DC/DC Railway Converter

- Chassis mount with screw terminal block
- EN 50155 approval for railway applications
- Optional DIN-rail mounting kit
- Ultra wide 4:1 input voltage range
- Full load operation up to +60°C with convection cooling
- Undervoltage lockout
- Reverse input voltage protection
- Input protection filter
- 3-year product warranty

The TEP 75WICMF 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. These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. Four threaded M3 inserts in the module makes chassis mount or attachment of a heatsink for optimal thermal management very simple. For easy connection there is also an unique adaptor available with screw terminals. A very high efficiency allows an operating temperature up to +80°C with natural convection cooling without power derating. Further features include output voltage trim, Remote On/Off and under voltage lockout. The very wide input voltage range and reverse input voltage protection make these converters also an interesting solution for battery operated systems.

### Models

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEP 75-2411WI-CMF</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>15’000 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TEP 75-2412WI-CMF</td>
<td></td>
<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>6’300 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TEP 75-2413WI-CMF</td>
<td></td>
<td>15 VDC (12.0 - 16.5 VDC)</td>
<td>5’000 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TEP 75-2415WI-CMF</td>
<td></td>
<td>24 VDC (19.2 - 26.4 VDC)</td>
<td>3’200 mA</td>
<td>87 %</td>
</tr>
<tr>
<td>TEP 75-2416WI-CMF</td>
<td></td>
<td>28 VDC (22.4 - 30.8 VDC)</td>
<td>2’700 mA</td>
<td>87 %</td>
</tr>
<tr>
<td>TEP 75-2418WI-CMF</td>
<td></td>
<td>48 VDC (38.4 - 52.8 VDC)</td>
<td>1’600 mA</td>
<td>87 %</td>
</tr>
<tr>
<td>TEP 75-4811WI-CMF</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>15’000 mA</td>
<td>90 %</td>
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<tr>
<td>TEP 75-4812WI-CMF</td>
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<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>6’300 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEP 75-4813WI-CMF</td>
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<td>15 VDC (12.0 - 16.5 VDC)</td>
<td>5’000 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TEP 75-4815WI-CMF</td>
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<td>24 VDC (19.2 - 26.4 VDC)</td>
<td>3’200 mA</td>
<td>88 %</td>
</tr>
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<td>TEP 75-4816WI-CMF</td>
<td></td>
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<td>2’700 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TEP 75-4818WI-CMF</td>
<td></td>
<td>48 VDC (38.4 - 52.8 VDC)</td>
<td>1’600 mA</td>
<td>87 %</td>
</tr>
<tr>
<td>TEP 75-7211WI-CMF</td>
<td>43 - 160 VDC (110 VDC nom.)</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>15’000 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEP 75-7212WI-CMF</td>
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<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>6’300 mA</td>
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</tr>
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<tr>
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<td>3’200 mA</td>
<td>90 %</td>
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<td>TEP 75-7218WI-CMF</td>
<td></td>
<td>48 VDC (38.4 - 52.8 VDC)</td>
<td>1’600 mA</td>
<td>90 %</td>
</tr>
</tbody>
</table>
## Input Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>At no load: 10 mA typ.</td>
</tr>
<tr>
<td></td>
<td>20 mA typ. (3.3 Vout model)</td>
</tr>
<tr>
<td></td>
<td>120 mA typ. (5 Vout model)</td>
</tr>
<tr>
<td></td>
<td>185 mA typ. (12 Vout model)</td>
</tr>
<tr>
<td></td>
<td>185 mA typ. (15 Vout model)</td>
</tr>
<tr>
<td></td>
<td>85 mA typ. (24 Vout model)</td>
</tr>
<tr>
<td></td>
<td>85 mA typ. (28 Vout model)</td>
</tr>
<tr>
<td></td>
<td>85 mA typ. (45 Vout model)</td>
</tr>
<tr>
<td></td>
<td>4 At full load: 3600 mA max.</td>
</tr>
<tr>
<td></td>
<td>1800 mA max.</td>
</tr>
<tr>
<td></td>
<td>1350 mA max.</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>50 VDC max. (1 s max)</td>
</tr>
<tr>
<td></td>
<td>100 VDC max. (1 s max)</td>
</tr>
<tr>
<td></td>
<td>185 VDC max. (1 s max)</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>7.7 VDC typ. / 8.1 VDC max.</td>
</tr>
<tr>
<td></td>
<td>7.3 VDC min. / 8.1 VDC max.</td>
</tr>
<tr>
<td></td>
<td>13 VDC min. / 13.5 VDC max.</td>
</tr>
<tr>
<td></td>
<td>11.5 VDC min. / 13.5 VDC max.</td>
</tr>
<tr>
<td></td>
<td>13.5 VDC min. / 13.5 VDC max.</td>
</tr>
<tr>
<td></td>
<td>13.5 VDC min. / 13.5 VDC max.</td>
</tr>
<tr>
<td></td>
<td>33 VDC min. / 34.5 VDC max.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>15'000 mA (fast acting)</td>
</tr>
<tr>
<td></td>
<td>8'000 mA (fast acting)</td>
</tr>
<tr>
<td></td>
<td>3'150 mA (slow blow)</td>
</tr>
<tr>
<td>Reverse Voltage Protection</td>
<td>Parallel diode (external input fuse required)</td>
</tr>
</tbody>
</table>

## Output Specifications

### Voltage Set Accuracy
-20% to +10% (± by external trim resistor)
See application note: www.tracopower.com/overview/tep75wicmf
Output power must not exceed rated power!

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Set Accuracy</td>
<td>±1% max.</td>
</tr>
<tr>
<td>Regulation</td>
<td>- Input Variation (Vmin - Vmax)</td>
</tr>
<tr>
<td></td>
<td>- Load Variation (0 - 100%)</td>
</tr>
<tr>
<td>Ripple and Noise (20 MHz Bandwidth)</td>
<td>3.3 Vout: 100 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>5 Vout: 100 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>12 Vout: 125 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>15 Vout: 125 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>24 Vout: 250 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>28 Vout: 250 mVp-p max. (w/ 4.7 ΩF)</td>
</tr>
<tr>
<td></td>
<td>48 Vout: 350 mVp-p max. (w/ 2.2 ΩF)</td>
</tr>
</tbody>
</table>

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Capacitive Load
3.3 Vout models: 60'600 µF max.
5 Vout models: 30'000 µF max.
12 Vout models: 5'250 µF max.
15 Vout models: 3'330 µF max.
24 Vout models: 1'330 µF max.
28 Vout models: 960 µF max.
48 Vout models: 330 µF max.

Minimum Load
Not required

Temperature Coefficient
±0.02 %/K max.

Start-up Time
60 ms typ. (110 Vin models)
25 ms typ. (other models)

Short Circuit Protection
Continuous, Automatic recovery

Output Current Limitation
150% typ. of Iout max.
(110 Vin models)
110 - 140% (other models)

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
  EN 62368-1
  IEC 60950-1
  IEC 62368-1
  UL 60950-1
  UL 62368-1
- Railway Applications
- Certification Documents
  EN 50155
  www.tracopower.com/overview/tep75wicmf

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)
- 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)
  External filter proposal: www.tracopower.com/overview/tep75wicmf

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
- Conducted RF Disturbances
  Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A
  1 s: EN 61000-4-8, 100 A/m, perf. criteria A
- PF Magnetic Field

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/tep75wicmf

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

**Remote Control**  
- Voltage Controlled Remote  
- Off Idle 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.  
  (Optional models with inverse logic available)

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

**Switching Frequency**  
270 - 330 kHz (PWM)  
300 kHz typ. (PWM)

**Insulation System**  
Reinforced Insulation (110 VIN models)  
Basic Insulation (other models)

**Working Voltage (rated)**  
157 VAC (110 VIN models)  
125 VAC (other input models)

**Isolation Test Voltage**  
- Input to Output, 60 s: 3'000 VAC (110 VIN models)  
  3'000 VDC (other models)  
- Input to Case, 60 s: 1'500 VAC (110 VIN models)  
  1'600 VDC (other models)  
- Output to Case, 60 s: 1'500 VAC (110 VIN models)  
  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: 336'000 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. metal case (24 and 48 VIN models)  
Alu base-plate w. plastic case (110 VIN models)

**Base Material**  
Non-conductive FR4 (UL 94 V-0 rated) (24 and 48 VIN models only)

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

**Housing Type**  
Metal Case (24 and 48 VIN models)  
Plastic Case (110 VIN models)

**Mounting Type**  
Chassis Mount

**Connection Type**  
Screw Terminal

**Weight**  
287 g

**Thermal Impedance**  
6.7 K/W

**Environmental Compliance**  
- REACH Declaration: www.tracopower.com/info/reach-declaration.pdf  
- RoHS Declaration: www.tracopower.com/info/rohs-declaration.pdf  

**Supporting Documents**  
Overview Link (for additional Documents): www.tracopower.com/overview/tep75wicmf

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: x.x±0.5 (x.xx±0.02)
- x.xx±0.25 (x.xxx±0.01)

**Screw 3:**
- Type M4
- Head diameter 6.88 (0.271)
- Rated current: 15 A

- The screw1 locked torque:
  - MAX 11.2kgf-cm/1.10N-m

- The screw2 locked torque:
  - MAX 5.2kgf-cm/0.51N-m

- The screw3 locked torque:
  - MAX 12kgf-cm/1.18N-m

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### 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>
</table>

NC: No Connection

*Sense line to be connected to the output either at the module or at the load under regard of polarity.*