AC/DC Medical Power Supply

TPP 100 Series, 100 Watt

- Encased 100 W power supply with screw connection in 2.44" x 3.6" package
- Certification according to IEC/EN/ES 60601-1 3rd edition 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
- Active power factor correction >0.95
- Protection class I and II prepared
- Operating up to 5000 m altitude
- Ready to meet ErP directive, <0.3 W no load power consumption
- 5-year product warranty

The TPP 100 Series of 100 Watt AC/DC encased 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 75 µA which 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 3.6" packaging format. The full load operating temperature range is -25°C to +80°C while it goes up to 80°C with 50% load derating. The EMC characteristic is dedicated for applications in industrial and medical fields. High reliability is provided by the 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

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<tbody>
<tr>
<td>TPP 100-112</td>
<td>100 W</td>
<td>12 VDC (10.8 - 13.2 VDC)</td>
<td>8’340 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TPP 100-115</td>
<td></td>
<td>15 VDC (13.5 - 16.5 VDC)</td>
<td>6’670 mA</td>
<td>92 %</td>
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<tr>
<td>TPP 100-124</td>
<td></td>
<td>24 VDC (21.6 - 26.4 VDC)</td>
<td>4’170 mA</td>
<td>92 %</td>
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<tr>
<td>TPP 100-128</td>
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<td>28 VDC (25.2 - 30.8 VDC)</td>
<td>3’580 mA</td>
<td>92 %</td>
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<tr>
<td>TPP 100-136</td>
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<td>36 VDC (32.4 - 39.6 VDC)</td>
<td>2’780 mA</td>
<td>91 %</td>
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<tr>
<td>TPP 100-148</td>
<td></td>
<td>48 VDC (43.2 - 52.8 VDC)</td>
<td>2’090 mA</td>
<td>91 %</td>
</tr>
</tbody>
</table>
## 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 = 930 VAC | 550 mA max. |
|                                       | - Full Load & Vin = 115 VAC | 1'150 mA max. |
| Power Consumption                     | - At no load          | 300 mA max. (Ready to meet ErP directive) |
| Input Inrush Current                  | - At 230 VAC          | 60 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 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

### Voltage Set Accuracy
- Input Variation (Vmin - Vmax)
- Load Variation (0 - 100%)

### Ripple and Noise
(20 MHz Bandwidth)
- 12 VDC model: 120 mVp-p typ. (w/ 10 µF X7R)
- 15 VDC model: 150 mVp-p typ. (w/ 10 µF X7R)
- 24 VDC model: 160 mVp-p typ. (w/ 1 µF X7R)
- 36 VDC model: 190 mVp-p typ. (w/ 1 µF X7R)
- 48 VDC model: 340 mVp-p typ. (w/ 0.1 µF X7R)
- 12 VDC model: 6'950 µF max.
- 15 VDC model: 4'450 µF max.
- 24 VDC model: 1'750 µF max.
- 36 VDC model: 1'280 µF max.
- 48 VDC model: 770 µF max.
- 48 VDC model: 430 µF max.

### Capacitive Load
- 12 VDC model: 6'950 µF max.
- 15 VDC model: 4'450 µF max.
- 24 VDC model: 1'750 µF max.
- 36 VDC model: 1'280 µF max.
- 48 VDC model: 770 µF max.
- 48 VDC model: 430 µF max.

### Minimum Load
Not required

### Temperature Coefficient
±0.02 %/K max.

### Hold-up Time
- At 230 VAC: 16 ms min.
- At 115 VAC: 16 ms min.

### Start-up Time
- At 230 VAC: 1'000 ms max.
- At 115 VAC: 1'000 ms max.

### Short Circuit Protection
Continuous, Automatic recovery

### Output Current Limitation
115 - 150% of Iout max.

### Overvoltage Protection
115 - 135% of Vin max.

### Transient Response
- Response Deviation: 3% max. (50% to 75% Load Step)
- Response Time: 500 µs typ. (50% to 75% Load Step)

## Safety Specifications
### Safety Standards
- IT / Multimedia Equipment: EN 60950-1
- UL 60950-1
- Medical Equipment: 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

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
### 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)
  - FCC Part 15 class B (internal filter)
  - FCC Part 18 class B (internal filter)
- Radiated Emissions
  - EN 55011 class A (internal filter)
  - EN 55032 class A (internal filter)
  - FCC Part 15 class A (internal filter)
  - FCC Part 18 class A (internal filter)
- Harmonic Current Emissions
  - EN 61000-3-2, class A
  - EN 61000-3-2, class D
- Voltage Fluctuations & Flicker
  - EN 61000-3-3

**EMS Immunity**
- 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
  - 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
  - Continuous: EN 61000-4-8, 10 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%, 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%, 250 periods, perf. criteria B

### General Specifications

**Relative Humidity**
- 95% max. (non-condensing)

**Temperature Ranges**
- Operating Temperature: -25°C to +85°C
- Storage Temperature: -40°C to +85°C

**Power Derating**
- High Temperature: 2.4 %/K above 60°C
- Low Input Voltage: 1.33 %/V below 100 VAC

**Cooling System**
- Natural convection (20 LFM)

**Altitude During Operation**
- 5000 m max.

**Switching Frequency**
- 45 - 75 kHz (PWM QR)

**Insulation System**
- Reinforced Insulation

**Working Voltage (rated)**
- 250 VAC

**Isolation Test Voltage**
- Input to Output: 60 s
  - 4'000 VAC
- Input to Case or PE: 60 s
  - 1'500 VAC
- Output to Case or PE: 60 s
  - 1'500 VAC

**Isolation Resistance**
- Input to Output: 500 VDC
  - 100 MΩ min.

**Leakage Current (at 254 VAC)**
- Touch Current: 75 µA max.

**Reliability**
- Calculated MTBF: 790'000 h (MIL-HDBK-217F, ground benign)

**Environment**
- Vibration: IEC 60068-2-6
- Mechanical Shock: IEC 60068-2-27

**Housing Material**
- Alu alloy, black anodized coating

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

**Weight**
210 g

**Environmental Compliance**
- Reach
- RoHS
  
- www.tracopower.com/info/reach-declaration.pdf
- www.tracopower.com/info/rohs-declaration.pdf

**Supporting Documents**
Overview Link (for additional Documents)
  
www.tracopower.com/overview/tpp100

**Outline Dimensions**

![Diagram of the TPP 100 Series, 100 Watt](image)

**Screw Terminal**

<table>
<thead>
<tr>
<th>Input (CON1)</th>
<th>Output (CON2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin</td>
<td>Function</td>
</tr>
<tr>
<td>1</td>
<td>Line</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

**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

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

Dimension in mm, () = inch
Tolerances: x.x ±0.50 (±0.02)
x.xx ±0.25 (±0.01)