

## 130 Watts

- 119-125W natural convection
- Latest approvals IEC62368-1
- High efficiency up to 91%
- Operation from -30 to 70°C
- EN55032 Level B conducted & radiated
- 3 Year warranty



The AFR130 series of power dense, open frame AC-DC power modules offer 130W fan and 119-125W convection cooled in a 2.15 x 3.59" package. They have low no load (<0.3W) power consumption and excellent efficiency up to 91%. They have a wide operating temperature of -30 to 70°C and are available in output models of 12, 24 & 48V. All come with a FiDUS 3 year warranty.

Dimensions:

3.59 x 2.15 x 1.32" (91.2 x 54.6 x 33.5mm)

### Models & Ratings

INSTALLATION ADVICE PG5

| Model Number <sup>(1)</sup> | Output voltage | Output Current    |                   |                    | Efficiency <sup>(2)</sup> | Capacitive load |
|-----------------------------|----------------|-------------------|-------------------|--------------------|---------------------------|-----------------|
|                             |                | Convection 115VAC | Convection 230VAC | Fan cooled (10CFM) |                           |                 |
| AFR13012                    | 12V            | 9.166A            | 9.917A            | 10.833A            | 90%                       | 4000uF          |
| AFR13024                    | 24V            | 4.583A            | 4.958A            | 5.417A             | 90%                       | 1000uF          |
| AFR13048                    | 48V            | 2.395A            | 2.604A            | 2.708A             | 91%                       | 330uF           |

### Notes

1. U channel and covered versions available. Please see AFR130U/C datasheet.

2. At 230VAC max load

### Key specifications

| Parameter             | Minimum  | Typical | Maximum | Units | Notes & Conditions        |
|-----------------------|--|---------|---------|-------|---------------------------|
| AC Input range        | 90   |         | 264     | VAC   | See derating curve page 3 |
| Operating temperature | -30  |         | 70      | °C    | See derating curve page 3 |
| Efficiency            | See ratings table above  |         |         |       |                           |
| Dimensions            | 3.59 x 2.15 x 1.32" (91.2 x 54.6 x 33.5mm)   |         |         |       |                           |
| EMC                   | EN55032 Level B conducted and radiated EN61000-3 and EN61000-4, harmonics, flicker, surge, EFT, ESD, conducted and radiated. |         |         |       |                           |
| Safety                | IEC/EN/UL 62368-1  |         |         |       |                           |

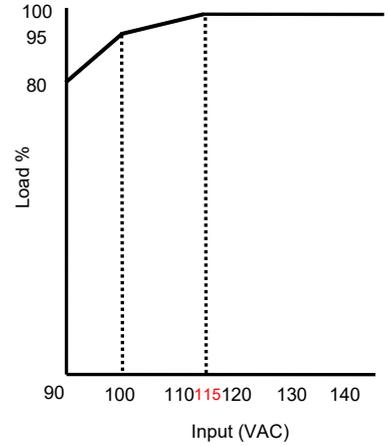
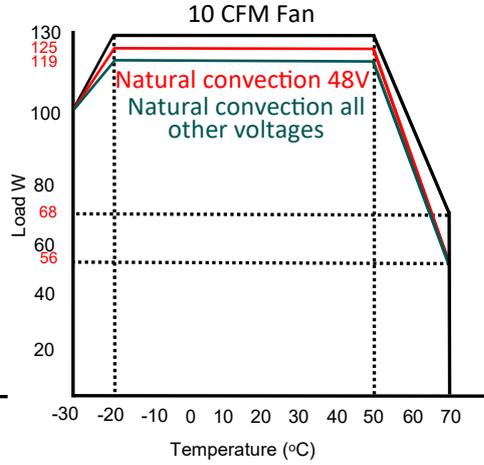
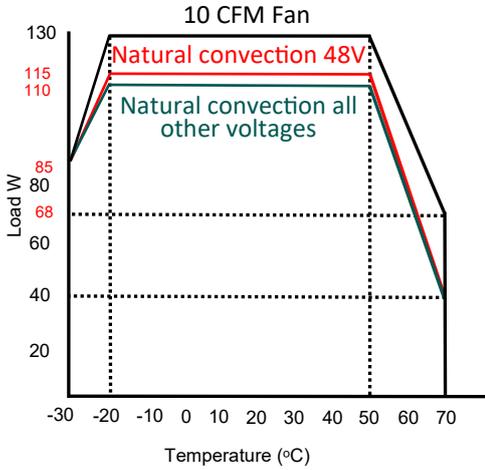
| Input               |         |         |         |       |                               |
|---------------------|---------|---------|---------|-------|-------------------------------|
| Parameter           | Minimum | Typical | Maximum | Units | Notes & Conditions            |
| Input voltage       | 90      |         | 264     | VAC   | See derating curve page 3     |
| Input frequency     | 47      |         | 63      | Hz    |                               |
| Power factor        | 0.9     |         |         |       | EN61000-3-2 class A compliant |
| Input current (rms) |         |         | 2       | A     | At 115VAC                     |
|                     |         |         | 1       |       | At 230VAC                     |
| Inrush current      |         |         | 50      | 0A    | 115VAC cold start at 25°C     |
|                     |         |         | 85      |       | 230VAC cold start at 25°C     |
| No load input power |         |         | 0.3     | W     |                               |

| Output                   |         |         |          |       |  |
|--------------------------|---------|---------|----------|-------|--|
| Parameter                | Minimum | Typical | Maximum  | Units | Notes & Conditions   |
| Output voltage           | 12      |         | 48       | VDC   | See Model & Ratings table  |
| Output Voltage Adjust    |         | ±10     |          | %     |  |
| Set point accuracy       |         |         | ±2       | %     |  |
| Line regulation          |         |         | ±1       | %     |  |
| Load regulation          |         |         | ±1       | %     | 0% to 100%   |
| Minimum load             | 0       |         |          | %     |  |
| Ripple & Noise           | 1%      |         | 160mVp-p | -     | All models measured with 0.1uF ceramic and 47uF electrolytic capacitor. 20 MHz bandwidth. 160mVp-p for 12V unit only |
| Hold up time             | 8       |         |          | ms    | At 115VAC to 90% Vout  |
| Overload protection      |         |         |          |       | Trip and restart. Automatic recovery   |
| Short circuit protection |         |         |          |       | Trip and restart. Automatic recovery. High current latch.  |
| Overvoltage protection   |         |         |          |       | Latching, requires manual power reset.   |

| General                    |         |         |         |                   |  |
|----------------------------|---------|---------|---------|-------------------|--|
| Parameter                  | Minimum | Typical | Maximum | Units             | Notes & Conditions                             |
| Isolation: Input to output | 4000    |         |         | VAC               | Or 5656VDC –test with DC only or remove Y caps |
| Input to ground            | 2000    |         |         | VAC               | Or 2828VDC –test with DC only or remove Y caps |
| Output to ground           | 1500    |         |         | VAC               | Or 2121VDC –test with DC only or remove Y caps |
| Power density              |         |         | 12.77   | W/in <sup>3</sup> |  |
| MTBF                       | 250     |         |         | kHrs              | As per MIL-HDBK-217F                           |
| Weight                     |         | 200     |         | g                 |  |

| Environmental           |   |         |         |       |  |
|-------------------------|---|---------|---------|-------|--|
| Parameter               | Minimum   | Typical | Maximum | Units | Notes & Conditions   |
| Operating temperature   | -30   |         | 70      | °C    | See derating curve page 3  |
| Storage temperature     | -30   |         | 80      | °C    |  |
| Temperature coefficient |   | ±0.05   |         | %/°C  |  |
| Altitude                |   |         | 5000    | m     | Derate 3.5W/km fanless operation above 2km<br>Derate 5W/km fan cooling above 2km |
| Humidity                | 20  |         | 90      | % RH  | Non condensing   |
| Vibration & Shock       | IEC 60068-2-27 (2G 10-500MHz x,y,z) and IEC 60068-2-6 |         |         |       |  |

Thermal Derating Curve 115-230VAC ——— Thermal Derating Curve 230-264VAC ——— AC Input Derating Curve <110VAC ———



## EMC: Emissions

|                  | Standard    | Test level | Criteria | Notes & Conditions      |
|------------------|-------------|------------|----------|-------------------------|
| Conducted        | EN55032     | B          |          | CISPR22-B, FCC PART15-B |
| Radiated         | EN55032     | B          |          | Class A for Class II.   |
| Harmonic current | EN61000-3-2 | Class A    |          |                         |
| Voltage flicker  | EN61000-3-3 |            |          |                         |

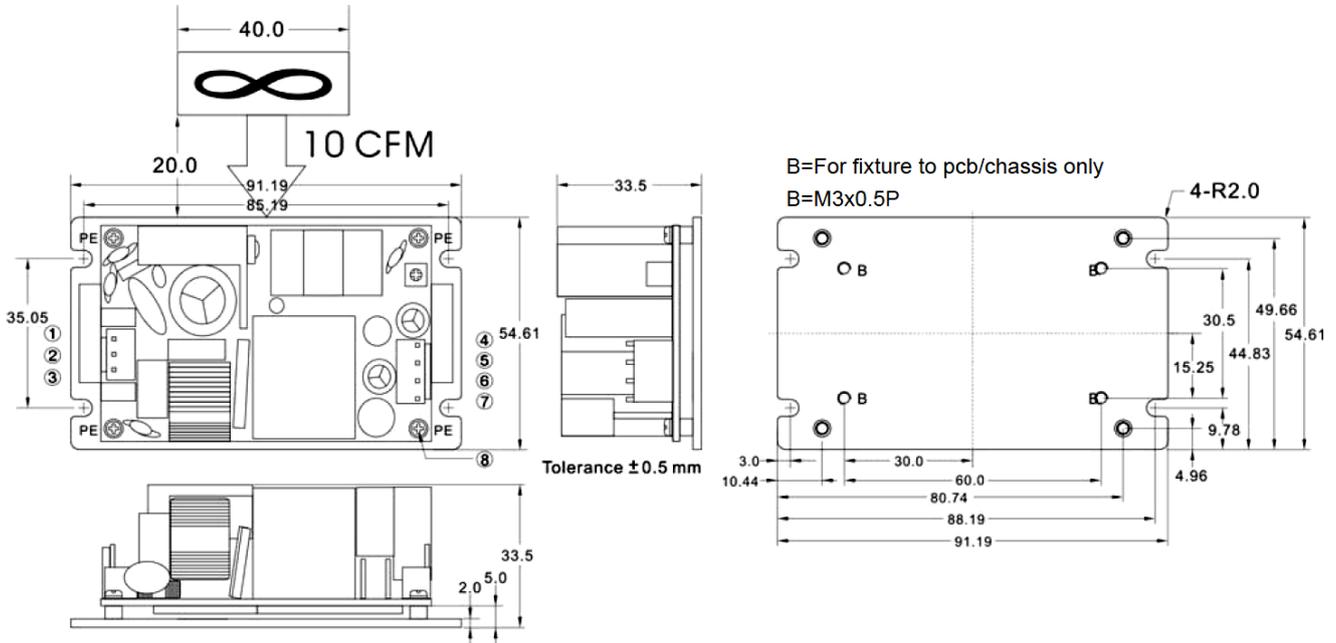
## EMC: Immunity

|                                | Standard     | Test level  | Criteria | Notes & Conditions                       |
|--------------------------------|--------------|---|----------|--|
| ESD                            | EN61000-4-2  | 3   | A        | 8kV Air, 4kV contact                     |
| Radiated                       | EN61000-4-3  | 3   | A        | 10V/m 80-1000Mhz 3V/m 1800-5000Mhz       |
| EFT                            | EN61000-4-4  | 3   | A        | 2kV                                      |
| Surges                         | EN61000-4-5  | Installation Class 3  | A        | 1kV Live-Neutral, 2kV Live/Neutral—Earth |
| Conducted                      | EN61000-4-6  | 2   | A        | 3Vrms.                                   |
| Magnetic Fields                | EN61000-4-8  | 3   | A        | 30A/m                                    |
| Voltage Dips and Interruptions | EN61000-4-11 | >95% 0.5 cycles, 30% 25 cycles, >95% 250 cycles: 110V: A,B, 240V: A,A,B |          |  |

## Safety Approvals

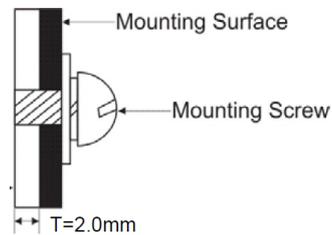
|                            | Safety standard | Notes & Conditions  |
|----------------------------|-----------------|---|
| UL/CSA                     | UL/CSA 62368-1  |   |
| CB                         | IEC 62368-1     |   |
| CE                         | EN 62368-1      | 2015/863/EU RoHS Directive and 2014/35/EU Low voltage directive |
| Equipment protection class |                 | Class I   |

## Mechanical Details



| Input Connector <sup>(2)</sup> |            |
|--------------------------------|------------|
| Pin Connections                |            |
| Pin                            | Function   |
| 1                              | AC Neutral |
| 2                              | NC         |
| 3                              | AC Line    |

| Output Connector <sup>(3)</sup> |          |
|---------------------------------|----------|
| Pin Connections                 |          |
| Pin                             | Function |
| 4                               | +Vout    |
| 5                               | +Vout    |
| 6                               | -Vout    |
| 7                               | -Vout    |

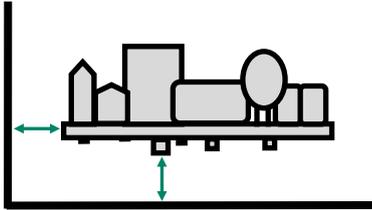


### Notes

- All dimensions shown in mm
- Input connector mates with VHR-3N
- Output connector mates with VHR-4N

## Installation Advice

### Safety



On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

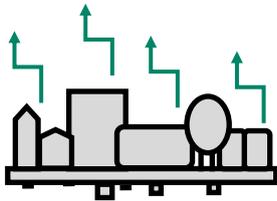
For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.

For **Class II** installations distances may need to be increased if being installed into a surrounding metal enclosure.

Ensure consideration of components on the underside of the PCB or low lying spills when measuring clearance distances between the PSU and the end-equipment. Also top surface especially in tight enclosures such as 1U boxes. An insulation material can be used between PSU and metal if smaller gap required.

FiDUS recommends installing the PSU on 6mm stand offs typically, but check the distances.

### EMC

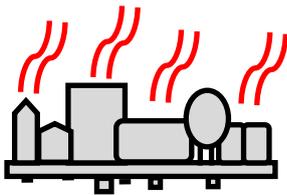


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that can be done to optimise EMC performance either as best practice, or if you are struggling for compliance:

- 1) Connect all marked EMI ground points to earth. Often these are combined with the safety earth point (in class I installations), but on some power supplies there may be additional earth tags or mounting points.
- 2) Minimise the length of input/output wiring where possible and try to maintain max distance of the conductors from the PSU, to prevent noise pick up. Avoid bundling input and output cables together. A common component to avoid placing wiring near is the PFC inductor in power factor corrected power supplies.
- 3) Apply additional filtering before the PSU input (ensure consideration of which frequencies there are issues with before selecting a filter).
- 4) When using an open frame PSU, mount the supply on a metal plate and connect EMI mounting points.
- 5) In multi circuit systems, decouple the circuits locally.
- 6) Ferrites added between the PSU and system input connector and/or the DC output cables can help in reducing radiated noise issues in systems. If seen, issues are commonly in the 30-150MHz area.

For more detailed assistance, if you still have any concerns with compliance, please get in contact with our Engineering department who are on hand to assist with any queries.

### Thermal

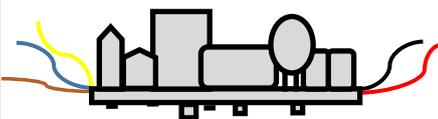


Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, as low as possible is paramount. As a general rule, for every 10°C drop in the operating temperature of the electrolytic capacitors you double their lifetime, and thus the lifetime of the power supply. When looking at thermal performance it is helpful to test under a worst-case set of conditions, to ensure component temperatures are in an acceptable range for the required service life. Then consider the impact of operational time, load and temperature profile to estimate a more realistic lifetime for your PSU.

Also, many FiDUS power supplies offer a *Peak Power* rating to provide for customers with pulsing loads. When using a peak power capability customers must consider:

- 1) Peak duration rating: the maximum length of time the peak can be drawn for
- 2) Duty cycle: the frequency with which the peak can be drawn. (e.g. 10% duty cycle, 1 second on:9 seconds off)
- 3) Average power value: datasheets will state the maximum average power acceptable with peak power PSUs. If any of these elements are exceeded the supply may overheat, with performance and lifetime suffering as a result.

### Connectivity



All FiDUS Power engineering samples requested will arrive with a free of charge loom kit for ease of testing.

The loom kit connects to the input/output terminals of the PSU and provides the customer with bare wire ends to connect with.

The loom kits can also prove advantageous for ease of installation in production. Please contact sales if you are interested in including the loom kit in your quotation.

Alternatively the input/output connector and mating part details can be found in the attached table.

|          | Part Number | Mating Part Number |
|----------|-------------|--------------------|
| Input    | JST: B3P-VH | JST: VHR-3N        |
| Output   | JST: B4P-VH | JST: VHR-4N        |
| Loom Kit | AFR130LK    |                    |