DC/DC Medical Converter

The THM 30 series is a range of medical 30 Watt DC/DC converters in 2.0" 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 +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</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THM 30-1211</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>5 VDC</td>
<td>6'000 mA</td>
<td>–5 VDC</td>
</tr>
<tr>
<td>THM 30-1212</td>
<td>12 VDC</td>
<td>2'500 mA</td>
<td>–5 VDC</td>
<td>3'000 mA</td>
</tr>
<tr>
<td>THM 30-1213</td>
<td>15 VDC</td>
<td>2'000 mA</td>
<td>–12 VDC</td>
<td>1'250 mA</td>
</tr>
<tr>
<td>THM 30-1215</td>
<td>24 VDC</td>
<td>1'250 mA</td>
<td>–15 VDC</td>
<td>1'000 mA</td>
</tr>
<tr>
<td>THM 30-1221</td>
<td>+5 VDC</td>
<td>3'000 mA</td>
<td>–5 VDC</td>
<td>3'000 mA</td>
</tr>
<tr>
<td>THM 30-1222</td>
<td>+12 VDC</td>
<td>1'250 mA</td>
<td>–12 VDC</td>
<td>1'250 mA</td>
</tr>
<tr>
<td>THM 30-1223</td>
<td>+15 VDC</td>
<td>1'000 mA</td>
<td>–15 VDC</td>
<td>1'000 mA</td>
</tr>
<tr>
<td>THM 30-2411</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>5 VDC</td>
<td>6'000 mA</td>
<td>–5 VDC</td>
</tr>
<tr>
<td>THM 30-2412</td>
<td>12 VDC</td>
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</tr>
<tr>
<td>THM 30-2413</td>
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<td>–12 VDC</td>
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</tr>
<tr>
<td>THM 30-2415</td>
<td>24 VDC</td>
<td>1'250 mA</td>
<td>–15 VDC</td>
<td>1'000 mA</td>
</tr>
<tr>
<td>THM 30-2421</td>
<td>+5 VDC</td>
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<td>3'000 mA</td>
</tr>
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<td>THM 30-2423</td>
<td>+15 VDC</td>
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<td>1'000 mA</td>
</tr>
<tr>
<td>THM 30-4811</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>5 VDC</td>
<td>6'000 mA</td>
<td>–5 VDC</td>
</tr>
<tr>
<td>THM 30-4812</td>
<td>12 VDC</td>
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</tr>
</tbody>
</table>

### Options

- Optional models with Remote On/Off function
- Optional models with inverse Remote On/Off function (passive = off)
## Input Specifications

| Input Current | - At no load | 12 Vin models: 11 mA typ. |
|              |            | 24 Vin models: 9 mA typ. |
|              |            | 48 Vin models: 9 mA typ. |

| Surge Voltage | 12 Vin models: 25 VDC max. (3 s max) |
|              | 24 Vin models: 50 VDC max. (3 s max) |
|              | 48 Vin models: 100 VDC max. (3 s max) |

| Under Voltage Lockout | 12 Vin models: 7.8 VDC min. / 8 VDC typ. / 8.6 VDC max. |
|                       | 24 Vin models: 15.8 VDC min. / 16 VDC typ. / 17.4 VDC max. |
|                       | 48 Vin models: 32 VDC min. / 33 VDC typ. / 34 VDC max. |

| Recommended Input Fuse | 12 Vin models: 6'300 mA (slow blow) |
|                        | 24 Vin models: 3'150 mA (slow blow) |
|                        | 48 Vin models: 1'600 mA (slow blow) |

(The need of an external fuse has to be assessed in the final application.)

## Output Specifications

### Output Voltage Adjustment

- 10% to +20% (15 & 24 Vout models)
- ±10% (other models)
- (single output models only)
- (By external trim resistor)

See application note: [www.tracopower.com/overview/thm30](http://www.tracopower.com/overview/thm30)

Output power must not exceed rated power!

### Voltage Set Accuracy

<table>
<thead>
<tr>
<th>Regulation</th>
<th>±1% max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Input Variation (Vmin - Vmax)</td>
<td>single output models: 0.2% max.</td>
</tr>
<tr>
<td></td>
<td>dual output models: 0.5% max.</td>
</tr>
<tr>
<td>- Load Variation (0 - 100%)</td>
<td>single output models: 0.2% max.</td>
</tr>
<tr>
<td></td>
<td>dual output models: 1% max. (Output 1)</td>
</tr>
<tr>
<td></td>
<td>dual output models: 1% max. (Output 2)</td>
</tr>
<tr>
<td>- Cross Regulation</td>
<td>dual output models: 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: 100 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: 7'200 µF max. |
| 12 Vout models: 1'200 µF max. |
| 15 Vout models: 1'000 µF max. |
| 24 Vout models: 375 µF max. |

- dual output

| 5 / -5 Vout models: 3'600 / 3'600 µF max. |
| 12 / -12 Vout models: 750 / 750 µF max. |
| 15 / -15 Vout models: 500 / 500 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, resistive 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

Standards
- IT / Multimedia Equipment: EN 62368-1
- Medical Equipment: IEC 60601-1
- Certification Documents: www.tracopower.com/overview/thm30

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 (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)

External filter proposal: www.tracopower.com/overview/thm30

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 61000-4-4, ±2 kV, perf. criteria A

- Conducted RF Disturbances
  Ext. input component: EN 61000-4-6, 10 Vrms, perf. criteria A
  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

Relative Humidity
95% max. (non condensing)

Temperature Ranges
- Operating Temperature
-40°C to +80°C
- Case Temperature
+105°C max.
- Storage Temperature
-55°C to +125°C

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

See application note: [www.tracopower.com/overview/thm30](http://www.tracopower.com/overview/thm30)

### Over Temperature Protection Switch Off
- Protection Mode
- Measurement Point

Depending on model

| Case | 115°C typ. (Automatic recovery) |

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

### Remote Control
- Voltage Controlled Remote (passive = on)
- Off Idle Input Current
- Remote Pin Input Current

- On: 3.5 to 12 VDC or open circuit
- Off: 0 to 1.2 VDC or short circuit

Refers to 'Remote' and '-'Vin' Pin

2.5 mA typ.

-0.5 to 1.0 mA

(Optional models with inverse Remote On/Off function (passive = off))

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

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

### Insulation System
- Reinforced Insulation

### Working Voltage
- 250 VAC

### Isolation Test Voltage
- Input to Output, 60 s: 5'000 VAC
- Input to Output, 1 s: 10'000 VDC

### 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: 1'140'000 h (MIL-HDBK-217F; ground benign)

### Washing Process

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

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

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

### Potting Material
- Pin Foundation Plating: Copper

### Pin Material
- Pin Surface Plating: Nickel (2 - 3 µm)

### Pin Surface Plating
- Housing Type: Plastic Case

### Housing Type
- Mounting Type: PCB Mount

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

### Footprint Type
- Soldering Profile: Lead-Free Wave Soldering

### Weight
- 32 g

### Thermal Impedance
- Case to Ambient: 12.9 K/W typ.

### Environmental Compliance


- SCIP Reference Number: 06ca58e7-a740-4f31-a81d-c4af720b99d6

### Supporting Documents

Overview Link for additional Documents: [www.tracopower.com/overview/thm30](http://www.tracopower.com/overview/thm30)

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)
Tolerances ±0.5 (±0.02)
Pin Ø 1 ±0.1 (0.039 ±0.004)
Pin pitch tolerances ±0.25 (±0.01)

<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.