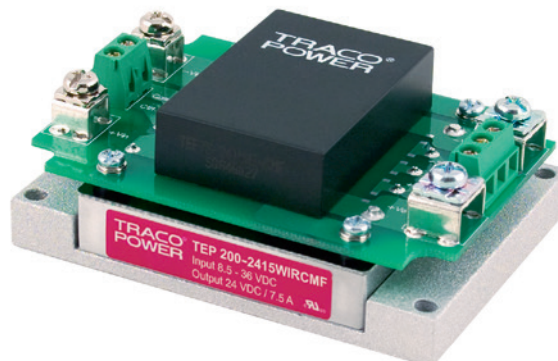


## Features

- ◆ Chassis mount with screw terminal block
- ◆ Including EMI filter to meet EN 55022, class A
- ◆ Ultra wide 4:1 input voltage ranges 8.5–36, 16.5–75, 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
- ◆ Remote On/Off input
- ◆ Reverse input voltage protection
- ◆ Over temperature protection
- ◆ 3-year product warranty



The TEP 200WIR 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 55022 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 on board power distribution.

## Standard Models

| Order code         | Input voltage                            | Output voltage | Output current max. | Efficiency typ. |
|--------------------|--|----------------|---------------------|-----------------|
| TEP 200-2412WIRCMF | <b>8.5 – 36 VDC</b><br>(24 VDC nominal)  | 12 VDC         | 15 A                | 89 %            |
| TEP 200-2413WIRCMF |  | 15 VDC         | 12 A                | 90 %            |
| TEP 200-2415WIRCMF |  | 24 VDC         | 7.5 A               | 90 %            |
| TEP 200-2416WIRCMF |  | 28 VDC         | 6.5 A               | 90 %            |
| TEP 200-2418WIRCMF |  | 48 VDC         | 3.7 A               | 89 %            |
| TEP 200-4812WIRCMF | <b>16.5 – 75 VDC</b><br>(48 VDC nominal) | 12 VDC         | 18 A                | 90 %            |
| TEP 200-4813WIRCMF |  | 15 VDC         | 14 A                | 91 %            |
| TEP 200-4815WIRCMF |  | 24 VDC         | 9 A                 | 90 %            |
| TEP 200-4816WIRCMF |  | 28 VDC         | 7.5 A               | 91 %            |
| TEP 200-4818WIRCMF |  | 48 VDC         | 4.5 A               | 90 %            |
| TEP 200-7212WIRCMF | <b>43 – 160 VDC</b><br>(110 VDC nominal) | 12 VDC         | 20 A                | 89 %            |
| TEP 200-7213WIRCMF |  | 15 VDC         | 16 A                | 90 %            |
| TEP 200-7215WIRCMF |  | 24 VDC         | 10 A                | 89 %            |
| TEP 200-7216WIRCMF |  | 28 VDC         | 8.5 A               | 90 %            |
| TEP 200-7218WIRCMF |  | 48 VDC         | 5 A                 | 89 %            |

## Options

|           |  |
|-----------|--|
| TEP-MK1   | Din-rail mounting kit (incl. mounting screws)  |
| on demand | Models with 3.3 VDC or 5.0 VDC output  |
|           | Models with 53 VDC output (input voltage range 33 - 75 VDC)  |
|           | Models with 2:1 input voltage ranges: 8.5-22, 16.5-36, 33-75 VDC (only to optimize cost at high volumes) |
|           | Models for PCB mount (EMI Filter not included), optional heatsink and chokes for external filter         |
|           | Negative (passive = Off) Remote On/Off function (standard is passive = On)                               |

## Input Specifications

|  |   |
|--|---|
| Input current at no load (nominal input voltage) | 24 V, 12 & 15 VDC models: 30 mA typ.<br>24 V, 24 VDC model: 35 mA typ.<br>24 V, 28 VDC model: 40 mA typ.<br>24 V, 48 VDC model: 45 mA typ.<br>48 V, 28 & 48 VDC models: 25 mA typ.<br>48 V, other models: 20 mA typ.<br>110 V, 28 & 48 VDC models: 15 mA typ.<br>110 V, other models: 10 mA typ.  |
| Start-up voltage                                 | 24 V models: 9.0 VDC max.<br>48 V models: 18 VDC max.<br>110 V models: 43 VDC max.  |
| Under voltage shut down (lock-out circuit)       | 24 V models: 7.3 – 8.1 VDC<br>48 V models: 15.5 – 16.3 VDC<br>110 V models: 33.0 – 36.0 VDC   |
| Surge voltage (1 sec. max.)                      | 24 V models: 50 VDC<br>48 V models: 100 VDC<br>110 V models: 185 VDC  |
| Conducted noise                                  | EN 55022 class A without external components  |
| EMC immunity                                     | EN 50121-3-2<br>EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A<br>EN 61000-4-3, 20 V/m, perf. criteria A<br>EN 61000-4-4, $\pm 2$ kV, perf. criteria A<br>EN 61000-4-5, $\pm 2$ kV perf. criteria A,<br>24 / 48V models: chemi-con KY 200 $\mu$ F, 100 V, ESR 48 mOhm<br>110 V models: ruby-con BXF 100 $\mu$ F, 250 V<br>EN 61000-4-6, 10 Vrms, perf. criteria A |
| Reverse voltage protection                       | parallel diode  |
| Recommended input fuse (slow blow)               | 24 V models: 20 A<br>48 / 110 V models: 10 A  |

## Output Specifications

|  |   |
|--|---|
| Voltage set accuracy (at full load, nominal input)           | $\pm 1$ %   |
| Output voltage adjustment                                    | +10 % / -20 % by external resistor<br>see application note  |
| Regulation   | - Input variation $V_{in}$ min. to $V_{in}$ max. 0.1 % max.<br>- Load variation (0 – 100 %) 12 / 15 VDC models: 0.25 % max.<br>24 – 48 VDC models: 0.2 % max. |
| Temperature coefficient                                      | $\pm 0.02$ %/K  |
| Minimum load   | not required  |
| Remote sense   | 10 % max. of $V_{out}$ nom.<br>(trim up value to subtract)  |
| Ripple and noise (20 MHz Bandwidth)                          | 12 / 15 VDC models: 100 mVp-p typ.<br>24 / 28 VDC models: 200 mVp-p typ.<br>48 VDC models: 300 mVp-p typ.   |
| Start up time (nominal $V_{in}$ and constant resistive load) | 75 ms typ. (at power On or remote On/Off)   |
| Transient response (25 % load step change)                   | 200 $\mu$ s typ., 250 $\mu$ s max.  |
| Output current limitation                                    | at 120 – 150 % of $I_{out}$ max.  |
| Over voltage protection                                      | at 115 – 130 % of $V_{out}$ nom.  |
| Short circuit protection                                     | indefinite, automatic recovery.   |

| Max. capacitive load [ $\mu$ F] | 12 VDC | 15 VDC | 24 VDC | 28 VDC | 48 VDC |
|---------------------------------|--------|--------|--------|--------|--------|
| 24 VDC Input models             | 12'500 | 8'000  | 3'100  | 2'300  | 770    |
| 48 VDC Input models             | 15'000 | 9'300  | 3'700  | 2'600  | 930    |
| 110 VDC Input models            | 16'600 | 10'600 | 4'100  | 3'000  | 1'000  |

### General Specifications

|   |  |  |
|---|--|--|
| Temperature ranges  | <ul style="list-style-type: none"> <li>- Operating (ambient)</li> <li>- Case temperature</li> <li>- Storage</li> </ul>   | -40°C to +75°C<br>+115°C max.<br>-40°C to +105°C   |
| Derating (convection cooling)<br>Guideline values:                    |  | depending on installation!<br>see Application note   |
| Over temperature protection   |  | at +120°C  |
| Thermal shock, mechanical shock & vibration                           | <ul style="list-style-type: none"> <li>- Test conditions</li> </ul>  | EN 61373, MIL-STD-810F<br><a href="http://www.tracopower.com/products/mil810.pdf">www.tracopower.com/products/mil810.pdf</a>   |
| Humidity (non condensing)   |  | 95 % rel H max.  |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign) |  | 300'000 h  |
| Isolation voltage (60sec.)  | <ul style="list-style-type: none"> <li>- Input/Output</li> <li>- Input/Case</li> </ul>   | 2'250 VDC (basic insulation)<br>1'600 VDC  |
| Isolation capacitance   | <ul style="list-style-type: none"> <li>- Input/Output</li> </ul>   | 2500 pF max.   |
| Isolation resistance  | <ul style="list-style-type: none"> <li>- Input/Output (500 VDC)</li> </ul>   | >1 GOhm min.   |
| Switching frequency   |  | 250 kHz typ. (puls width modulation)   |
| Safety standards  | <ul style="list-style-type: none"> <li>- UL online certification E188913, QQQQ2</li> <li>- Railway immunity</li> <li>- Flamability identified acc.</li> <li>- Certification documents</li> </ul> | UL 60950-1 2nd edition + AM1<br>IEC/EN 60950-1<br>EN 50155,<br>EN45545-2<br><a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a>   |
| Remote On/Off   | <ul style="list-style-type: none"> <li>- positive logic (standard)</li> <li>- negative logic (option)</li> <li>- Off idle current:</li> </ul>  | <ul style="list-style-type: none"> <li>- On: 3 to 12 VDC or open circuit</li> <li>- Off: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- On: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- Off: 3 to 12 VDC or open circuit</li> <li>3 mA</li> </ul> |
| Environmental compliance  | <ul style="list-style-type: none"> <li>- Reach</li> <li>- RoHS</li> </ul>  | <a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a><br>RoHS directive 2011/65/EU  |

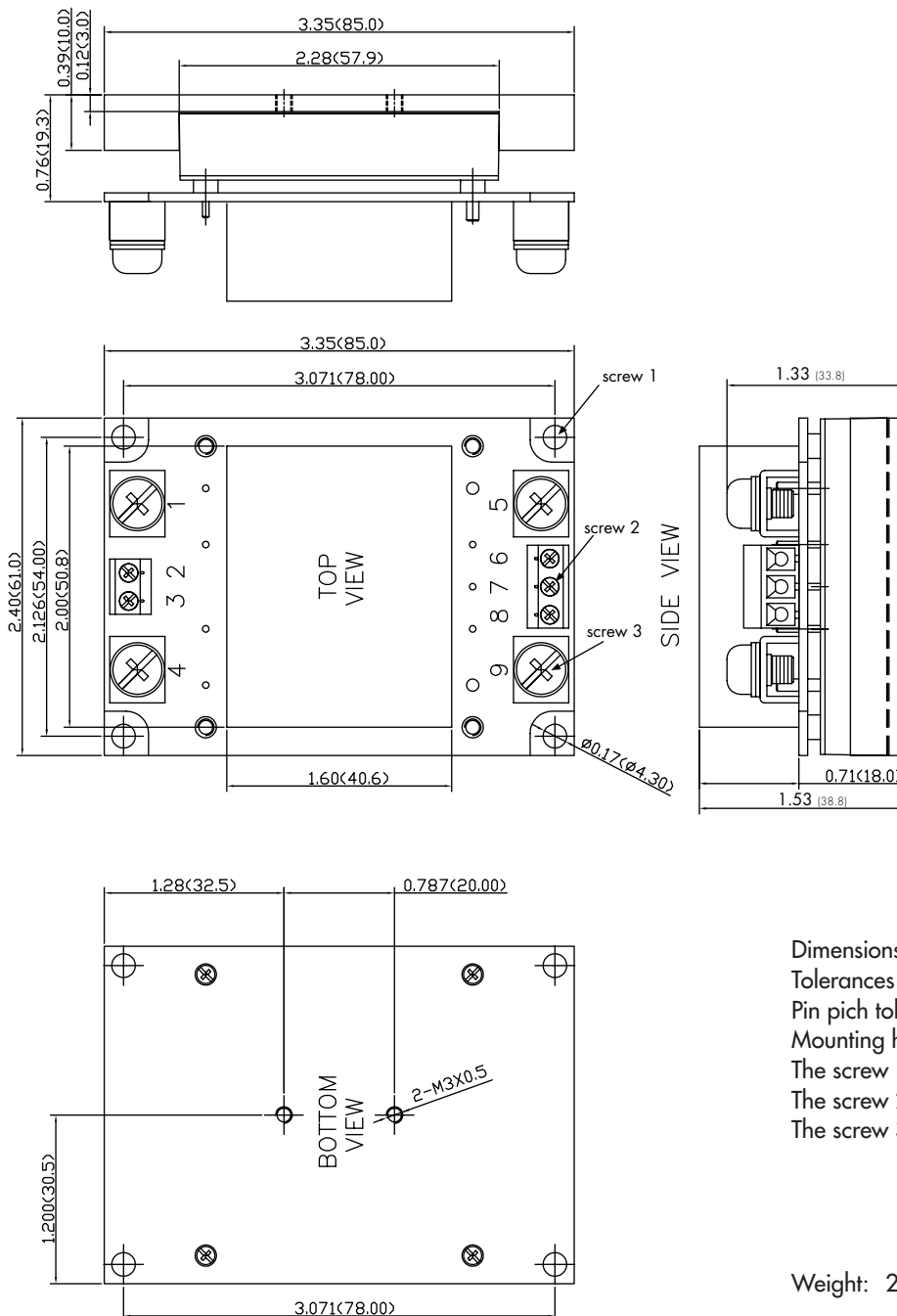
**Application note:** [www.tracopower.com/products/tep200wir-application.pdf](http://www.tracopower.com/products/tep200wir-application.pdf)

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

### General Specifications

|                  |   |
|------------------|---|
| Casing material  | 24 Vin & 48 Vin models: metal<br>110 Vin models: Aluminium base-plate with plastic casing |
| Potting material | silicone (UL94V-0 rated)  |
| Base material    | FR4   |

### Dimensions



| Pin-Out |               |
|---------|---------------|
| Pin     |               |
| 1       | - Vin         |
| 2       | NC            |
| 3       | Remote On/Off |
| 4       | + Vin         |
| 5       | - Vout        |
| 6       | - Sense*      |
| 7       | Trim          |
| 8       | + Sense*      |
| 9       | + Vout        |

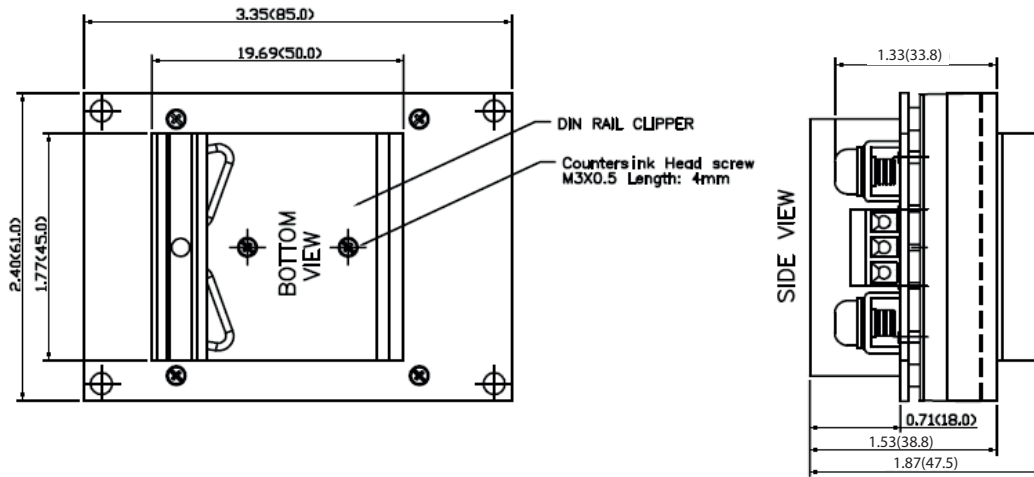
\*Sense line to be connected to the output either at the module or at the load under regard of polarity.

Dimensions in Inch, ( ) = mm  
 Tolerances  $\pm 0.02$  ( $\pm 0.5$ )  
 Pin pitch tolerances  $\pm 0.01$  ( $\pm 0.25$ )  
 Mounting hole pitch tolerances  $\pm 0.01$  ( $\pm 0.25$ )  
 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

Weight: 287 g (10.12oz)

### Options

TEP-MK1 DIN-rail clip for chassis mount models



Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at [www.tracopower.com](http://www.tracopower.com)