

- 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
- 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 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 makes these converters interesting solution for battery operated systems. Typical applications are in telecom/datacom, industry control and railway systems for on-board 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 |
| | - Railway Applications - Certification Documents | IEC 62368-1 |
| | | UL 60950-1 |
| | | UL 62368-1 |
| | | EN 50155 |
| | | 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 |

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

| | | |
|--------------|--|---|
| 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 |
|--------------|--|---|

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. (If sense function is not used, sense pins must be connected to corresponding polarity output pins.) |
| Remote Control | <ul style="list-style-type: none"> - Voltage Controlled Remote (passive = on) - 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) |
| Regulator Topology | | Forward Converter |
| 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 |

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

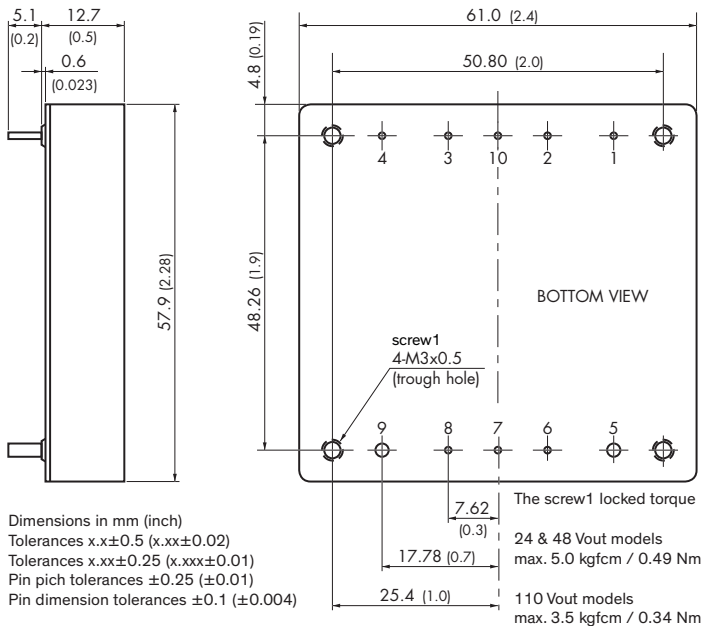
| | |
|--------------------------|---|
| Housing Material | Alu base-plate w. metal case (24 and 48 Vin models) Alu base-plate w. plastic case (110 Vin models) |
| Base Material | Non-conductive FR4 (UL 94 V-0 rated) (24 and 48 Vin models only) |
| Potting Material | Silicone (UL 94 V-0 rated) |
| Pin 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 260°C / 6 s max. |
| 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-1 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) f7133ffe-527a-42e2-9bc2-f7351f90f2e9 - SCIP Reference Number |

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) |