

- Compact metal package
- 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 200WIR Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges. They come in rugged, sealed industry standard half brick package. 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.

Models				
Order Code	Input Voltage Range	Output Voltage nom.	Output Current max.	Efficiency typ.
TEP 200-2412WIR	9 - 36 VDC (24 VDC nom.)	12 VDC	15'000 mA	89 %
TEP 200-2413WIR		15 VDC	12'000 mA	90 %
TEP 200-2415WIR		24 VDC	7'500 mA	90 %
TEP 200-2416WIR		28 VDC	6'500 mA	90 %
TEP 200-2418WIR		48 VDC	3'700 mA	89 %
TEP 200-4812WIR	18 - 75 VDC (48 VDC nom.)	12 VDC	18'000 mA	90 %
TEP 200-4813WIR		15 VDC	14'000 mA	91 %
TEP 200-4815WIR		24 VDC	9'000 mA	90 %
TEP 200-4816WIR		28 VDC	7'500 mA	91 %
TEP 200-4818WIR		48 VDC	4'500 mA	90 %
TEP 200-7212WIR	43 - 160 VDC (110 VDC nom.)	12 VDC	20'000 mA	89 %
TEP 200-7213WIR		15 VDC	16'000 mA	90 %
TEP 200-7215WIR		24 VDC	10'000 mA	89 %
TEP 200-7216WIR		28 VDC	8'500 mA	90 %
TEP 200-7218WIR		48 VDC	5'000 mA	89 %

### Options

<b>TEP-HS1</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/products/tep-hs1.pdf">www.tracopower.com/products/tep-hs1.pdf</a>
<b>on demand</b> (backorder with MOQ non stocking item)	<ul style="list-style-type: none"> <li>- Optional model with 3.3 VDC / 50'000 mA Output and 9 - 36 VDC Input</li> <li>- Optional model with 5 VDC / 36'000 mA Output and 9 - 36 VDC Input</li> <li>- Optional model with 3.3 VDC / 50'000 mA Output and 18 - 75 VDC Input</li> <li>- Optional model with 5 VDC / 40'000 mA Output and 18 - 75 VDC Input</li> <li>- Optional model with 53 VDC / 3'800 mA Output and 33 - 75 VDC Input</li> <li>- Optional model with 3.3 VDC / 57'000 mA Output and 43 - 160 VDC Input</li> <li>- Optional model with 5 VDC / 44'000 mA Output and 43 - 160 VDC Input</li> <li>- 2:1 Input models</li> <li>- Negative (passive = Off) Remote On/Off function</li> <li>- Sync pin to synchronize switching frequency of up to 3 units (EMC reason)</li> </ul>

### Input Specifications

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

### Output Specifications

Output Voltage Adjustment		<b>-20% to +10%</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.1% max.</b> <b>0.1% max.</b>
Ripple and Noise (20 MHz Bandwidth)		3.3 Vout models: <b>75 mVp-p max.</b> (w/ 1 µF X7R // 25 µF poscap) 5 Vout models: <b>75 mVp-p max.</b> (w/ 1 µF X7R // 25 µF poscap) 12 Vout models: <b>100 mVp-p max.</b> (w/ 1 µF X7R // 25 µF poscap) 15 Vout models: <b>100 mVp-p max.</b> (w/ 1 µF X7R // 25 µF poscap) 24 Vout models: <b>200 mVp-p max.</b> (w/ 4.7 µF X7R) 28 Vout models: <b>200 mVp-p max.</b> (w/ 4.7 µF X7R) 48 Vout models: <b>300 mVp-p max.</b> (w/ 2.2 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.
	- 48 Vin input	24 Vout models: 3'100 µF max.
		28 Vout models: 2'300 µF max.
		48 Vout models: 770 µF max.
		3.3 Vout models: 151'000 µF max.
	- 110 Vin input	5 Vout models: 80'000 µF max.
		12 Vout models: 15'000 µF max.
		15 Vout models: 9'300 µF max.
		24 Vout models: 3'700 µF max.
	28 Vout models: 2'600 µF max.	
	48 Vout models: 930 µF max.	
	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: 4'100 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.	
Oversvoltage 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	EN 50155
	- Certification Documents	<a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

### 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: <a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a>

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<b>EMS Immunity</b>		EN 50155 (Railway Applications) EN 50121-3-2 (EMC for Rolling Stock) Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A 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 20 $\mu$ F 110 Vin models: 2 x KXJ 150 $\mu$ F EN 61000-4-6, 10 Vrms, perf. criteria A Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A
- Electrostatic Discharge		
- RF Electromagnetic Field		
- EFT (Burst) / Surge		
- Conducted RF Disturbances		
- PF Magnetic Field		

<b>General Specifications</b>		
<b>Relative Humidity</b>		<b>95% max.</b> (non condensing)
<b>Temperature Ranges</b>	- Operating Temperature	-40°C to +75°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
<b>Power Derating</b>	- High Temperature	See application note: <a href="http://www.tracopower.com/overview/tep200wir">www.tracopower.com/overview/tep200wir</a>
<b>Over Temperature Protection Switch Off</b>	- Protection Mode	<b>115°C typ.</b> (Automatic recovery at 105°C typ.)
	- Measurement Point	<b>Base-Plate</b>
<b>Cooling System</b>		<b>Natural convection</b> (20 LFM)
<b>Sense Function</b>		<b>10% max. of Vout nom.</b> (Sense line to be connected to the output either at the module or at the load under regard of polarity.)
<b>Remote Control</b>	- Voltage Controlled Remote	<b>On: 3.0 to 12 VDC or open circuit</b> <b>Off: 0 to 1.2 VDC or short circuit</b> <b>Refers to 'Remote' and '-Vin' Pin</b>
	- Off Idle Input Current	<b>3 mA typ.</b>
	- Remote Pin Input Current	<b>-0.5 to 1.0 mA</b>
<b>Altitude During Operation</b>		<b>2'000 m max.</b> (for reinforced insulation) <b>5'000 m max.</b> (for functional insulation)
<b>Switching Frequency</b>		<b>225 - 275 kHz</b> (PWM) <b>250 kHz typ.</b> (PWM)
<b>Insulation System</b>		<b>Reinforced Insulation</b> (110 Vin models only) <b>Functional Insulation</b> (other models)
<b>Working Voltage</b> (rated)		<b>145 VAC</b> (3.3 and 5 Vout models) <b>185 VAC</b> (48 and 53 Vout models) <b>172 VAC</b> (other output models)
<b>Isolation Test Voltage</b>	- Input to Output, 60 s	<b>3'000 VAC</b> (110 Vin models) <b>3'000 VDC</b> (other models)
	- Input to Case, 60 s	<b>1'500 VAC</b> (110 Vin models) <b>1'600 VDC</b> (other models)
	- Output to Case, 60 s	<b>1'500 VAC</b> (110 Vin models) <b>1'600 VDC</b> (other models)
<b>Isolation Resistance</b>	- Input to Output, 500 VDC	<b>1'000 M<math>\Omega</math> min.</b>
<b>Isolation Capacitance</b>	- Input to Output, 100 kHz, 1 V	<b>2'500 pF max.</b>
<b>Reliability</b>	- Calculated MTBF	<b>300'000 h</b> (MIL-HDBK-217F, ground benign)
<b>Environment</b>	- Vibration	<b>MIL-STD-810F</b> <b>EN 61373</b>
	- Mechanical Shock	<b>MIL-STD-810F</b> <b>EN 61373</b>
	- Thermal Shock	<b>MIL-STD-810F</b> <b>EN 50155</b>
<b>Housing Material</b>		<b>Alu base-plate w. plastic case</b> (110 Vin models) <b>Alu base-plate w. metal case</b> (other models)

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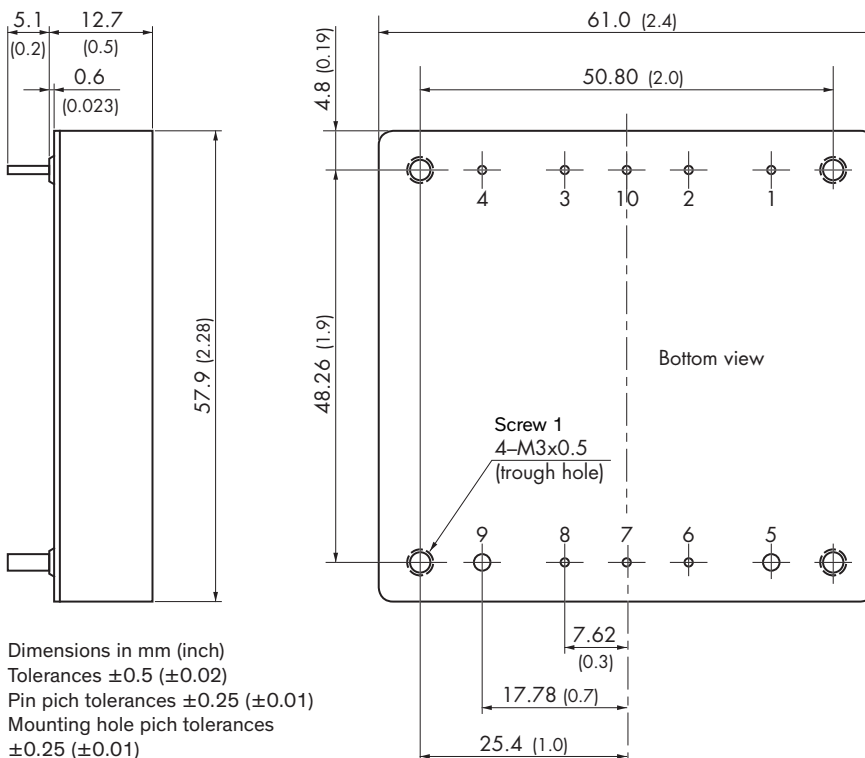
Base Material	Non-conductive FR4 (UL94 V-0 rated) (24 Vin & 48 Vin models only)
Potting Material	Silicone (UL 94 V-0 rated)
Pin Material	Copper
Pin Foundation Plating	Nickel (2 - 3 $\mu\text{m}$ )
Pin Surface Plating	Tin (3 - 5 $\mu\text{m}$ ), matte
Connection Type	THD (Through-Hole Device)
Weight	105 g
Thermal Impedance	6.1 K/W 4.6 K/W (with Heat Sink)
Environmental Compliance	- REACH Declaration <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I - Flammability (EN 45545-2) <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tep200wir](http://www.tracopower.com/overview/tep200wir)

### Outline Dimensions



Pinout	
Pin	Function
1	-Vin (GND)
2	NC
3	Remote
4	+Vin (Vcc)
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout
10	Sync (on demand)

NC: No Connection

The screw 1 locked torque (24 and 48Vout models):  
 MAX 5.0kgf-cm/0.49N-m

The screw 1 locked torque (110Vout models):  
 MAX 3.5kgf-cm/0.34N-m