DC/DC Converter

THM 60WI Series, 60 Watt

- Wide 4:1 input voltage 60 W DC/DC converter in a compact 2.3 x 1.45 " 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
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <4.5 µA
- Operating temperature range: -40 to +75°C
- EMC compliance according to IEC 60601-1-2 4th edition
- Operating up to 5000m altitude
- 5 year product warranty

The THM 60WI series is a range of medical 60 Watt DC/DC converters in a compact 2.3" x 1.45" plastic package and with wide 4:1 input voltage range. They provide a reinforced isolation system (5000 VAC) and a very low leakage current of less than 4.5 µA. With a high efficiency of up to 92% and highest-grade components the converters can reliably operate in an ambient temperature range of −40°C up to +75°C with derating. For more demanding applications regarding temperature, Traco also offers a special heatsink which will greatly increase the thermal capabilities for natural convection conditions. The units are approved according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP as well as IEC/EN/UL 62368-1 and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. The THM 60WI constitutes a reliable solution not only for medical equipment but also for demanding ranges of application such as control & measurement and transportation.

### Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Vnom</th>
<th>Imax</th>
<th>Vnom</th>
<th>Imax</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>THM 60-2411WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>5.1 VDC</td>
<td>12'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>THM 60-2412WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>12 VDC</td>
<td>5'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>THM 60-2413WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>15 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>THM 60-2415WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>24 VDC</td>
<td>2'500 mA</td>
<td></td>
<td></td>
<td>89 %</td>
</tr>
<tr>
<td>THM 60-2422WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>+12 VDC</td>
<td>2'500 mA</td>
<td>-12 VDC</td>
<td>2'500 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 60-2423WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>+15 VDC</td>
<td>2'000 mA</td>
<td>-15 VDC</td>
<td>2'000 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 60-4811WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>5.1 VDC</td>
<td>12'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>THM 60-4812WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>12 VDC</td>
<td>5'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>THM 60-4813WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>15 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
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<td>THM 60-4815WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>24 VDC</td>
<td>2'500 mA</td>
<td></td>
<td></td>
<td>91 %</td>
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<td>+12 VDC</td>
<td>2'500 mA</td>
<td>-12 VDC</td>
<td>2'500 mA</td>
<td>91 %</td>
</tr>
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<td>+15 VDC</td>
<td>2'000 mA</td>
<td>-15 VDC</td>
<td>2'000 mA</td>
<td>92 %</td>
</tr>
</tbody>
</table>

### Options

## 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</td>
<td>15 mA typ.</td>
<td>12 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>10'000 mA (fast acting)</td>
<td>6'300 mA (slow blow)</td>
</tr>
<tr>
<td></td>
<td>(The need of an external fuse has to be assessed in the final application)</td>
<td></td>
</tr>
<tr>
<td>Input Filter</td>
<td>Internal Pi-Type</td>
<td></td>
</tr>
</tbody>
</table>

## Output Specifications

### Output Voltage Adjustment

- **Voltage Set Accuracy**
  - ±1% max.

- **Regulation**
  - Input Variation (Vmin - Vmax)
    - single output models: 0.2% max.
    - dual output models: 0.5% max.
  - Load Variation (0 - 100%)
    - single output models: 0.2% max.
    - dual output models: 1% max. (Output 1)
    - 1% max. (Output 2)
  - Cross Regulation (25% / 100% asym. load)
    - dual output models: 5% max.

- **Ripple and Noise**
  - (20 MHz Bandwidth)
    - single output
      - 5.1 Vout models: 75 mVp-p typ. (w/ 10 µF, 25 V, X7R)
      - 12 Vout models: 100 mVp-p typ. (w/ 10 µF, 25 V, X7R)
      - 15 Vout models: 100 mVp-p typ. (w/ 10 µF, 25 V, X7R)
      - 24 Vout models: 150 mVp-p typ. (w/ 4.7 µF, 50 V, X7R)
    - dual output
      - 12 / -12 Vout models: 100 / 100 mVp-p typ. (w/ 10 µF, 25 V, X7R)
      - 15 / -15 Vout models: 100 / 100 mVp-p typ. (w/ 10 µF, 25 V, X7R)

- **Capacitive Load**
  - single output
    - 5.1 Vout models: 17'000 µF max.
    - 12 Vout models: 3'000 µF max.
    - 15 Vout models: 1'900 µF max.
    - 24 Vout models: 730 µF max.
  - dual output
    - 12 / -12 Vout models: 1'500 / 1'500 µF max.
    - 15 / -15 Vout models: 940 / 940 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.

- **Overvoltage Protection**
  - 130% typ. of Vout nom. (15 and 24 Vout models)
  - 120% typ. of Vout nom. (5.1, 12, ±12 and ±15 Vout models)

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

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

<table>
<thead>
<tr>
<th>Safety Standards</th>
<th>EN 62368-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>- IT / Multimedia Equipment</td>
<td>IEC 62368-1</td>
</tr>
<tr>
<td>- Medical Equipment</td>
<td>UL 62368-1</td>
</tr>
<tr>
<td>- Certification Documents</td>
<td>ANSI/AAMI ES 60601-1</td>
</tr>
<tr>
<td></td>
<td>2 x MOPP (Means Of Patient Protection)</td>
</tr>
</tbody>
</table>

### EMC Specifications

<table>
<thead>
<tr>
<th>EMI Emissions</th>
<th>EN 55011 class A (with external filter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Conducted Emissions</td>
<td>EN 55011 class B (with external filter)</td>
</tr>
<tr>
<td>- Radiated Emissions</td>
<td>EN 55011 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class A (with external filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 15 class A (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 15 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class A (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (with external filter)</td>
</tr>
</tbody>
</table>

External filter proposal: [www.tracopower.com/overview/thm60wi](http://www.tracopower.com/overview/thm60wi)

### EMS Immunity

| Electrostatic Discharge | 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, 10 V/m, perf. criteria A |
| EFT (Burst) / Surge | EN 61000-4-4, ±2 kV, perf. criteria A |
| | EN 61000-4-5, ±2 kV, perf. criteria A |

Ext. input component: 24Vin models: 2 x 220 μF, 100 V // TVS SMDJ58A
48Vin models: 2 x 220 μF, 100 V // TVS SMDJ120A

### General Specifications

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>95% max. (non-condensing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Ranges</td>
<td>- Operating Temperature: -40°C to +75°C</td>
</tr>
<tr>
<td></td>
<td>- Case Temperature: +105°C max.</td>
</tr>
<tr>
<td></td>
<td>- Storage Temperature: -55°C to +125°C</td>
</tr>
</tbody>
</table>

Power Derating

| High Temperature | See application note: [www.tracopower.com/overview/thm60wi](http://www.tracopower.com/overview/thm60wi) |

Over Temperature Protection Switch Off

| Protection Mode | 108°C min. / 115°C typ. / 125°C max. (Automatic recovery at 100°C typ.) |
| Measurement Point | Case |

Cooling System

| Natural convection (20 LFM) |

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### Remote Control

- Voltage Controlled Remote
  - Off Idle Input Current
  - Remote Pin Input Current
  - On: 3.0 to 12 VDC or open circuit
  - Off: 0 to 1.2 VDC or short circuit
  - Refers to 'Remote' and '-Vin' Pin
  - 3 mA typ.
  - -0.5 to 0.5 mA

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

### Switching Frequency
- 225 - 275 kHz (PWM)
- 250 kHz typ. (PWM)

### Insulation System
- Reinforced Insulation

### Working Voltage (rated):
- 250 VAC

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

### Creepage
- - Input to Output
  - 8 mm min.

### Clearance
- - Input to Output
  - 8 mm min.

### Isolation Resistance
- - Input to Output, 500 VDC
  - 10'000 MΩ min.

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

### Reliability
- - Calculated MTBF
  - 1'064'000 h (MIL-HDBK-217F, ground benign)

### Washing Process
- Allowed (hermetical product)

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

### Housing Type
- Plastic Case

### Mounting Type
- PCB Mount

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

### Footprint Type
- Quarter-Brick

### Soldering Profile
- Wave Soldering
  - 260°C / 6 s max.

### Weight
- 51 g

### Environmental Compliance
- - REACH Declaration
  - www.tracopower.com/info/reach-declaration.pdf
  - REACH SVHC list compliant
  - REACH Annex XVII compliant
  - www.tracopower.com/info/rohs-declaration.pdf
  - - RoHS Declaration
  - Exemptions: 7a, 7c-1
  - (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (05A rule). The SCIP number is provided on request.)

### Supporting Documents

- Overview Link (for additional Documents)
  - www.tracopower.com/overview/thm60wi

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

**Outline Dimensions**

Dimensions in mm (inch)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>3</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>4</td>
<td>–Vout</td>
<td>–Vout</td>
</tr>
<tr>
<td>5</td>
<td>–Sense</td>
<td>–Sense</td>
</tr>
<tr>
<td>6</td>
<td>Trim</td>
<td>Common</td>
</tr>
<tr>
<td>7</td>
<td>+Sense</td>
<td>+Sense</td>
</tr>
<tr>
<td>8</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

Dimensions

- Pin (4, 8): Ø1.5 (Ø0.06)
- Pin (other): Ø1.0 (Ø0.04)

Pin dimension tolerances ±0.1 (0.004)

Screw lock torque: Max. 0.34 Nm (3.5 kgfcm)