PHM250 Series

FiDUS
power in motion...

250 Watts

- Medical approvals EN/IEC/ES606061-1 with 2xMOPP and EN60601-1-2
- ITE approval EN/IEC/UL62368-1
- Overload to 300W for 3 sec
- Operation from –40 to 70°C
- Universal 90-264VAC input with no derating
- Up to 93% efficient
- 3 Year Warranty

The PHM250 series offers up to 150W convection cooled and 250W fan cooled in a dense, 2 x 4" open frame package. The units are designed for use in medical and ITE applications, are very efficient and have low emissions, meeting EN55011/32 level B. They have a wide temperature range from -40 to +70°C and offer low no load power consumption of <0.21W / 3W for fan versions. Outputs are available from 12 to 48V complete with over voltage, over current, over temperature and short circuit protections.

Dimensions:
Open frame: 2 x 4 x 1.23" (50.8 x 101.6 x 31.3mm)
Covered: 2.48 x 4.79 x 1.57" (63 x 121.6 x 40mm)
Internal fan: 2.48 x 4.79 x 2" (63 x 121.6 x 50.8mm)
External fan: 2.48 x 4.79 x 1.97" (63 x 121.6 x 50mm)

Models & Ratings

INSTALLATION ADVICE PG5

Model Number[1]	Output voltage	Output Power		Output Current		Noise[3]	Efficiency[4]
		Natural convection[2]	With 8 CFM	Natural convection[2]	With 8 CFM		
PHM25012	12V	150W	250W	12.5A	20.83A	108mVp-p	91%
PHM25015	15V	150W	250W	10A	16.66A	135mVp-p	91%
PHM25019	19V	150W	250W	7.89A	13.15A	170mVp-p	91%
PHM25024	24V	150W	250W	6.25A	10.41A	210mVp-p	92%
PHM25030	30V	150W	250W	5A	8.32A	270mVp-p	92%
PHM25036	36V	150W	250W	4.16A	6.94A	300mVp-p	93%
PHM25048	48V	150W	250W	3.12A	5.2A	300mVp-p	93%

Notes

1. For covered version add **–C**, for internal fan add **-IF**, for external fan add **–EF**
2. For –C version derate natural convection rating by 20%
3. Noise measured with 20MHz bandwidth 0.1uF ceramic and 47uF electrolytic
4. Efficiency at full load and nominal line voltage
5. 300W peak 3sec, 45W 10 sec or 27sec for convection cooled units

Key specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	85		264	VAC	100% power from 90 to 264VAC. See derating curve for details p3
Operating temperature	-40		70	°C	Derate linearly from 100% power at 50°C to 50% power at 70°C. See derating curve for details p3
Efficiency	91		93	%	
Dimensions	Open frame: 2 x 4 x 1.23" (50.8 x 101.6 x 31.3mm) Covered: 2.48 x 4.79 x 1.57" (63 x 121.6 x 40mm) Internal fan: 2.48 x 4.79 x 2" (63 x 121.6 x 50.8mm) External fan: 2.48 x 4.79 x 1.97" (63 x 121.6 x 50mm)				
EMC	EN55011/32 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated. IEC60601-1-2 (4th Edition)				
Safety	EN/IEC/ES606061-1, EN/IEC/UL 62368-1				

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Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	85		264	VAC	100% power from 90 to 264VAC. See derating curve for details p3
Input frequency	47		63	Hz	
Power factor	0.9		0.99		EN61000-3-2 class A & D compliant
Input current (rms)			3.1	A	Low line. At 100VAC
			1.3		High line. At 240VAC
Inrush current			20	A	100VAC cold start at 25°C
			50		240VAC cold start at 25°C
No load input power	0.21		3	W	3W for fan integrated versions
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			4	%	±10% AC line change at nominal load and ±40% load change at 60% load nominal line.
Minimum load	0			%	
Ripple & Noise	108		300	mV(Vp-p)	All models measured with 0.1 and 0.47uF capacitor and 20 MHz bandwidth. See model table page 1
Hold up time		10		ms	
Overload protection	120		150	%	Trip and restart. Automatic recovery
Short circuit protection					Trip and restart. Automatic recovery
Overvoltage protection	112		132	%	Trip and restart. Automatic recovery

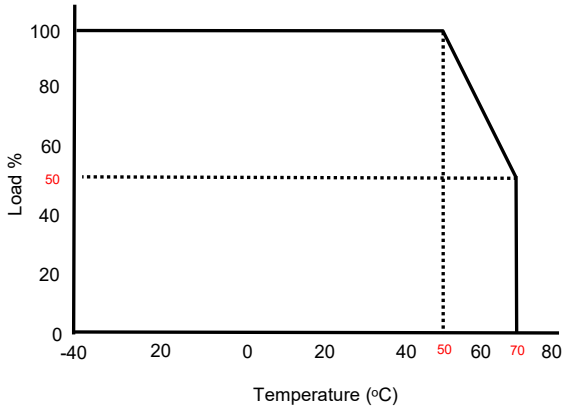
General

Parameter		Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		91		93	%	See models page 1
Isolation:	Input to output	4000			VAC	2 x MOPP
	Input to ground	2826			VAC	
	Output to ground	1500			VAC	BF rated
Isolation resistance			50		MΩ	
Power density			25.4		W/In^3	
MTBF		300			kHrs	As per MIL-HDBK-217F, 25°C GB
Weight		Open frame 200g, covered 325g external fan 330g and internal fan 340g				

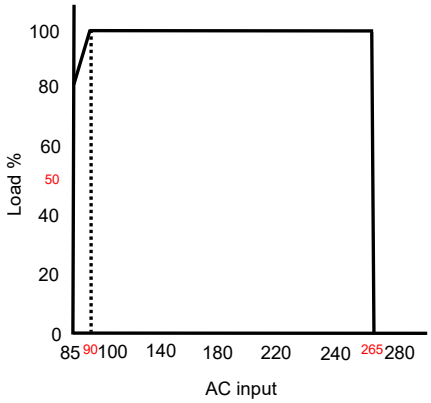
Environmental

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 or 8CFM
Temperature coefficient			±0.04	%/°C	
Humidity	0		95	% RH	Non condensing
Operating altitude			5000	m	
Vibration			5	g	10-500hz, 10min/cycle in each axis x, y and z

Derating thermal curve



AC Derating curve



EMC: Emissions

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

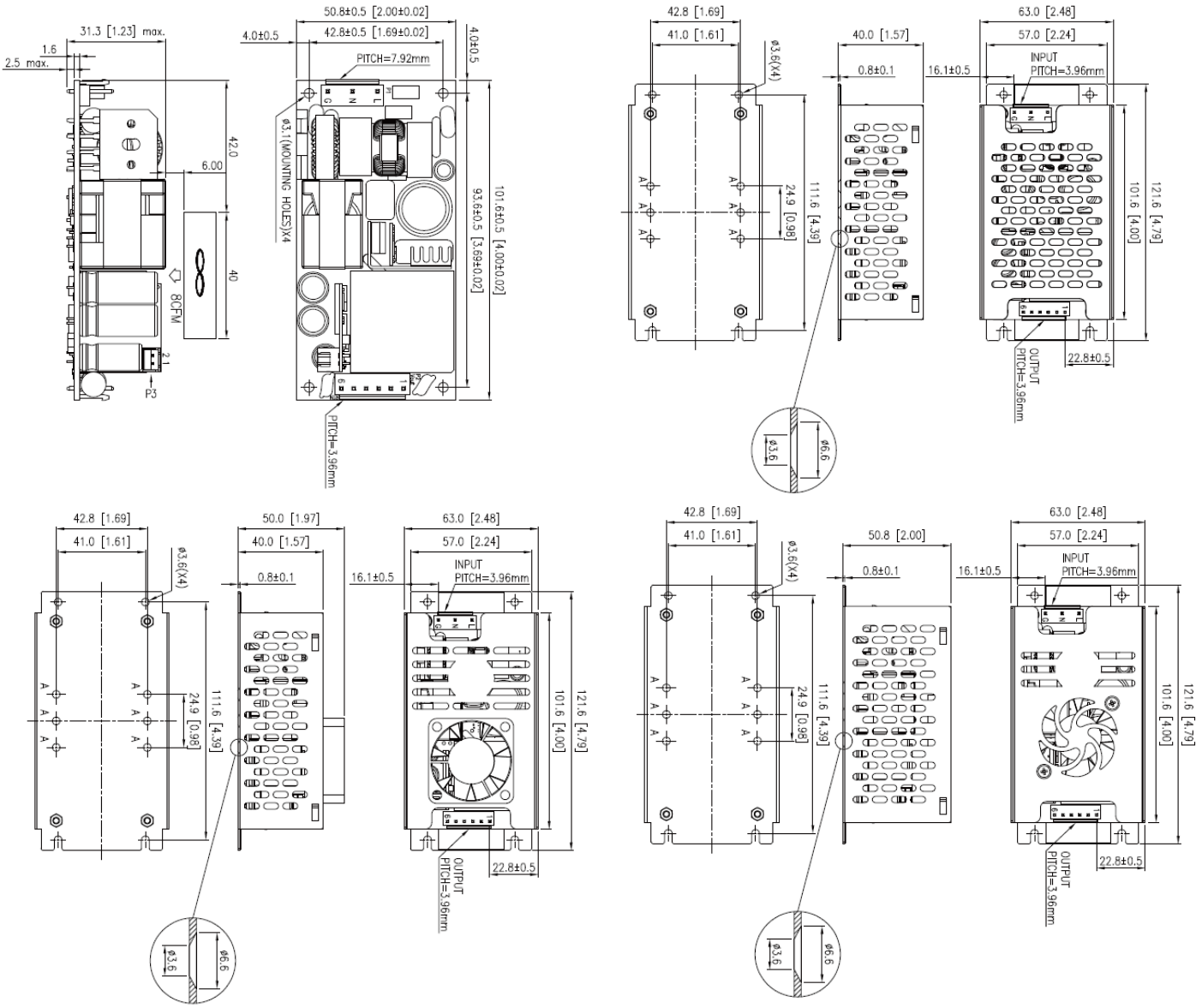
EMC: Immunity

	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, 100% 1 cycles, 30% for 25/30 cycles, interrupt 250/300 cycles performance criteria A, A, A, B		

Safety Approvals

	Safety standard	Notes & Conditions
UL	ES 60601-1:2005 (R2012), CSA-C22.2 No 60601-1:14 UL62368-1 CAN/CSA No 62368-1-14	
CB	IEC 60601-1 2005 + A1 (Ed 3.1) IEC 62368-1 Ed2	
TUV	EN 60601-1:2006 + A1: 2013 EN 62368-1 : 2014 Ed2	
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	Body floating (BF) rated
Equipment protection class		Class I

Mechanical Details

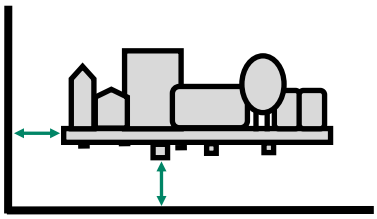


Notes

1. All dimensions shown in millimetres [inches]
2. AC input header mates with JST VHR-5N, output header mates with JST VHR-6N Pins 1-3 Vout pins 4-6 Gnd

Installation Advice

Safety

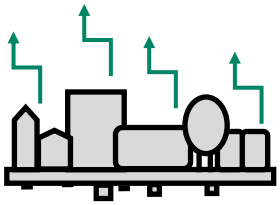


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

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

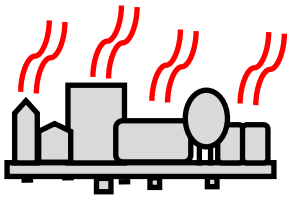


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that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