

- Chassis mount with screw terminal block
- Including EMI filter to meet EN 55032, class A
- 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 200WIRCMF 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 55032 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 onboard power distribution.

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

### Options

<b>TEP-MK1</b>	- Din-Rail mounting kit
<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 Output and 33 - 75 VDC Input (2:1)</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>- Chassis mount models without filter: <a href="http://www.tracopower.com/products/tep200wircmf.pdf">www.tracopower.com/products/tep200wircmf.pdf</a></li> <li>- Negative (passive = Off) Remote On/Off function</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)
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/tep200wircmf">www.tracopower.com/overview/tep200wircmf</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> (with 1 µF X7R & 25 µF poscap) 5 Vout models: <b>75 mVp-p max.</b> (with 1 µF X7R & 25 µF poscap) 12 Vout models: <b>100 mVp-p max.</b> (with 1 µF X7R & 25 µF poscap) 15 Vout models: <b>100 mVp-p max.</b> (with 1 µF X7R & 25 µF poscap) 24 Vout models: <b>200 mVp-p max.</b> (with 4.7 µF X7R) 28 Vout models: <b>200 mVp-p max.</b> (with 4.7 µF X7R) 48 Vout models: <b>300 mVp-p max.</b> (with 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.	
		- 48 Vin input	15 Vout models: 8'000 µF max.
			24 Vout models: 3'100 µF max.
			28 Vout models: 2'300 µF max.
		- 110 Vin input	48 Vout models: 770 µF max.
			3.3 Vout models: 151'000 µF max.
			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.	
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	IEC 60950-1
		EN 60950-1
		UL 60950-1
	- Railway Applications	EN 50155
	- Certification Documents	<a href="http://www.tracopower.com/overview/tep200wircmf">www.tracopower.com/overview/tep200wircmf</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55011 class A (internal filter)
		EN 55032 class A (internal filter)
	- Radiated Emissions	EN 55011 class A (internal filter)
		EN 55032 class A (internal filter)
EMS Immunity		EN 50155 (Railway Applications)
		EN 50121-3-2 (EMC for Rolling Stock)
	- 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
		Ext. input component: 24 & 48 Vin models: 2 x KY 220 µF
		110 Vin models: 2 x KXJ 150 µF
	- 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	

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## General Specifications

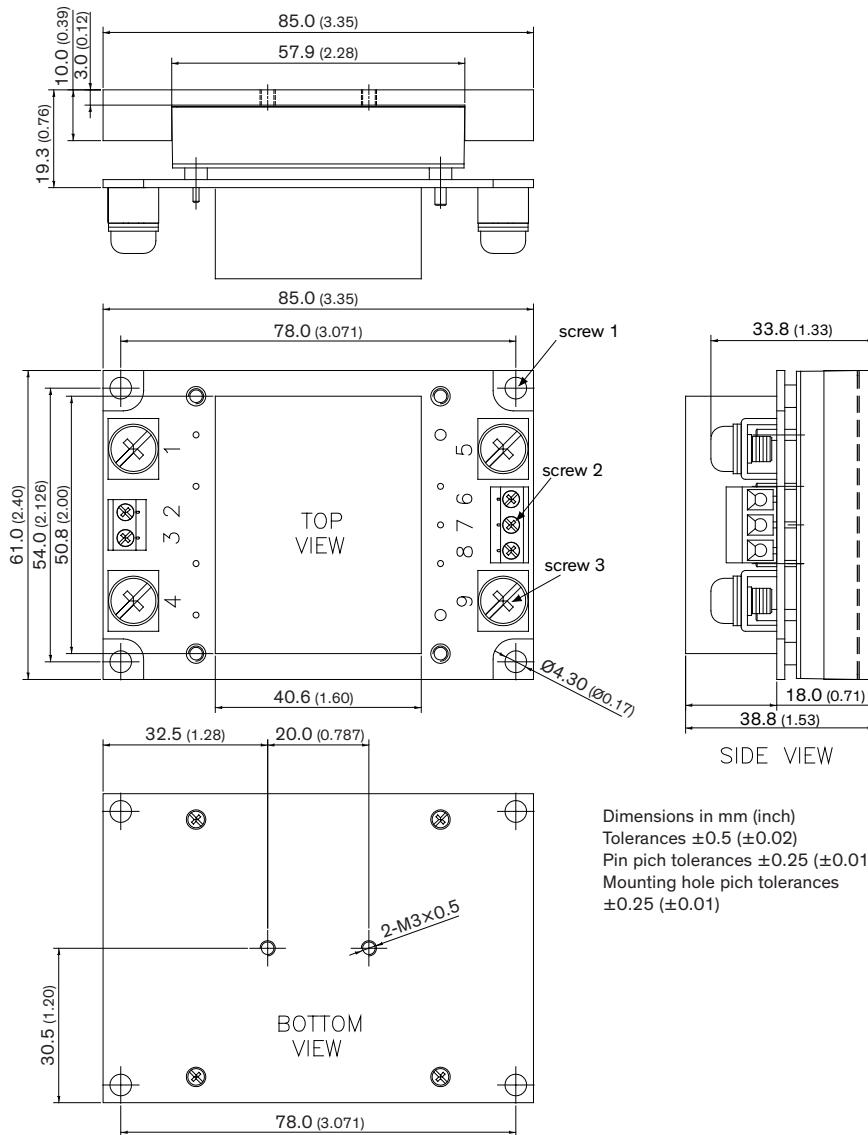
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +75°C +105°C max. -40°C to +105°C
Power Derating	- High Temperature	See application note: <a href="http://www.tracopower.com/overview/tep200wircmf">www.tracopower.com/overview/tep200wircmf</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	115°C typ. (Automatic recovery at 105 °C) Base-Plate
Cooling System		Natural convection (20 LFM)
Sense Function		10% max. of Vout nom. (Sense line to be connected to the output either at the module or at the load under regard of polarity.)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current - Remote Pin 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. -0.5 to 1.0 mA
Altitude During Operation		2'000 m max.
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Isolation Test Voltage	- Input to Output, 60 s  - Input to Case, 60 s  - Output to Case, 60 s	3'000 VAC (110 Vin models) 2'121 VAC (other models) 1'500 VAC (110 Vin models) 1'121 VAC (other models) 1'500 VAC (110 Vin models) 1'121 VAC (other models)
Isolation Resistance	- Input to Output, 500 VDC	1'000 MOhm min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'500 pF max.
Reliability	- Calculated MTBF	300'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration  - Mechanical Shock  - Thermal Shock	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F
Housing Material		Alu base-plate w. plastic case (110 Vin models) Alu base-plate w. metal case (other models)
Base Material		Non-conductive FR4 (UL94 V-0 rated) (24 Vin & 48 Vin models only)
Potting Material		Silicone (UL 94 V-0 rated)
Connection Type		Screw Terminal
Weight		287 g
Thermal Impedance		6.1 K/W
Environmental Compliance	- Reach - RoHS - Flammability (EN 45545-2)	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> <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)	<a href="http://www.tracopower.com/overview/tep200wircmf">www.tracopower.com/overview/tep200wircmf</a>
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**Outline Dimensions**



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

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

NC: No Connection

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