AC/DC Medical Power Supply

TPP 180-M Series, 180 Watt

- High power-density: 180 Watt in 3.6"x2.44" package (encased)
- I/O isolation 4000 VAC rated for 250 VAC working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Peak power operation up to 220 Watt for 5s
- Operating temperature –40°C to 85°C
- Active power factor correction >0.9
- Operating up to 5000m altitude
- 5-year product warranty

The TPP 180-M is series of encased AC/DC power supplies coming in an encased package. They feature a reinforced double I/O isolation (4000 VAC) system according to latest medical safety standards (60601-1 3rd edition, 2 x MOPP). The leakage current is below 100 μA and makes the units suitable for BF (body floating) applications. The excellent efficiency of up to 94% allows a high power-density and compact design (3.6" x 2.44"). The operating temperature range is –40°C to +85°C with derating above 50°C. In natural convection operation these power supplies deliver 150 Watt going up to 180 Watt with forced air cooling. Additionally, they can deliver 220 Watt peak power for 5s. The EMC characteristic is dedicated for applications in industrial and medical fields. High reliability is provided by using high quality components and an excellent thermal management making the TPP 180-M an ideal solution for industrial and medical devices and for demanding safety and space critical applications.

### Models

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>TPP 180-112-M</td>
<td>180 W</td>
<td>12 VDC (11.0 - 13.0 VDC)</td>
<td>15’000 mA</td>
<td>12’500 mA</td>
<td>18’334 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TPP 180-115-M</td>
<td>15 VDC (13.8 - 16.2 VDC)</td>
<td>12’000 mA</td>
<td>10’000 mA</td>
<td>14’667 mA</td>
<td>92 %</td>
<td></td>
</tr>
<tr>
<td>TPP 180-124-M</td>
<td>24 VDC (22.1 - 25.9 VDC)</td>
<td>7’500 mA</td>
<td>6’250 mA</td>
<td>9’167 mA</td>
<td>94 %</td>
<td></td>
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<tr>
<td>TPP 180-136-M</td>
<td>36 VDC (33.1 - 38.9 VDC)</td>
<td>5’000 mA</td>
<td>4’170 mA</td>
<td>6’111 mA</td>
<td>93 %</td>
<td></td>
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<tr>
<td>TPP 180-148-M</td>
<td>48 VDC (44.2 - 51.8 VDC)</td>
<td>3’750 mA</td>
<td>3’130 mA</td>
<td>4’583 mA</td>
<td>93 %</td>
<td></td>
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<tr>
<td>TPP 180-153-M</td>
<td>53 VDC (48.8 - 57.2 VDC)</td>
<td>3’400 mA</td>
<td>2’830 mA</td>
<td>4’151 mA</td>
<td>93 %</td>
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### Options

- Optional model with 18 VDC / 10’000 mA
- Optional model with 28 VDC / 6’430 mA
## Input Specifications

| Input Voltage  | Operational Range: 85 - 264 VAC (Full Range)  
|               | Rated Range: 100 - 240 VAC (Full Range)  
| - AC Range    | Operational Range: 120 - 370 VDC (Designed for, no certification)  
| - DC Range    | Polarity: +DC: L / −DC: N  

| Input Frequency | Operational Range: 47 - 440 Hz  
|                | Certified: 50/60 Hz  

| Input Current | - Full Load & Vin = 230 VAC  
|              | - Full Load & Vin = 115 VAC  
|              | 1'500 mA max.  
|              | 2'550 mA max.  

| Power Consumption | - No load & Vin = 230 VAC  
|                  | - No load & Vin = 115 VAC  
|                  | 200 mW max. (Ready to meet ErP directive)  
|                  | 200 mW max.  

| Input Inrush Current | - At 230 VAC  
|                     | - At 115 VAC  
|                     | 100 A max.  
|                     | 50 A max.  

| Power Factor | - At 230 VAC  
|             | - At 115 VAC  
|             | 0.9 min. (Active Power Factor Correction)  
|             | 0.9 min. (Active Power Factor Correction)  

| Input Protection | T 4 A / 250 VAC  

**Recommended Input Fuse**

4’000 mA (Slow blow)  
(The need of an external fuse has to be assessed in the final application.)

## Output Specifications

**Output Voltage Adjustment**

±8% (By trim potentiometer)  
Output power must not exceed rated power!

**Voltage Set Accuracy**

±1% max.

**Regulation**

- Input Variation (Vmin - Vmax)  
  - Load Variation (0 – 100%)  
  0.2% max.  
  0.5% max.

**Boost Power**

Output Current peak: See model table  
Peak power time: 5 s max.  
Peak power duty cycle: 20% max.  
Average operation power: 99 W max.  
(at natural convection)

### Ripple and Noise

(20 MHz Bandwidth)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 VDC model</td>
<td>200 mVp-p max. (w/ 1 µF)</td>
<td></td>
</tr>
<tr>
<td>15 VDC model</td>
<td>200 mVp-p max. (w/ 1 µF)</td>
<td></td>
</tr>
<tr>
<td>18 VDC model</td>
<td>220 mVp-p max. (w/ 1 µF)</td>
<td></td>
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<tr>
<td>24 VDC model</td>
<td>220 mVp-p max. (w/ 1 µF)</td>
<td></td>
</tr>
<tr>
<td>28 VDC model</td>
<td>220 mVp-p max. (w/ 1 µF)</td>
<td></td>
</tr>
<tr>
<td>36 VDC model</td>
<td>220 mVp-p max. (w/ 1 µF)</td>
<td></td>
</tr>
<tr>
<td>48 VDC model</td>
<td>350 mVp-p max. (w/ 0.1 µF)</td>
<td></td>
</tr>
<tr>
<td>53 VDC model</td>
<td>350 mVp-p max. (w/ 0.1 µF)</td>
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</tbody>
</table>

**Capacitive Load**

<table>
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<tr>
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<th>Value</th>
<th>Note</th>
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<tbody>
<tr>
<td>12 VDC model</td>
<td>10’000 µF max.</td>
<td></td>
</tr>
<tr>
<td>15 VDC model</td>
<td>6’800 µF max.</td>
<td></td>
</tr>
<tr>
<td>18 VDC model</td>
<td>4’700 µF max.</td>
<td></td>
</tr>
<tr>
<td>24 VDC model</td>
<td>2’700 µF max.</td>
<td></td>
</tr>
<tr>
<td>28 VDC model</td>
<td>1’800 µF max.</td>
<td></td>
</tr>
<tr>
<td>36 VDC model</td>
<td>1’200 µF max.</td>
<td></td>
</tr>
<tr>
<td>48 VDC model</td>
<td>680 µF max.</td>
<td></td>
</tr>
<tr>
<td>53 VDC model</td>
<td>560 µF max.</td>
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</table>

**Minimum Load**

Not required

**Temperature Coefficient**

±0.02 %/K max.

**Hold-up Time**

- At 230 VAC  
  10 ms min.  
- At 115 VAC  
  10 ms min.

**Start-up Time**

- At 230 VAC  
  1’500 ms max.  
- At 115 VAC  
  1’500 ms max.

**Short Circuit Protection**

Continuous, Automatic recovery

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
TPP 180-M Series, 180 Watt

Output Current Limitation
130 - 175% of Iout max.
150% typ. of Iout max.

Overvoltage Protection
115 - 135% of Vout max.
150% typ. of Iout max.

Transient Response
- Response Deviation
  3% typ. / 10% max. (75% to 100% Load Step)
- Response Time
  600 µs typ. (75% to 100% Load Step)

Safety Specifications

Safety 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
- Certification Documents
  2 x MOPP (Means Of Patient Protection)
  www.tracopower.com/overview/tp180-m

Protection Class
Class I & II (Prepared): Reinforced Insulation

Pollution Degree
PD 2

Over Voltage Category
OVC II

EMC Specifications

EMI Emissions
- Conducted Emissions
  EN 55011 class B (internal filter)
  EN 55032 class B (internal filter)
  FCC Part 15 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)
- Harmonic Current Emissions
  EN 61000-3-2, class D
  EN 61000-3-3
- Voltage Fluctuations & Flicker

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
- EFT (Burst) / Surge
  EN 61000-4-3, 20 V/m, perf. criteria A
  EN 61000-4-4, ±2 kV, perf. criteria A

Conducted RF Disturbances
- Continuous
  EN 61000-4-8, 30 A/m, perf. criteria A
- 1 s
  EN 61000-4-8, 1000 A/m, perf. criteria A

PF Magnetic Field
- EN 61000-4-6, 20 Vrms, perf. criteria A

Voltage Dips & Interruptions
- 230 VAC / 50 Hz
  30%, 25 periods, perf. criteria A
  >95%, 0.5 periods, perf. criteria B
  >95%, 250 periods, perf. criteria B
- 115 VAC / 60 Hz
  30%, 25 periods, perf. criteria A
  >95%, 0.5 periods, perf. criteria B
  >95%, 250 periods, perf. criteria B

General Specifications

Relative Humidity
95% max. (non condensing)

Temperature Ranges
- Operating Temperature
  -40°C to +85°C
- Storage Temperature
  -40°C to +85°C

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
## TPP 180-M Series, 180 Watt

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
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</table>
| **Power Derating** | - High Temperature  
- Low Input Voltage | Depending on model  
1.33 %/V below 100 VAC  
See application note: [www.tracopower.com/overview/tpp180-m](http://www.tracopower.com/overview/tpp180-m) |
| **Over Temperature Protection Switch Off** | - Protection Mode  
- Measurement Point | 115°C min. / 125°C typ. / 135°C max.  
(Automatic recovery at 112°C typ.)  
See application note: [www.tracopower.com/overview/tpp180-m](http://www.tracopower.com/overview/tpp180-m) |
| **Cooling System** | - Option 1  
- Option 2 | Forced air cooling (with external fan, 10 CFM)  
Natural convection (20 LFM) |
| **Altitude During Operation** | | 5'000 m max. |
| **Switching Frequency** | | 135 - 205 kHz (PWM)  
170 kHz typ. (PWM) |
| **Insulation System** | | Reinforced Insulation |
| **Working Voltage (rated)** | | 250 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  
- Input to Case or PE  
- Output to Case or PE | 27.5 mm min.  
5 mm min.  
4.3 mm min. |
| **Clearance** | - Input to Output  
- Input to Case or PE  
- Output to Case or PE | 9.3 mm min.  
5 mm min.  
4.3 mm min. |
| **Isolation Resistance** | - Input to Output, 500 VDC | 100 MΩ min. |
| **Isolation Capacitance** | - Input to Output, 100 kHz, 1 V | 1'250 pF typ. / 1'500 pF max. |
| **Leakage Current (264 VAC / 63 Hz)** | - Touch Current | 100 µA max. |
| **Distance Through Isolation** | | 0.4 mm |
| **Reliability** | - Calculated MTBF | 1'145'000 h (MIL-HDBK-217F, ground benign) |
| **Environment** | - Vibration  
- Mechanical Shock  
- Thermal Shock | IEC 60068-2-6  
5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz  
IEC 60068-2-27  
50 g, 3 axis, 11 ms  
MIL-STD-810F |
| **Housing Material** | | Aluminum |
| **Housing Type** | | Metal Case |
| **Mounting Type** | | Chassis Mount |
| **Connection Type** | | Pin Connector |
| **Weight** | | 218 g |
| **Environmental Compliance** | - REACH Declaration  
- RoHS Declaration  
- SCIP Reference Number | [www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)  
REACH SVHC list compliant  
REACH Annex XVII compliant  
Exemptions: 7a, 7c-f  
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (DEA rule))  
f3f44547-8d9a-4d5b-a46e-1a966c754e45 |

### Supporting Documents

- **Overview Link** (for additional Documents): [www.tracopower.com/overview/tpp180-m](http://www.tracopower.com/overview/tpp180-m)

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[www.tracopower.com](http://www.tracopower.com)  
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Outline Dimensions

Pin connectors

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<tr>
<th>Pin</th>
<th>Function</th>
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<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC (N) / DC–</td>
<td>1</td>
<td>+Vout</td>
</tr>
<tr>
<td>3</td>
<td>AC (L) / DC+</td>
<td>2</td>
<td>–Vout</td>
</tr>
</tbody>
</table>

CON1: Molex Housing 09-50-8031
Molex Crimp Terminals 08500106 (2478), 08520112 (6838), 45570

CON2: Screw locked torque: 2.5 kgfcm / 0.25 Nm max.
Wire dimension range: 24 - 14 AWG

All dimension in mm (inch)
Tolerance: X.X ±0.5 (X.XX ±0.02)
X.XX ±0.25 (X.XXX ±0.01)
Max. center screw penetration depth: 2.8 (0.11)
Max. corner screw penetration depth: 2.0 (0.08)
Setup screw locked torque: max. 5 kgfcm / 0.49 Nm
CON2 screw locked torque: max. 2.5 kgfcm / 0.25 Nm
wires 24 -14 AWG