

500 Watts

- 240W Convection cooled / 508.6W Fan cooled
- Latest Medical safety approvals IEC 60601-1 (3.1) & BF rated
- 4th ed. Medical EMC IEC 60601-1-2 (2014)
- 5V Standby and Remote on/off option
- EN55011 Level B conducted & radiated
- -40 to +70°C Operation
- 3 Year warranty



Dimensions:

3 x 5 x 1.38" (76.2 x 127 x 35mm)

The RHM500 series of power dense, open frame AC-DC power modules offer 240W convection cooled and 508.6W fan cooled in a 3 x 5" package. The units are designed for use in medical applications, are very efficient and have low emissions, meeting EN55011 Level B. They have a wide temperature range from -40 to +70°C and offer low no load power consumption of <1W. Outputs are available from 12 to 48V and all models come with a Fidus 3 year warranty.

Models & Ratings

INSTALLATION ADVICE PG5

Model Number ⁽¹⁾	Output voltage	Output Current		Efficiency ⁽³⁾
		Convection	25CFM Fan	
RHM50012	12V	19.69A	41.67A	90%
RHM50015	15V	15.75A	33.33A	90%
RHM50019	19V	12.44A	26.31A	90%
RHM50024	24V	9.85A	20.83A	91%
RHM50030	30V	7.88A	16.66A	91%
RHM50036	36V	6.56A	13.88A	92%
RHM50048	48V	4.92A	10.41A	92%

Notes

1. Looms kits available, see 'Installation Advice' pg5
2. Add suffix '-P' for optional remote on/off 5V standby output
3. Efficiency at full load and nominal line voltage

Key specifications

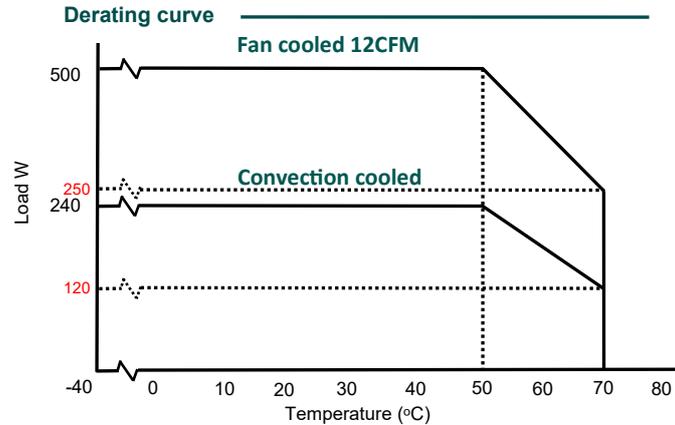
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	90		264	VAC	
Operating temperature	-40		70	°C	Derate linearly from 100% load at 50°C to 50% load at 70°C. See derating curve on page 3
Efficiency	90		92	%	
Dimensions	3 x 5 x 1.38" (76.2 x 127 x 35mm)				
EMC	EN55011 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated. IEC60601-1-2 (4th Edition)				
Safety	IEC60601-1 2006/A1:2013, ES60601-1:2005 (R2012), CSA-C22.2 No. 60601-1:14, EN60601-1:2006/A1:2013				

Input					
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	
Input frequency	47		63	Hz	
Power factor	0.95				EN61000-3-2 class A compliant
Input current (rms)			5.6	A	Low line. At 115VAC
			2.4		High line. At 240VAC
Inrush current			60	A	115VAC cold start at 25°C
			120		230VAC cold start at 25°C
No load input power			1	W	
Earth leakage current			100	uA	240VAC 60Hz

Output					
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		48	VDC	See Model & Ratings table
Total regulation	±3% 12-36V models. ±2% 48V model			%	±10% AC line change at nominal load and ±40% load change at 60% load nominal line.
Line regulation			1	%	Full load. 10% nominal line voltage change
Minimum load	0			%	
Ripple & Noise	12V model 120mVp-p. 15V model 150mVp-p. 19V model 190mVp-p. 24V model 240mVp-p. 30V model 300mVp-p. 36V model 360mVp-p. 48V model 480mVp-p			mV(Vp-p)	All models measured with 0.1 and 0.47uF capacitor and 20 MHz bandwidth.
Hold up time	12		16	ms	16ms at convection load, 12ms at max load
Overload protection	110		150	%	Trip and restart. Automatic recovery
Short circuit protection					Trip and restart. Automatic recovery
Overvoltage protection	112		132	%	Trip and restart. Automatic recovery

General					
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	90		92	%	
Isolation: Input to Output	4000			VAC	2 x MOPP (BF rated)
	Input to Ground	2000		VAC	
Isolation resistance		50		MΩ	
Power density		24.6		W/ln ³	
MTBF	200			kHrs	As per MIL-HDBK-217F, 25°C GB
Weight		450		g	

Environmental					
Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-40		70	°C	Derate linearly from 100% load at 50°C to 50% load at 70°C. See derating curve on page 3
Storage temperature	-40		85	°C	
Cooling					Convection cooled and fan cooled with 25 CFM
Temperature coefficient			±0.04	%/°C	
Humidity	0		95	% RH	Non condensing
Operating altitude			3000	m	
Vibration			5	g	10-500hz, 10min/cycle in each axis x, y and z



EMC: Emissions

	Standard	Test level	Criteria	Notes & Conditions
Conducted	EN55011	B		
Radiated	EN55011	B		
Harmonic current	EN61000-3-2	Class A		
Voltage flicker	EN61000-3-3			

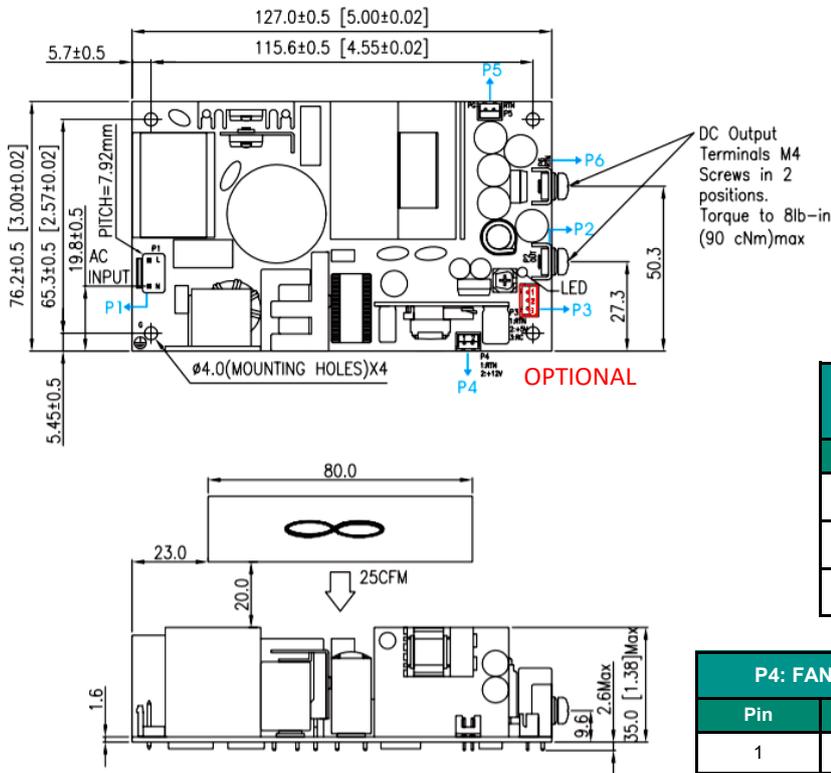
EMC: Immunity

	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	4	A	±8kV contact,
Radiated	EN61000-4-3	3	A	10V/m 80% AM (1kHz) 80-2700MHz (6V for ISM & amateur radio frequencies)
EFT	EN61000-4-4	3	A	±2kV (100V and 240V 50Hz)
Surges	EN61000-4-5	Installation Class 3	A	±2kV (100V and 240V 50Hz) ±1kV L-N
Conducted	EN61000-4-6	3/6Vrms	A	80% AM (1kHz)
Magnetic Fields	EN61000-4-8	30A/m	A	50/60Hz 1 min
Voltage Dips	EN61000-4-11	100% for 0.5 cycles, 60% 5 cycles, 30% for 25/30 cycles, interrupt 250/300 cycles and 1 sec - performance criteria A, A, B		

Safety Approvals

	Safety standard	Notes & Conditions
UL	ES 60601-1:2005 (R2012), CSA-C22.2 No 60601-1:14	
CB	IEC 60601-1 2005 + A1 (Ed 3.1)	
TUV	EN 60601-1:2006 + A1: 2013	
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

Mechanical Details



Input Pin Connections P1	
Pin	Function
1	Line
2	Neutral

Output Pin Connections	
Pin	Function
P2	Vout
P6	Return

P3: Remote on off and 5V Standby Power (optional)	
Pin	Function
P1	Return
P2	+5V 0.5A natural convection / 1A with 25 CFM
P3	Remote control

P4: FAN Output (12V)	
Pin	Function
1	Return
2	+12V 100mA natural convection / 300mA with 25 CFM

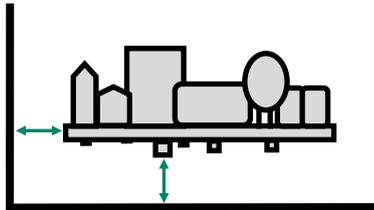
P5: PG (5V)	
Pin	Function
1	PG
2	Return

Notes

1. All dimensions shown in millimetres (inches)
2. AC input header mates with JST VHR-3N and JST SVH series crimp terminal
3. DC output P2 and P6 terminals M4 screws in 2 positions torque to 8 lb-in (90 CNm) max.
4. DC output P3 connector mates with JST housing XHP-3 and JST SXH series crimp terminals
5. DC output P4 and P5 connector mates with JST housing XHP-2 and JST SXH series crimp terminals
6. Remote on off operation: to enable short pins 2 and 3, to disable short to pin 1 or leave floating.

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.

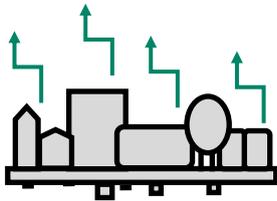
For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.

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

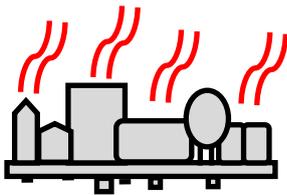


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that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

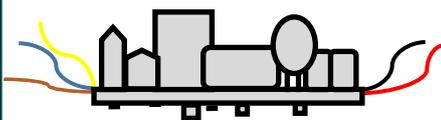


Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, 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	B3P-VH	VHR3N
Output	M3 screw terminal	N/A
Loom Kit	RHM500 LK	