

# HPU1K5 Series



- Low Profile 1.7" (43.2 mm), Industrial Supply
- Medical Safety Approvals (-M versions)
- Industrial Heavy Duty Terminals
- Output Power up to 1500 W
- Load dependant variable speed fans for audible noise reduction
- High Power Density - 18W/in<sup>3</sup>
- -20 °C to +70 °C Operation
- 5V / 1A Standby Supply
- AC OK, DC OK & Inhibit
- SEMI F47 Compliant
- Fault & Overtemperature Signals
- 3 Year Warranty

The HPU1K5 is a very low profile 1500 Watt AC - DC power supply with market leading power density that is designed for use in a wide range of industrial and medical applications. The HPU1K5 delivers 1200 Watts at Low Line and 1500 Watts at High Line with three output models 12 V, 24 V & 48 V.

The HPU1K5 is supplied with a range of signals and control, self cooling via integral fans and customer mounting options on three faces making it suitable for a variety of enclosures and applications where status reporting and control functions are increasingly required.

## Models and Ratings

Output Power	Output Voltage V1	Voltage Adj V1	Max Output Current V1		Standby Supply V2	Model Number
			<180 VAC	>180 VAC		
1200 W	12.0 VDC	11-14 V	100 A	100 A	5 V/1 A	HPU1K5PS12
1500 W	24.0 VDC	22-28 V	50 A	63 A	5 V/1 A	HPU1K5PS24
1500 W	48.0 VDC	45-52 V	25 A	31 A	5 V/1 A	HPU1K5PS48

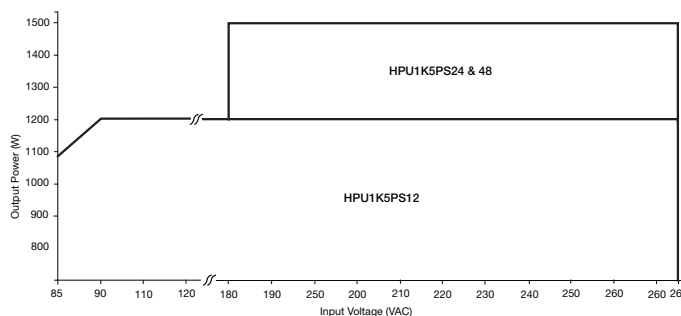
For medical versions, add suffix '-M' to model number.

## Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	85	115/230	264	VAC	Derate output power < 90 VAC. See fig. 1.
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.9			EN61000-3-2 class A compliant EN61000-3-2 class C for loads ≥10%
Input Current - No Load		0.6		A	
Input Current - Full Load		13/6.5		A	115/230 VAC
Inrush Current			35	A	230 VAC cold start, 25 $\mu$ C
Earth Leakage Current		0.45/0.9	1.1	mA	115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)
Earth Leakage Current (-M)		<300	<500	$\mu$ A	115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)
Input Protection	T20 A/250 V internal fuse in both line and neutral				

## Input Derating Curve

Figure 1



## Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			$\pm 1^{(V1)}$ , $\pm 5^{(V2)}$	%	50% load, 115/230 VAC
Output Voltage Adjustment				%	V1 only. See model table above & mech. details.
Minimum Load	0			A	
Start Up Delay		1		s	230 VAC full load, see fig.2
Hold Up Time	16			ms	
Drift			$\pm 0.2$	%	After 20 min warm up
Line Regulation			$\pm 0.5$	%	90-264 VAC
Load Regulation			$\pm 0.5^{(V1)}$ , $\pm 5^{(V2)}$	%	0-100% load.
Transient Response - V1			4	%	Recovery within 2% in less than 500 $\mu$ s for a 50-75% and 75-50% load step
Over/Undershoot - V1		0.5		%	See fig.3
Ripple & Noise			2	% pk-pk	V1: 12 V models, 20 MHz bandwidth
			1		V1: 24-48 V models, 20 MHz bandwidth, see fig.4
			3		V2: 5 V standby, 20 MHz bandwidth
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		140	% I nom	Output 1 only, auto reset. See fig 5.
Short Circuit Protection					Continuous, trip & restart (hiccup mode) all outputs
Temperature Coefficient			0.02	%/C	
Overtemperature Protection				$^{\circ}$ C	Protects unit from overtemperature. Auto restart.

### Start Up Delay From AC Turn On

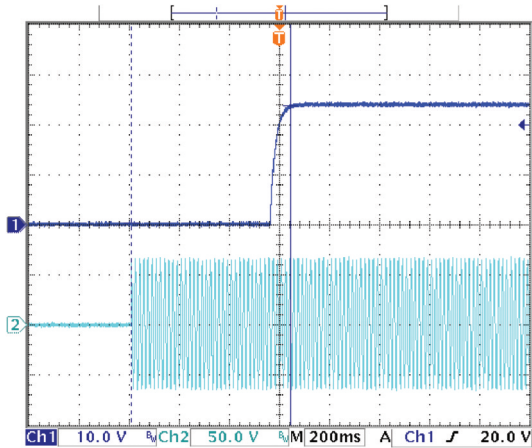


Figure 2 - V1 Start up examples from AC turn on (650ms)

### Overshoot

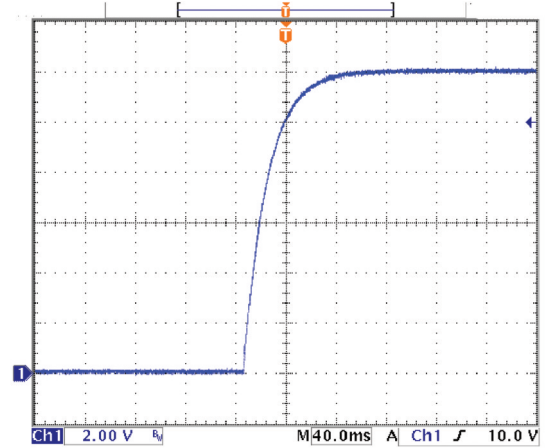


Figure 3 - V1 Typical overshoot at start up.

### Output Ripple and Noise

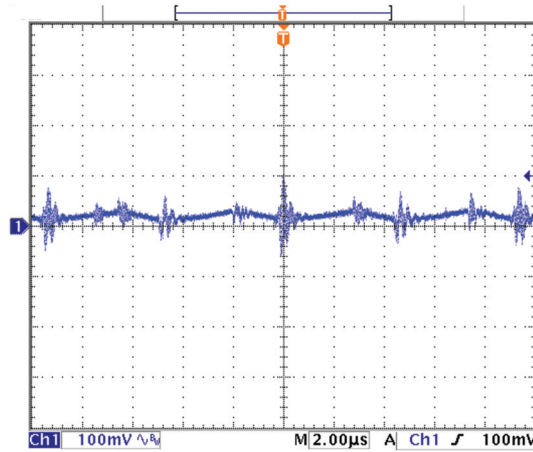


Figure 4 - V1 HPU1K5PS24 (Full load) 160mV pk-pk ripple and noise 20 MHz bandwidth

### Output Overload Characteristic

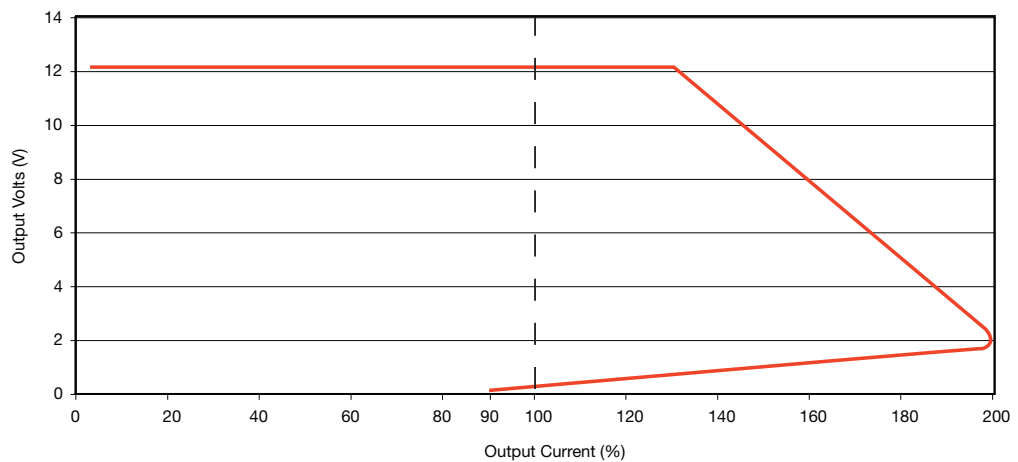


Figure 5  
Typical V1 Overload  
Characteristic  
(HPU1K5PS12 shown)

## General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		90		%	
Isolation: Input to Output Input to Ground Output to Ground <sup>(1)</sup>	4000			VAC	
	1500			VAC	
	500			VDC	
Switching Frequency		70/130		kHz	PFC converter / Main converter
Power Density			18	W/in <sup>3</sup>	
Mean Time Between Failure		470		kHrs	TELECORDIA SR-332, 25°C
Weight			5.2 (2.35)	lb (kg)	

## Signals & Control

Characteristic	Notes & Conditions
<b>Signals &amp; Control</b>	
Remote Sense	Compensates for 0.5 V total voltage drop
AC OK	AC OK is an opto isolated transistor, referenced to logic ground, providing a minimum of 3 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally on when AC is healthy. See fig. 6 & 13.
DC OK	DC OK is an opto isolated transistor, referenced to logic ground, providing warning of loss of output. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally on when output DC is healthy. See fig. 7 & 13.
Inhibit	Floating isolated optocoupler diode referenced to logic ground powered diode inhibits the supply. See fig. 8 & 14.
Fault	Fault is an opto isolated transistor, referenced to logic ground, providing warning of output voltage below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally off when there is no fault. See fig. 9.
Current Share	Connecting pins 3/4 and 5/6 of like voltage units (8 maximum) will force the current to share between the outputs. Units share current within 10% of each other at full load. See fig. 11 & 12.
V Program	The voltage program function allows ±10% remote adjustment of V1 via 0-5V signal. See fig. 10.
5V Standby (V2)	5 V/1 A supply, always present when AC supplied

## Signals & Control

### AC OK/Power Fail

AC OK is an isolated signal providing a minimum of 3 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

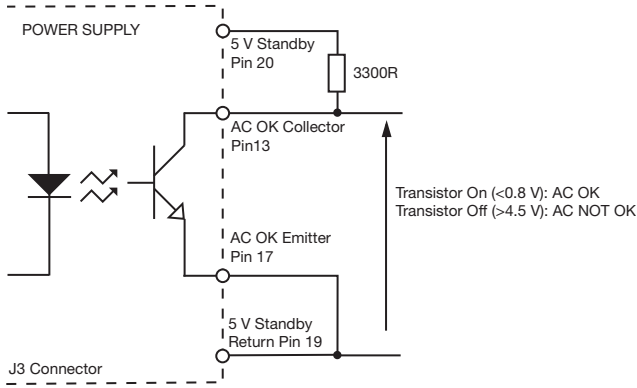


Figure 6

### DC OK

DC OK is an isolated signal providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

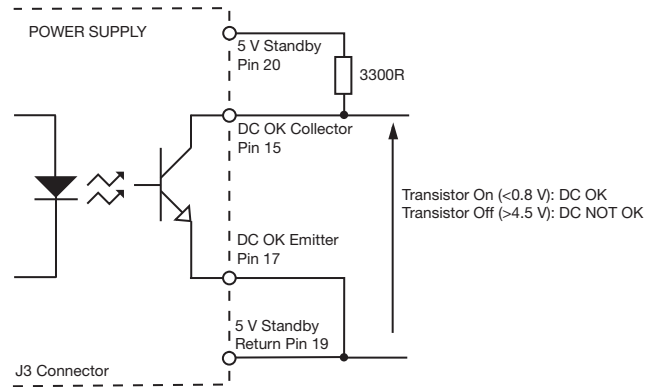


Figure 7

### Inhibit

Inhibit is an isolated control signal which can turn the power supply and fans off by supplying 2 to 5mA into the pin.

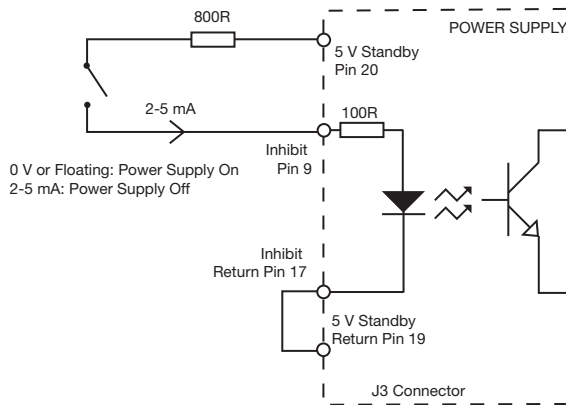


Figure 8

### Fault

Fault is an isolated signal providing warning of either Power Fail, DC Fail or Overtemperature. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

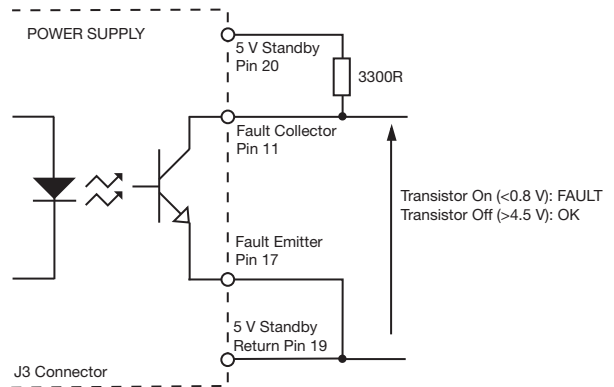


Figure 9

### V Program

V Program allows remote voltage adjustment within the range  $\pm 10\%$

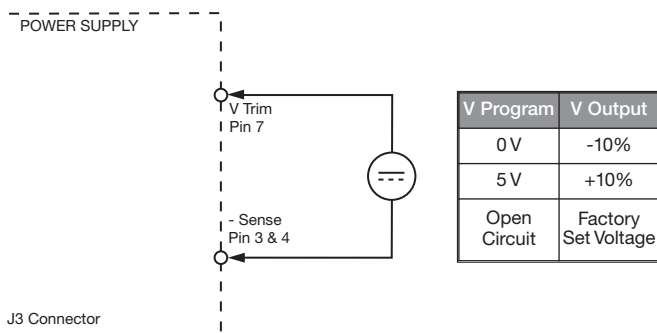


Figure 10

### Current Share

Connecting pins 5 or 6 and 3 or 4 of like voltage units (8 maximum) will force the current to share between the outputs. Units share current within 10% of each other at full load. Derate output to 90% of total combined load.

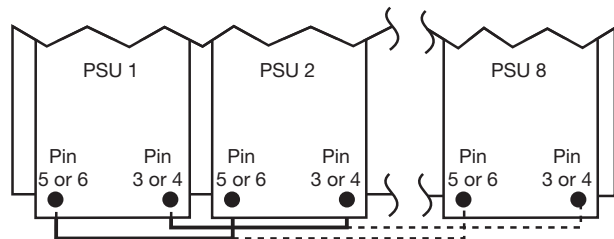
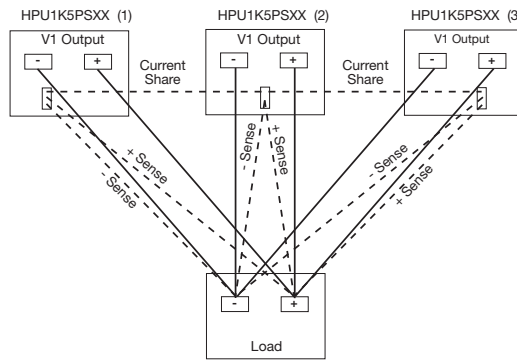


Figure 11

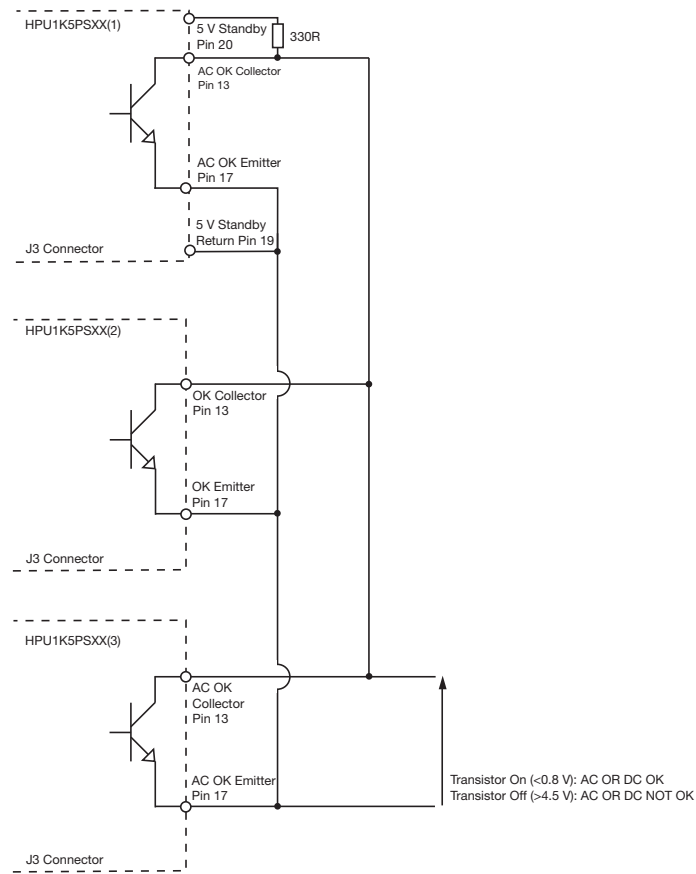
## Signals - Parallel Load & Current Share Connection Example

Figure 12



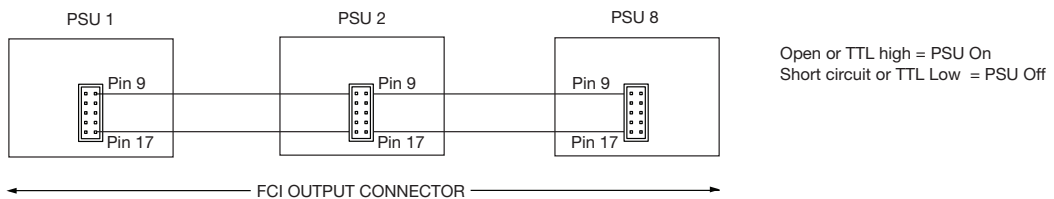
## Parallel AC OK Connection (DC OK follows same format)

Figure 13



## Parallel Remote Inhibit Connection

Figure 14

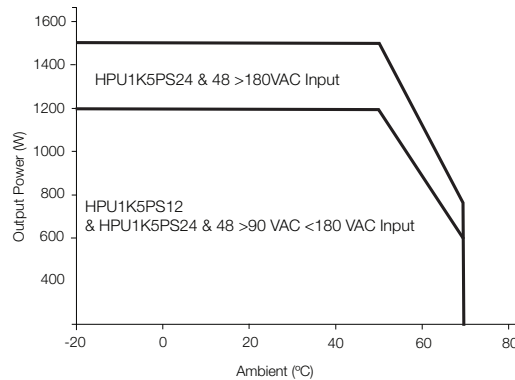


## Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C. See fig. 15.
Warm up time		20		Minutes	
Storage Temperature	-40		+85	°C	
Cooling					2 x integral variable speed fans load dependant
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

## Temperature Derating Curve

Figure 15



## 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		For loads ≥10%
		Class C		
ESD	EN61000-4-2	3	A	
Radiated	EN61000-4-3	3	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation class 3	A	
		3	A	
Dips and Interruptions	EN61000-4-11	Dip: 30% 10 ms	A	
		Dip: 60% 100 ms	B	
		Dip: 100% 5000 ms	B	
	SEMI F47			Compliant

## Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55022	Class A		
Radiated	EN55022	Class A		
Voltage Fluctuations	EN61000-3-3			

## Safety Agency Approvals

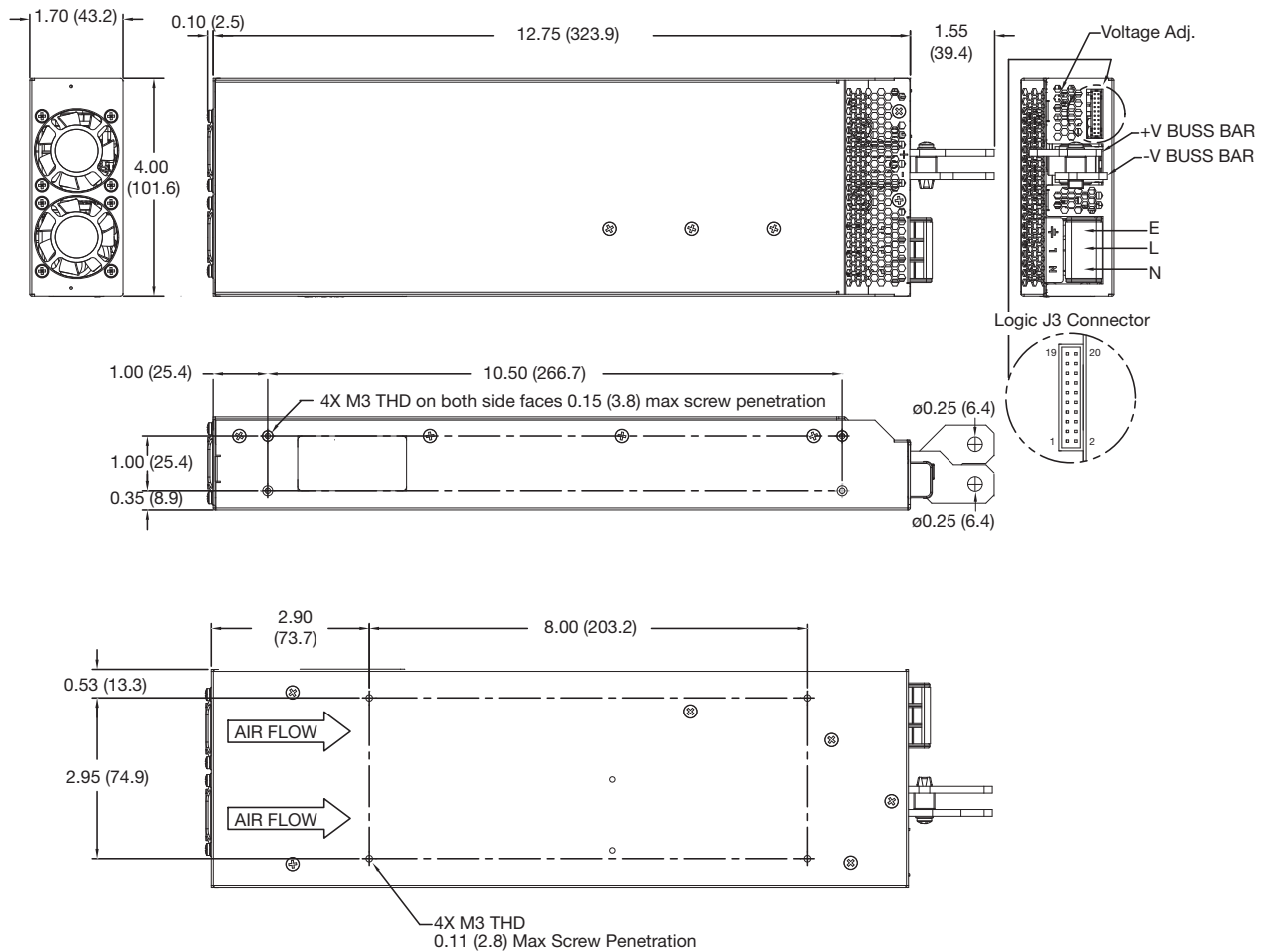
Safety Agency	Safety Standard	Category
CB Report	UL US/13910/UL IEC60950-1:2005 Ed 2	Information Technology
UL	UL File #139109 UL60950-1 (2007), CSA 22.2 No.60950-1-07 Ed 2	Information Technology
TUV	TUV Certificate # B 09 06 57396 060 EN60950-1/A11:2009	Information Technology
CE	LVD	
Industrial	SEMI F47	

Safety Agency	Safety Standard	Category
CB Report	Certificate #US/18302/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



Logic Connector: J3, JST, PN S20B-PHDSS (LF) SN					
Pin	Function	Pin	Function	Pin	Function
1	+ Sense	8	NC	15	DC OK
2	+ Sense	9	Inhibit	16	NC
3	- Sense	10	NC	17	Signal GND
4	- Sense	11	Fault	18	NC
5	Current Share	12	NC	19	5 V Standby Rtn (V2)
6	Current Share	13	AC OK	20	5 V Standby (V2)
7	V Program	14	NC		

Mates with JST PN PHDR-20VS, Crimp contacts JST PN SPHD-00IT-P0.5

**Notes:**

1. All dimensions are in inches (mm).
2. Weight 5.2 lbs (2.35 kg)