DC/DC Railway Converter  

- Rugged, compact metal case
- Screw terminal adaptor available for easy connection
- EN 50155 approval for railway applications
- 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-75WI Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges which come in a rugged, sealed metal case. These converters are suitable for a wide range of applications. For easy connection there is also an unique adaptor available with screw terminals. A very high efficiency allows an operating temperature up to +60°C with natural convection cooling without power derating. Further features include output voltage trimming, 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.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>TEP 75-2411WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>5 VDC</td>
<td>15'000 mA</td>
<td>88 %</td>
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<tr>
<td>TEP 75-2412WI</td>
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<td>12 VDC</td>
<td>6'300 mA</td>
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<td>TEP 75-2413WI</td>
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<td>15 VDC</td>
<td>5'000 mA</td>
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<tr>
<td>TEP 75-2415WI</td>
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<td>24 VDC</td>
<td>3'200 mA</td>
<td>87 %</td>
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<tr>
<td>TEP 75-2416WI</td>
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<td>28 VDC</td>
<td>2'700 mA</td>
<td>87 %</td>
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<tr>
<td>TEP 75-2418WI</td>
<td></td>
<td>48 VDC</td>
<td>1'600 mA</td>
<td>87 %</td>
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<tr>
<td>TEP 75-4811WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>5 VDC</td>
<td>15'000 mA</td>
<td>90 %</td>
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<tr>
<td>TEP 75-4812WI</td>
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<td>12 VDC</td>
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<td>90 %</td>
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<tr>
<td>TEP 75-4813WI</td>
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<td>15 VDC</td>
<td>5'000 mA</td>
<td>89 %</td>
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<tr>
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<td>24 VDC</td>
<td>3'200 mA</td>
<td>88 %</td>
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<td></td>
<td>48 VDC</td>
<td>1'600 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td>TEP 75-7211WI</td>
<td>43 - 160 VDC (110 VDC nom.)</td>
<td>5 VDC</td>
<td>15'000 mA</td>
<td>91 %</td>
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<tr>
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<td></td>
<td>12 VDC</td>
<td>6'300 mA</td>
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<td></td>
</tr>
</tbody>
</table>

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Options

| Suffix -CMF | - Chassis mount models with filter to meet EN 55032 class A: www.tracopower.com/products/tep75wicmf.pdf |

Options on demand (backorder with MOQ: non stocking item)

- Optional model with 3.3 VDC / 20’000 mA Output and 9 - 36 VDC Input
- Optional model with 3.3 VDC / 20’000 mA Output and 18 - 75 VDC Input
- Optional model with 3.3 VDC / 20’000 mA Output and 43 - 160 VDC Input
- Inverse Remote On/Off function (passive = off)

Input Specifications

| Input Current | 110 Vin models: 10 mA typ. |
| 24 Vin models: 85 mA typ. (3.3 Vout model) |
| 24 Vin models: 120 mA typ. (5 Vout model) |
| 24 Vin models: 185 mA typ. (12 Vout model) |
| 24 Vin models: 185 mA typ. (15 Vout model) |
| 24 Vin models: 85 mA typ. (24 Vout model) |
| 24 Vin models: 85 mA typ. (28 Vout model) |
| 24 Vin models: 85 mA typ. (48 Vout model) |
| 48 Vin models: 60 mA typ. (3.3 Vout model) |
| 48 Vin models: 60 mA typ. (5 Vout model) |
| 48 Vin models: 90 mA typ. (12 Vout model) |
| 48 Vin models: 50 mA typ. (15 Vout model) |
| 48 Vin models: 50 mA typ. (24 Vout model) |
| 48 Vin models: 50 mA typ. (28 Vout model) |
| 48 Vin models: 50 mA typ. (48 Vout model) |

- At no load
  - 24 Vin models: 10 mA typ.
  - 48 Vin models: 185 mA typ.
  - 110 Vin models: 10 mA typ.
- At full load
  - 24 Vin models: 3’600 mA max.
  - 48 Vin models: 1’800 mA max.
  - 110 Vin models: 1’350 mA max.

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: 15’000 mA (fast acting)
48 Vin models: 8’000 mA (fast acting)
110 Vin models: 3’150 mA (slow blow)
(The need of an external fuse has to be assessed in the final application)

Reverse Voltage Protection

Parallel diode (24 Vin and 48 Vin models only)
(external input fuse required)

Input Filter

Internal Pi-Type (for 24 Vin models an input capacitor 4.7 µF X7R or 68 µF Nippon chemi-con KY is recommended for a reliable supply)

Output Specifications

Output Voltage Adjustment

See application note: www.tracopower.com/overview/tep75wi

-20% to +10% (By external trim resistor)
Output power must not exceed rated power!

Voltage Set Accuracy ±1% max.
Regulation
- Input Variation (Vmin - Vmax) 0.1% max.
- Load Variation (0 - 100%) 0.1% max.

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

(20 MHz Bandwidth)

<table>
<thead>
<tr>
<th>Voltage Models</th>
<th>Max. Ripple and Noise (100 mVp-p max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>5 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>12 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>15 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>24 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>28 Vout models</td>
<td>4.7 µF</td>
</tr>
<tr>
<td>48 Vout models</td>
<td>2.2 µF</td>
</tr>
</tbody>
</table>

### Capacitive Load

<table>
<thead>
<tr>
<th>Voltage Models</th>
<th>Max. Capacitive Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 Vout models</td>
<td>60'600 µF max.</td>
</tr>
<tr>
<td>5 Vout models</td>
<td>30'000 µF max.</td>
</tr>
<tr>
<td>12 Vout models</td>
<td>5'250 µF max.</td>
</tr>
<tr>
<td>15 Vout models</td>
<td>3'330 µF max.</td>
</tr>
<tr>
<td>24 Vout models</td>
<td>1'330 µF max.</td>
</tr>
<tr>
<td>28 Vout models</td>
<td>960 µF max.</td>
</tr>
<tr>
<td>48 Vout models</td>
<td>330 µF max.</td>
</tr>
</tbody>
</table>

### 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
  - www.tracopower.com/overview/tep75wi

### EMC Specifications

**EMI Emissions**
- Conducted Emissions
  - EN 55011 class B (with external filter)
  - EN 55032 class B (with external filter)
- Radiated Emissions
  - EN 55011 class B (with external filter)
  - EN 55032 class B (with external filter)

**External filter proposal:**
- www.tracopower.com/overview/tep75wi

**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
  - EN 61000-4-4, ±2 kV, perf. criteria A
- EFT (Burst) / Surge
  - 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 KY 150 µF
- 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

### General Specifications

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

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

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**Temperature Ranges**
- Operating Temperature: -40°C to +75°C
- Case Temperature: +105°C max.
- Storage Temperature: -55°C to +125°C

**Power Derating**
- High Temperature: See application note: [www.tracopower.com/overview/tep75wi](http://www.tracopower.com/overview/tep75wi)

**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 norm.

**Remote Control**
- Voltage Controlled Remote: On: 3.0 to 12 VDC or open circuit
  Off: 0 to 1.2 VDC or short circuit
- Off Idle Input Current: 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 V in models)
Basic Insulation (other models)

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

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

**Washing Process**
Allowed (hermetical product)

**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)

**Pin Material**
Copper

**Pin Foundation Plating**
Nickel (2 - 3 µm)

**Pin Surface Plating**
Tin (3 - 5 µm), matte

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

**Mounting Type**
PCB Mount

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

**Footprint Type**
Half-Brick

**Weight**
97 g

**Thermal Impedance**
6.7 K/W
4.7 K/W (with Heat Sink)

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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Environmental Compliance - REACH Declaration
- REACH SVHC list compliant
- REACH Annex XVII compliant
- RoHS Declaration
- RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).
  The SCIP number is provided on request.
- Flammability (EN 45545-2)

Supporting Documents
Overview Link (for additional Documents) www.tracopower.com/overview/tep75wi

Outline Dimensions

![Outline Dimensions Diagram]

**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>Case</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>

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

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