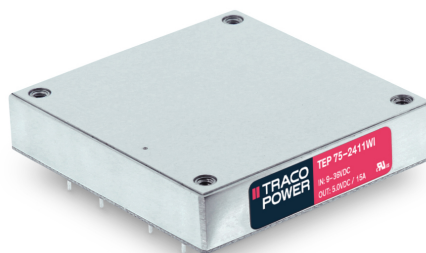


## DC/DC Railway Converter

## TEP 75WI Series, 75 Watt

- 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
- 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 makes these converters also an interesting solution for battery operated systems.

| Models        |                                |                                  |                     |                 |
|---------------|--------------------------------|----------------------------------|---------------------|-----------------|
| Order Code    | Input Voltage Range            | Output Voltage nom. (adjustable) | Output Current max. | Efficiency typ. |
| TEP 75-2411WI | 9 - 36 VDC<br>(24 VDC nom.)    | 5 VDC (4.0 - 5.5 VDC)            | 15'000 mA           | 88 %            |
| TEP 75-2412WI |                                | 12 VDC (9.6 - 13.2 VDC)          | 6'300 mA            | 88 %            |
| TEP 75-2413WI |                                | 15 VDC (12.0 - 16.5 VDC)         | 5'000 mA            | 88 %            |
| TEP 75-2415WI |                                | 24 VDC (19.2 - 26.4 VDC)         | 3'200 mA            | 87 %            |
| TEP 75-2416WI |                                | 28 VDC (22.4 - 30.8 VDC)         | 2'700 mA            | 87 %            |
| TEP 75-2418WI |                                | 48 VDC (38.4 - 52.8 VDC)         | 1'600 mA            | 87 %            |
| TEP 75-4811WI | 18 - 75 VDC<br>(48 VDC nom.)   | 5 VDC (4.0 - 5.5 VDC)            | 15'000 mA           | 90 %            |
| TEP 75-4812WI |                                | 12 VDC (9.6 - 13.2 VDC)          | 6'300 mA            | 90 %            |
| TEP 75-4813WI |                                | 15 VDC (12.0 - 16.5 VDC)         | 5'000 mA            | 89 %            |
| TEP 75-4815WI |                                | 24 VDC (19.2 - 26.4 VDC)         | 3'200 mA            | 88 %            |
| TEP 75-4816WI |                                | 28 VDC (22.4 - 30.8 VDC)         | 2'700 mA            | 88 %            |
| TEP 75-4818WI |                                | 48 VDC (38.4 - 52.8 VDC)         | 1'600 mA            | 87 %            |
| TEP 75-7211WI | 43 - 160 VDC<br>(110 VDC nom.) | 5 VDC (4.0 - 5.5 VDC)            | 15'000 mA           | 91 %            |
| TEP 75-7212WI |                                | 12 VDC (9.6 - 13.2 VDC)          | 6'300 mA            | 91 %            |
| TEP 75-7213WI |                                | 15 VDC (12.0 - 16.5 VDC)         | 5'000 mA            | 91 %            |
| TEP 75-7215WI |                                | 24 VDC (19.2 - 26.4 VDC)         | 3'200 mA            | 90 %            |
| TEP 75-7216WI |                                | 28 VDC (22.4 - 30.8 VDC)         | 2'700 mA            | 90 %            |
| TEP 75-7218WI |                                | 48 VDC (38.4 - 52.8 VDC)         | 1'600 mA            | 90 %            |

## Options

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix -CM</b>                                          | - Chassis mount models w/o filter: <a href="http://www.tracopower.com/overview/tep75wicm">www.tracopower.com/overview/tep75wicm</a>                                                                                                                                                                                                                                              |
| <b>Suffix -CMF</b>                                         | - Chassis mount models w/ filter to meet EN 55032 class A: <a href="http://www.tracopower.com/overview/tep75wicmf">www.tracopower.com/overview/tep75wicmf</a>                                                                                                                                                                                                                    |
| <b>TEP-HS1</b>                                             | - Optional Heat Sink: <a href="http://www.tracopower.com/overview/tep-hs1">www.tracopower.com/overview/tep-hs1</a>                                                                                                                                                                                                                                                               |
| <b>on demand</b><br>(backorder with MOQ non stocking item) | <ul style="list-style-type: none"> <li>- Optional model with 3.3 VDC and 20'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 3.3 VDC and 20'000 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 3.3 VDC and 20'000 mA Output, and 43 - 160 VDC Input</li> <li>- Optional models with inverse Remote On/Off function (passive = off)</li> </ul> |

## Input Specifications

|                        |                |                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current          | - At no load   | 110 Vin models: <b>10 mA typ.</b><br>24 Vin models: <b>85 mA typ.</b> (3.3 Vout model)<br><b>120 mA typ.</b> (5 Vout model)<br><b>185 mA typ.</b> (12 Vout model)<br><b>185 mA typ.</b> (15 Vout model)<br><b>85 mA typ.</b> (24 Vout model)<br><b>85 mA typ.</b> (28 Vout model)<br><b>85 mA typ.</b> (48 Vout model) |
|                        | - At full load | 48 Vin models: <b>60 mA typ.</b> (3.3 Vout model)<br><b>60 mA typ.</b> (5 Vout model)<br><b>90 mA typ.</b> (12 Vout model)<br><b>50 mA typ.</b> (15 Vout model)<br><b>50 mA typ.</b> (24 Vout model)<br><b>50 mA typ.</b> (28 Vout model)<br><b>50 mA typ.</b> (48 Vout model)                                         |
| Surge Voltage          |                | 24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)<br>110 Vin models: <b>185 VDC max.</b> (1 s max.)                                                                                                                                                                        |
|                        |                | 24 Vin models: <b>7.3 VDC min. / 7.7 VDC typ. / 8.1 VDC max.</b><br>48 Vin models: <b>15.5 VDC min. / 16 VDC typ. / 16.3 VDC max.</b><br>110 Vin models: <b>33 VDC min. / 34.5 VDC typ. / 36 VDC max.</b>                                                                                                              |
| Under Voltage Lockout  |                |                                                                                                                                                                                                                                                                                                                        |
|                        |                |                                                                                                                                                                                                                                                                                                                        |
| Recommended Input Fuse |                | 24 Vin models: <b>15'000 mA</b> (fast acting)<br>48 Vin models: <b>8'000 mA</b> (fast acting)<br>110 Vin models: <b>3'150 mA</b> (slow blow)                                                                                                                                                                           |
|                        |                | (The need of an external fuse has to be assessed in the final application.)                                                                                                                                                                                                                                            |
| Input Filter           |                |                                                                                                                                                                                                                                                                                                                        |
|                        |                | <b>Internal Pi-Type</b> (For 24 Vin models an input capacitor 4.7 $\mu$ F X7R or 68 $\mu$ F Nippon chemi-con KY is recommended for a reliable supply.)                                                                                                                                                                 |

## Output Specifications

|                           |                                 |                                                                                                                                           |
|---------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage Adjustment |                                 | <b>-20% to +10%</b> (By external trim resistor)                                                                                           |
|                           | See application note:           | <a href="http://www.tracopower.com/overview/tep75wi">www.tracopower.com/overview/tep75wi</a><br>Output power must not exceed rated power! |
| Voltage Set Accuracy      |                                 | <b><math>\pm 1\%</math> max.</b>                                                                                                          |
| Regulation                | - Input Variation (Vmin - Vmax) | <b>0.1% max.</b>                                                                                                                          |
|                           | - Load Variation (0 - 100%)     | <b>0.1% max.</b>                                                                                                                          |

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

|                                        |                                                                                                                                                                                                             |                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Ripple and Noise<br>(20 MHz Bandwidth) | 3.3 Vout models:                                                                                                                                                                                            | 100 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 5 Vout models:                                                                                                                                                                                              | 100 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 12 Vout models:                                                                                                                                                                                             | 125 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 15 Vout models:                                                                                                                                                                                             | 125 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 24 Vout models:                                                                                                                                                                                             | 250 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 28 Vout models:                                                                                                                                                                                             | 250 mVp-p max. (w/ 4.7 $\mu$ F)                     |
|                                        | 48 Vout models:                                                                                                                                                                                             | 350 mVp-p max. (w/ 2.2 $\mu$ F)                     |
| Capacitive Load                        | 3.3 Vout models:                                                                                                                                                                                            | 60'600 $\mu$ F max.                                 |
|                                        | 5 Vout models:                                                                                                                                                                                              | 30'000 $\mu$ F max.                                 |
|                                        | 12 Vout models:                                                                                                                                                                                             | 5'250 $\mu$ F max.                                  |
|                                        | 15 Vout models:                                                                                                                                                                                             | 3'330 $\mu$ F max.                                  |
|                                        | 24 Vout models:                                                                                                                                                                                             | 1'330 $\mu$ F max.                                  |
|                                        | 28 Vout models:                                                                                                                                                                                             | 960 $\mu$ F max.                                    |
|                                        | 48 Vout models:                                                                                                                                                                                             | 330 $\mu$ F max.                                    |
| Minimum Load                           | Not required                                                                                                                                                                                                |                                                     |
| Temperature Coefficient                | $\pm 0.02$ %/K max.                                                                                                                                                                                         |                                                     |
| Hold-up Time                           | 10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation:<br><a href="http://www.tracopower.com/info/holdup_en50155.pdf">www.tracopower.com/info/holdup_en50155.pdf</a> ) |                                                     |
| Start-up Time                          | 60 ms typ. (110 Vin models)<br>25 ms typ. (other models)                                                                                                                                                    |                                                     |
| Short Circuit Protection               | Continuous, Automatic recovery                                                                                                                                                                              |                                                     |
| Output Current Limitation              | 150% typ. of Iout max.<br>(110 Vin models)<br>110 - 140% (other models)                                                                                                                                     |                                                     |
| Overvoltage Protection                 | 115 - 130% of Vout nom.                                                                                                                                                                                     |                                                     |
| Transient Response                     | - Response Time                                                                                                                                                                                             | 200 $\mu$ s typ. / 250 $\mu$ s max. (25% Load Step) |

## Safety Specifications

|           |                                                     |                                                                                                          |
|-----------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Standards | - IT / Multimedia Equipment                         | EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1                       |
|           | - Railway Applications<br>- Certification Documents | EN 50155<br><a href="http://www.tracopower.com/overview/tep75wi">www.tracopower.com/overview/tep75wi</a> |

## EMC Specifications

|                           |                       |                                                                                                                            |
|---------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------|
| EMI (Emissions)           | - Conducted Emissions | EN 50121-3-2 (EMC for Rolling Stock)<br>EN 55011 class B (with external filter)<br>EN 55032 class B (with external filter) |
|                           | - Radiated Emissions  | EN 55011 class B (with external filter)<br>EN 55032 class B (with external filter)                                         |
| External filter proposal: |                       | <a href="http://www.tracopower.com/overview/tep75wi">www.tracopower.com/overview/tep75wi</a>                               |

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

|                     |                             |                                                                                              |
|---------------------|-----------------------------|----------------------------------------------------------------------------------------------|
| EMS (Immunity)      |                             | EN 50121-3-2 (EMC for Rolling Stock)                                                         |
|                     |                             | EN 55024 (IT Equipment)                                                                      |
|                     |                             | EN 55035 (Multimedia)                                                                        |
|                     | - Electrostatic Discharge   | Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A                                              |
|                     |                             | Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A                                          |
|                     | - RF Electromagnetic Field  | EN 61000-4-3, 20 V/m, perf. criteria A                                                       |
|                     | - EFT (Burst) / Surge       | EN 61000-4-4, $\pm 2$ kV, perf. criteria A                                                   |
|                     |                             | EN 61000-4-5, $\pm 2$ kV, perf. criteria A                                                   |
|                     |                             | Ext. input component: 24 & 48 Vin models: 2 x KY 220 $\mu$ F                                 |
|                     |                             | 110 Vin models: 2 x KY 150 $\mu$ F                                                           |
|                     | - 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                                                |
| EMC / Environmental | - Certification Documents   | <a href="http://www.tracopower.com/overview/tep75wi">www.tracopower.com/overview/tep75wi</a> |

| General Specifications                 |                                            |                                                                                                                         |
|----------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Relative Humidity                      |                                            | 95% max. (non condensing)                                                                                               |
| 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                         | Depending on model                                                                                                      |
|                                        | See application note:                      | <a href="http://www.tracopower.com/overview/tep75wi">www.tracopower.com/overview/tep75wi</a>                            |
| 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.                                                                                                   |
|                                        |                                            | (If sense function is not used, sense pins must be connected to corresponding polarity output pins.)                    |
| Remote Control                         | - Voltage Controlled Remote (passive = on) | On: 3.0 to 12 VDC or open circuit                                                                                       |
|                                        |                                            | Off: 0 to 1.2 VDC or short circuit                                                                                      |
|                                        | - Off Idle Input Current                   | Refers to 'Remote' and '-Vin' Pin<br>3 mA typ.<br>(Optional models with inverse Remote On/Off function (passive = off)) |
| Altitude During Operation              |                                            | 2'000 m max. (for basic insulation)                                                                                     |
|                                        |                                            | 5'000 m max. (for functional insulation)                                                                                |
| 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 M $\Omega$ 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                        |                                            | According to Cleaning Guideline                                                                                         |
|                                        |                                            | <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>                          |

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

|                          |                         |                                                                                                                                                                                                                                                                    |
|--------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment              | - Vibration             | MIL-STD-810F<br>EN 61373                                                                                                                                                                                                                                           |
|                          | - Mechanical Shock      | MIL-STD-810F<br>EN 61373                                                                                                                                                                                                                                           |
|                          | - Thermal Shock         | MIL-STD-810F                                                                                                                                                                                                                                                       |
|                          | - Flammability          | EN 45545-2<br><a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>                                                                                                                                 |
| Housing Material         |                         | Alu base-plate w. metal case (24 and 48 Vin models)<br>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)<br>Plastic Case (110 Vin models)                                                                                                                                                                                                 |
| Mounting Type            |                         | PCB Mount                                                                                                                                                                                                                                                          |
| Connection Type          |                         | THD (Through-Hole Device)                                                                                                                                                                                                                                          |
| Footprint Type           |                         | Half-Brick                                                                                                                                                                                                                                                         |
| Soldering Profile        |                         | Lead-Free Wave Soldering<br>260°C / 6 s max.                                                                                                                                                                                                                       |
| Weight                   |                         | 97 g                                                                                                                                                                                                                                                               |
| Thermal Impedance        | - Case to Ambient       | 6.7 K/W typ.<br>4.7 K/W typ. (with Heat Sink)                                                                                                                                                                                                                      |
|                          | - REACH Declaration     | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant                                                                                        |
| Environmental Compliance | - RoHS Declaration      | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
|                          | - SCIP Reference Number | b8b2d372-1660-418f-8c53-9823dfbc0f73                                                                                                                                                                                                                               |

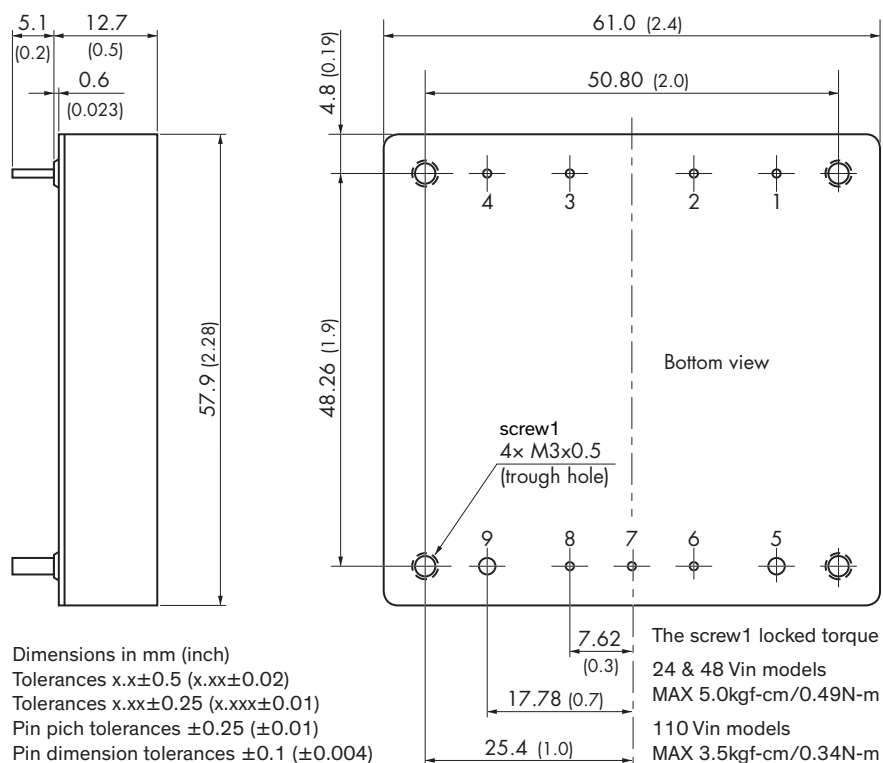
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tep75wi](http://www.tracopower.com/overview/tep75wi)

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

### Outline Dimensions



Pin diameter pin 5 & 9: 2.0 (0.08)  
Pin diameter other pins: 1.0 (0.04)

| Pinout |            |
|--------|------------|
| Pin    | Function   |
| 1      | -Vin (GND) |
| 2      | Case       |
| 3      | Remote     |
| 4      | +Vin (Vcc) |
| 5      | -Vout      |
| 6      | -Sense*    |
| 7      | Trim       |
| 8      | +Sense*    |
| 9      | +Vout      |

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

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