

- 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. (adjustable)	Output Current max.	Efficiency typ.
TEP 200-2412WIR	9 - 36 VDC (24 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	15'000 mA	89 %
TEP 200-2413WIR		15 VDC (12.0 - 16.5 VDC)	12'000 mA	90 %
TEP 200-2415WIR		24 VDC (19.2 - 26.4 VDC)	7'500 mA	90 %
TEP 200-2416WIR		28 VDC (22.4 - 30.8 VDC)	6'500 mA	90 %
TEP 200-2418WIR		48 VDC (38.4 - 52.8 VDC)	3'700 mA	89 %
TEP 200-4812WIR	18 - 75 VDC (48 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	18'000 mA	90 %
TEP 200-4813WIR		15 VDC (12.0 - 16.5 VDC)	14'000 mA	91 %
TEP 200-4815WIR		24 VDC (19.2 - 26.4 VDC)	9'000 mA	90 %
TEP 200-4816WIR		28 VDC (22.4 - 30.8 VDC)	7'500 mA	91 %
TEP 200-4818WIR		48 VDC (38.4 - 52.8 VDC)	4'500 mA	90 %
TEP 200-7212WIR	43 - 160 VDC (110 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	20'000 mA	89 %
TEP 200-7213WIR		15 VDC (12.0 - 16.5 VDC)	16'000 mA	90 %
TEP 200-7215WIR		24 VDC (19.2 - 26.4 VDC)	10'000 mA	89 %
TEP 200-7216WIR		28 VDC (22.4 - 30.8 VDC)	8'500 mA	90 %
TEP 200-7218WIR		48 VDC (38.4 - 52.8 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)	<ul style="list-style-type: none"> - 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 - Optional models with 2:1 Input - Optional models with inverse Remote On/Off function (passive = off) - Optional models with 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. 110 Vin models: 10 mA typ. 48 Vin models: 20 mA typ. (3.3 Vout model) 20 mA typ. (5 Vout model) 20 mA typ. (12 Vout model) 20 mA typ. (15 Vout model) 20 mA typ. (24 Vout model) 20 mA typ. (28 Vout model) 20 mA typ. (48 Vout model)
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) - Load Variation (0 - 100%)	0.1% max. 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, resistive 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.	
Hold-up Time		10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: www.tracopower.com/info/holdup_en50155.pdf)	
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

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	www.tracopower.com/overview/tep200wir
Pollution Degree		PD 2
Over Voltage Category		OVC II

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 50121-3-2 (EMC for Rolling Stock)
		EN 55011 class B (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
		EN 55011 class B (with external filter)
		EN 55032 class B (with external filter)
		External filter proposal: www.tracopower.com/overview/tep200wir

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EMS Immunity	<ul style="list-style-type: none"> - Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field 	EN 50121-3-2 (EMC for Rolling Stock) Air: EN 61000-4-2, ± 8 kV, perf. criteria A Contact: EN 61000-4-2, ± 6 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A 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 μ F 110 Vin models: 2 x KXJ 150 μ 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
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General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	<ul style="list-style-type: none"> - Operating Temperature - Case Temperature - Storage Temperature 	-40°C to +75°C +115°C max. -55°C to +125°C
Power Derating	<ul style="list-style-type: none"> - High Temperature 	Depending on model See application note: www.tracopower.com/overview/tep200wir
Over Temperature Protection Switch Off	<ul style="list-style-type: none"> - Protection Mode - Measurement Point 	120°C typ. (Automatic recovery at 105°C typ.) 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	<ul style="list-style-type: none"> - 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 (Optional models with inverse Remote On/Off function (passive = off))
Altitude During Operation		2'000 m max. (for reinforced insulation) 5'000 m max. (for functional insulation)
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		145 VAC (3.3 and 5 Vout models) 185 VAC (48 and 53 Vout models) 172 VAC (other output models)
Isolation Test Voltage	<ul style="list-style-type: none"> - Input to Output, 60 s - Input to Case, 60 s - Output to Case, 60 s 	3'000 VAC 1'500 VAC 1'500 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω 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)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	<ul style="list-style-type: none"> - Vibration - Mechanical Shock - Thermal Shock - Flammability 	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F EN 45545-2 www.tracopower.com/info/en45545-declaration.pdf

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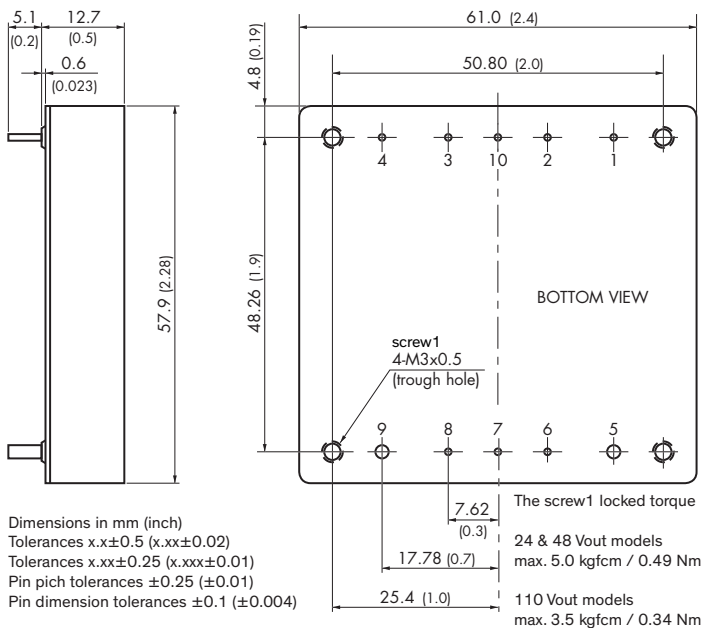
Housing Material		Alu base-plate w. metal case (24 and 48 Vin models) Alu base-plate w. plastic case (110 Vin models)
Base Material		Non-conductive FR4 (UL 94 V-0 rated) (24 and 48 Vin models only)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 μm)
Pin Surface Plating		Tin (3 - 5 μm), matte
Housing Type		Metal Case (24 and 48 Vin models) 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
Weight		105 g
Thermal Impedance	- Case to Ambient	6.1 K/W typ. 4.6 K/W typ. (with Heat Sink)
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	f7133ffe-527a-42e2-9bc2-f7351f90f2e9

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tep200wir

Outline Dimensions



Pinout

Pin	Single	Pin Diameter
1	-Vin (GND)	1.0 mm (0.04 inch)
2	Case	1.0 mm (0.04 inch)
3	Remote On/Off	1.0 mm (0.04 inch)
4	+Vin (Vcc)	1.0 mm (0.04 inch)
5	-Vout	2.0 mm (0.08 inch)
6	-Sense	1.0 mm (0.04 inch)
7	Trim	1.0 mm (0.04 inch)
8	+Sense	1.0 mm (0.04 inch)
9	+Vout	2.0 mm (0.08 inch)
10	Sync (on demand)	1.0 mm (0.04 inch)