DC/DC Medical Converter

THM 20WI Series, 20 Watt

- Ultra wide 4:1 input voltage 20 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 80°C
- EMC compliance to IEC 60601-1-2 4th edition and EN50532 class A
- Operating up to 5000m altitude
- 5-year product warranty

The THM 20WI series is a range of medical 20 Watt DC/DC converters in 1.6” x 1.0” plastic package and with ultra wide 4:1 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 89% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +80°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 VDC</td>
<td>Imax mA</td>
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</tr>
<tr>
<td>THM 20-2411WI</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 20-2412WI</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 20-2413WI</td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 20-2415WI</td>
<td>24 VDC</td>
<td>833 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 20-2421WI</td>
<td>+5 VDC</td>
<td>2'000 mA</td>
<td>~5 VDC</td>
<td>2'000 mA</td>
</tr>
<tr>
<td>THM 20-2422WI</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>~12 VDC</td>
<td>833 mA</td>
</tr>
<tr>
<td>THM 20-2423WI</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>~15 VDC</td>
<td>667 mA</td>
</tr>
<tr>
<td>THM 20-4811WI</td>
<td>5 VDC</td>
<td>4'000 mA</td>
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</tbody>
</table>

### Options

- Optional models with remote-control function
- Optional models with remote-control function with inverse logic
### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Input Current**        | At no load: 24 Vin models: 10 mA typ.  
                          | 48 Vin models: 9 mA typ.  
|                          | Surge Voltage: 24 Vin models: 50 VDC max. (3 s max)  
                          | 48 Vin models: 100 VDC max. (3 s max)  
| **Under Voltage Lockout**| 24 Vin models: 7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.  
                          | 48 Vin models: 15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.  
| **Recommended Input Fuse**| 24 Vin models: 4'000 mA (slow blow)  
                          | 48 Vin models: 2'000 mA (slow blow)  
|                          | The need of an external fuse has to be assessed in the final application.  
| **Input Filter**         | Internal Pi-Type |

### Output Specifications

<table>
<thead>
<tr>
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<th>Details</th>
</tr>
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</table>
| **Output Voltage Adjustment**        | -10% to +20% (15 & 24 Vout single models)  
                          | ±10% (other single output models)  
                          | (By external trim resistor)  
|                                      | See application note: [www.tracopower.com/overview/thm20wi](http://www.tracopower.com/overview/thm20wi)  
| **Voltage Set Accuracy**             | ±1% max. |
| **Regulation**                       | - Input Variation (Vmin - Vmax): 0.2% max.  
                          | - Load Variation (0 - 100%): 0.5% max.  
                          | - Cross Regulation (25% / 100% asym. load): 0.2% max.  
                          | dual output models: 1% max. (Output 1)  
                          | 1% max. (Output 2) |
| **Ripple and Noise** (20 MHz Bandwidth) | - single output: 50 mVp-p typ.  
                          | 12 Vout models: 75 mVp-p typ.  
                          | 15 Vout models: 75 mVp-p typ.  
                          | 24 Vout models: 100 mVp-p typ.  
                          | dual output: 5 / -5 Vout models: 50 / 50 mVp-p typ.  
                          | 12 / -12 Vout models: 75 / 75 mVp-p typ.  
                          | 15 / -15 Vout models: 75 / 75 mVp-p typ.  
| **Capacitive Load**                  | - single output: 5'000 µF max.  
                          | 12 Vout models: 850 µF max.  
                          | 15 Vout models: 700 µF max.  
                          | 24 Vout models: 220 µF max.  
                          | dual output: 12 / -12 Vout models: 500 / 500 µF max.  
                          | 15 / -15 Vout models: 350 / 350 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.
<table>
<thead>
<tr>
<th><strong>Overvoltage Protection</strong></th>
<th>125% typ. of Vout nom. (depending on model)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.2 VDC typ. (6 VDC model)</td>
</tr>
<tr>
<td></td>
<td>15 VDC typ. (12 VDC model)</td>
</tr>
<tr>
<td></td>
<td>20 VDC typ. (15 VDC model)</td>
</tr>
<tr>
<td></td>
<td>30 VDC typ. (24 VDC model)</td>
</tr>
<tr>
<td></td>
<td>6.2 VDC typ. (±5 VDC model)</td>
</tr>
<tr>
<td></td>
<td>15 VDC typ. (±12 VDC model)</td>
</tr>
<tr>
<td></td>
<td>20 VDC typ. (±15 VDC model)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Transient Response</strong></th>
<th>Response Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>250 µs typ. (25% Load Step)</td>
</tr>
</tbody>
</table>

### Safety Specifications

<table>
<thead>
<tr>
<th><strong>Safety Standards</strong></th>
<th>EN 62368-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IEC 62368-1</td>
</tr>
<tr>
<td></td>
<td>UL 62368-1</td>
</tr>
<tr>
<td></td>
<td>EN 60601-1</td>
</tr>
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<td>IEC 60601-1</td>
</tr>
<tr>
<td></td>
<td>ANSI/AAMI ES 60601-1</td>
</tr>
</tbody>
</table>

**Pollution Degree**
- PD 2

**Over Voltage Category**
- OVC II

### EMC Specifications

#### EMI Emissions

- **Conducted Emissions**
  - EN 60601-1-2 edition 4 (Medical Devices)
  - EN 55011 class A (with internal filter)
  - EN 55011 class B (with external filter)
  - EN 55032 class A (with external filter)
  - FCC Part 18 class A (with external filter)
  - FCC Part 18 class B (with external filter)

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

**External filter proposal:**
- www.tracopower.com/overview/thm20wi

#### 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, 10 V/m, perf. criteria A
  - EN 61000-4-4, ±2 kV, perf. criteria A
  - EN 61000-4-5, ±2 kV, perf. criteria A

- **EFT (Burst) / Surge**
  - Ext. input component: 24 Vin models: 2 x KY 220 µF // TVS SMDJ58A
  - 48 Vin models: 2 x KY 220 µF // TVS SMDJ120A

- **Conducted RF Disturbances**
  - EN 61000-4-6, 10 Vrms, perf. criteria A

- **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><strong>Relative Humidity</strong></th>
<th>95% max. (non condensing)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature Ranges</strong></td>
<td></td>
</tr>
<tr>
<td>- Operating Temperature</td>
<td>-40°C to +80°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><strong>Power Derating</strong></td>
<td>2 %/K above 55°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 min.

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

### 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
1,712,000 h (MIL-HDBK-217F, ground benign)

### Environment
- Vibration
- 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
24 g

### Thermal Impedance
14.4 K/W

### Environmental Compliance
- Reach
- RoHS

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**Supporting Documents**

- Overview Link (for additional Documents)
  - www.tracopower.com/overview/thm20wi

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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.