RHM250 Series

FiDUS
power in motion...

250 Watts

- Power dense 250W in 3 x 5”
- Latest Medical safety approvals
- 4th ed. Medical EMC IEC 60601-1-2 (2014)
- Earth leakage <250uA (BF rated)
- EN55011 Level B conducted & radiated
- -40 to +70°C Operation
- 3 Year warranty

The RHM250 series offers 250W in a dense, 3 x 5” open frame 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 <0.21W. Outputs are available from 12 to 48V and all models come with a Fidus 3 year warranty.

Dimensions:

3 x 5 x 1.46” (76.2 x 127 x 37mm)

Models & Ratings

INSTALLATION ADVICE PG5

Model Number	Output Power	Output voltage	Output Current	Efficiency[2]
RHM25012	250W	12V	20.83A	91%
RHM25015	250W	15V	16.66A	92%
RHM25019	250W	19V	13.15A	93%
RHM25024	250W	24V	10.41A	94%
RHM25030	250W	30V	8.33A	94%
RHM25036	250W	36V	6.94A	94%
RHM25048	250W	48V	5.20A	94%

Notes

1. Looms kits available, see ‘Installation Advice’ pg5
2. 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% power at 50°C to 50% power at 70°C
Efficiency	91		94	%	
Dimensions	3 x 5 x 1.46” (76.2 x 127 x 37mm)				
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				

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Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	
Input frequency	47		63	Hz	
Power factor	0.9				EN61000-3-2 class A compliant
Input current (rms)			3	A	Low line. At 100VAC
			1.5		High line. At 240VAC
Inrush current			75	A	100VAC cold start at 25°C
			150		240VAC cold start at 25°C
No load input power			0.21	W	
Earth leakage current			250	uA	240VAC 60Hz

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		48	VDC	See Model & Ratings table
Total regulation	±5% 12-19V models. ±3% 24V model. ±2% 30-48V models.			%	±10% AC line change at nominal load and ±40% load change at 60% load nominal line.
Minimum load	0			%	
Ripple & Noise	12V model 120mVp-p. 15V model 150mVp-p. 19V model 190mVp-p. 24V model 240mVp-p. 30-48V models 300mVp-p			mV(Vp-p)	All models measured with 0.1 and 0.47uF capacitor and 20 MHz bandwidth.
Hold up time		16		ms	
Overload protection	105		130	%	Trip and restart. Automatic recovery
Short circuit protection					Trip and restart. Automatic recovery
Overvoltage protection	112		132	%	Trip and restart. Automatic recovery

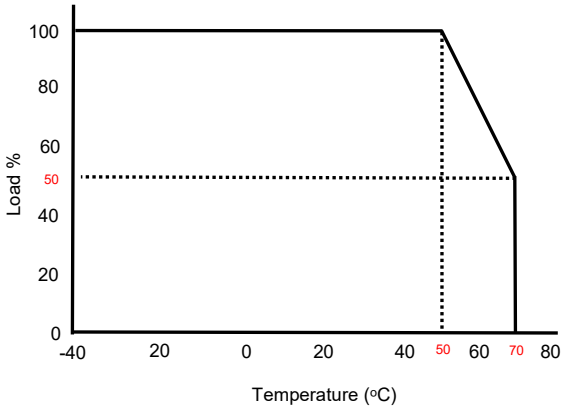
General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	91		94	%	
Isolation: Input to Output	4000			VAC	2 x MOPP (BF rated)
Input to Ground	1500			VAC	
Isolation resistance		50		MΩ	
Power density		11.4		W/In^3	
MTBF	200			kHrs	As per MIL-HDBK-217F, 25°C GB
Weight		330		g	

Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-40		70	°C	Derate linearly from 100% power at 50°C to 50% power at 70°C
Storage temperature	-40		85	°C	
Cooling					Convection cooled
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

Derating curve



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			

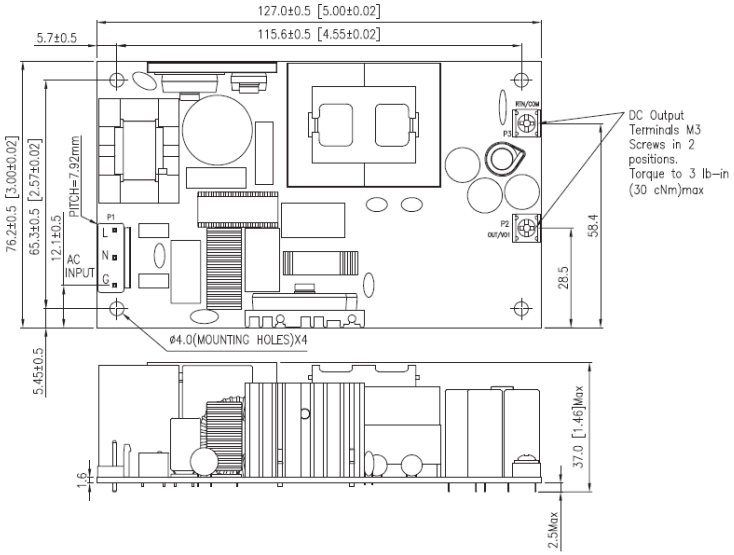
EMC: Immunity

	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	4	A	±15kV air, ±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	Ground
2	Neutral
3	Line

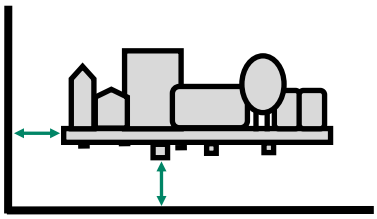
Output Pin Connections	
Pin	**Function**
P2	Vout
P3	Return

Notes

1. All dimensions shown in millimetres (inches)
2. AC input header mates with JST VHR-5N
3. DC output M3 screws torque to 3 lb-in (30 CNm) max.
4. An 8mm clearance is advised for installation

Installation Advice

Safety

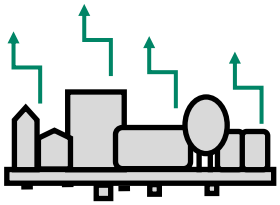


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

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

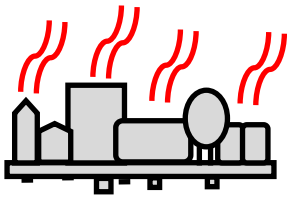


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that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

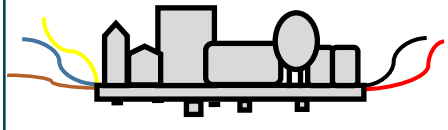
Thermal



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 capacitators 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	B5P-VH	VHR5N
Output	M3 screw terminal	N/A
Loom Kit	RHM250 LK	