

VKP420 Series

FIDUS
power in motion...

420 Watts

- 300W Convection / 420W Fan cooled
- 600W peak for 5 seconds
- Surge 900W <1 sec
- 5V standby rail 1.5A max
- IT & medical (BF) safety approvals
- 4th ed EMC immunity IEC60601-1-2
- 10 Year warranty



Dimensions:

3.7 x 6.6 x 1.46" (95 x 167 x 34mm)

The VKP420 series of compact open frame AC-DC PSUs provide 300W (420W fan cooled) from a 3.7" x 6.6" package. The range is approved for use in both IT and medical applications and is available with either a 12, 24 or 60V output. In addition to the rated output, the VKP420 offers a 600W peak for up to 5 seconds and a surge current of up to 3x nominal current for less than a second. The unit is excellent for Energy Star applications with a no load power consumption of 0.2W. The units come complete with a FIDUS 10 year warranty.

Models & Ratings

INSTALLATION ADVICE PG5

| Model Number | Output Power | Output voltage | Output Current | | | | Fan output ⁽⁴⁾ | Efficiency ⁽⁵⁾ |
|-------------------------|--------------|----------------|----------------|---------------------------|---------------------|----------------------|---------------------------|---------------------------|
| | | | Convection | Forced Air ⁽¹⁾ | Peak ⁽²⁾ | Surge ⁽³⁾ | | |
| VKP42012 | 420W | 12V | 25.0A | 35.0A | 50.0A | 75.0A | 12V | 90% |
| VKP42024 | 420W | 24V | 12.5A | 17.5A | 25.0A | 37.5A | 12V | 91% |
| VKP42060 ⁽⁶⁾ | 420W | 60V | 5.0A | 7A | 10.0A | 15.0A | 12V | 92% |

Notes

1. Requires 10 CFM
2. 5 seconds, duty cycle <10%, average power to not exceed 420W
3. For surge currents <1sec Vo>60%. Please see surge curve page 3
4. Fan speed controlled by loading
5. Full load
6. 60V unit is ITE safety only
7. 5V standby 1A convection cooled and 1.5A fan cooled

Key specifications

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|-----------------------|---|---------|---------|-------|--|
| AC Input range | 90 | | 264 | VAC | No derating |
| Operating temperature | -20 | | 70 | °C | Derate linearly from 100% power at 50°C to 50% power at 70°C. See derating curve |
| Efficiency | 90 | | 92 | % | At full load |
| Dimensions | 3.7 x 6.6 x 1.46" (95 x 167 x 34mm) | | | | |
| EMC | EN55022/11 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics (class D), flicker, Surge, EFT, ESD, conducted and radiated. | | | | |
| Safety | IEC 60601-1:3.1 edition, ANSI/AAMI/CSA 60601-1: 3rd edition, EN60601-1: 3.1 edition. IEC 60950-1: 2nd edition, UL/CSA 60950-1: 2nd edition, EN60950-1: 2nd edition. Please see note 6 below model table | | | | |

Input

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|-----------------------|--|---------|---------|-------|--|
| Input voltage | 90 | | 264 | VAC | No derating |
| Input frequency | 47 | | 63 | Hz | |
| Power factor | | | | | EN61000-3-2 class D compliant |
| Input current | 2.5 | | 5 | A | 2.5A at 230VAC 5A at 115VAC |
| Inrush current | | <35/70 | | A | 115/230 VAC cold start at 25°C |
| Earth leakage current | | | 300 | uA | |
| Touch current | | | 100 | uA | |
| Remote on / off | TTL compatible (active low). When disconnected from secondary common output is off. Remote off status<0.5W | | | | |
| No load power | | | 0.2 / 5 | W | 5W when remote is on. <0.2W when remote off used |

Output

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|-------------------------------------|---------|---------|---------|-------|--|
| Output voltage | 12 | | 60 | VDC | See Model & Ratings table |
| Set point accuracy | | | ±1 | V | |
| Line regulation | | | ±1 | % | ±10% change of nominal line input |
| Load regulation | | | ±1 | % | ±40% load change from 60% load |
| Minimum load | 0 | | | % | |
| Ripple & Noise | | 1 | | % | 15MHz band. 0.47uF + 47uF capacitor on output |
| Hold up time | >16 | | | mS | At rated load and 115VAC |
| Overload / Short circuit protection | 110 | | 130 | % | Trip & restart. Automatic recovery |
| Overvoltage protection | 60 | | 78 | V | 60V unit. Latch off. AC reset required |
| | 26.2 | | 31 | | 24V unit. Latch off. AC reset required |
| | 13.1 | | 15.1 | | 12V unit. Latch off. AC reset required |
| | 7 | | 9.5 | | 5V stand by. Latch off. AC reset required |
| DC OK output | | | | | 10-50ms delay for OK (5V) and 10ms warning for not OK. |
| Remote sense | | 0.5 | | V | Voltage drop compensation on DC output |
| Capacitive load | | | 20000 | uF | |
| Fan output | | 12 | | V | |
| 5V standby | 1 | | 1.5 | A | 1A convection cooled, 1.5A fan cooled |

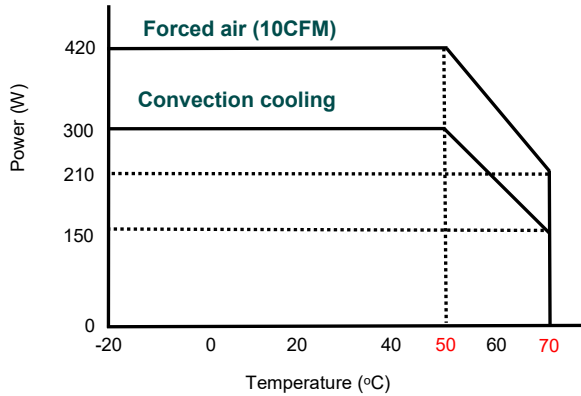
General

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|----------------------------|---------|---------|---------|-------------------|--------------------------------|
| Efficiency | 90 | | 92 | % | See models & Ratings table |
| Isolation: Input to Output | 4000 | | | VAC | |
| Input to Ground | 1500 | | | VAC | |
| Output to Ground | 1500 | | | VAC | |
| Power density | | | 11.8 | W/ln ³ | |
| Weight | | 650 | | g | |
| MTBF | | 200 | | KHrs | MIL-HDBK-217F, rated load 50°C |

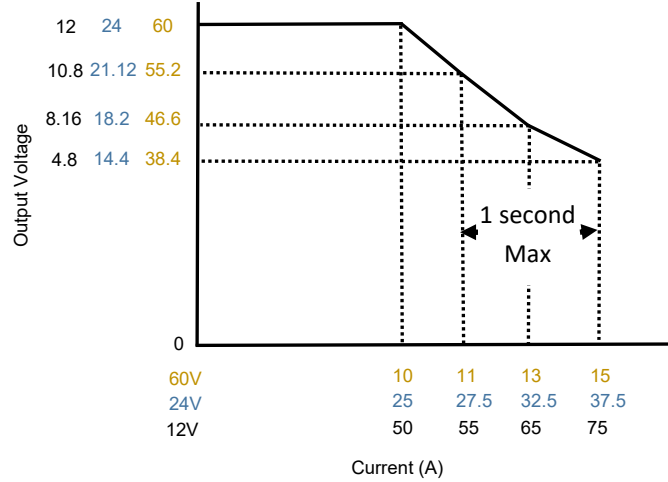
Environmental

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|-----------------------|---------|---------|---------|-------|--|
| Operating temperature | -20 | | 70 | °C | Derate linearly from 100% power at 50°C to 50% power at 70°C. See derating curve |
| Storage temperature | -40 | | 85 | °C | |
| Cooling | | | | | Fan cooled (requires 10CFM, starts at >50%±10% load) or convection cooled |
| Humidity | 5 | | 95 | %RH | Non-condensing |
| Operating altitude | | | 5000 | M | |

Derating curve



Surge curve



EMC: Emissions

| | Standard | Test level | Criteria | Notes & Conditions |
|------------------|-------------|------------|----------|----------------------------------|
| Conducted | EN55022/11 | B | | |
| Radiated | EN55022/11 | B | | |
| Harmonic current | EN61000-3-2 | Class A | | Also meets Class D requirements. |
| Voltage flicker | EN61000-3-3 | | | |

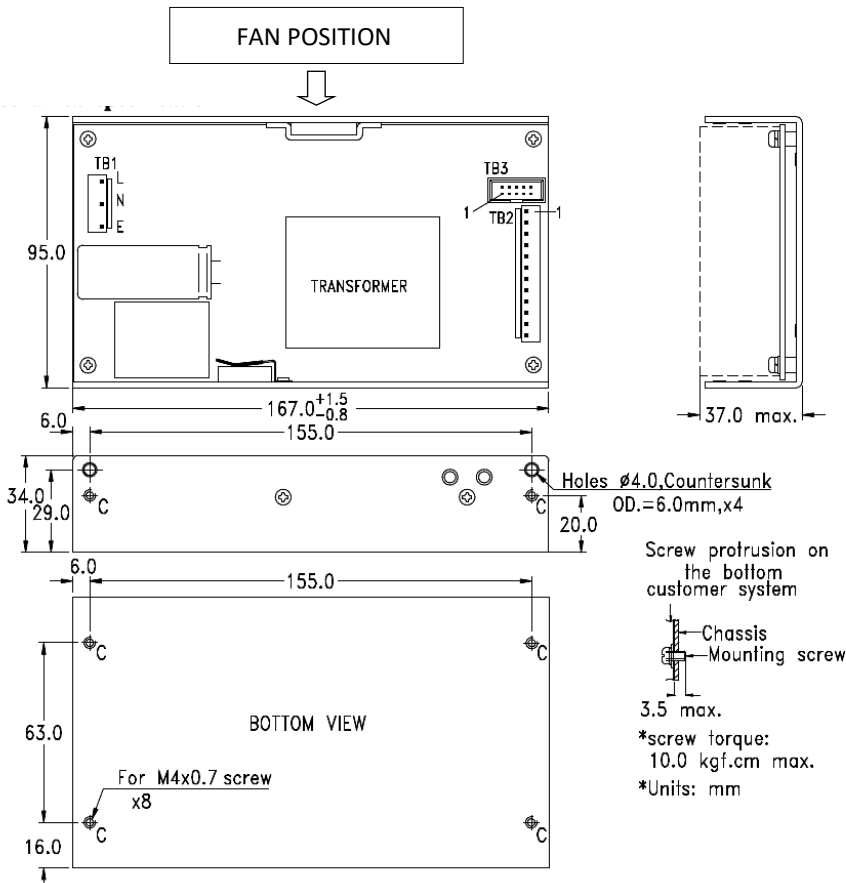
EMC: Immunity

| | Standard | Test level | Criteria | Notes & Conditions |
|------------------------|--------------|--|----------|---------------------------------|
| ESD | EN61000-4-2 | 4 | A | ±8kV contact, ±15kV air |
| Radiated | EN61000-4-3 | 3 | A | 10V/m 80% AM |
| EFT | EN61000-4-4 | 3 | A | 4KV |
| Surges | EN61000-4-5 | Installation Class 3 | A | 1KV Line-Line, 2KV Earth - Line |
| Conducted | EN61000-4-6 | 3 | A | 10V 80% AM |
| PFMF | EN61000-4-8 | | A | 30A/m |
| Dips and interruptions | EN61000-4-11 | Dips: 30% 500ms, 60% 200ms, 100% 10ms, 00% 20ms, 100% 5000ms, . Per criteria A B A B B | | |

Safety Approvals

| | Safety standard | Notes & Conditions |
|-----------------------------|--|--|
| UL | UL/CSA/ 60950-1: 2nd edition ANSI/AAMI/CSA/ 60601-1: 3.1 edition | 60V product is ITE only |
| CB | IEC 60950-1: 2nd edition IEC 60601-1: 3.1 edition | 60V product is ITE only |
| TUV | EN60950-1: 2nd edition EN60601-1: 3.1 edition | 60V product is ITE only |
| CE | | 2011/65/EU RoHS Directive and 2014/35/EU Low voltage directive |
| Means of patient protection | Input to Output: 2 x MOPP Input to Ground: 1 x MOPP Output to Ground: 1 x MOPP | 60V product is ITE only |
| Equipment protection class | | Class I |

Mechanical Details



| Pin Connections—Signals (TB2) ⁽⁴⁾ | |
|--|----------|
| Pin | Function |
| 1-6 | +Vout |
| 7-12 | -Vout |

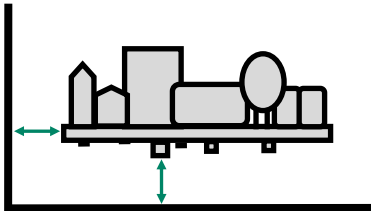
| Pin Connections—Signals (TB3) ⁽⁶⁾ | |
|--|----------------|
| Pin | Function |
| 1 | +5V |
| 2 | +5V |
| 3 | +Fan |
| 4 | -Fan |
| 5 | P.G. |
| 6 | P.G. GND |
| 7 | CTL GND |
| 8 | CTL |
| 9 | Remote Sense - |
| 10 | Remote Sense + |

Notes

- All dimensions in mm
- TB3: Signals 10 way IDC, mates with AWHC 10-0111-T 10 way IDC connector
- TB1: JST B5P-VH mates with JST VHR-5N
- TB2: JST B12P-VH, mates with Molex 09-50-7121
- Fan is to be positioned 6cm above the centre of PSU

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.

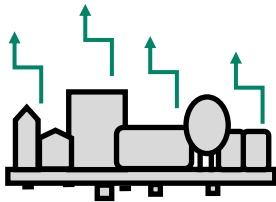
For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.

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

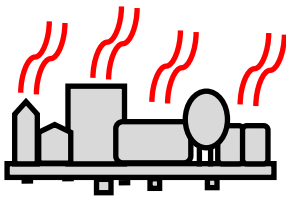


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that 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

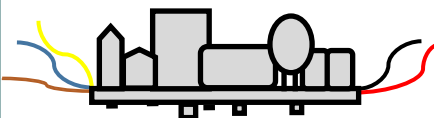


Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, 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 B5P-VH | JST VAR5N |
| Output | JSTB12P-VH | Molex 09-50-8121 |
| Loom Kit | VKP420 LK | |