AC/DC Medical Power Supply

- Open frame power supply with pin connection
- 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
- EMC compliance to IEC 60601-1-2 ed. 4
- Protection class I and II
- Operating up to 5000 m altitude
- Ready to meet ErP directive, <0.15 W no load power consumption
- 5-year product warranty

The TPP 65A Series of 65 Watt AC/DC power supplies feature a reinforced double I/O isolation system according to latest medical safety standards (60601-1 3rd edition, 2 x MOPP). 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 2.0” x 3.0” packaging format. The full load operating temperature range is −40°C to +60°C while it goes up to 85°C with 50% load derating. The EMC characteristic is dedicated for applications in industrial and domestic 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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TPP 65-105A-J</td>
<td>50 W</td>
<td>5 VDC (4.5 - 5.5 VDC)</td>
<td>10'000 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TPP 65-112A-J</td>
<td>65 W</td>
<td>12 VDC (10.8 - 13.2 VDC)</td>
<td>5'420 mA</td>
<td>93 %</td>
</tr>
<tr>
<td>TPP 65-124A-J</td>
<td></td>
<td>24 VDC (21.6 - 26.4 VDC)</td>
<td>2'710 mA</td>
<td>94 %</td>
</tr>
<tr>
<td>TPP 65-148A-J</td>
<td></td>
<td>48 VDC (43.2 - 52.8 VDC)</td>
<td>1'360 mA</td>
<td>93 %</td>
</tr>
</tbody>
</table>

Options

- Optional model with 15 VDC / 4’340 mA

Note - 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:**
  - Certified: 47 - 440 Hz
  - 50/60 Hz

**Input Current**
- **Full Load & Vin = 230 VAC**
  - 950 mA max.
- **Full Load & Vin = 115 VAC**
  - 1650 mA max.

**Power Consumption**
- **No load & Vin = 230 VAC**
  - 150 mW max. (Ready to meet ErP directive)
- **No load & Vin = 115 VAC**
  - 150 mW 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]
- (The need of an external fuse has to be assessed in the final application)

### Output Specifications

**Output Voltage Adjustment**
±10% (By trim potentiometer)
- Output power must not exceed rated power!

**Voltage Set Accuracy**
±1% max.

**Regulation**
- **Input Variation (Vmin – Vmax)**
  - 0.2% max.
- **Load Variation (0 - 100%)**
  - 0.7% max. (5 VDC model)
  - 0.5% max. (other output models)

**Ripple and Noise**
- (20 MHz Bandwidth)

  **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)
  - 48 VDC model:
    - 150 mVp-p typ. (w/ 0.1 µF X7R)

**Capacitive Load**
- **5 VDC model:**
  - 20'000 µF max.
- **12 VDC model:**
  - 4'520 µF max.
- **15 VDC model:**
  - 2'895 µF max.
- **24 VDC model:**
  - 1'130 µF max.
- **48 VDC model:**
  - 285 µF max.

**Minimum Load**
- Not required

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

**Hold-up Time**
- **At 115 VAC**
  - 16 ms min.
- **At 230 VAC**
  - 1’000 ms max.

**Start-up Time**
- Continuous, Automatic recovery

**Short Circuit Protection**
- 125 - 140% of Vout nom.

**Output Current Limitation**
- 120 - 180% of Iout max.
  - 145% typ. of Iout max.

**Overvoltage Protection**
- Response Deviation
  - 3% max. (50% to 75% Load Step)
- Response Time
  - 600 µs typ. (50% to 75% Load Step)

### 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
- **Certification Documents**
  - 2 x MOPP (Means Of Patient Protection)
  - www.tracopower.com/overview/tp65a

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

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

<table>
<thead>
<tr>
<th>EMI Emissions</th>
<th>EN 60601-1-2 edition 4 (Medical Devices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Conducted Emissions</td>
<td>EN 55011 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (internal filter)</td>
</tr>
<tr>
<td>- Radiated Emissions</td>
<td>EN 55011 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (internal filter)</td>
</tr>
<tr>
<td>- Harmonic Current Emissions</td>
<td>EN 61000-3-2, class A</td>
</tr>
<tr>
<td>- Voltage Fluctuations &amp; Flicker</td>
<td>EN 61000-3-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMS Immunity</th>
<th>EN 60601-1-2 edition 4 (Medical Devices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Electrostatic Discharge</td>
<td>Air: EN 61000-4-2, ±15 kV, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>Contact: EN 61000-4-2, ±8 kV, perf. criteria A</td>
</tr>
<tr>
<td>- RF Electromagnetic Field</td>
<td>EN 61000-4-3, 20 V/m, perf. criteria A</td>
</tr>
<tr>
<td>- EFT (Burst) / Surge</td>
<td>EN 61000-4-4, ±2 kV, perf. criteria A</td>
</tr>
<tr>
<td>- Conducted RF Disturbances</td>
<td>L to L: EN 61000-4-5, ±1 kV, perf. criteria A</td>
</tr>
<tr>
<td>- PF Magnetic Field</td>
<td>Continuous: EN 61000-4-6, 20 Vrms, perf. criteria A</td>
</tr>
<tr>
<td>- Voltage Dips &amp; Interruptions</td>
<td>230 VAC / 50 Hz: EN 61000-4-11</td>
</tr>
<tr>
<td></td>
<td>30%, 25 periods, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 0.5 periods, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 1 period, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 250 periods, perf. criteria B</td>
</tr>
<tr>
<td>- Humidity</td>
<td>EN 61000-4-11</td>
</tr>
<tr>
<td>- Storage Temperature</td>
<td>115 VAC / 60 Hz: EN 61000-4-11</td>
</tr>
<tr>
<td></td>
<td>30%, 25 periods, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 0.5 periods, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 1 period, perf. criteria A</td>
</tr>
<tr>
<td></td>
<td>&gt;95%, 250 periods, perf. criteria B</td>
</tr>
</tbody>
</table>

### General Specifications

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>95% max. (non condensing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Ranges</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Power Derating</td>
<td>Depending on model</td>
</tr>
<tr>
<td>High Temperature</td>
<td></td>
</tr>
<tr>
<td>Low Input Voltage</td>
<td></td>
</tr>
</tbody>
</table>

See application note: [www.tracopower.com/overview/tpp65a](http://www.tracopower.com/overview/tpp65a)

<table>
<thead>
<tr>
<th>Cooling System</th>
<th>Natural convection (20 LFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altitude During Operation</td>
<td>5'000 m max.</td>
</tr>
<tr>
<td>Regulator Topology</td>
<td>Flyback Converter</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>50 - 140 kHz (PWM)</td>
</tr>
<tr>
<td>Insulation System (rated)</td>
<td>Reinforced Insulation</td>
</tr>
<tr>
<td>Working Voltage (rated)</td>
<td>258 VAC</td>
</tr>
<tr>
<td>Isolation Test Voltage</td>
<td></td>
</tr>
<tr>
<td>- Input to Output, 60 s</td>
<td>4'000 VAC</td>
</tr>
<tr>
<td>- Input to Case or PE, 60 s</td>
<td>2'500 VAC</td>
</tr>
<tr>
<td>- Output to Case or PE, 60 s</td>
<td>2'500 VAC</td>
</tr>
<tr>
<td>Creepage</td>
<td>8 mm min.</td>
</tr>
<tr>
<td>Clearance</td>
<td>8 mm min.</td>
</tr>
<tr>
<td>Isolation Resistance</td>
<td>100 MΩ2 min.</td>
</tr>
<tr>
<td>Leakage Current (at 264 VAC)</td>
<td>75 µA max.</td>
</tr>
<tr>
<td>Reliability</td>
<td>1'500'000 h (MIL-HDBK-217F, ground benign)</td>
</tr>
</tbody>
</table>

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

### Mounting Type
- Chassis Mount

### Connection Type
- Pin Connector

### Weight
- 117 g

### Environmental Compliance
- REACH Declaration
  www.tracopower.com/info/reach-declaration.pdf
- RoHS Declaration
  www.tracopower.com/info/rohs-declaration.pdf
- SCIP Reference Number
  4b1cc295-c90c-4971-8d48-2678e0b46d7b

### Supporting Documents
Overview Link (for additional Documents)
www.tracopower.com/overview/tpp65a

### Outline Dimensions

#### Pin Connectors

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>1,2*</td>
<td>–Vout</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>3,4</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

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

**Input:**
JST series
mates with JST crimp terminal: SVH-21T-P1.1 and terminal housing: VHR-3N

**Output:**
JST series
mates with JST crimp terminal: SVH-21T-P1.1 and terminal housing: VHR-4N

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**Dimensions in mm (inch)**

- Voltage Adj.
  - 69.8 (2.748)
  - 76.2 (3.00)
  - 63.2 (2.496)

- Tolerances:
  - ±0.5 (±0.02)
  - ±0.25 (±0.01)

- Mounting screw lock torque: Max. 0.33 Nm (3.4 kgfcm)