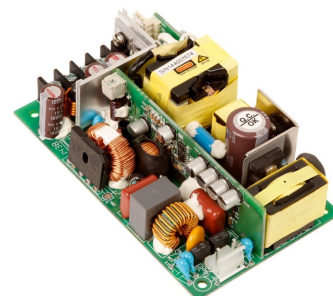


240 Watts

- High power density 3 x 5"
- 160W Convection / 240W Fan cooled
- 320W Peak power for 5 seconds
- IT & Medical (BF) safety approvals
- Open frame, U-Channel & Covered versions
- EN55022 Level B conducted & radiated
- 10 Year warranty



The VKR240 series of compact open frame AC-DC PSUs provide 240W (160W convection) from a 3" x 5" package. The range has options for use in both IT and medical applications and is available with outputs from 12 to 48V. In addition to the rated output, the VKR240 offers a 320W peak for up to 5 seconds. Optional U-channel and covered versions are available, all with a FiDUS 10 year warranty.

Dimensions:

Open Frame: 3 x 5 x 1.42" (76.2 x 127.0 x 36.1mm)
Covered (-C): 3.3 x 5 x 1.7" (83.8 x 127.0 x 43mm)
U-Channel (-U): 3.3 x 5 x 1.7" (83.8 x 127.0 x 43mm)

Models & Ratings

INSTALLATION ADVICE PG5

Model Number ⁽¹⁾	Output Power	Output voltage	Output Current			Fan Output	Efficiency ⁽⁷⁾
			Forced-Air ⁽⁵⁾	Convection	Peak ⁽⁶⁾		
VKR24012	240W	12V	20A	13.3A	26.6A	12V/0.3A	91%
VKR24015	240W	15V	16A	10.66A	21.3A	12V/0.3A	91%
VKR24018	240W	18V	13.33A	8.88A	17.8A	12V/0.3A	91%
VKR24024	240W	24V	10A	6.66A	13.3A	12V/0.3A	91%
VKR24028	240W	28V	8.55A	5.7A	11.4A	12V/0.3A	92%
VKR24036	240W	36V	6.66A	4.45A	8.9A	12V/0.3A	92%
VKR24048	240W	48V	5A	3.35A	6.67A	12V/0.3A	92%
VKR24012-M ⁽²⁾	240W	12V	20A	13.3A	26.6A	12V/0.3A	91%
VKR24015-M ⁽²⁾	240W	15V	16A	10.66A	21.3A	12V/0.3A	91%
VKR24018-M ⁽²⁾	240W	18V	13.33A	8.88A	17.8A	12V/0.3A	91%
VKR24024-M ⁽²⁾	240W	24V	10A	6.66A	13.3A	12V/0.3A	91%
VKR24028-M ⁽²⁾	240W	28V	8.55A	5.7A	11.4A	12V/0.3A	92%
VKR24036-M ⁽²⁾	240W	36V	6.66A	4.45A	8.9A	12V/0.3A	92%
VKR24048-M ⁽²⁾	240W	48V	5A	3.35A	6.67A	12V/0.3A	92%

Notes

1. Add suffix '-A' to model number for non-green mode version w/o standby.
2. Suffix '-M' added for Medical version
3. Add suffix '-C' for covered version
4. Add suffix '-U' for U-Channel version
5. Requires 18 CFM
6. 5 seconds, duty cycle <10%, average power not to exceed 160W
7. At 100% load, convection rating.
8. Loom kit available, see 'Installation Advice', page 5

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
Efficiency	91		92	%	
Dimensions	Open Frame: 3 x 5 x 1.42" (76.2 x 127.0 x 36.1mm), Covered(-C)/U-Channel(-U): 3.3 x 5 x 1.7" (83.8 x 127 x 43mm)				
EMC	EN55022 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated,				
Safety	Standard models: IEC/UL/CSA/EN 60950-1: 2nd edition, CE. '-M' models: IEC/ES/CSA/EN 60601-1: 3rd edition, CE				

VKR240 Series

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Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	No derating
Input frequency	47		63	Hz	
Power factor		0.99			EN61000-3-2 class A compliant
Input current		2/4			2A at 230VAC, 4A at 115VAC
Inrush current		<30/60		A	115/230 VAC cold start at 25°C
No load input power			0.5	W	-A version performance differs
Earth leakage current			300	uA	
Touch current			100	uA	

Output

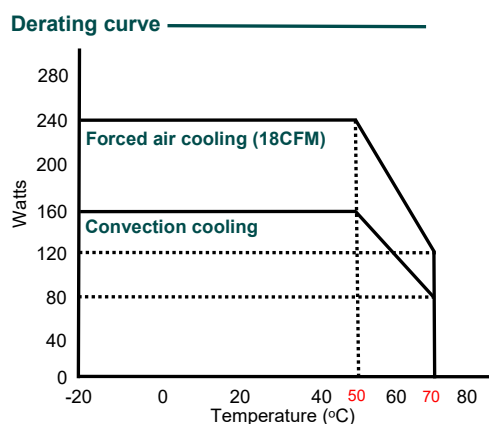
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		48	VDC	See Model & Ratings table
Set point accuracy			<±1	%	
Line regulation		±0.5		%	
Load regulation		±1		%	
Minimum load	0			%	
Transient response			4	%	Recovery within 1% within 500 µs for 25% step
Ripple & Noise			1%	pk-pk	Measured with 20MHz bandwidth and 0.47uf Cap
Hold up time		20		mS	At rated load and 115VAC
Overload / Short circuit protection					Trip & restart. Automatic recovery
Overvoltage protection					Latch off. AC reset required

General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	91		92	%	See models & Ratings table
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	
Signals & controls	Remote sense				Compensates for 0.5V lead drop max
Power density			11.3	W/In ³	
MTBF	180			Khrs	MIL-HDBK-217F, rated load, 50°C
Weight	353	505	562	g	Open frame, U channel and coverd

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
Storage temperature	-40		85	°C	
Cooling					Fan cooled (18CFM) or convection cooled
Temperature coefficient			±0.05	%/°C	
Humidity	5		95	%RH	Non-condensing
Operating Altitude			5000	M	



EMC: Emissions

	Standard	Test level	Criteria	Notes & Conditions
Conducted	EN55022	B		
Radiated	EN55022	B		
Harmonic current	EN61000-3-2	Class A		Also Class D compliant
Voltage flicker	EN61000-3-3			

EMC: Immunity

	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	3	A	±6kV contact, ±8kV air
Radiated	EN61000-4-3	3	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation Class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and interruptions	EN61000-4-11	Dips: 30% 10ms, 60% 100ms, 95% 5000ms. Perf criteria A,C,C		

Safety Approvals

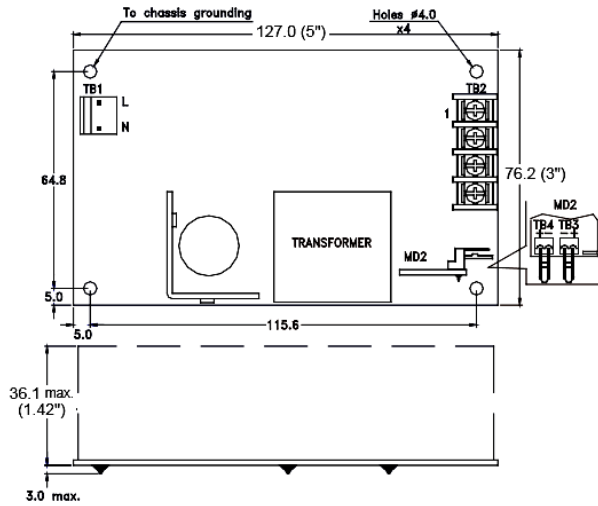
	Safety standard	Notes & Conditions
UL	UL/CSA-22.2 No. 60950-1: 2nd edition ANSI/AAMI/CSA 60601-1: 3.1 edition	Medical safety only for (-M) models, IT only for standard models
CB	IEC60950-1: 2nd edition IEC60601-1: 3.1 edition	Medical safety only for (-M) models, IT only for standard models
TUV	EN60950-1: 2nd edition EN60601-1: 3.1 edition	Medical safety only for (-M) models, IT only for standard models
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	
Equipment protection class		Class I

VKR240 Series

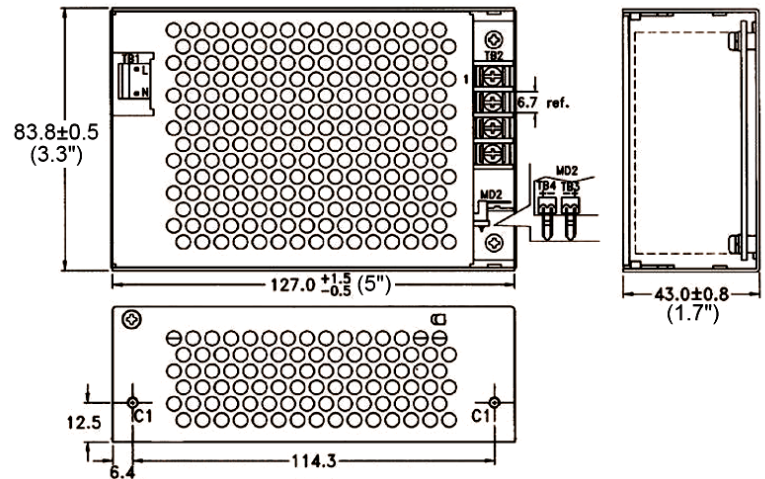
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Mechanical Details

Open Frame



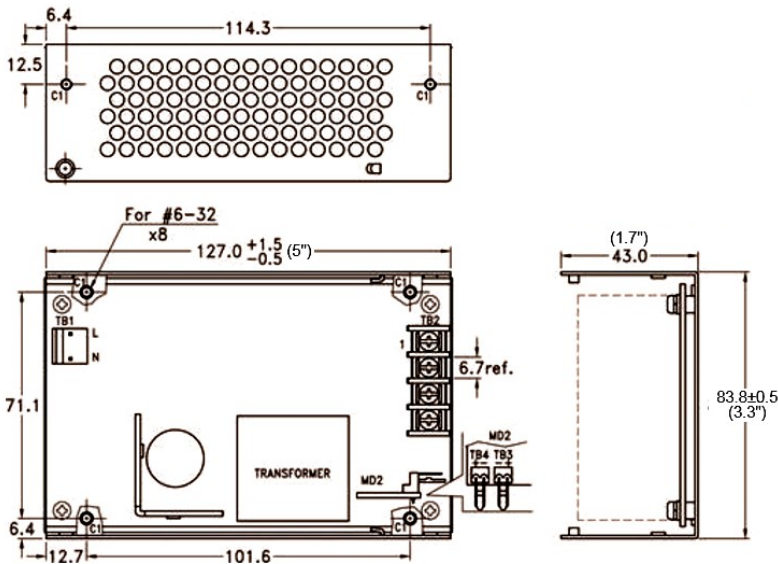
Covered (-C)



Pin Connections—Input (TB1)⁽⁴⁾

Pin	Function
L	Live
N	Neutral

U-Channel (-U)



Pin Connections (TB2)

Pin	12V Output	All Other Outputs
1	+Vout	+Vout
2	+Vout	+Vout
3	GND	+Vout
4	GND	+Vout
5		GND
6		GND
7		GND
8		GND

TB3/4: Pin Connections

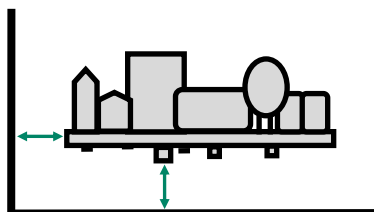
Pin	TB3 Fan Output	TB4 Remote Sense
-	GND	Sense -
+	+12V	Sense +

Notes

- All dimensions in mm (inches)
- Mounting holes: Open frame: 64.8 x 115.6mm
-U/-C: 12.5 x 114.3mm (Side edge), 71.1 x 101.6mm (Bottom)
- Recommended: if available, connect PSU to metal sheet beneath the PSU via the EMI ground.
- TB1: AC input header: Molex 09-65-2029 mates with Molex 09-50-1023
- TB2: 12V: Terminal blocks. All others: Molex 09-65-2088 mates with Molex 09-50-1081
- TB3/4: Molex 5045-02A or equivalent mates with: Molex 22-01-1022

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.

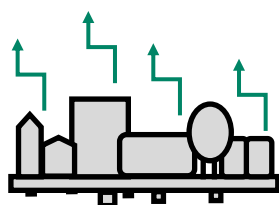
For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.

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

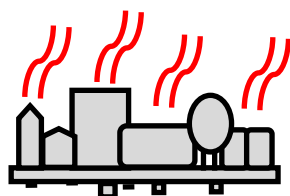


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that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

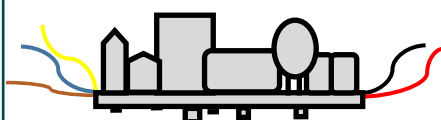


Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, 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	Molex 09-65-2029	Molex 09-50-1023
Output	12V: Screw terminal blocks Others: Molex 09-65-2088	Molex 09-50-1081
Loom Kit	12V: VKR240 12V LK Others: VKR240 LK	