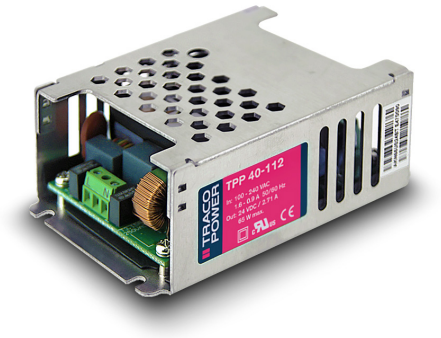
# TRACO POWER

## 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×MOPP**
- **Low leakage current <75 µA rated for BF applications**
- **Risk management process according to ISO 14971 including risk management file**
- **Acceptance criteria for electronic assemblies according to IPC-A-610 Level 3**
- **EMC emission to IEC 60601-1-2 ed.4**
- **Protection class I and II**
- **Approved for operation up to 5000 m MSL**
- **Ready to meet ErP directive, < 0.15 W no load power consumption**
- **5 year product warranty**




ErP ready · CE · CB Scheme · prepared · cULus ES 60601-1

**Open frame version with pin connection see TPP 40A Series**

**www.tracopower.com/overview/tpp40a**

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 × MOPP up to 5000 m MSL. The earth 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 2.44" x 3.0" 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 voltage | | | Output current max. | | | Efficiency max. |
|---|---|---|---|---|---|---|---|
| | Vout 1 | Vout 2 | Vout 3 | Vout 1 | Vout 2 | Vout 3 | |
| **TPP 40-105** | 5 VDC | | | 8.0 A | | | 90 % |
| **TPP 40-112** | 12 VDC | | | 3.34 A | | | 92 % |
| **TPP 40-115** | 15 VDC | | | 2.67 A | | | 92 % |
| **TPP 40-124** | 24 VDC | | | 1.67 A | | | 92 % |
| **TPP 40-221** | +12 VDC | +5 VDC | | 3.34 A | 4 A | | 89 % |
| **TPP 40-231** | +15 VDC | +5 VDC | | 2.67 A | 4 A | | 88.5 % |
| **TPP 40-251** | +24 VDC | +5 VDC | | 1.67 A | 4 A | | 86 % |
| **TPP 40-321M2** | +12 VDC | +5 VDC | –12 VDC | 3.34 A | 4 A | 0.5 A | 88 % |
| **TPP 40-331M3** | +15 VDC | +5 VDC | –15 VDC | 2.67 A | 4 A | 0.5 A | 88 % |
| **TPP 40-3512** | +24 VDC | +5 VDC | +12 VDC | 1.67 A | 4 A | 0.5 A | 86 % |

Note: - Vout 1 is ajustable by ±10% with internal potentiomet
- Multi output models have a common ground (not isolated)
- Total power should not exceed 40 Watt for continuose operation
- Other output voltages are available on request

## Input Specifications

| | | | |
|---|---|---|---|
| Input voltage range | – AC range (universal input)<br>– DC range | | 85 – 264 VAC<br>120 – 370 VDC |
| Input frequency | | | 47 – 63 Hz |
| Input current at full load | – at 115 VAC / 230 VAC | | 1.05 A max. / 0.55 A max. |
| Input protection | | | T3.15 A/250 VAC (internal fuse in both line & neutral) |
| Input inrush current | – at 230 VAC | | 60 A max. |
| Zero load power consumption | | | 0.15 W max. (acc. ErP directive) |

## Output Specifications

| | | | |
|---|---|---|---|
| Voltage set accuracy | | single output:<br>multi output: | ±1%<br>±1% Vout1<br>±2% Vout2, Vout3 |
| Regulation - single output | – Input variation<br>– Load variation (0 - 100%) | <br>5 VDC model:<br>other models: | 0.2% max.<br>0.7% max.<br>0.5% max. |
| Regulation - multi output | – Input variation<br>– Load variation (0 - 100%)<br><br><br>– cross regulation (25% / 100%) | <br>Vout1:<br>Vout2:<br>Vout3: | 0.2% max.<br>0.5% max.<br>1.5% max. (0.1W to full load: 0.7% max.)<br>0.7% max.<br>1.5% max. |
| Minimum load | | | not required (Vout 3 requires 0.5 W over Vout 1/Vout 2 to be stabilized) |
| Temperature coefficient | | | 0.02%/K |
| Hold-up time | – Vin = 115 VAC | | 25 ms typ. |
| Start-up time | | | <1s |
| Rise time | | | 20 ms typ. |
| Ripple and noise (20MHz Bandwidth) | - single output model<br><br>- multi output Vout 1<br><br><br>– Vout 2<br>– Vout 3 | 5-15 VDC outputs:<br>24 VDC output:<br>12 VDC:<br>15 VDC:<br>24 VDC<br>5 VDC:<br>(-)12 VDC:<br>15 VDC: | 75 mVp-p typ. w. cap. 10µF/25V 1206 X7R MLCC<br>75 mVp-p typ. w. cap. 1µF/50V 1206 X7R MLCC<br>120 mVp-p typ. w. cap. 1µF/50V 1206 X7R MLCC<br>150 mVp-p typ. w. cap. 1µF/50V 1206 X7R MLCC<br>240 mVp-p typ. w. cap. 1µF/50V 1206 X7R MLCC<br>100 mVp-p typ. w. cap. 10µF/25V 1206 X7R MLCC<br>120 mVp-p typ. w. cap. 10µF/25V 1206 X7R MLCC<br>150 mVp-p typ. w. cap. 10µF/25V 1206 X7R MLCC |
| Overvoltage protection | | | 125 – 140% of nominal Vout |
| Current limitation | | single output:<br>multi output: | at 145% Iout typ.<br>at 145% Pout1 +Pout2 |
| Short circuit protection | | | hiccup mode (automatic recovery) |
| Transiente response | – Peak deviation<br>– Recovery time | Vout1: | 3% max. (25% load step change)<br>600 µs typ. |
| Capacitive load | | 5 VDC output model:<br>12 VDC output model:<br>15 VDC output model:<br>24 VDC output model:<br>+12 VDC / +5 VDC output model:<br>+15 VDC / +5 VDC output model:<br>+24 VDC / +5 VDC output model:<br>+12 VDC / +5 VDC / -12 VDC output model:<br>+15 VDC / + 5 VDC / -15 VDC output model:<br>+24 VDC / +5 VDC / -12 VDC output model: | 16‘000 µF max.<br>2,785 µF max.<br>1‘780 µF max.<br>700 µF max.<br>1‘750 µF / 2’000 µF max.<br>1‘670 µF / 2’000 µF max.<br>440 µF / 2’000 µF max.<br>1‘750 µF / 2’000 µF / 420 µF max.<br>1‘670µF / 2’000 µF / 420 µF max.<br>440 µF / 2’000 µF / 420 µF max. |

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

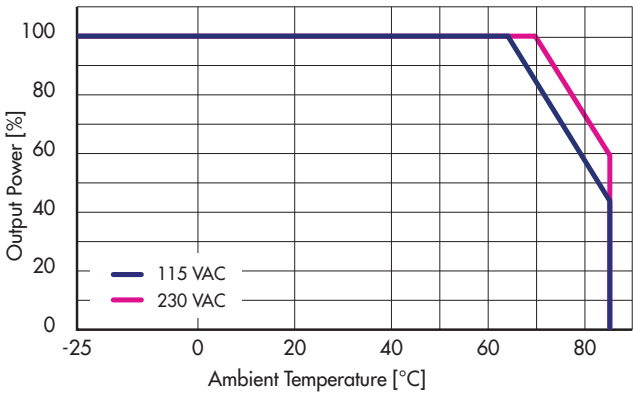
## General Specifications

| | | | |
|---|---|---|---|
| Operating temperature | | | –40°C to +85°C with derating, see graph on p.4 |
| Output power derating | – Temperature | single output: | 2.67 %/K above +70°C at 230 VAC<br>2.75 %/K above +65°C at 115 VAC |
| | | multi output: | 1.60 %/K above +60°C at 230 VAC<br>1.67 %/K above +55°C at 115 VAC |
| | – Low input voltage | | 1.33 %/V below 100 VAC |
| Storage temperature | | | –40°C to +85°C |
| Humidity (non condensing) | | | 5 – 95 % rel. H max. |
| Altitude during operation | | | 5000 m |
| Switching frequency - single output (at 230 VAC) | | 5 VDC model: | 70 kHz typ. (pulse frequency modulation) |
| | | other models: | 120 kHz typ. (pulse frequency modulation) |
| Switching frequency - multi output (at 230 VAC) | – Vout 1 | 5 VDC model: | 70 kHz typ. (pulse frequency modulation) |
| | | other models: | 115 kHz typ. (pulse frequency modulation) |
| | – Vout 2 | | 750 kHz typ. (pulse frequency modulation) |
| | – Vout 3 | | 510 kHz typ. (pulse frequency modulation) |
| Isolation voltage (2 × MOPP insulation) | – Input / Output (60 s) | | 4000 VAC |
| | – Input / Case (60 s) | | 2500 VAC |
| Leakage current (at 264 VAC/60Hz) | | | 75 µA max. |
| Isolation resistance (at 500 VDC) | | | 100 MOhm min. |
| Reliability | – calculated MTBF at +25°C acc. to IEC 61709 | | 3‘000‘000 h for single output models<br>1‘700‘000 h for multi output models |
| Protection class | | | class II prepared |
| Electromagnetic compatibility (EMC), emissions | – Conducted & Radiated input surpression | | EN 55011 limits to IEC 60601-1-2 4th editon<br>EN 55032 class B (internal filter) |
| | – Harmonic current emissions | | IEC / EN 61000-3-2, class B |
| | – Voltage flicker | | IEC / EN 61000-3-3, class B |
| Electromagnets compatibility (EMC), immunity | | | IEC / EN 60601-1-2 |
| | – Electrostatic discharge ESD | | IEC / EN 61000-4-2, 8kV/6kV perf. criteria A |
| | – RF field immunity | | IEC / EN 61000-4-3, 20V/m perf. criteria A |
| | – Electrical fast transients/burst immunity | | IEC / EN 61000-4-4, ± 2kV perf. criteria A |
| | – Surge | | IEC / EN 61000-4-5, ± 1kV/± 2kV perf. criteria A |
| | – Conducted RF | | IEC / EN 61000-4-6, 20 Vrms perf. criteria A |
| | – Magnetic field (only for single output models) | | IEC / EN 61000-4-8, 10A/m perf. criteria A |
| Voltage dip and interruptions according to EN 60601-1-2 reference: 100 VAC / 50Hz | | | 30%, 500ms perf. criteria A<br>60%, 100ms perf. criteria B<br>> 95%, 10ms perf. criteria A<br>> 95%, 5000ms perf. criteria B |
| Safety standards and certification | | | IEC/EN 60601-1 3rd edition,<br>ANSI/AAMI ES60601-1:2005(R)2012 |
| | – Certification documents | | www.tracopower.com/overview/tpp40 |
| Environment | – Vibration acc. IEC 60068-2-6 | | 3 axis, sine sweep, 10–55Hz, 1g, 1oct/min |
| | – Shock acc. IEC 60068-2-27 | | 3 axis, 10g half sine, 11msShock<br>20 G (3 directions each 3 times) |
| Environmental compliance | – Reach | | www.tracopower.com/products/reach-declaration.pdf |
| | – RoHS | | RoHS directive 2011/65/EU |
| Connection | | | screw terminal |

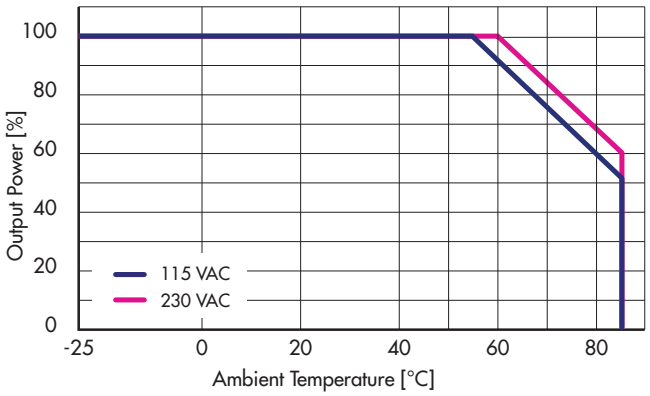
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## Derating graphs

**Single output models:**



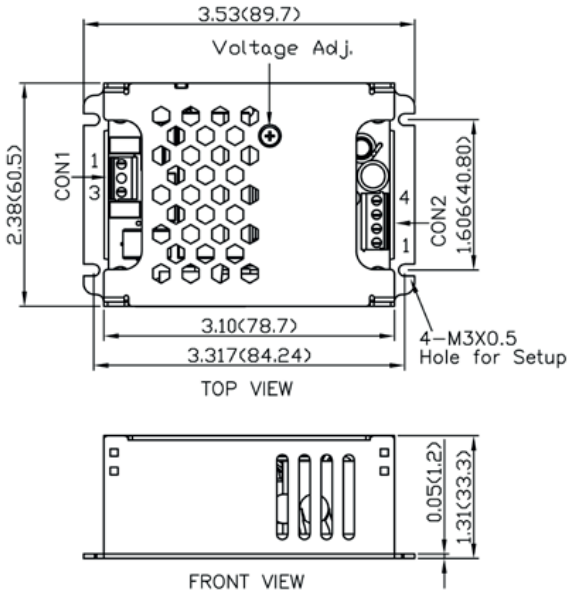

**Multi output models:**

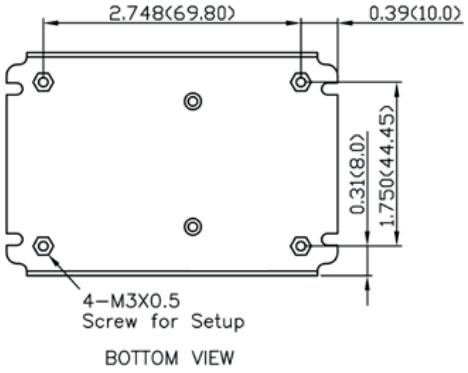



All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## Outline Dimensions

**Single output enclosed:**



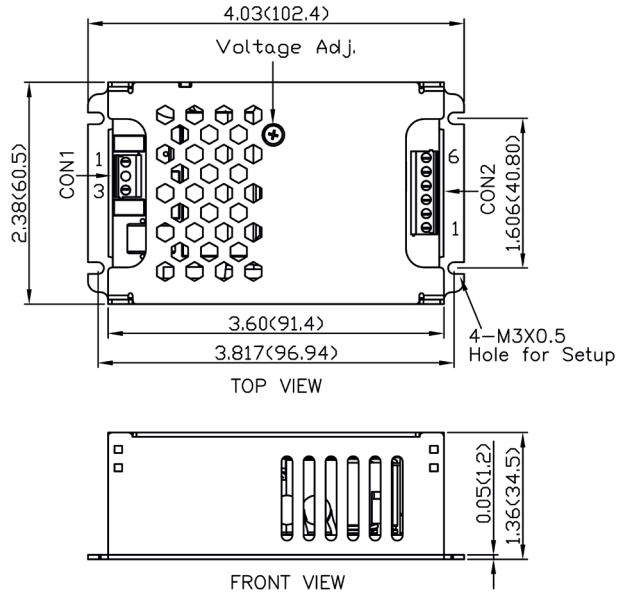



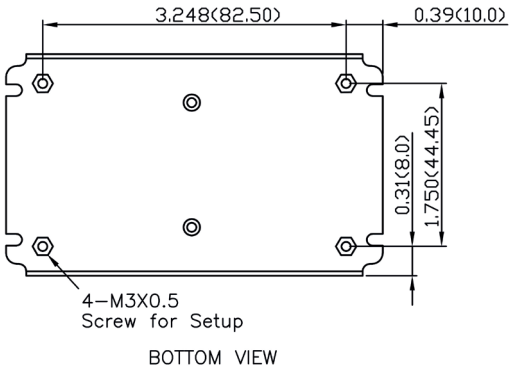

| Screw Terminal | | | |
|---|---|---|---|
| Input | | Output | |
| Pin | Single | Pin* | Dual |
| 1 | Line | 1,2 | –Vout |
| 3 | Neutral | 3,4 | +Vout |

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

**Weight:** 169 g (5.96 oz)

**Multi output enclosed:**




| Screw Terminal | | | |
|---|---|---|---|
| Input | | Output | |
| Pin | Single | Pin* | Dual |
| 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)

**Weight:** 216 g (7.80 oz)

Dimensions in inch, () = mm
Tolerances: x.xx±0.02 (x.x±0.5) x.xxx±0.01 (x.xx±0.25)
Wire dimensions range 26 - 16 AWG
M3×0.5 screw locked torque MAX 5Kgf.cm/0.49N.m
Terminal screw locked torque MAX 2Kgf.cm/0.2N.m

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