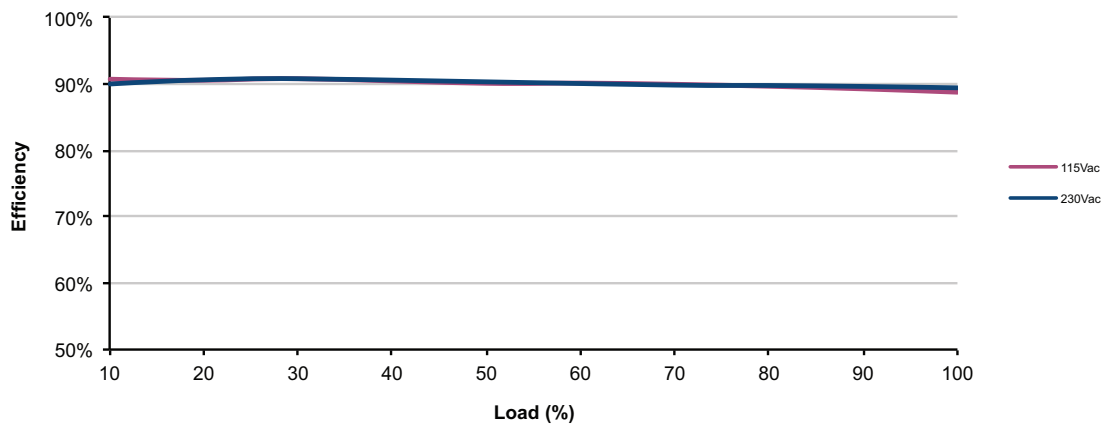


### General

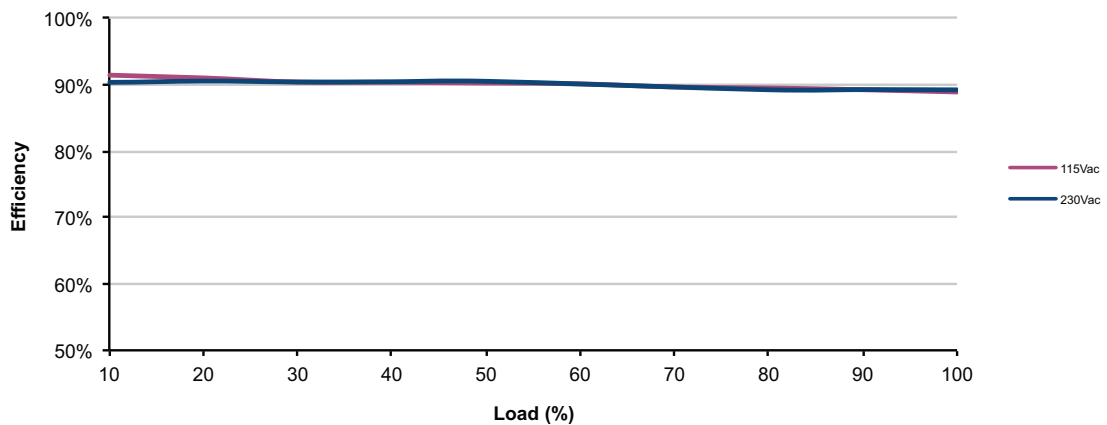
| Characteristic                                                    | Minimum | Typical    | Maximum | Units             | Notes & Conditions                         |
|-------------------------------------------------------------------|---------|------------|---------|-------------------|--------------------------------------------|
| Efficiency                                                        |         | 89         |         | %                 | See Models and Ratings table and curves.   |
| Isolation: Input to Output<br>Input to Ground<br>Output to Ground | 3000    |            |         | VAC               |                                            |
|                                                                   | 1500    |            |         | VAC               |                                            |
|                                                                   |         |            |         | VDC               | Output return is connected to input ground |
| Switching Frequency                                               |         | 55         |         | kHz               | At full load                               |
| Power Density                                                     |         | 5.9        |         | W/in <sup>3</sup> |                                            |
| Mean Time Between Failure                                         |         | >100       |         | kHrs              | MIL-HDBK-217F at 25 °C GB                  |
| Weight                                                            |         | 0.82 (370) |         | lb (g)            |                                            |

### Efficiency Curves

#### VES90PS12



#### VES90PS24



### EMC: Emissions

| Phenomenon       | Standard    | Test Level | Notes & Conditions   |
|------------------|-------------|------------|----------------------|
| Emissions        | EN55022     | Level B    | Conducted & Radiated |
| Harmonic Current | EN61000-3-2 | Class A    |                      |
| Voltage Flicker  | EN61000-3-3 |            |                      |

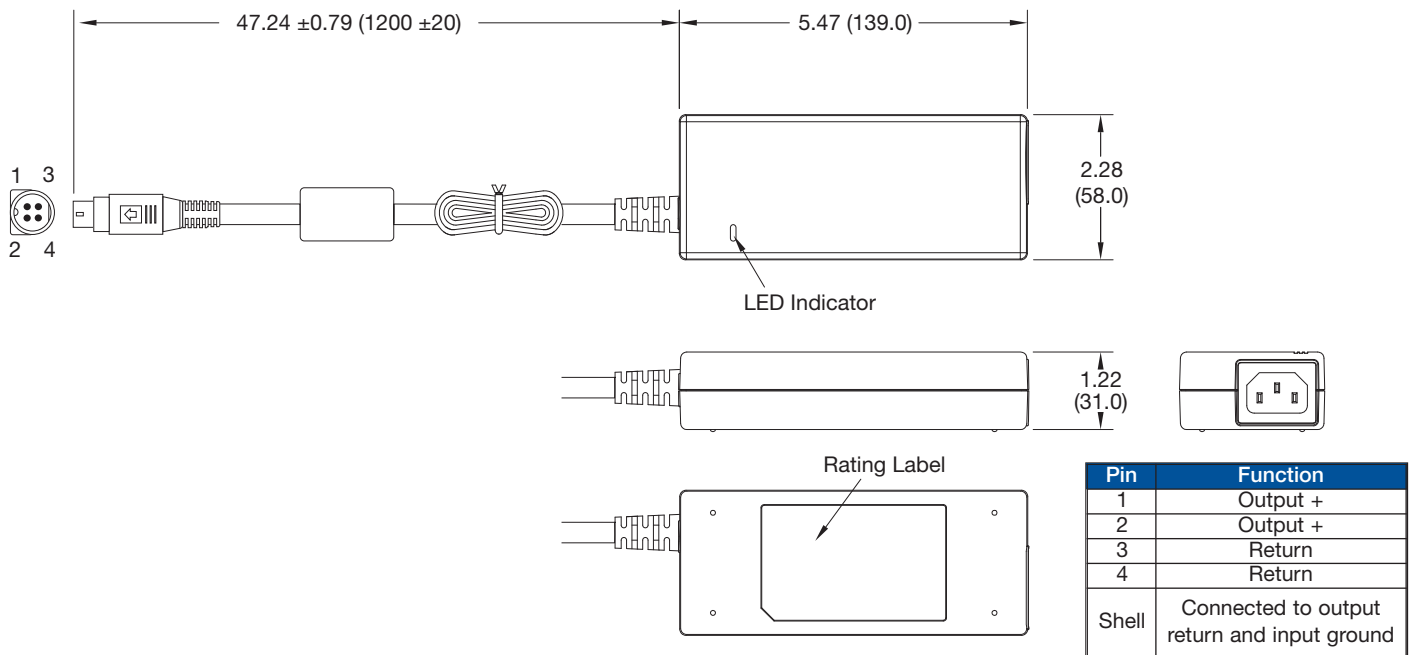
### EMC: Immunity

| Phenomenon             | Standard     | Test Level                | Criteria | Notes & Conditions |
|------------------------|--------------|---------------------------|----------|--------------------|
| ESD                    | EN61000-4-2  | ±15 kV Air, ±8 kV contact | A        |                    |
| Radiated               | EN61000-4-3  | 3 V/m                     | A        |                    |
| EFT/Burst              | EN61000-4-4  | 2                         | A        |                    |
| Surge                  | EN61000-4-5  | Installation Class 3      | A        |                    |
| Conducted              | EN61000-4-6  | 3 V                       | A        |                    |
| Magnetic Fields        | EN61000-4-8  | 3 A/m                     | A        |                    |
| Dips and Interruptions | EN61000-4-11 | Dip: 30% 500 ms           | A/B      | High Line/Low Line |
|                        |              | Dip: 60% 200 ms           | A/B      | High Line/Low Line |
|                        |              | Dip: 100% 5000 ms         | B        |                    |
|                        |              | Int: 100% 10 ms           | A        |                    |

### Safety Approvals

| Safety Agency | Safety Standard                                | Notes & Conditions                  |
|---------------|------------------------------------------------|-------------------------------------|
| UL            | UL60950-1                                      | ITE. 19, 24 & 47 V models meets LPS |
| TUV           | EN60950-1                                      |                                     |
| CB            | IEC60950-1                                     |                                     |
| CCC           | China Compulsory Certification (CCC) Qualified |                                     |

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