

AC/DC Medical Power Supply

TPP 40 Series, 40 Watt

- Enclosed power supply with screw terminal connection
- Certification according to IEC/EN/ES 60601-1 edition 3.2 for 2 x MOPP
- Low leakage current <75 µA rated for BF applications
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- EMC compliance to IEC 60601-1-2 ed. 4
- Protection class I and II prepared
- Operating up to 5000 m altitude
- Ready to meet ErP directive, <0.15 W no load power consumption
- 5-year product warranty



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

The TPP 40 Series of 40 Watt AC/DC power supplies feature a reinforced double I/O isolation system according to latest medical safety standards IEC/EN/ES 60601-1 edition 3.2 for 2 x MOPP up to 5000 m altitude. The leakage current is below 75 µA what makes the units suitable for BF (body floating) applications.

The excellent efficiency of up to 92% allows a high power density for the standard 2.38" x 3.53" packaging format. The full load operating temperature range is -40°C to +70°C while it goes up to 85°C with 50% load derating. The EMC characteristic complies to IEC 60601-1-2 ed.4 and is dedicated for applications in industrial and domestic fields. 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	Output 1		Output 2		Output 3		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	Vnom	I _{max}	
TPP 40-105	40 W	5 VDC	8'000 mA					90 %
TPP 40-112		12 VDC	3'340 mA					92 %
TPP 40-115		15 VDC	2'670 mA					92 %
TPP 40-124		24 VDC	1'670 mA					92 %
TPP 40-221		+12 VDC	3'340 mA	+5 VDC	6'000 mA			89 %
TPP 40-231		+15 VDC	2'670 mA	+5 VDC	6'000 mA			89 %
TPP 40-251		+24 VDC	1'670 mA	+5 VDC	6'000 mA			86 %
TPP 40-321M2		+12 VDC	3'340 mA	+5 VDC	6'000 mA	-12 VDC	500 mA	88 %
TPP 40-331M3		+15 VDC	2'670 mA	+5 VDC	6'000 mA	-15 VDC	500 mA	88 %
TPP 40-3512		+24 VDC	1'670 mA	+5 VDC	6'000 mA	+12 VDC	500 mA	86 %

Note - Total output power must not exceed 40 W.
- Other output models are available on request.

Input Specifications

Input Voltage	- AC Range	Operational Range: 85 - 264 VAC (Full Range) Rated Range: 100 - 240 VAC (Full Range)
	- DC Range	Operational Range: 120 - 370 VDC (Designed for, no certification) Polarity: +DC: L / -DC: N
Input Frequency		Operational Range: 47 - 440 Hz Certified: 50/60 Hz
Power Consumption	- No load & Vin = 230 VAC	150 mW max. (Ready to meet ErP directive)
	- No load & Vin = 115 VAC	150 mW max.
Input Current	- Full load & Vin = 230 VAC	single output models: 500 mA max. dual output models: 550 mA max. triple output models: 550 mA max.
		single output models: 1'000 mA max. dual output models: 1'050 mA max. triple output models: 1'050 mA max.
	- Full load & Vin = 115 VAC	single output models: 1'000 mA max. dual output models: 1'050 mA max. triple output models: 1'050 mA max.
Input Inrush Current	- At 230 VAC	60 A max.
	- At 115 VAC	35 A max.
Input Protection		T 3.15 A / 250 VAC (Internal Fuse in L & N)
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)

Output Specifications

Output Voltage Adjustment		±10% (only single output models) (By trim potentiometer) Output power must not exceed rated power!
Voltage Set Accuracy		±1% max. (Output 1) ±2% max. (Output 2 and 3)
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.2% max. dual output models: 0.2% max. triple output models: 0.2% max.
		single output models: 0.7% max. (5 VDC model) 0.5% max. (other output models)
		dual output models: 0.5% max. (Output 1) 1.5% max. (Output 2)
	- Load Variation (0 - 100%)	triple output models: 0.5% max. (Output 1) 1.5% max. (Output 2) 0.7% max. (Output 3)
		dual output models: 1.5% max.
		triple output models: 1.5% max.
	- Cross Regulation (25% / 100% asym. load)	dual output models: 1.5% max.
		triple output models: 1.5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	5 VDC model: 75 mVp-p typ. (w/ 10 µF X7R) 12 VDC model: 75 mVp-p typ. (w/ 10 µF X7R) 15 VDC model: 75 mVp-p typ. (w/ 10 µF X7R) 24 VDC model: 75 mVp-p typ. (w/ 1 µF X7R)
		12 / 5 VDC model: 120 / 100 mVp-p typ. (w/ 10 µF X7R) 15 / 5 VDC model: 150 / 100 mVp-p typ. (w/ 10 µF X7R) 24 / 5 VDC model: 240 / 100 mVp-p typ. (w/ 10 µF X7R)
		12 / 5 / -12 VDC model: 120 / 100 / 120 mVp-p typ. (w/ 10 µF X7R) 15 / 5 / -15 VDC model: 150 / 100 / 150 mVp-p typ. (w/ 10 µF X7R) 24 / 5 / 12 VDC model: 240 / 100 / 120 mVp-p typ. (w/ 10 µF X7R)
	- dual output	
	- triple output	

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

Capacitive Load	- single output	5 VDC model:	16'000 µF max.
		12 VDC model:	2'785 µF max.
		15 VDC model:	1'780 µF max.
		24 VDC model:	700 µF max.
	- dual output	12 / 5 VDC model:	1'750 / 2'000 µF max.
		15 / 5 VDC model:	1'670 / 2'000 µF max.
		24 / 5 VDC model:	440 / 2'000 µF max.
	- triple output	12 / 5 / -12 VDC model:	1'750 / 2'000 / 420 µF max.
		15 / 5 / -15 VDC model:	1'670 / 2'000 / 420 µF max.
		24 / 5 / 12 VDC model:	440 / 2'000 / 420 µF max.
Minimum Load		Not required (0.5 W for Vout1 and Vout2 if Vout3 = Full Load)	
Temperature Coefficient		±0.02 %/K max.	
Hold-up Time	- At 115 VAC	25 ms min.	
Start-up Time	- At 230 VAC	1'000 ms max.	
Short Circuit Protection		Continuous, Automatic recovery	
Output Current Limitation		115 - 180% of Iout max. (Pout 1 + Pout 2) 145% typ. of Iout max. (Pout 1 + Pout 2)	
Overvoltage Protection		125 - 140% of Vout nom. (only Output 1)	
Transient Response	- Response Deviation	3% max. (50% to 75% Load Step)	
	- Response Time	600 µs typ. (50% to 75% Load Step) (Only Output 1)	

Safety Specifications

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/tpp40
	Protection Class	Class I & II (Prepared): Reinforced Insulation
	Pollution Degree	PD 2
	Over Voltage Category	OVC II

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 60601-1-2 edition 4 (Medical Devices)
		EN 55011 class B (internal filter)
		EN 55032 class B (internal filter)
	- Radiated Emissions	FCC 47 Part 18 class B (internal filter)
		EN 55011 class B (internal filter)
		EN 55032 class B (internal filter)
		FCC 47 Part 18 class B (internal filter)
	- Harmonic Current Emissions	EN 61000-3-2, class A
	- Voltage Fluctuations & Flicker	EN 61000-3-3

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

EMS (Immunity)		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, 20 V/m, perf. criteria A
- EFT (Burst) / Surge		EN 61000-4-4, ± 2 kV, perf. criteria A
	L to L:	EN 61000-4-5, ± 1 kV, perf. criteria A
- Conducted RF Disturbances		EN 61000-4-6, 20 Vrms, perf. criteria A
- PF Magnetic Field	Continuous:	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
EMC / Environmental	- Certification Documents	www.tracopower.com/overview/tpp40

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	Depending on model
	- Low Input Voltage	Depending on model
	See application note: www.tracopower.com/overview/tpp40	
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		50 - 140 kHz (PWM) (Output 1)
		750 kHz typ. (PWM) (Output 2)
		510 kHz typ. (PWM) (Output 3)
Insulation System		Reinforced Insulation
Working Voltage (rated)		258 VAC
Isolation Test Voltage	- Input to Output, 60 s	4'000 VAC
	- Input to Case or PE, 60 s	2'500 VAC
	- Output to Case or PE, 60 s	2'500 VAC
Creepage	- Input to Output	8 mm min.
Clearance	- Input to Output	8 mm min.
Isolation Resistance	- Input to Output, 500 VDC	100 M Ω min.
Leakage Current (at 264 VAC)	- Touch Current	75 μ A max.
Reliability	- Calculated MTBF	3'000'000 h (for single output models)
		1'700'000 h (for multi output models)
		(MIL-HDBK-217F, ground benign)
Environment	- Vibration	IEC 60068-2-6
		5 g, 3 axis, sine sweep, 5-500 Hz, 1 oct/min
	- Mechanical Shock	IEC 60068-2-27
		50 g, 3 axis, half sine, 11 ms
Housing Material		Aluminum
Housing Type		Metal Case
Mounting Type		Chassis Mount
Connection Type		Screw Terminal
Weight	- single output	169 g
	- dual output	216 g
	- triple output	216 g

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

Environmental Compliance - REACH Declaration

- RoHS Declaration

- SCIP Reference Number

www.tracopower.com/info/reach-declaration.pdf

REACH SVHC list compliant

REACH Annex XVII compliant

www.tracopower.com/info/rohs-declaration.pdf

Exemptions: 7a, 7c-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)

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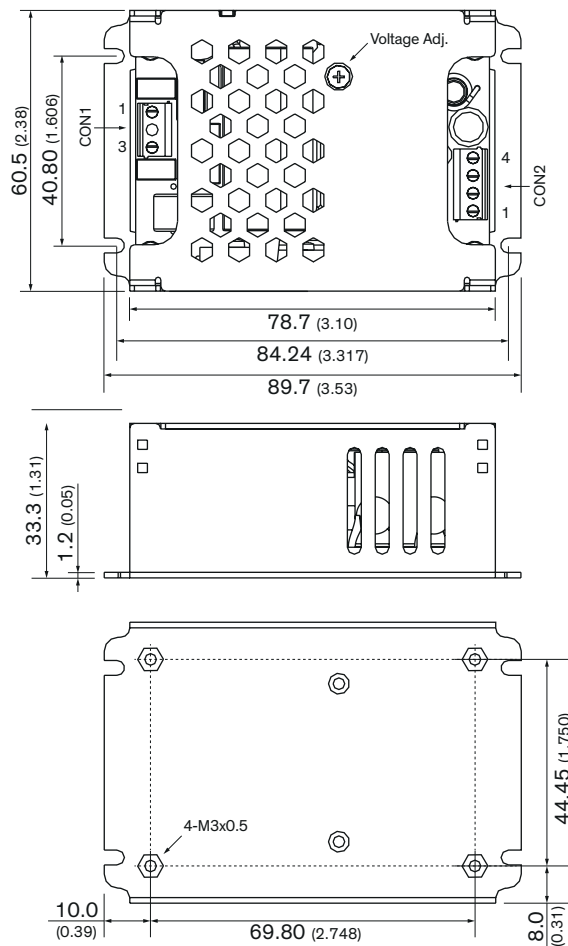
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tpp40

Outline Dimensions

Single Output Models



Max. corner screw penetration: 2.3 (0.09)
Max. center screw penetration: 2.0 (0.08)

All dimensions in mm (inch)

Tolerance: X.X $\pm$ 0.5 (X.XX $\pm$ 0.02)

X.XX $\pm$ 0.25 (X.XXX $\pm$ 0.010)

Mounting screw locked torque:
max. 4.2 kgfcm / 0.41 Nm

Screw Terminal

Input (CON1)		Output (CON2)	
Pin	Function	Pin*	Function
1	Line	1,2	-Vout
3	Neutral	3,4	+Vout

* Terminal rated for 10 A max.
(at higher current connection has to be split)

CON1: Terminal Block

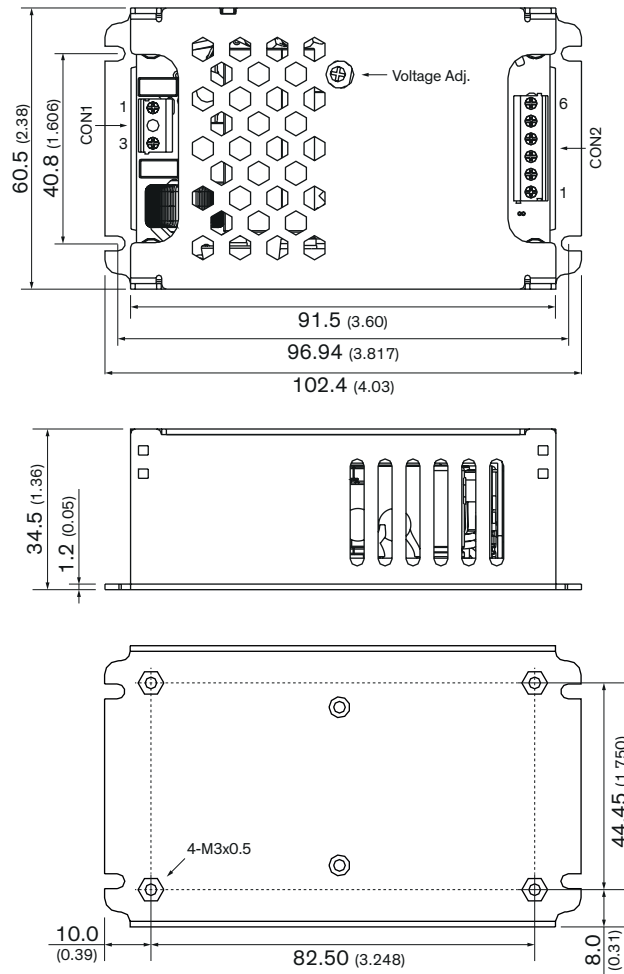
Max. screw locked torque 2 kgfcm / 0.2 Nm
Wire dimension range: 26 - 16 AWG

CON2: Terminal Block

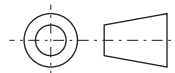
Max. screw locked torque 2 kgfcm / 0.2 Nm
Wire dimension range: 26 - 16 AWG

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Multi Output Models



Max. corner screw penetration: 2.3 (0.09)
Max. center screw penetration: 2.0 (0.08)



All dimensions in mm (inch)
Tolerance: X.X ± 0.5 (X.XX ± 0.02)
X.XX ± 0.25 (X.XXX ± 0.010)

Mounting screw locked torque:
max. 4.2 kgfcm / 0.41 Nm

Screw Terminal

Input (CON1)		Output (CON2)	
Pin	Function	Pin*	Function
1	Line	1	Vout 3**
3	Neutral	2,3	COM
		4,5	Vout 2
		6	Vout 1

* Terminal rated for 10 A max.
(at higher current connection has to be split)

** Not connected on dual output models

CON1: Terminal Block
Max. screw locked torque 2 kgfcm / 0.2 Nm
Wire dimension range: 26 - 16 AWG

CON2: Terminal Block
Max. screw locked torque 2 kgfcm / 0.2 Nm
Wire dimension range: 26 - 16 AWG