

# FCM400 Series



- Integral Low Noise Fan
- 400 W Output Power
- 600 W Peak Rating 500 ms
- Screw Terminals
- Class B Conducted Emissions
- 5 V Standby Rail
- 80 V – 275 VAC Input Operation
- IT & Medical Safety Approvals
- Remote On/Off & Power Fail Signal as Standard

The FCM400 AC-DC power supply provides upto 400 W continuous and 600 W peak output power for up to 0.5 seconds.

Packaged in a compact 6" (152 mm) x 4" (102 mm) x 1.9" (49 mm) and certified to IEC60950 & IEC60601 family safety approvals, the FCM400 can be easily integrated into a wide range of both industrial and medical applications. A low noise fan allows quiet operation at full power from -10 °C to 50 °C and 50% power at +70 °C.

The unit comprises of a main output with voltages from 12-48 VDC and a peripheral output providing a 5 VDC standby supply which can be utilised with the signals and control features of the unit to provide detection of loss of AC input and remote on/off control.

## Models and Ratings

Output Power		Output Voltage V1	Output Current V1		Standby Supply V2	Model Number
P nom	P peak <sup>(1)</sup>		I nom	I peak <sup>(1)</sup>		
400 W	600 W	12.0 VDC	33.3 A	50 A	5.0 V/0.5 A	FCM400PS12
400 W	600 W	15.0 VDC	26.6 A	40 A	5.0 V/0.5 A	FCM400PS15
400 W	600 W	24.0 VDC	16.6 A	25 A	5.0 V/0.5 A	FCM400PS24
400 W	600 W	28.0 VDC	14.2 A	21.4 A	5.0 V/0.5 A	FCM400PS28
400 W	600 W	36.0 VDC	11.1 A	16.7 A	5.0 V/0.5 A	FCM400PS36
400 W	600 W	48.0 VDC	8.3 A	12.5 A	5.0 V/0.5 A	FCM400PS48

**Notes:**

1. Peak duration is 500 ms max, average power must not exceed 400 W.

## Input Characteristics

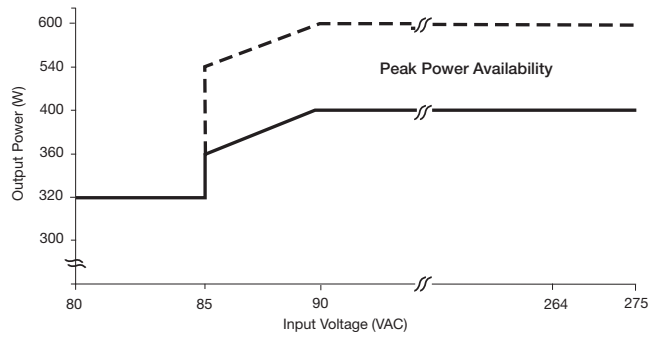
Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	80	115/230	275	VAC	Derate output power <90 VAC. See fig 1. Power fail signal cannot be used <90 VAC.
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.9			EN61000-3-2 class A compliant
Input Current - No Load		0.11/0.15		A	115/230 VAC
Input Current - Full Load		4.1/2.1		A	115/230 VAC
Inrush Current			60	A	230 VAC, 25 $\mu$ C
Earth Leakage Current		100/165	260	$\mu$ A	115 VAC 60 Hz/230 VAC 50 Hz (Typ), 264 VAC/60 Hz (Max.)
Input Protection	F10 A/250 V internal fuse in both line and neutral				

## Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			$\pm 0.5^{(v1)}$ , $\pm 5^{(v2)}$	%	50% load, 115/230 VAC
Output Voltage Adjustment	$\pm 10$			%	V1 only via potentiometer. See mech. details (page 11).
Minimum Load	0			A	
Start Up Delay		1		s	230 VAC full load (see fig.2)
Hold Up Time	20	35		ms	90 VAC full load (see fig.3)
Drift			$\pm 0.2$	%	After 20 min warm up
Line Regulation			$\pm 0.5$	%	90-264 VAC
Load Regulation			$\pm 1^{(v1)}$ , $\pm 5^{(v2)}$	%	0-100% load.
Transient Response - V1			4	%	Recovery within 1% in less than 500 $\mu$ s for a 50-75% and 75-50% load step
Over/Undershoot - V1			5	%	
Ripple & Noise		0.5	1 <sup>(v1)</sup> , 2 <sup>(v2)</sup>	% pk-pk	20 MHz bandwidth (see fig.4 & 5)
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	150		165	% I nom	Output 1 only, auto reset (see fig.6)
Short Circuit Protection					Continuous (see fig. 6)
Temperature Coefficient			0.05	%/C	
Overtemperature Protection				$^{\circ}$ C	Auto recovery - temperature of main transformer

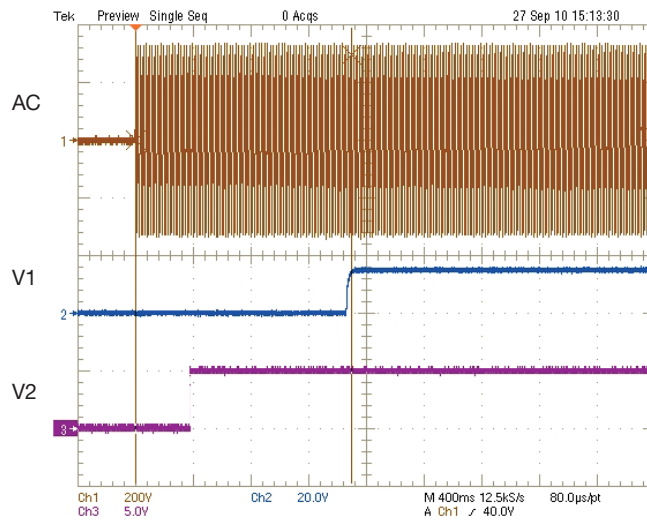
## Input Voltage Derating

Figure. 1



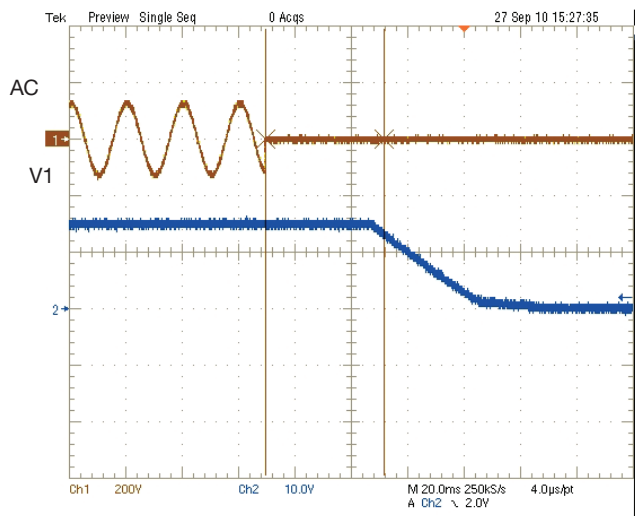
## Start Up Delay From AC Turn On

Figure. 2  
V1 & V2 start up example from AC turn on (1.5 s)



## Hold Up Time From Loss of AC

Figure 3  
V1 hold up example at 400 W load with 90 VAC input (42 ms)



### Output Ripple & Noise

Figure 4  
V1 FCM400PS12 (full load)  
50 mV pk-pk ripple. 20 MHz BW

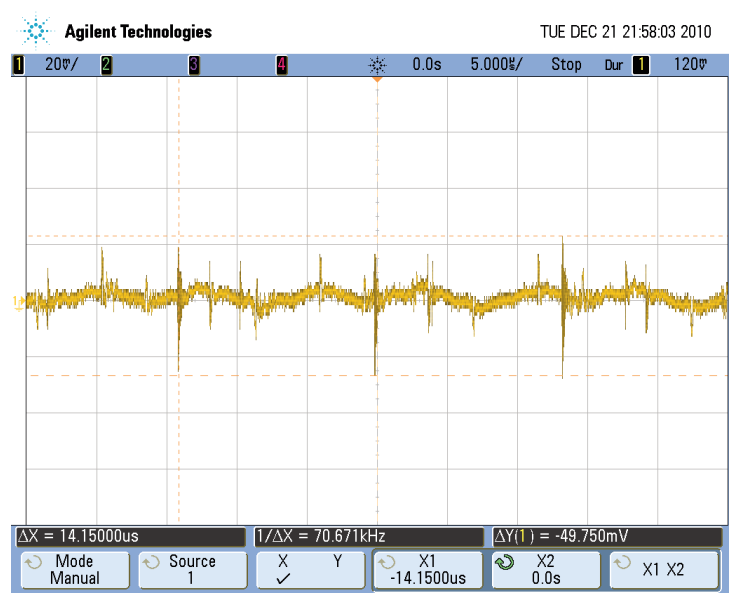
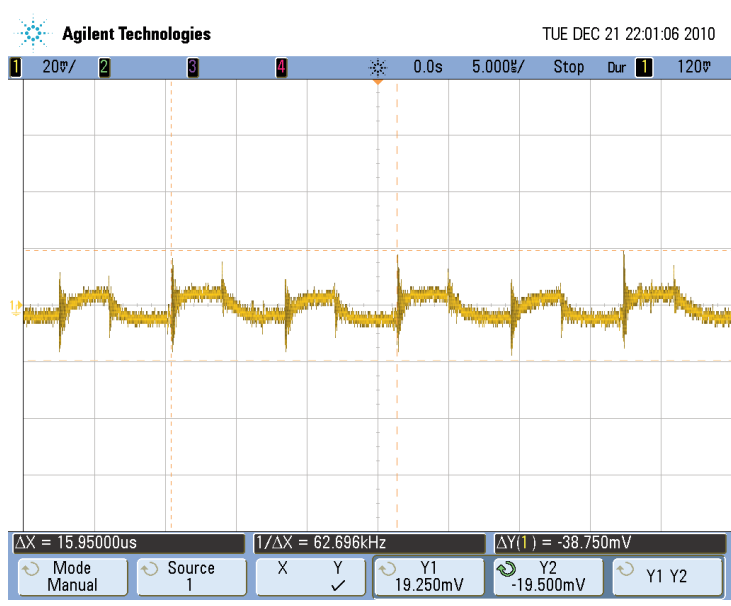
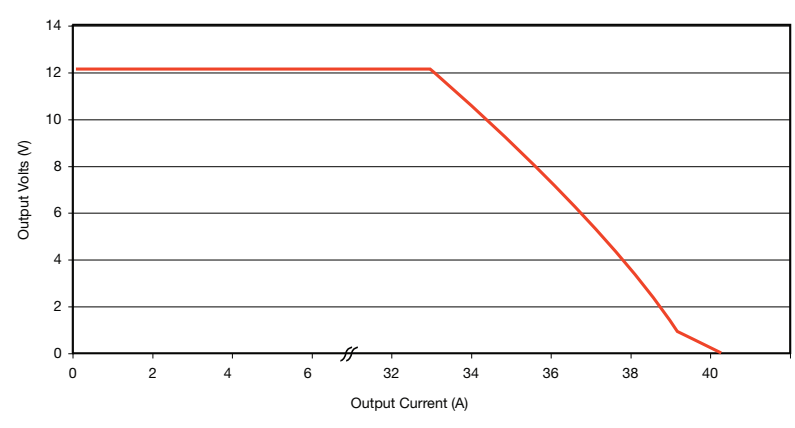


Figure 5  
V1 FCM400PS24 (full load)  
38 mV pk-pk ripple. 20 MHz BW



### Output Overload Characteristic

Figure 6  
Typical V1 Overload  
Characteristic  
(FCM400PS12 shown)



## General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		87		%	Full load (see fig.7 & 8)
Isolation: Input to Output Input to Ground Output to Ground	4000			VAC	
	1500			VAC	
	500			VAC	
Switching Frequency		70 / 65		kHz	PFC / Main Converter.
Power Density			13.9	W/in <sup>3</sup>	
Mean Time Between Failure		236		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight		1.8 (800)		lb (g)	

## Efficiency Versus Load

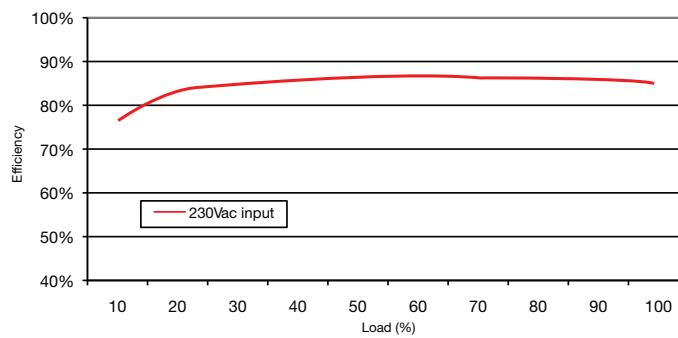


Figure 7  
FCM400PS12

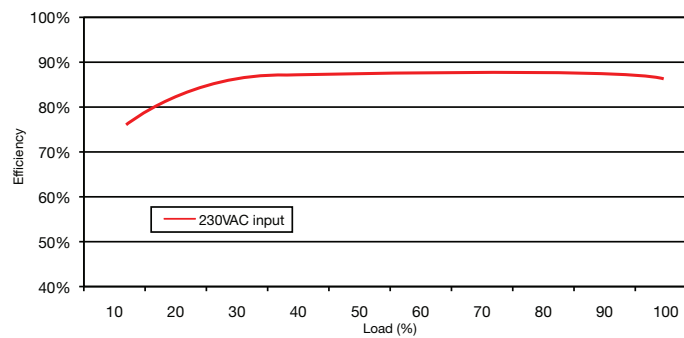


Figure 8  
FCM400PS24

Characteristic	Notes & Conditions
<b>Signals</b>	
Power Fail	Uncommitted opto isolated transistor, normally off when AC is good (see fig.9 - 11) Provides $\geq 5$ ms (typically 20-30ms) warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommitted isolated optocoupler diode, powered diode inhibits the supply (see fig.12-17)
Standby Supply V2	Isolated 5 V/0.5 A supply, always present when AC supplied.

## Signals

### Power Fail

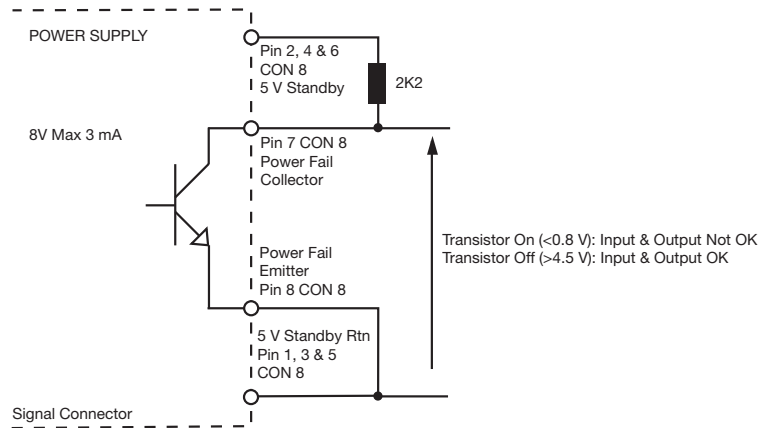


Figure 9

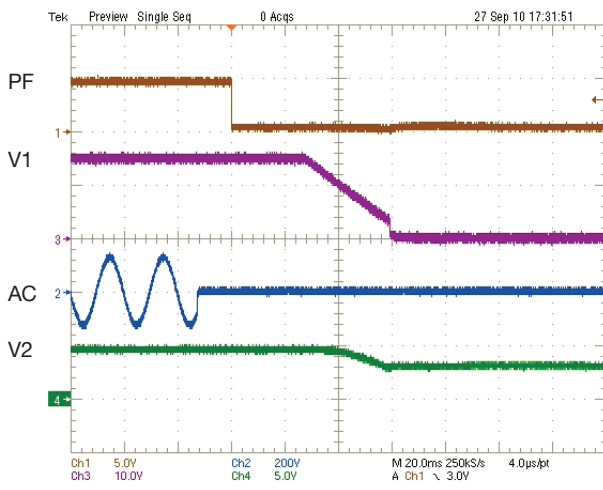


Figure 10  
Power Fail signal example  
at AC switch off

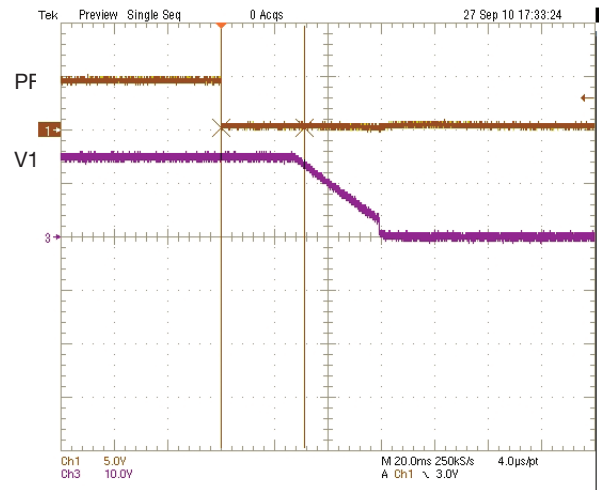


Figure 11  
V1 warning time example at Power Fail signal 230  
VAC 400 W load (31 ms)

## Signals

### Remote On/Off (Inhibit/Enable)

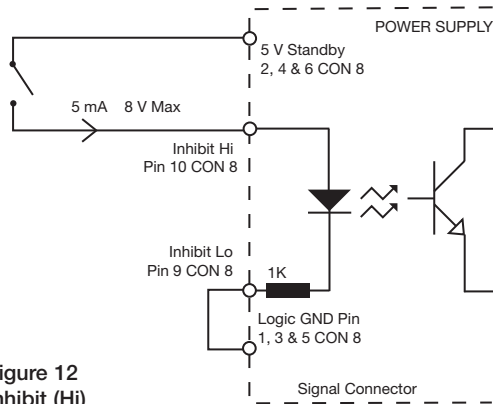


Figure 12  
Inhibit (Hi)

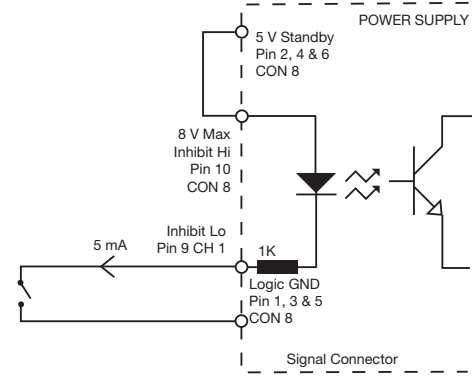


Figure 13  
Inhibit (Lo)

Figure 14  
Example of outputs switching off when Inhibit (Lo) configuration used & switch closed

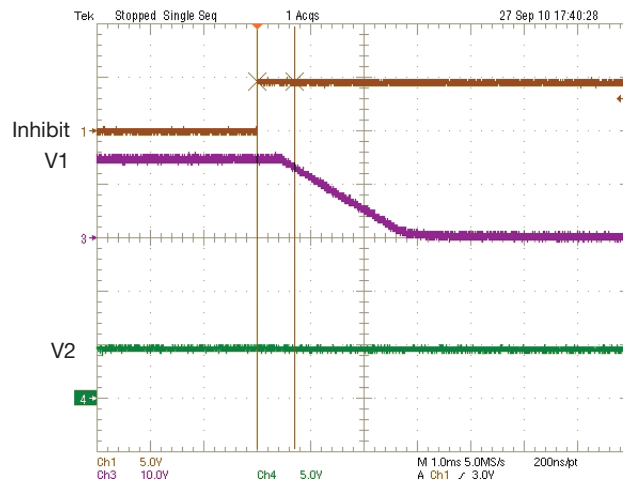
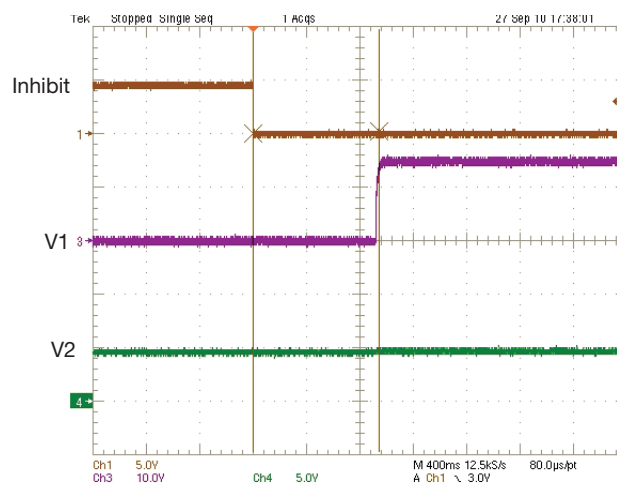


Figure 15  
Example of outputs switching on when Inhibit (Lo) configuration used & switch open



## Signals

### Remote On/Off (Inhibit/Enable)

Figure 16  
Enable (Hi)

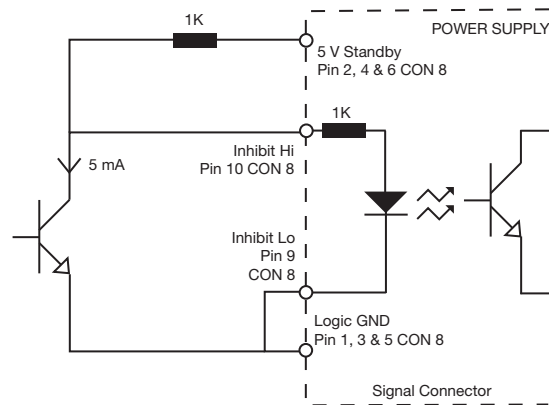
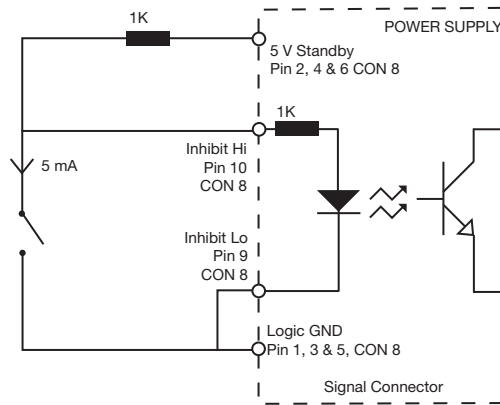


Figure 17  
Enable (Lo)



#### Notes

1. At AC switch on the output (V) may momentarily rise when the unit is disabled using the 5V standby in conjunction with the Remote On/Off function.

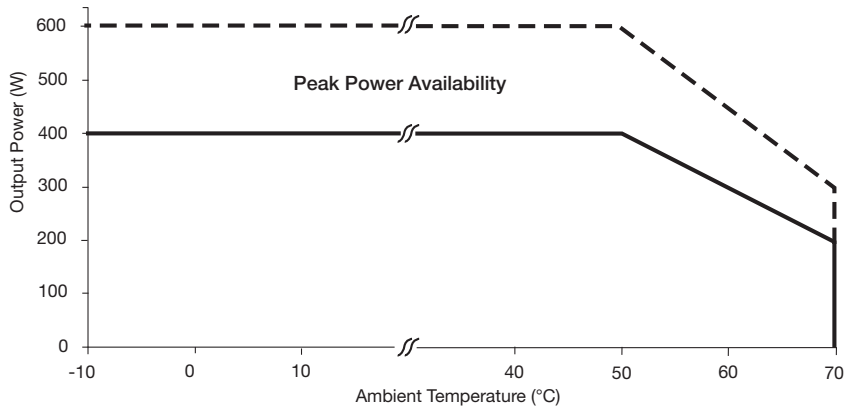
## Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-10		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C. See fig.18.
Warm up Temperature		20		Minutes	
Storage Temperature	-40		+85	°C	
Cooling					Forced cooled via low noise integral fan
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Shock					3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration					Single axis 10-500 Hz at 2 g x 10 sweeps



## Derating Curve

Figure 18



## Electromagnetic Compatibility - Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Low Voltage PSU EMC	EN61204-3	High severity level	as below	
Harmonic Current	EN61000-3-2	Class A		
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	Dip: 30% 10 ms	A	
		Dip: 60% 100 ms	B	
		Dip: 100% 5000 ms	B	
	EN60601-1-2 (EN61000-4-11)	Dip: 30% 500 ms	A	
		Dip: 60% 100 ms	A	Requires load derating to approx TBA% with 100VAC input.
		Int.: >95% 5000 ms	B	

## Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55011/22	Class B		
Radiated	EN55011/22	Class A		
Voltage Fluctuations	EN61000-3-3			

## Safety Agency Approvals

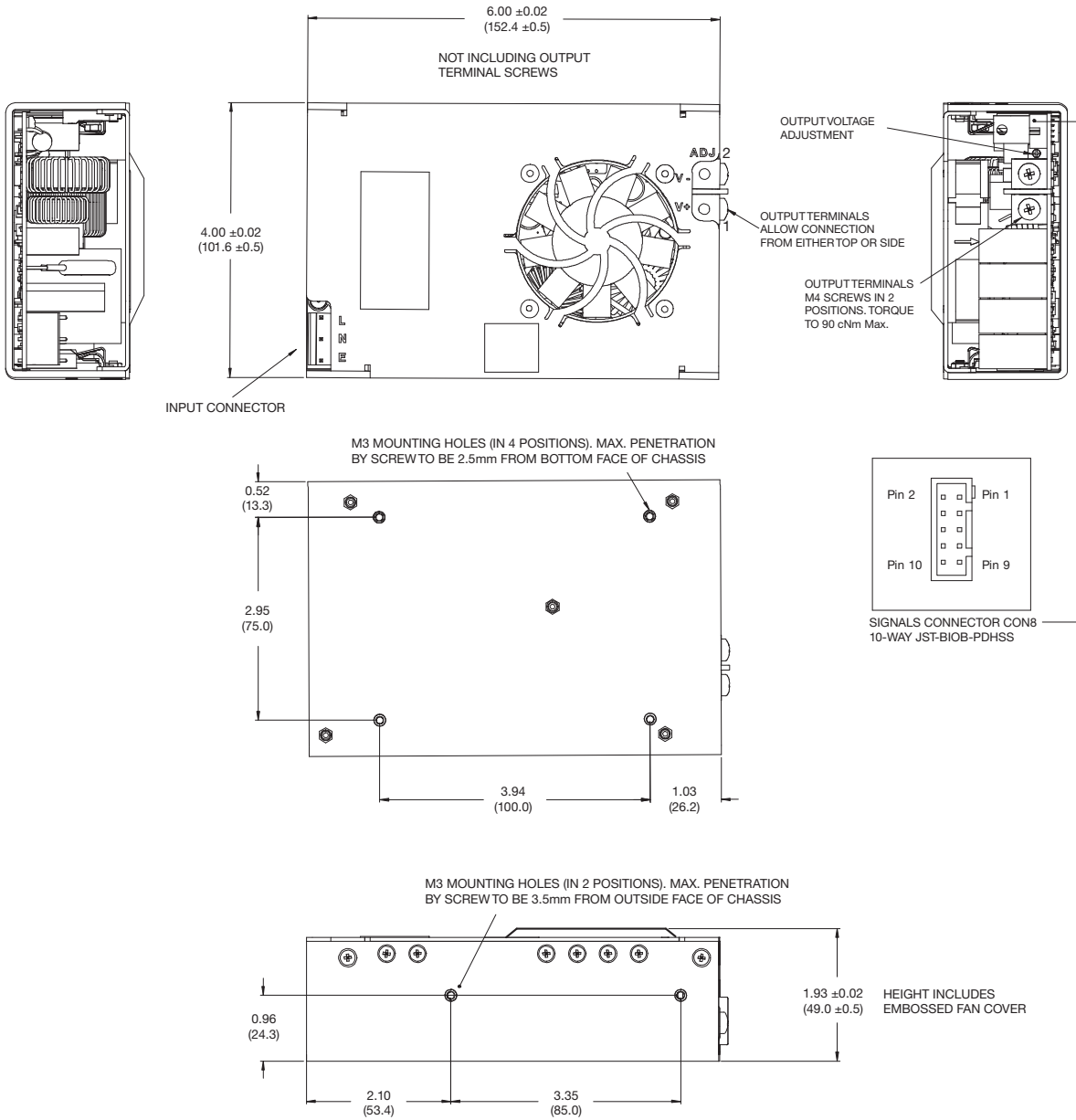
Safety Agency	Safety Standard	Category
CB Report	UL Cert #US/15598/UL, IEC60950-1:2005 Ed 2	Information Technology
UL	UL File #E139109-A43-UL, UL60950-1 (2007), CSA 22.2 No.60950-1-07 Ed 2	Information Technology
TUV	TUV Certificate # B 10 09 57396 081, EN60950-1/A11 2009	Information Technology
CE	LVD	

Safety Agency	Safety Standard	Category
CB Report	Certificate #US/17946/UL, IEC60601-1 Ed 3 Including Risk Management	Medical
UL	UL File # E146893, ANSI/AAMI ES 60601-1:2005 & CSA C22.2 No. 60601-1:08	Medical
TUV	EN60601-1:2006	Medical

Means of Protection		Category
Primary to Secondary	2 x MOPP (Means of Patient Protection)	IEC60601-1 Ed 3
Primary to Earth	1 x MOPP (Means of Patient Protection)	

Equipment Protection Class	Safety Standard	Notes & Conditions
Class I	IEC60950-1:2005 Ed 2 & IEC60601-1 Ed 3	See safety agency conditions of acceptability for details

# Mechanical Details



**Notes**

- 1. Dimensions shown in inches (mm). Tolerance: ±0.02 (±0.5)
- 2. Weight: 1.8 lb (800g).

Signals Connector CON 8	
1	5 V Standby Return
2	5 V Standby
3	5 V Standby Return
4	5 V Standby
5	5 V Standby Return
6	5 V Standby
7	Power Fail (Collector)
8	Power Fail (Emitter)
9	Remote On / Off (Cathode)
10	Remote On / Off (Anode)

Mating plug: JST p/n PHDR-10VS  
Contact: 26-22 AWG JST p/n SPHD-001T-P0.5

Input Connector CON 2 Tyco part #640445-5	
Pin 1	Line
Pin 2	Neutral
Pin 3	Earth

J1 mates with Tyco MTA-156 & 5L-156 product lines