TRACO POWER

DC/DC Railway Converter

TEP 200WIR Series, 200 Watt

- **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**

UL 60950-1 IEC 60950-1

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 couling 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

TEP-HS1	- Optional Heat Sink: www.tracopower.com/products/tep-hs1.pdf
on demand (backorder with MOQ non stocking item)	- Optional model with 3.3 VDC / 50'000 mA Output and 9 - 36 VDC Input - Optional model with 5 VDC / 36'000 mA Output and 9 - 36 VDC Input - Optional model with 3.3 VDC / 50'000 mA Output and 18 - 75 VDC Input - Optional model with 5 VDC / 40'000 mA Output and 18 - 75 VDC Input - Optional model with 53 VDC / 3'800 mA Output and 33 - 75 VDC Input - Optional model with 3.3 VDC / 57'000 mA Output and 43 - 160 VDC Input - Optional model with 5 VDC / 44'000 mA Output and 43 - 160 VDC Input - 2:1 Input models - Negative (passive = Off) Remote On/Off function - Sync pin to synchronize switching frequency of up to 3 units (EMC reason)

Input Specifications

Input Current	- At no load	24 Vin models:	**35 mA typ.**
		48 Vin models:	**20 mA typ.**
		110 Vin models:	**10 mA typ.**
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:	**32'000 mA** (fast acting)
		48 Vin models:	**20'000 mA** (fast acting)
		110 Vin models:	**10'000 mA** (fast acting)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Output Voltage Adjustment			**−20% to +10%** (By external trim resistor)
		See application note:	www.tracopower.com/overview/tep200wir
			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.**
Ripple and Noise (20 MHz Bandwidth)		3.3 Vout models:	**75 mVp-p max.** (w/ 1 µF X7R // 25 µF poscap)
		5 Vout models:	**75 mVp-p max.** (w/ 1 µF X7R // 25 µF poscap)
		12 Vout models:	**100 mVp-p max.** (w/ 1 µF X7R // 25 µF poscap)
		15 Vout models:	**100 mVp-p max.** (w/ 1 µF X7R // 25 µF poscap)
		24 Vout models:	**200 mVp-p max.** (w/ 4.7 µF X7R)
		28 Vout models:	**200 mVp-p max.** (w/ 4.7 µF X7R)
		48 Vout models:	**300 mVp-p max.** (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.
		24 Vout models:	3'100 µF max.
		28 Vout models:	2'300 µF max.
		48 Vout models:	770 µF max.
	- 48 Vin input	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.
	- 110 Vin input	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.
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
		IEC 60950-1
		UL 60950-1
	- Railway Applications	EN 50155
	- Certification Documents	www.tracopower.com/overview/tep200wir
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:	www.tracopower.com/overview/tep200wir
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 20 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		–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/tep200wir
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. (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		On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current		3 mA typ.
	- Remote Pin Input Current		-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 (110 Vin models only) Basic Insulation (other 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 MΩ 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		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. 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)
Pin Material			Copper
Pin Foundation Plating			Nickel (2 - 3 µm)
Pin Surface Plating			Tin (3 - 5 µm), 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		www.tracopower.com/info/reach-declaration.pdf
	- RoHS		www.tracopower.com/info/rohs-declaration.pdf
	- Flammability (EN 45545-2)		www.tracopower.com/info/en45545-declaration.pdf

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tep200wir

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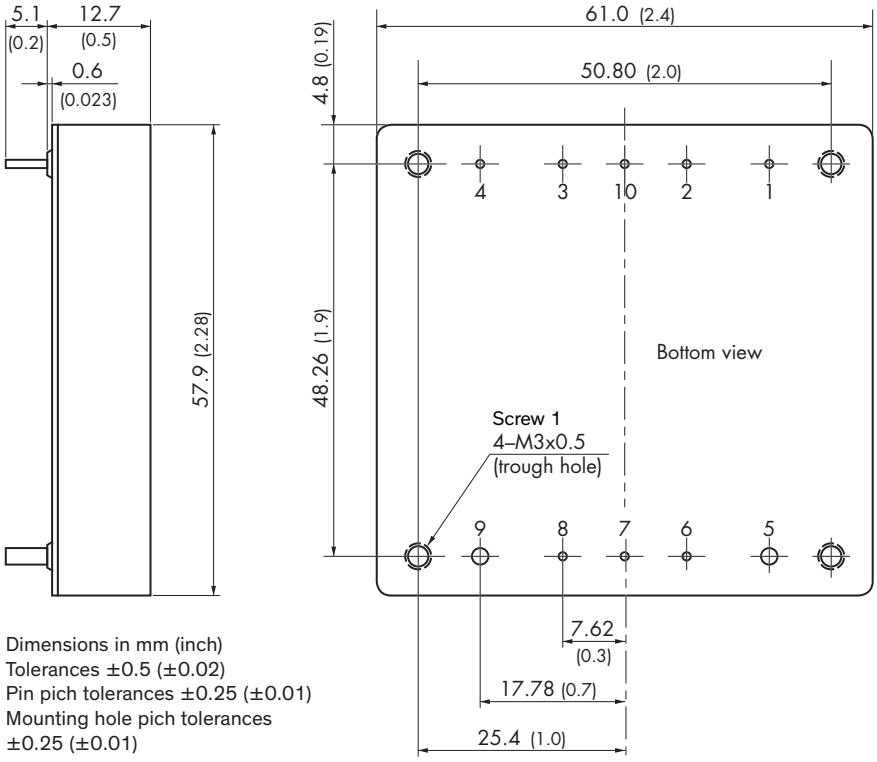
Outline Dimensions



Dimensions in mm (inch)
Tolerances ±0.5 (±0.02)
Pin pich tolerances ±0.25 (±0.01)
Mounting hole pich tolerances
±0.25 (±0.01)

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

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

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