

- 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
- Adjustable output voltage +10 / -20%
- Sense line
- Remote On/Off input
- Under voltage lock-out circuit
- 3-year product warranty



The TEP 160WIR Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges which come in a rugged, sealed industry standard half brick package. A very high efficiency allows full power operation without forced air cooling at 25°C This temperature can be increased to 40°C with optional mounted heatsink or up to 60°C when mounted on an iron base plate. 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. These series is available in many optional designs on demand --> see options.

| Models | | | | |
|-----------------|--------------------------------|----------------------------------|---------------------|-----------------|
| Order Code | Input Voltage Range | Output Voltage nom. (adjustable) | Output Current max. | Efficiency typ. |
| TEP 160-2412WIR | 9 - 36 VDC (24 VDC nom.) | 12 VDC (9.6 - 13.2 VDC) | 12'000 mA | 90 % |
| TEP 160-2413WIR | | 15 VDC (12.0 - 16.5 VDC) | 9'500 mA | 91 % |
| TEP 160-2415WIR | | 24 VDC (19.2 - 26.4 VDC) | 6'000 mA | 90 % |
| TEP 160-2416WIR | | 28 VDC (22.4 - 30.8 VDC) | 5'000 mA | 90 % |
| TEP 160-2418WIR | | 48 VDC (38.4 - 52.8 VDC) | 3'000 mA | 90 % |
| TEP 160-4812WIR | 18 - 75 VDC (48 VDC nom.) | 12 VDC (9.6 - 13.2 VDC) | 13'000 mA | 91 % |
| TEP 160-4813WIR | | 15 VDC (12.0 - 16.5 VDC) | 10'000 mA | 91 % |
| TEP 160-4815WIR | | 24 VDC (19.2 - 26.4 VDC) | 6'500 mA | 91 % |
| TEP 160-4816WIR | | 28 VDC (22.4 - 30.8 VDC) | 5'500 mA | 91 % |
| TEP 160-4818WIR | | 48 VDC (38.4 - 52.8 VDC) | 3'200 mA | 91 % |
| TEP 160-7212WIR | 43 - 160 VDC (110 VDC nom.) | 12 VDC (9.6 - 13.2 VDC) | 15'000 mA | 90 % |
| TEP 160-7213WIR | | 15 VDC (12.0 - 16.5 VDC) | 12'000 mA | 90 % |
| TEP 160-7215WIR | | 24 VDC (19.2 - 26.4 VDC) | 7'500 mA | 90 % |
| TEP 160-7216WIR | | 28 VDC (22.4 - 30.8 VDC) | 6'500 mA | 90 % |
| TEP 160-7218WIR | | 48 VDC (38.4 - 52.8 VDC) | 3'800 mA | 90 % |

| Options | |
|--|---|
| TEP-HS1 | - Optional Heat Sink: www.tracopower.com/overview/tep-hs1 |
| on demand (backorder with MOQ non stocking item) | <ul style="list-style-type: none"> - Optional model with 3.3 VDC and 40'000 mA Output, and 9 - 36 VDC Input - Optional model with 5 VDC and 28'000 mA Output, and 9 - 36 VDC Input - Optional model with 3.3 VDC and 40'000 mA Output, and 18 - 75 VDC Input - Optional model with 5 VDC and 30'000 mA Output, and 18 - 75 VDC Input - Optional model with 3.3 VDC and 43'000 mA Output, and 43 - 160 VDC Input - Optional model with 5 VDC and 32'000 mA Output, and 43 - 160 VDC Input - Optional models with Sync pin to synchronize switching frequency of up to 3 units (EMC reason) - Chassis mount models w/o filter: www.tracopower.com/overview/tep160wircm - Chassis mount models w/ filter to meet EN 55032 class A: www.tracopower.com/overview/tep160wircmf - Optional models with inverse Remote On/Off function (passive = off) |

| Input Specifications | |
|------------------------|--|
| Input Current | - At no load 24 Vin models: 25 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: 25'000 mA (fast acting) 48 Vin models: 15'000 mA (fast acting) 110 Vin models: 8'000 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/tep160wir 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.

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|---------------------------|-----------------|--|----------------------------------|
| Capacitive Load | - 24 Vin input | 3.3 Vout models: 121'000 µF max. | |
| | | 5 Vout models: 56'000 µF max. | |
| | | 12 Vout models: 10'000 µF max. | |
| | | - 48 Vin input | 15 Vout models: 6'300 µF max. |
| | | | 24 Vout models: 2'500 µF max. |
| | | | 28 Vout models: 1'700 µF max. |
| | | - 110 Vin input | 48 Vout models: 620 µF max. |
| | | | 3.3 Vout models: 121'000 µF max. |
| | | | 5 Vout models: 60'000 µF max. |
| | | 12 Vout models: 10'800 µF max. | |
| | | 15 Vout models: 6'600 µF max. | |
| | | 24 Vout models: 2'700 µF max. | |
| | | 28 Vout models: 1'900 µF max. | |
| | | 48 Vout models: 660 µF max. | |
| Minimum Load | | 3.3 Vout models: 130'000 µF max. | |
| | | 5 Vout models: 64'000 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: 790 µF max. | |
| Temperature Coefficient | | Not required | |
| Hold-up Time | | ±0.02 %/K max. | |
| Start-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) | |
| Short Circuit Protection | | 75 ms typ. | |
| Output Current Limitation | | Continuous, Automatic recovery | |
| Overvoltage Protection | | 120 - 150% of Iout max. | |
| Transient Response | - Response Time | 115 - 130% of Vout nom. | |
| | | 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/tep160wir |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | OVC II |

EMC Specifications

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| EMI (Emissions) | - Conducted Emissions | EN 50121-3-2 (EMC for Rolling Stock) |
| | | EN 55011 class A (with external filter) |
| | | EN 55011 class B (with external filter) |
| | | EN 55032 class A (with external filter) |
| | | EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55011 class A (with external filter) |
| | | EN 55011 class B (with external filter) |
| | | EN 55032 class A (with external filter) |
| | | EN 55032 class A (with external filter) |
| | | EN 55032 class B (with external filter) |
| | | External filter proposal: www.tracopower.com/overview/tep160wir |

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|---------------------|---|--|
| EMS (Immunity) | - Electrostatic Discharge | EN 50121-3-2 (EMC for Rolling Stock) |
| | - RF Electromagnetic Field - EFT (Burst) / Surge | 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 |
| | - Conducted RF Disturbances - PF Magnetic Field | Ext. input component: 24 & 48 Vin models: 2x KY 220 μ F 110 Vin models: 2x 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 |
| EMC / Environmental | - Certification Documents | www.tracopower.com/overview/tep160wir |

General Specifications

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| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature - Case Temperature - Storage Temperature | -40°C to +75°C +115°C max. -55°C to +125°C |
| Power Derating | - High Temperature | Depending on model See application note: www.tracopower.com/overview/tep160wir |
| Over Temperature Protection Switch Off | - 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 | - 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 Vout models) 172 VAC (other output models) |
| Isolation Test Voltage | - 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 | 350'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |

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| | | |
|--------------------------|--|--|
| Environment | - 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 |
| 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 - RoHS Declaration - SCIP Reference Number | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant 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)) 2f0f12ea-8c1e-4f75-863d-c66836c1954b |

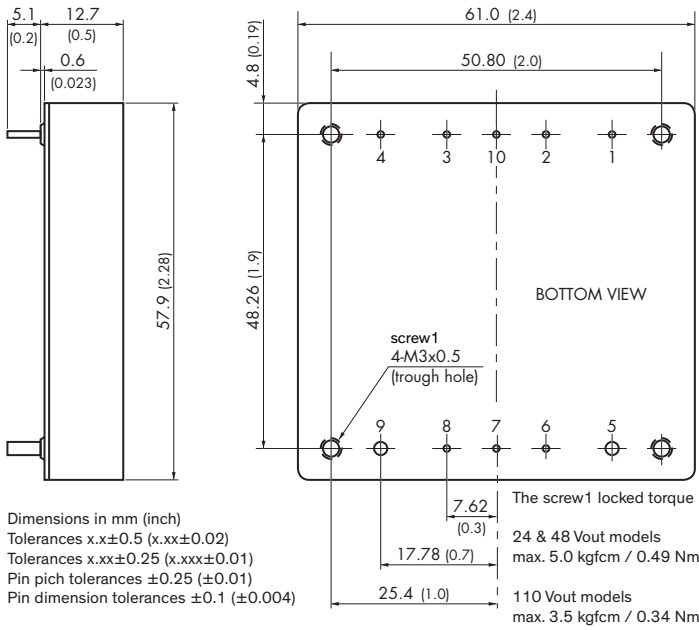
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tep160wir

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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) |