TRACO POWER

AC/DC Medical Power Supply

TPP 450A Series, 450 Watt

- **High power density 3" x 5" open frame medical power supply**
- **450 Watt with forced air cooling, up to 320 Watt convection cooled without derating up to 50°C**
- **Medical certification to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP**
- **EMC compliance to IEC/EN 60601-1-2 4th edition**
- **Risk management process according to ISO 14971 incl. risk management file**
- **Acceptance criteria for electronic assemblies acc. to IPC-A-610 class 3**
- **Isolation (4000 VAC) and leakage current (<100 µA) rated for BF applications**
- **Standard features: 5 V standby output 12 V fan output, Remote On/Off, Power Good Signal, variable fan speed**
- **Operating up to 5000 m altitude**
- **5-year product warranty**

ES 60601-1 IEC 60601-1
UL 62368-1 IEC 62368-1

The TPP 450A Series of 450 Watt AC/DC power supplies feature a reinforced double I/O isolation system according to latest medical safety standards (60601-1 3rd edition, 2 x MOPP). The earth leakage current is below 100 µA what makes the units suitable for BF (body floating) applications. The excellent efficiency of up to 94% allows a high power density for the standard 3" x 5" packaging format.
Natural convection cooled power up to 320 W at +50°C and 150W at +85°C. Thus you can power your medical device in a quiet and hygienic way as you don't need to run a fan to cool down the power supply. High reliability is provided by use of industrial quality grade components and an excellent thermal management. It makes the products an ideal solution for medical devices and for demanding safety and space critical applications.

Models

Order Code	Output Power max.	Output Voltage nom. (adjustable)	Output Current max. (Forced air cooling)	Output Current max. (Natural convection)	Efficiency typ.
TPP 450-112A-M	450 W	12 VDC (11.0 - 13.0 VDC)	37'500 mA	20'800 mA	91 %
TPP 450-115A-M		15 VDC (13.8 - 16.2 VDC)	30'000 mA	16'600 mA	92 %
TPP 450-124A-M		24 VDC (22.1 - 25.9 VDC)	18'750 mA	13'300 mA	93 %
TPP 450-128A-M		28 VDC (25.8 - 30.2 VDC)	16'100 mA	11'400 mA	93 %
TPP 450-136A-M		36 VDC (33.1 - 38.9 VDC)	12'500 mA	8'900 mA	93 %
TPP 450-148A-M		48 VDC (44.2 - 51.8 VDC)	9'400 mA	6'650 mA	94 %
TPP 450-153A-M		53 VDC (48.8 - 57.2 VDC)	8'550 mA	6'050 mA	94 %

Options

TPP 450-AUX1	- Optional cable for auxilary output connection (2 x 4 pin): www.tracopower.com/products/tpp450-aux1.pdf
TPP 450-AUX2	- Optional cable for auxilary output connection (2 x 5 pin): www.tracopower.com/products/tpp450-aux2.pdf

Input Specifications

Input Voltage	- AC Range		85 - 264 VAC (Full Range)
	- DC Range		120 - 370 VDC (Designed for, no certification)
Input Frequency			47 - 63 Hz
Input Current	- Full Load & Vin = 230 VAC		2'400 mA max.
	- Full Load & Vin = 115 VAC		5'800 mA max.
Power Consumption	- at no Load		500 mW max. (Ready to meet ErP directive)
Input Inrush Current	- at 230 VAC		100 A max.
Power Factor	- at 230 VAC		0.95 min. (Active Power Factor Correction)
	- at 115 VAC		0.95 min. (Active Power Factor Correction)
Input Protection			T 6.3 A / 250 VAC (Internal Fuse in L & N)

Output Specifications

Output Voltage Adjustment			±8% (By trim potentiometer) Output power must not exceed rated power!
Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)		0.2% max.
	- Load Variation (0 - 100%)		0.5% max.
Ripple and Noise (20 MHz Bandwidth)		12 VDC model:	250 mVp-p typ. (with 1 µF X7R)
		15 VDC model:	300 mVp-p typ. (with 1 µF X7R)
		24 VDC model:	240 mVp-p typ. (with 1 µF X7R)
		28 VDC model:	280 mVp-p typ. (with 1 µF X7R)
		36 VDC model:	360 mVp-p typ. (with 1 µF X7R)
		48 VDC model:	480 mVp-p typ. (with 1 µF X7R)
		53 VDC model:	530 mVp-p typ. (with 0.1 µF X7R)
Capacitive Load		12 VDC model:	31'250 µF max.
		15 VDC model:	20'000 µF max.
		24 VDC model:	7'820 µF max.
		28 VDC model:	5'750 µF max.
		36 VDC model:	3'500 µF max.
		48 VDC model:	1'960 µF max.
		53 VDC model:	1'600 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Hold-up Time	- at 230 VAC		12 ms min.
	- at 115 VAC		12 ms min.
Start-up Time	- at 230 VAC		2'000 ms max.
	- at 115 VAC		2'000 ms max.
Short Circuit Protection			Continuous, Automatic recovery (Level 1, nom.) Latch (Level 2, instantaneous high current)
Output Current Limitation			115 - 155% of Iout max.
Overvoltage Protection			110 - 135% of Vout nom. (Latch out, Standby Power Source always present)
Transient Response	- Response Deviation		3% max. (50% to 75% Load Step)
	- Response Time		600 µs typ. (50% to 75% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Medical Equipment	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 2 x MOPP (Means Of Patient Protection)
	- Certification Documents	www.tracopower.com/overview/tpp450a

All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Protection Class	Class I Prepared: Connection to PE
Pollution Degree	PD 2
Over Voltage Category	OVC II

EMC Specifications

EMC Emissions			EN 60601-1-2 edition 4 (Medical Devices)
	- Conducted Emissions		EN 55011 class B (internal filter)
			EN 55032 class B (internal filter)
			FCC Part 15, class B
			FCC Part 18, class B
	- Radiated Emissions		EN 55011 class A (internal filter)
			EN 55032 class A (internal filter)
			FCC Part 15, class A
			FCC Part 18, class A
	- Harmonic Current Emissions		EN 61000-3-2, class A
			EN 61000-3-2, class D
	- Voltage Fluctuations & Flicker		EN 61000-3-3
			(For optimal EMI performance the power supply should be mounted to a grounded aluminium plate (480 x 248 x 12 mm) with electrical contact to the four PCB mounting holes. To comply with safety standards, this plate must be grounded.)
EMC Immunity			EN 55024 (IT Equipment)
			EN 60601-1-2 edition 4 (Medical Devices)
	- Electrostatic Discharge	Air:	EN 61000-4-2, ±15 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±8 kV, perf. criteria A
	- RF Electromagnetic Field		EN 61000-4-3, 3 V/m, perf. criteria A
	- EFT (Burst)		EN 61000-4-4, ±2 kV, perf. criteria A
	- Surge	L to L:	EN 61000-4-5, ±1 kV, perf. criteria A
		L to PE:	EN 61000-4-5, ±2 kV, perf. criteria A
	- Conducted RF Disturbances		EN 61000-4-6, 20 Vrms, perf. criteria A
	- PF Magnetic Field		EN 61000-4-8, 30 A/m, perf. criteria A
	- Voltage Dips & Interruptions	230 VAC / 50 Hz:	EN 61000-4-11
			30%, 25 periods, perf. criteria A
			>95%, 0.5 periods, perf. criteria A
			>95%, 1 period, perf. criteria A
			>95%, 250 periods, perf. criteria B
		115 VAC / 60 Hz:	EN 61000-4-11
			30%, 25 periods, perf. criteria A
			>95%, 0.5 periods, perf. criteria A
			>95%, 1 period, perf. criteria A
			>95%, 250 periods, perf. criteria B

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Storage Temperature	–40°C to +85°C
Power Derating	- High Temperature	see application note www.tracopower.com/overview/tpp450a
	- Low Input Voltage	1.33 %/V below 100 VAC
Over Temperature Protection Switch off		110 to 125°C (Latch out, Standby Power Source always present)
Cooling System	- Option 1	Forced air cooling (with external fan, 21 CFM)
	- Option 2	Natural convection (20 LFM)
Fan Power Source	- Characteristic	Variable fan speed (temperature regulated)
	- Output Voltage	12 VDC
	- Output Current	500 mA max.

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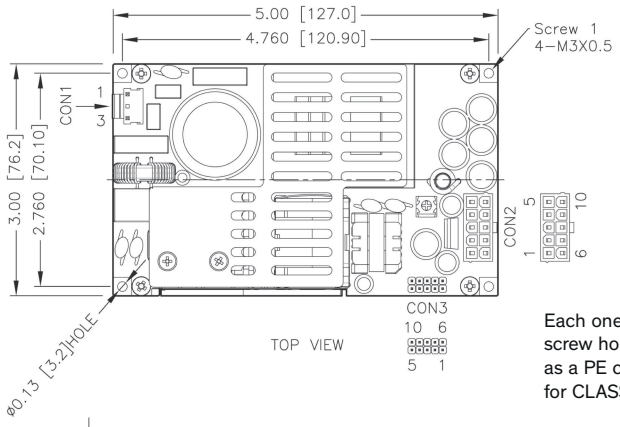
Standby Power Source	- Output Voltage	5 VDC
	- Output Current	2000 mA max.
Altitude During Operation		5'000 m max.
Switching Frequency		55 - 85 kHz (PFM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		312 VAC
Isolation Test Voltage	- Input to Output, 60 s	5'657 VDC
	- Input to Case or PE, 60 s	3'535 VDC
	- Output to Case or PE, 60 s	3'535 VDC
Isolation Resistance	- Input to Output, 500 VDC	100 MOhm min.
Leakage Current (264 VAC)	- Touch Current	100 µA max.
Reliability	- Calculated MTBF	410'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration	IEC 60068-2-6
	- Mechanical Shock	IEC 60068-2-27
Connection Type		JST
Weight		462 g
Power OK Signal		Open collector output
	- Power OK	Low level
	- Power Off	High resistance
		(Refers to 'PG' Pin)
	- Pin Specifications	50 VDC / 50 mA / 120 mW max.
Remote Control	- Voltage Controlled Remote	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to '+Remote' and '-Remote' Pin
	- Remote Pin Input Current	-0.5 to 1.0 mA (Standby power source is always present)
Environmental Compliance	- Reach	www.tracopower.com/info/reach-declaration.pdf
	- RoHS	www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents

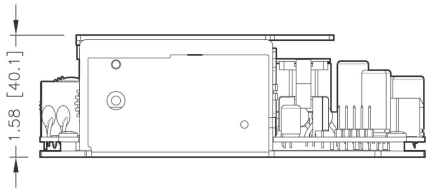
Overview Link (for additional Documents)	www.tracopower.com/overview/tpp450a

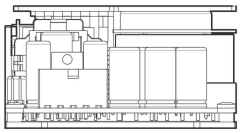
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Outline Dimensions



Each one of the 4 screw holes can be used as a PE connection for CLASS I application.





Dimensions in inch, [ ] = mm
Outside dimension tolerance: ±0.02 inch [±0.5 mm]
Hole spacing tolerance: ±0.01 inch [±0.25 mm]

Input	
CON1	
Pin	Function
1	AC (L)
3	AC (N)

Auxiliary	
CON3	
Pin	Function
1	+Fan
2	+Sense
3	+Remote
4	PG
5	+Standby
6	–Fan
7	–Sense
8	–Remote
9	No Pin
10	–Standby

Output	
CON2	
Pin*	Function
1-5	+Vout
6-10	–Vout

*Terminal rated for 13 A max. (at higher current connection has to be split)

CON1:
Molex housing:
09-50-8031
Molex crimp terminals:
2478,6838,45570

CON2:
Molex housing:
39-01-2105
Molex crimp terminals:
5556,45750

CON3:
Molex housing:
90143-0010
Molex crimp terminals:
90119

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