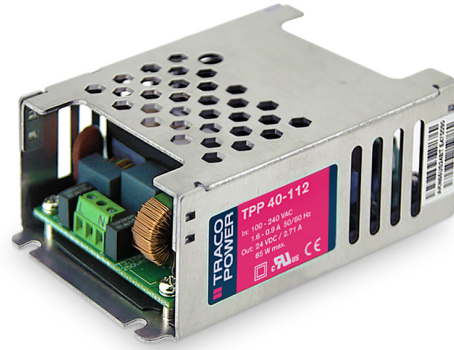


## AC/DC Medical Power Supply

## TPP 40 Series, 40 Watt

- Enclosed power supply with screw terminal connection
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Low leakage current <75  $\mu$ A 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

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 3rd edition for 2 x MOPP up to 5000 m altitude. The earth leakage current is below 75  $\mu$ A 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 2.44" x 3.0" packaging format. The full load operating temperature range is  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  while it goes up to  $85^{\circ}\text{C}$  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 <sub>max</sub>	Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
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.
  - Multi output models have a common ground.

### Input Specifications

Input Voltage	- AC Range - DC Range	85 - 264 VAC (Full Range) 120 - 370 VDC (Designed for, no certification)
Input Frequency		47 - 63 Hz
Input Current	- Full Load & Vin = 230 VAC - Full Load & Vin = 115 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.
Power Consumption	- At no load	150 mW max. (Ready to meet ErP directive)
Input Inrush Current	- at 230 VAC	60 A max.
Input Protection		T 3.15 A / 250 VAC (Internal Fuse in L & N)

### Output Specifications

Output Voltage Adjustment		±10% (By trim potentiometer) (only Output 1) 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) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	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) 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.
Ripple and Noise (20 MHz Bandwidth)	- single output - dual output - triple output	5 VDC model: 75 mVp-p typ. (with 10 µF X7R) 12 VDC model: 75 mVp-p typ. (with 10 µF X7R) 15 VDC model: 75 mVp-p typ. (with 10 µF X7R) 24 VDC model: 75 mVp-p typ. (with 1 µF X7R) 12 / 5 VDC model: 120 / 100 mVp-p typ. (with 10 µF X7R) 15 / 5 VDC model: 150 / 100 mVp-p typ. (with 10 µF X7R) 24 / 5 VDC model: 240 / 100 mVp-p typ. (with 10 µF X7R) 12 / 5 / -12 VDC model: 120 / 100 / 120 mVp-p typ. (with 10 µF X7R) 15 / 5 / -15 VDC model: 150 / 100 / 150 mVp-p typ. (with 10 µF X7R) 24 / 5 / 12 VDC model: 240 / 100 / 120 mVp-p typ. (with 10 µF X7R)
Capacitive Load	- single output - dual output - triple 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. 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. 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.

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

Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		115 - 180% of I <sub>out</sub> max. 145% typ. of I <sub>out</sub> max. (P <sub>out</sub> 1 + P <sub>out</sub> 2)
Overvoltage Protection		125 - 140% of V <sub>out</sub> nom. (only Output 1)
Transient Response	- Response Deviation - Response Time	3 % max. (50% to 75% Load Step) 600 μs typ. (50% to 75% Load Step) (Only Output 1)

## Safety Specifications

Safety Standards	- Medical Equipment  - Certification Documents	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 2 x MOPP (Means Of Patient Protection)
Protection Class		Class I (Prepared): Connection to PE Class II (Prepared): Reinforced Insulation
Pollution Degree		PD 2
Over Voltage Category		OVC II

## EMC Specifications

EMI Emissions	- Conducted Emissions  - Radiated Emissions  - Harmonic Current Emissions - Voltage Fluctuations & Flicker	EN 60601-1-2 edition 4 (Medical Devices) EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 18, class B EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 18, class B EN 61000-3-2, class A EN 61000-3-3
EMS Immunity	- Electrostatic Discharge  - RF Electromagnetic Field - EFT (Burst) / Surge  - Conducted RF Disturbances - PF Magnetic Field - Voltage Dips & Interruptions	EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, ±15 kV, perf. criteria A Contact: EN 61000-4-2, ±8 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A L to L: EN 61000-4-5, ±1 kV, perf. criteria A L to PE: EN 61000-4-5, ±2 kV, perf. criteria A EN 61000-4-6, 20 V <sub>rms</sub> , perf. criteria A Continuous: EN 61000-4-8, 30 A/m, perf. criteria A 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 - Storage Temperature	-40°C to +85°C -40°C to +85°C

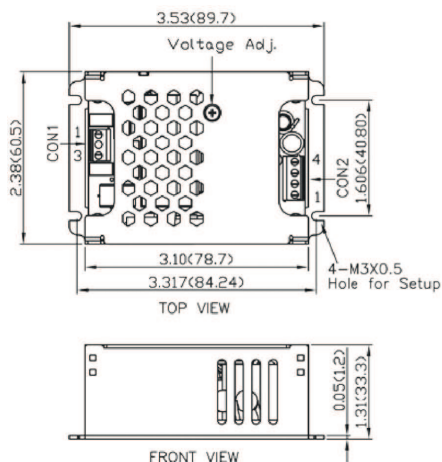
All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.

Power Derating	- High Temperature - Low Input Voltage	
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
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 - Input to Case or PE, 60 s - Output to Case or PE, 60 s	4'000 VAC 2'500 VAC 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 MΩ min.
Leakage Current (at 264 VAC)	- Touch Current	75 μA 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  - Mechanical Shock	IEC 60068-2-6 3 axis, sine sweep, 10 - 55 Hz, 1 g, 1 oct/min IEC 60068-2-27 3 axis, 10 g half sine, 11 ms shock 20 g (3 directions each 3 times)
Housing Material		Aluminium
Connection Type		Screw Terminal
Weight	- single output - dual output - triple output	169 g 216 g 216 g
Environmental Compliance	- Reach - RoHS	

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

## Outline Dimensions

### Single Output Models



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:  $\pm 0.02$  inch ( $\pm 0.5$  mm)  
Hole spacing tolerance:  $\pm 0.01$  inch ( $\pm 0.25$  mm)

### Screw Terminal

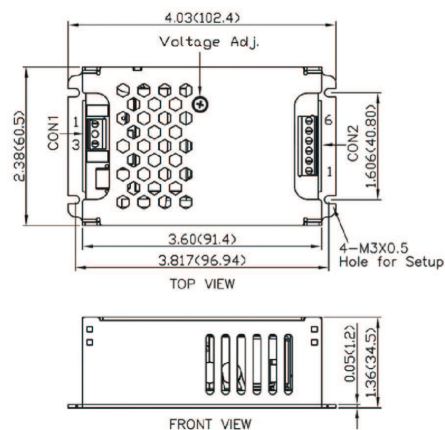
Input (CON1)		Output (CON2)	
Pin	Function	Pin*	Function
1	Line	1,2	-Vout
3	Neutral	3,4	+Vout

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

**CON1:** Terminal Block  
mates with Screw locked torque MAX 2Kgf.cm/0.2N.m  
Wire dimension range: 26 - 16 AWG

**CON2:** Terminal Block  
mates with Screw locked torque MAX 2Kgf.cm/0.2N.m  
Wire dimension range: 26 - 16 AWG

### Multi Output Models



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:  $\pm 0.02$  inch ( $\pm 0.5$  mm)  
Hole spacing tolerance:  $\pm 0.01$  inch ( $\pm 0.25$  mm)

### 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)

**CON1:** Terminal Block  
mates with Screw locked torque MAX 2Kgf.cm/0.2N.m  
Wire dimension range: 26 - 16 AWG

**CON2:** Terminal Block  
mates with Screw locked torque MAX 2Kgf.cm/0.2N.m  
Wire dimension range: 26 - 16 AWG

Specifications can be changed without notice.

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