DC/DC Railway Converter

- Chassis mount with screw terminal block
- Including EMI filter to meet EN 55032, class A
- Ultra wide 4:1 input voltage ranges 9–36, 18–75, 43–160 VDC
- EN 50155 approval for railway applications
- Very high efficiency up to 91%
- No minimum load
- Soft start
- Under voltage lock-out circuit
- Adjustable output voltage +10 / -20%
- Sense line

The TEP 200WIRCMF Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges. They come in chassis mount version with screw terminal block and with integrated EMI input filter to meet EN 55032 class A. A very high efficiency allows full power operation at 25°C with only 100 LFM air flow cooling and operation at 60°C with only 40% power derating. The very wide input voltage range and reverse input voltage protection make these converters interesting solution for battery operated systems. Typical applications are in telecom/datacom, industry control and railway systems for onboard power distribution.

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>TEP 200-2412WIRCMF</td>
<td>TEP 200-2413WIRCMF</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>12 VDC</td>
<td>15’000 mA</td>
<td>89 %</td>
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<tr>
<td>TEP 200-2415WIRCMF</td>
<td>TEP 200-2416WIRCMF</td>
<td>12 VDC</td>
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<td>89 %</td>
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<td>TEP 200-2418WIRCMF</td>
<td>15 VDC</td>
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<td>90 %</td>
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<td>TEP 200-4812WIRCMF</td>
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<td>18 - 75 VDC (48 VDC nom.)</td>
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<td>15 VDC</td>
<td>14’000 mA</td>
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<tr>
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<td>24 VDC</td>
<td>9’000 mA</td>
<td>90 %</td>
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<tr>
<td>TEP 200-7212WIRCMF</td>
<td>TEP 200-7213WIRCMF</td>
<td>43 - 160 VDC (110 VDC nom.)</td>
<td>12 VDC</td>
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<tr>
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<td>16’000 mA</td>
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<td>TEP 200-7218WIRCMF</td>
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<td>10’000 mA</td>
<td>89 %</td>
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<tr>
<td>TEP 200-7218WIRCMF</td>
<td>28 VDC</td>
<td>8’500 mA</td>
<td>90 %</td>
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<tr>
<td>TEP 200-7218WIRCMF</td>
<td>48 VDC</td>
<td>5’000 mA</td>
<td>89 %</td>
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</tbody>
</table>
Options

|---------|-------------------------------------------------------------------------------------------------|
| on demand (backorder with MOQ, non stocking item) | - Optional model with 3.3 VDC / 50'000 mA Output and 9 - 36 VDC Input  
- Optional model with 5 VDC / 36'000 mA Output and 9 - 36 VDC Input  
- Optional model with 3.3 VDC / 50'000 mA Output and 18 - 75 VDC Input  
- Optional model with 5 VDC / 40'000 mA Output and 18 - 75 VDC Input  
- Optional model with 53 VDC / 3'800 mA Output and 33 - 75 VDC Input  
- Optional model with 3.3 VDC / 57'000 mA Output and 43 - 160 VDC Input  
- Optional model with 5 VDC / 44'000 mA Output and 43 - 160 VDC Input  
- 2:1 Input models  
- Negative (passive = Off) Remote On/Off function |

Input Specifications

| Input Current | - At no load 24 Vin models: 35 mA typ.  
48 Vin models: 20 mA typ.  
110 Vin models: 10 mA typ. |
| Surge Voltage | 24 Vin models: 50 VDC max. (1 s max.)  
48 Vin models: 100 VDC max. (1 s max.)  
110 Vin models: 185 VDC max. (1 s max.) |
| Under Voltage Lockout | 24 Vin models: 7.3 VDC min. / 7.7 VDC typ. / 8.1 VDC max.  
48 Vin models: 15.5 VDC min. / 16 VDC typ. / 16.3 VDC max.  
110 Vin models: 33 VDC min. / 34.5 VDC typ. / 36 VDC max. |
| Recommended Input Fuse | 24 Vin models: 32'000 mA (fast acting)  
48 Vin models: 20'000 mA (fast acting)  
110 Vin models: 10'000 mA (fast acting) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | Internal Pi-Type |

Output Specifications

| Output Voltage Adjustment | ~20% to +10% (By external trim resistor)  
See application note: [www.tracopower.com/overview/tep200wircm](http://www.tracopower.com/overview/tep200wircm)  
Output power must not exceed rated power! |
| Voltage Set Accuracy | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax)  
0.1% max.  
0.1% max. |
| Ripple and Noise (20 MHz Bandwidth) | 3.3 Vout models: 75 mVp-p max. (w/ 1 µF X7R // 25 µF poscap)  
5 Vout models: 75 mVp-p max. (w/ 1 µF X7R // 25 µF poscap)  
12 Vout models: 100 mVp-p max. (w/ 1 µF X7R // 25 µF poscap)  
15 Vout models: 100 mVp-p max. (w/ 1 µF X7R // 25 µF poscap)  
24 Vout models: 200 mVp-p max. (w/ 47 µF X7R)  
28 Vout models: 200 mVp-p max. (w/ 47 µF X7R)  
48 Vout models: 300 mVp-p max. (w/ 22 µF X7R) |

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
| Capacitive Load | - 24 Vin input | 3.3 Vout models: 151'000 µF max. |
| | | 5 Vout models: 72'000 µF max. |
| | | 12 Vout models: 12'500 µF max. |
| | | 15 Vout models: 8'000 µF max. |
| | | 24 Vout models: 3'100 µF max. |
| | | 28 Vout models: 2'300 µF max. |
| | | 48 Vout models: 770 µF max. |
| | - 48 Vin input | 3.3 Vout models: 151'000 µF max. |
| | | 5 Vout models: 80'000 µF max. |
| | | 12 Vout models: 15'000 µF max. |
| | | 15 Vout models: 9'300 µF max. |
| | | 24 Vout models: 4'100 µF max. |
| | | 28 Vout models: 3'000 µF max. |
| | | 48 Vout models: 930 µF max. |
| | - 110 Vin input | 3.3 Vout models: 172'000 µF max. |
| | | 5 Vout models: 88'000 µF max. |
| | | 12 Vout models: 16'600 µF max. |
| | | 15 Vout models: 10'600 µF max. |
| | | 24 Vout models: 3'700 µF max. |
| | | 28 Vout models: 3'000 µF max. |
| | | 48 Vout models: 1'000 µF max. |

Minimum Load  
Not required

Temperature Coefficient  
±0.02 %/K max.

Start-up Time  
75 ms typ.

Short Circuit Protection  
Continuous, Automatic recovery

Output Current Limitation  
120 - 150% of Iout max.

Overvoltage Protection  
115 - 130% of Vout nom.

Transient Response  
- Response Time  
200 µs typ. / 250 µs max. (25% Load Step)

Safety Specifications

| Safety Standards | - IT / Multimedia Equipment  
| | EN 60950-1  
| | IEC 60950-1  
| | UL 60950-1  
| | - Railway Applications  
| | EN 50155  
| | - Certification Documents  
| | www.tracopower.com/overview/tep200wircmf

Pollution Degree  
PD 2

Over Voltage Category  
OVC II

EMC Specifications

| EMI Emissions | - Conducted Emissions  
| | EN 55011 class A (internal filter)  
| | EN 55032 class A (internal filter)  
| | - Radiated Emissions  
| | EN 55011 class A (internal filter)  
| | EN 55032 class A (internal filter)  

EMS Immunity  
- Electrostatic Discharge  
  Air: EN 61000-4-2, ±8 kV, perf. criteria A  
  Contact: EN 61000-4-2, ±6 kV, perf. criteria A  
- RF Electromagnetic Field  
  EN 61000-4-3, 20 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: 24 & 48 Vin models: 2 x KY 220 µF  
110 Vin models: 2 x KYJ 150 µF  
- Conducted RF Disturbances  
  Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A  
  Ext.: EN 61000-4-8, 100 A/m, perf. criteria A  
- PF Magnetic Field  
  Continuous: EN 61000-4-8, 100 A/m, perf. criteria A

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

www.tracopower.com  
October 26, 2020
### General Specifications

**Relative Humidity** 95% max. (non condensing)

**Temperature Ranges**
- Operating Temperature -40°C to +75°C
- Case Temperature +105°C max.
- Storage Temperature -40°C to +105°C

**Power Derating**
- High Temperature See application note: www.tracopower.com/overview/tep200wircmf

**Over Temperature Protection Switch Off**
- Protection Mode 115°C typ. (Automatic recovery at 105°C typ.)
- Measurement Point Base-Plate

**Cooling System** Natural convection (20 LFM)

**Sense Function** 10% max. of Vout nom.
(Sense line to be connected to the output either at the module or at the load under regard of polarity)

**Remote Control**
- Voltage Controlled Remote On: 3.0 to 12 VDC or open circuit
- Off Idle Input Current
- Remote Pin Input Current Off: 0 to 1.2 VDC or short circuit
  Refers to ‘Remote’ and ‘-Vin’ Pin 3 mA typ.
  -0.5 to 1.0 mA

**Altitude During Operation** 2'000 m max.

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

**Insulation System**
- Reinforced Insulation (110 VIn models only)
- Basic Insulation (other models)

**Working Voltage** (rated)
- 145 VAC (3.3 and 5 Vout models)
- 185 VAC (4.8 and 53 Vout models)
- 172 VAC (other output models)

**Isolation Test Voltage**
- Input to Output, 60 s 3'000 VAC (110 VIn models)
- Input to Case, 60 s 3'000 VDC (other models)
- Output to Case, 60 s 1'500 VAC (110 VIn models)
- Output to Case, 60 s 1'600 VDC (other models)

**Isolation Resistance**
- Input to Output, 500 VDC 1'000 MΩ min.

**Isolation Capacitance**
- Input to Output, 100 kHz, 1 V 2'500 pF max.

**Reliability**
- Calculated MTBF 300'000 h (MIL-HDBK-217F, ground benign)

**Environment**
- Vibration MIL-STD-810F
  - EN 61373
- Mechanical Shock MIL-STD-810F
  - EN 61373
- Thermal Shock MIL-STD-810F
  - EN 50155

**Housing Material**
- Alu base-plate w. plastic case (110 VIn models)
- Alu base-plate w. metal case (other models)

**Base Material**
- Non-conductive FR4 (UL94 V-0 rated) (24 VIn & 48 VIn models only)

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

**Connection Type**
- Screw Terminal

**Weight** 287 g

**Thermal Impedance** 6.1 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/tep200wircmf

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

Dimensions in mm (inch)

* Tolerances ±0.5 (±0.02)
* Pin pitch tolerances ±0.025 (±0.01)
* Mounting hole pitch tolerances ±0.025 (±0.01)

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
</tr>
<tr>
<td>3</td>
<td>Remote</td>
</tr>
<tr>
<td>4</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>5</td>
<td>–Vout</td>
</tr>
<tr>
<td>6</td>
<td>–Sense</td>
</tr>
<tr>
<td>7</td>
<td>Trim</td>
</tr>
<tr>
<td>8</td>
<td>+Sense</td>
</tr>
<tr>
<td>9</td>
<td>+Vout</td>
</tr>
</tbody>
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NC: No Connection

The screw 1 locked torque: MAX 11.2kgf-cm/1.14N-m

The screw 2 locked torque: MAX 5.2kgf-cm/0.51N-m

The screw 3 locked torque: MAX 16.8kgf-cm/1.64N-m