TRACO POWER

AC/DC Medical Power Supplies

TPP 450A Series, 450 Watt

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

IEC 60601-1 ES 60601-1
UL 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 × 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 is 320W up to +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.

Encased version see TPP 450 Series

www.tracopower.com/overview/tpp450

Models

Order Code	Output Power (max.)	Output Voltage (adj. ±8%)	Output Current natural convection	Output Current forced air cooling	Efficiency (typ.)
TPP 450-112A-M	450 Watt	12 VDC	20.8 A	37.5 A	91 %
TPP 450-115A-M		15 VDC	16.6 A	30.0 A	92 %
TPP 450-124A-M		24 VDC	13.3 A	18.75 A	93 %
TPP 450-136A-M		36 VDC	8.86 A	12.5 A	93 %
TPP 450-148A-M		48 VDC	6.65 A	9.4 A	94 %

Input Specifications

Input voltage range	– AC range (universal input) – DC range – Power derating at low input voltage		85 – 264 VAC (47 – 63 Hz) 120 – 370 VDC 1.33 %/V below 100 VAC
Input current at full load	– at 100 VAC – at 240 VAC		5.8 A max. 2.4 A max.
Input protection	– Internal fuse in line and neutral		T 6.3 A / 250 VAC
Zero load power consumption	(acc. ErP directive)	12 Vout models: other output models:	0.3 W typ. 0.5 W typ.
Leakage current	– at 264 VAC		100 µA max.
Power factor			0.95 min. (active power correction)

Output Specifications

Voltage set accuracy	– at 230 VAC		± 1%
Output voltage adjustment			± 8%
Regulation	– Input variation (85 - 264 VAC) – Load variation (0 - 100%)		0.2% max. 0.5% max.
Minimum load			not required
Temperature coefficient			0.02 %/K max.
Hold-up time	– at 115 VAC		14 ms typ.
Start-up time			2 s max.
Rise time			30 ms typ.
Ripple and noise (20 MHz Bandwidth)		12 VDC model: 15 VDC model: 24 VDC model: 36 VDC model: 48 VDC model:	250 mVp-p typ. (w. cap. 1µF/25V 1206 X7R MLCC) 300 mVp-p typ. (w. cap. 1µF/25V 1206 X7R MLCC) 240 mVp-p typ. (w. cap. 1µF/50V 1206 X7R MLCC) 360 mVp-p typ. (w. cap. 1µF/50V 1206 X7R MLCC) 480 mVp-p typ. (w. cap. 1µF/50V 1206 X7R MLCC)
Transiente response	– Peak deviation (50 - 75% load change) – Recovery time		3% Vout typ. 600 µs typ.
Overvoltage protection (Featured by main power output)			110 – 135% of Vout (latch mode)
Overload protection (Featured by main power output and standby power output)			115 – 150% of Iout max. (current limitation)
Short circuit protection (Featured by all outputs)	– Protection level 1 (nominal) – Protection level 2 (instantaneous high current)		continuous, automatic recovery (hiccup mode) latch
Auxiliary outputs	– Power source for fan (variable fan speed control) – Standby power source		12 VDC / 500 mA max. Refers to pin +Fan and –Fan 5 VDC / 2000 mA max. Refers to pin +Standby and –Standby
Capacitive load		12 Vout model: 15 Vout model: 24 Vout model: 36 Vout model: 48 Vout model:	31‘250 µF max. 20‘000 µF max. 7'820 µF max. 3'500 µF max. 1'960 µF max.

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

General Specifications

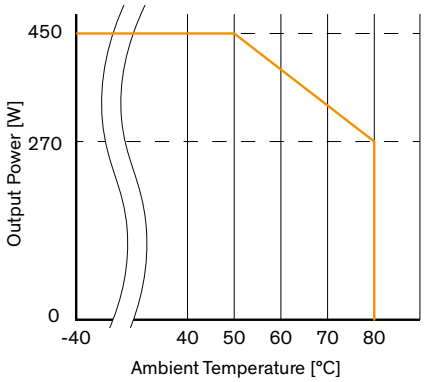
Operating temperature		–40°C to +85°C see thermal considerations for power derating
Storage temperature		–40°C to +85°C
Over temperature protection		Applies at 110 – 125°C (latch out) Standby power source is allways present
Humidity (non condensing)		5 – 95 % rel. H
Altitude during operation		5000 m max.
Switching frequency	– at 230 VAC 15 Vout models: other output models:	75 kHz typ. (pulse frequency modulation) 65 kHz typ. (pulse frequency modulation)
Isolation voltage (2 × MOPP insulation)	– Input to output (60 s) – Input/output to field ground (60 s)	4000 VAC 2500 VAC
Isolation resistance	– at 500 VDC	100 MOhm min.
Reliability	– calculated MTBF at +25°C acc. to MIL-HDBK-217F	400‘000 h
Protection class *		class I
EMC emissions *	– conducted input emission – radiated emission – Medical devices emission limits – Harmonic current emissions – Voltage flicker	EN 55032, class B EN 55032, class A IEC 60601-1-2 ed.4 IEC / EN 61000-3-2, class A and D IEC / EN 61000-3-3
EMC immunity	– Electrostatic discharge (ESD) – RF field immunity – Electrical fast transients/burst immunity – Surge – Conducted RF – Magnetic field (only for single output models) – Voltage dips and interruptions	EN 60601-1-2 ed.4, EN 55024, IEC 61000-6-2 EN 61000-4-2, ±15 kV air, ±8 kV contact perf. criteria A EN 61000-4-3, 3 V/m perf. criteria A EN 61000-4-4, ±2 kV perf. criteria A EN 61000-4-5, ±1 kV line to line, ±2kV line to ground, perf. criteria A EN 61000-4-6, 20 Vrms perf. criteria A EN 61000-4-8, 30 A/m perf. criteria A EN 61000-4-11 EN 60601-1-2 (perf. criterias pending)
Safety standards	– Medical equipment – IT and multimedia equipment – Certification documents	IEC/EN 60601-1 3rd edition, ANSI/AAMI ES 60601-1:2005(R)2012 UL 62368-1 www.tracopower.com/overview/tpp450a
Environment	– Vibration – Shock – Thermal shock	acc. IEC 60068-2-6 acc. IEC 60068-2-27 acc. MIL-STD-810F
Environmental compliance	– Reach – RoHS	www.tracopower.com/info/reach-declaration.pdf RoHS directive 2011/65/EU
Connection		Pin terminal
Remote control	– On – Off (Standby power source is allways present) – Input current of Remote-pins	Open or 3 to 12 VDC Short or 0 to 1.2 VDC Applied between +Remote and –Remote pin –0.5 to 1.0 mA max.
PG - Power good signal	– Power good – Power off – PG-pin maximum ratings	Open collector type Low level (indicated by PG-pin) High resistance (indicated by PG-pin) 50 VDC max. / 50 mA max. / 120 mW max.

* For optimal EMI performance the power supply should be mounted to a grounded aluminium plate (480×248×12 mm) with electrical contact to the four PCB mounting holes. To comply with safety standards, this plate must be grounded to PE.

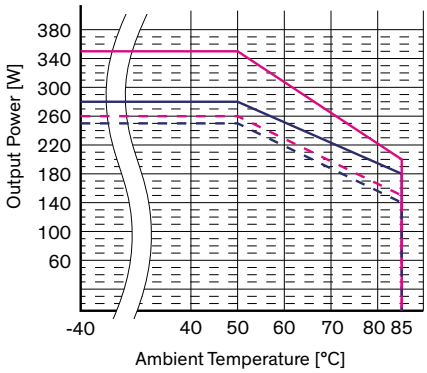
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Thermal Cosiderations

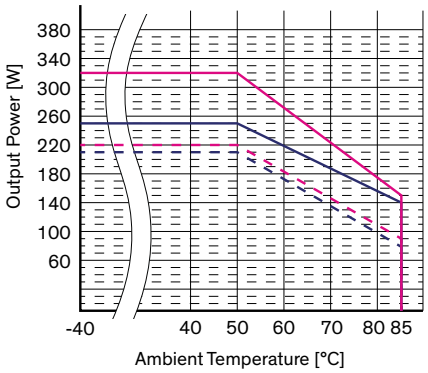
Forced air cooling of 21 CFM (external fan)



Mounted to a thermal conducting metal plate or chassis (480x248x12 mm)



Natural convection



all models at input voltage 115 or 230 VAC

12 &15 Vout models at input voltage 230 VAC

12 &15 Vout models at input voltage 115 VAC

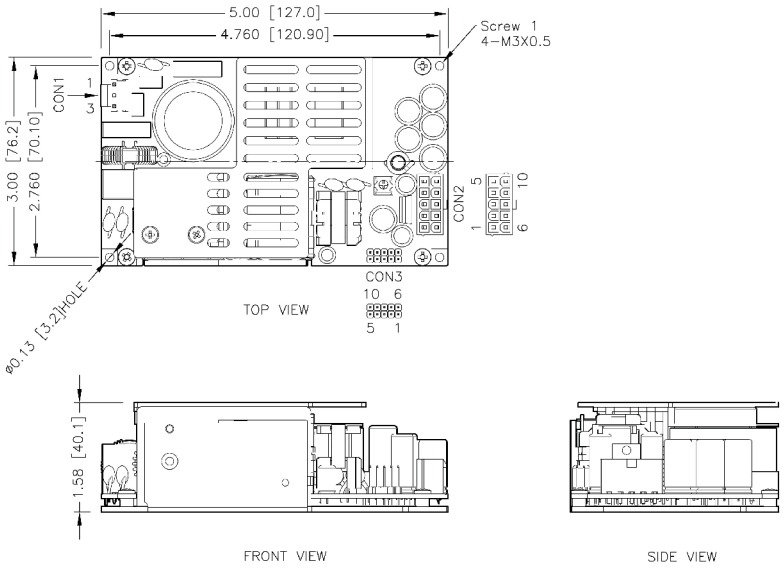
other output models at input voltage 230 VAC

other output models at input voltage 115 VAC

The units are optionally available with casing and internal fan to meet the considerations for forced air cooling (see TPP 450 Series).

The thermal considerations refer to the test setup (horizontal mounting) for certification.
Temperature reference positions for to determine the effective temperature limits in the application will be advised.

Dimension



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

Output	
CON 2	
Pin	Function
1-5	+Vout
6-10	–Vout

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

CON 1:
Molex housing:
09-50-8031
Molex crimp terminals:
2478,6838,45570

CON 2:
Molex housing:
39-01-2105
Molex crimp terminals:
5556,45750

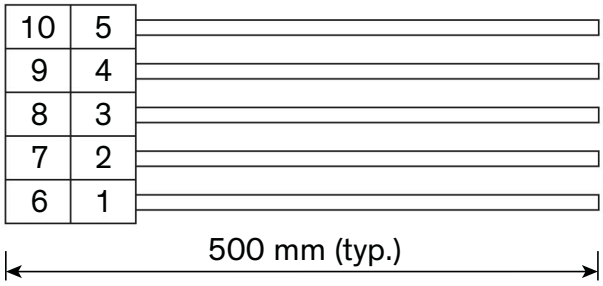
CON 3:
Molex housing:
90143-0010
Molex crimp terminals:
90119

Weight: 462 g (16.29 oz)

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

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

Optional cable for auxilary output connection



Order code	Connection
TPP 450-AUX2	2 × 5 pin
TPP 450-AUX1	2 × 4 pin

Auxilary cables

Pin	AUX2	AUX1	Color	AWG
1	+Fan	No Wire	yellow	26
2	+Sense		gray	26
3	+Remote		orange	26
4	PG		blue	26
5	+Standby		red	22
6	–Fan	No Wire	brown	26
7	–Sense		green	26
8	–Remote		brown	26
9	No Wire		---	---
10	–Standby		black	22