DC/DC Medical Converter

- Ultra wide 4:1 input voltage 15 W DC/DC converter in a 1.6 x 1 " plastic case
- I/O isolation 5000 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
- Low leakage current <2.5 μA
- Operating temperature –40°C to 85°C
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- Operating up to 5000m altitude
- 5-year product warranty

The THM 15WI series is a range of medical 15 Watt DC/DC converters in 1.6" x 1.0" plastic package and with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VAC isolation and a very low leakage current of less than 2.5 μA. The units are approved to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. With a high efficiency of up to 90% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +85°C. They constitute a reliable solution not only for medical equipment but also for demanding ranges of application such as transportation, control & measurement or IGBT drivers.

### Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THM 15-2411WI</td>
<td>5 VDC</td>
<td>3'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 VDC</td>
<td>1'250 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 VDC</td>
<td>1'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 VDC</td>
<td>625 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+5 VDC</td>
<td>1'500 mA</td>
<td>–5 VDC</td>
<td>1'500 mA</td>
</tr>
<tr>
<td></td>
<td>+12 VDC</td>
<td>625 mA</td>
<td>–12 VDC</td>
<td>625 mA</td>
</tr>
<tr>
<td></td>
<td>+15 VDC</td>
<td>500 mA</td>
<td>–15 VDC</td>
<td>500 mA</td>
</tr>
<tr>
<td>THM 15-2421WI</td>
<td>5 VDC</td>
<td>3'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 VDC</td>
<td>1'250 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 VDC</td>
<td>1'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 VDC</td>
<td>625 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+5 VDC</td>
<td>1'500 mA</td>
<td>–5 VDC</td>
<td>1'500 mA</td>
</tr>
<tr>
<td></td>
<td>+12 VDC</td>
<td>625 mA</td>
<td>–12 VDC</td>
<td>625 mA</td>
</tr>
<tr>
<td></td>
<td>+15 VDC</td>
<td>500 mA</td>
<td>–15 VDC</td>
<td>500 mA</td>
</tr>
</tbody>
</table>

### Options

- Optional models with remote-control function
- Optional models with remote-control function with inverse logic

www.tracopower.com

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## Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current - At no load</td>
<td>10 mA typ.</td>
<td>9 mA typ.</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>50 VDC max. (3 s max)</td>
<td>100 VDC max. (3 s max)</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</td>
<td>15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>3'150 mA (slow blow)</td>
<td>1'600 mA (slow blow)</td>
</tr>
<tr>
<td>(The need of an external fuse has to be assessed in the final application)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Output Specifications

### Output Voltage Adjustment

- **Voltage Set Accuracy**
  - ±10% to +20% (15 & 24 Vout single models)
  - ±10% (other single output models)
  - (By external trim resistor)
  - See application note: [www.tracopower.com/overview/thm15wi](http://www.tracopower.com/overview/thm15wi)
  - Output power must not exceed rated power!

#### Regulation

<table>
<thead>
<tr>
<th>Variation</th>
<th>Single output</th>
<th>Dual output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Variation (Vmin - Vmax)</td>
<td>0.2% max.</td>
<td>0.5% max.</td>
</tr>
<tr>
<td>Load Variation (0 - 100%)</td>
<td>0.2% max.</td>
<td>1% max. (Output 1)</td>
</tr>
<tr>
<td>Cross Regulation (25% / 100% asym. load)</td>
<td>1% max. (Output 2)</td>
<td>5% max.</td>
</tr>
</tbody>
</table>

#### Ripple and Noise (20 MHz Bandwidth)

- Single output
  - 5 Vout models: 50 mVp-p typ. (w/ 10 µF X7R)
  - 12 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)
  - 15 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)
  - 24 Vout models: 100 mVp-p typ. (w/ 4.7 µF X7R)
- Dual output
  - 5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 10 µF X7R)
  - 12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)
  - 15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)

#### Capacitive Load

- Single output
  - 5 Vout models: 3800 µF max.
  - 12 Vout models: 650 µF max.
  - 15 Vout models: 530 µF max.
  - 24 Vout models: 190 µF max.
- Dual output
  - 5 / -5 Vout models: 1'900 / 1'900 µF max.
  - 12 / -12 Vout models: 380 / 380 µF max.
  - 15 / -15 Vout models: 270 / 270 µF max.

### Minimum Load

- Not required

### Temperature Coefficient

- ±0.02 %/K max.

### Start-up Time

- 30 ms typ. / 60 ms max.

### Short Circuit Protection

- Continuous, Automatic recovery

### Output Current Limitation

- 185% max. of Iout max.
- 150% typ. of Iout max.

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

- 125% typ. of Vout nom. (depending on model)
- 6.2 VDC typ. (5 VDC model)
- 15 VDC typ. (12 VDC model)
- 20 VDC typ. (15 VDC model)
- 30 VDC typ. (24 VDC model)
- 6.2 VDC typ. (±5 VDC model)
- 15 VDC typ. (±12 VDC model)
- 20 VDC typ. (±15 VDC model)

**Transient Response**

- Response Time: 250 µs typ. (25% Load Step)

### Safety Specifications

<table>
<thead>
<tr>
<th>Safety Standards</th>
<th>EN 62368-1</th>
<th>IEC 62368-1</th>
<th>UL 62368-1</th>
<th>EN 60601-1</th>
<th>IEC 60601-1</th>
<th>ANSI/AAMI ES 60601-1</th>
<th>2 x MOPP (Means Of Patient Protection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.tracopower.com/overview/thm15wi">www.tracopower.com/overview/thm15wi</a></td>
</tr>
</tbody>
</table>

### EMC Specifications

**EMI Emissions**

- Conducted Emissions
  - EN 55011 class A (internal filter)
  - EN 55011 class B (with external filter)
  - EN 55032 class A (internal filter)
  - EN 55032 class B (with external filter)
  - FCC Part 18 class A (internal filter)
  - FCC Part 18 class B (with external filter)

- Radiated Emissions
  - EN 55011 class A (internal filter)
  - EN 55011 class B (with external filter)
  - EN 55032 class A (internal filter)
  - EN 55032 class B (with external filter)
  - FCC Part 18 class A (internal filter)
  - FCC Part 18 class B (with external filter)

**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

**Conducted RF Disturbances**

- EN 61000-4-6, 10 Vrms, perf. criteria A
- 24 Vin models: 2 x KY 220 µF // TVS SMDJ58A
- 48 Vin models: 2 x KY 220 µF // TVS SMDJ120A

**PF Magnetic Field**

- Continuous: EN 61000-4-8, 100 A/m, perf. criteria A
- 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

### 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>Case Temperature</td>
<td>+105°C max.</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>High Temperature</td>
<td>2.5 %/K above 65°C</td>
</tr>
</tbody>
</table>

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
### Over Temperature Protection Switch Off
- Protection Mode
- Measurement Point

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

### Remote Control
- Voltage Controlled Remote
  - Off Idle Input Current
  - Remote Pin Input Current

### Altitude During Operation
5'000 m max.

### Switching Frequency
- 225 - 285 kHz (PWM)
- 250 kHz typ. (PWM)

### Insulation System
- Reinforced Insulation

### Isolation Test Voltage
- Input to Output, 60 s
  5'000 VAC

### Creepage
- Input to Output
  8 mm

### Clearance
- Input to Output
  8 mm

### Isolation Capacitance
- Input to Output, 100 kHz, 1 V
  20 pF typ.

### Leakage Current
- Touch Current
  2.5 µA max. (240 VAC, 60 Hz)

### Reliability
- Calculated MTBF
  2'080'000 h (MIL-HDBK-217F, ground benign)

### Environment
- Vibration
  MIL-STD-810F
- Thermal Shock
  MIL-STD-810F

### Housing Material
- Non-conductive Plastic (UL 94 V-0 rated)

### Base Material
- Non-conductive Plastic (UL 94 V-0 rated)

### Potting Material
- Silicone (UL 94 V-0 rated)

### Pin Material
- Copper

### Pin Foundation Plating
- Nickel (2 - 3 µm)

### Pin Surface Plating
- Tin (3 - 5 µm), matte

### Soldering Profile
- 265°C / 10 s max.

### Connection Type
- THD (Through-Hole Device)

### Weight
- 15.3 K/W

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

### Supporting Documents
- Overview Link (for additional Documents)
  www.tracopower.com/overview/thm15wi

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

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Outline Dimensions

Dimensions in mm (inch)
Tolerances ±0.5 (±0.02)
Pin Ø 1.0 ±0.1 (0.039 ±0.004)
Pin pitch tolerances ±0.25 (±0.01)

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>−Vin (GND)</td>
<td>−Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>4</td>
<td>−Vout</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>Trim</td>
<td>−Vout</td>
</tr>
<tr>
<td>6</td>
<td>No pin*/Remote</td>
<td>No pin*/Remote</td>
</tr>
</tbody>
</table>

*If remote is not selected there will be no pin.