

Features

- ◆ Compact metal package
- ◆ Ultra wide 4:1 input voltage ranges
8.5–36, 16.5–75, 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
- ◆ Reverse input voltage protection
- ◆ Over temperature protection
- ◆ Optional Heatsink
- ◆ Optional as chassis mount models with screw terminal block and EMI Filter
- ◆ 3-year product warranty



(Models pictured with optional heatsink)

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 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 on board power distribution.

These series is available in many optional designs on demand --> see options.

Standard Models

| Order code | Input voltage | Output voltage | Output current max. | Efficiency typ. |
|-----------------|--|----------------|---------------------|-----------------|
| TEP 160-2412WIR | 8.5 – 36 VDC (24 VDC nominal) | 12 VDC | 12 A | 90 % |
| TEP 160-2413WIR | | 15 VDC | 9.5 A | 91 % |
| TEP 160-2415WIR | | 24 VDC | 6.0 A | 90 % |
| TEP 160-2416WIR | | 28 VDC | 5.0 A | 90 % |
| TEP 160-2418WIR | | 48 VDC | 3.0 A | 90 % |
| TEP 160-4812WIR | 16.5 – 75 VDC (48 VDC nominal) | 12 VDC | 13 A | 91 % |
| TEP 160-4813WIR | | 15 VDC | 10 A | 91 % |
| TEP 160-4815WIR | | 24 VDC | 6.5 A | 91 % |
| TEP 160-4816WIR | | 28 VDC | 5.5 A | 91 % |
| TEP 160-4818WIR | | 48 VDC | 3.2 A | 91 % |
| TEP 160-7212WIR | 43 – 160 VDC (110 VDC nominal) | 12 VDC | 15 A | 90 % |
| TEP 160-7213WIR | | 15 VDC | 12 A | 90 % |
| TEP 160-7215WIR | | 24 VDC | 7.5 A | 90 % |
| TEP 160-7216WIR | | 28 VDC | 6.5 A | 90 % |
| TEP 160-7218WIR | | 48 VDC | 3.8 A | 90 % |

Options

| | |
|-----------|--|
| TEP-HS1 | Heat-sink for standard version (incl. mounting screws and thermal pad) |
| TEP-MK1 | Din-rail mounting kit for chassis mount models (incl. mounting screws) |
| TCK-xxx | Common mode chokes for filter proposals to meet EN55022 class A/B --> see application note |
| on demand | Models with 3.3 VDC/~ 40 A or 5.0 VDC/~ 30 A output |
| | Chassis mount models with screw terminal block |
| | Chassis mount models with screw terminal block and input filter to meet EN 555022 class A |
| | Negative (passive = Off) Remote On/Off function (standard is passive = On) |
| | Sync pin to synchronize switching frequency of up to 3 units (EMC reason) |

Input Specifications

| | |
|--|---|
| Input current at no load (nominal input voltage) | 24 V models: 25 mA typ. 48 V models: 20 mA typ. 110 V models: 10 mA typ. |
| Start-up voltage | 24 V models: 9.0 VDC max. 48 V models: 18 VDC max. 110 V models: 43 VDC max. |
| Under voltage shut down (lock-out circuit) | 24 V models: 7.3 – 8.1 VDC 48 V models: 15.5 – 16.3 VDC 110 V models: 33.0 – 36.0 VDC |
| Surge voltage (1 sec. max.) | 24 V models: 50 VDC 48 V models: 100 VDC 110 V models: 185 VDC |
| Conducted noise | EN 55022 class A/B with external components see application note |
| EMC immunity | EN 50121-3-2 EN 61000-4-2, air ± 8 kV, contact ± 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 24 / 48 V models: chemi-con KY 200 μ F, 100 V, ESR 48 mOhm 110 V models: ruby-con BXF 100 μ F, 250 V EN 61000-4-6, 10 Vrms, perf. criteria A |
| – ESD (electrostatic discharge) | |
| – Radiated immunity | |
| – Fast transient / surge (with external input capacitor) | |
| – Conducted immunity | |
| Reverse voltage protection | parallel diode |
| Recommended input fuse (slow blow) | 24 V models: 20 A 48 / 110 V models: 10 A |

Output Specifications

| | |
|--|---|
| Voltage set accuracy (at full load, nominal input) | ± 1 % |
| Output voltage adjustment | +10 % / –20 % by external resistor see application note |
| Regulation | – Input variation V_{in} min. to V_{in} max. 0.1 % max. – Load variation (0 – 100%) 0.1 % max. |
| Temperature coefficient | ± 0.02 %/K |
| Minimum load | not required |
| Remote sense | 10 % max. of V_{out} nom. (trim up value to subtract) |
| Ripple and noise (20 MHz Bandwidth) | 12 / 15 VDC models: 100 mVp-p typ. 24 / 28 VDC models: 200 mVp-p typ. 48 VDC models: 300 mVp-p typ. |
| Start up time (nominal V_{in} and constant resistive load) | 75 ms typ. (at power On or remote On) |
| Transient response (25% load step change) | 250 μ s typ. |
| Output current limitation | at 120 – 150 % of I_{out} max. |
| Over voltage protection | at 115 – 130 % of V_{out} nom. |
| Short circuit protection | indefinite, automatic recovery. |

General Specifications

| | | |
|---|--|---|
| Temperature ranges | <ul style="list-style-type: none"> - Operating - Case temperature - Storage | <ul style="list-style-type: none"> -40°C to +75°C +115°C max. -55°C to +125°C |
| Thermal impedance | <ul style="list-style-type: none"> - without heat-sink - with heat-sink | <ul style="list-style-type: none"> 6.1°C/W 5.1°C/W |
| Power Derating | <ul style="list-style-type: none"> - without heat-sink - with heat-sink - with iron base plate (19" x 3.5" x 0.063") | <ul style="list-style-type: none"> depending on installation! 1.5 %/K above +25°C 1.5 %/K above +40°C 1.8 %/K above +60°C please refer to application note for temperature measure point that should not exceed 115°C. |
| Over temperature protection | | at +120°C |
| Thermal shock, mechanical shock & vibration | <ul style="list-style-type: none"> - Test conditions | <ul style="list-style-type: none"> EN 61373, MIL-STD-810F www.tracopower.com/products/mil810.pdf |
| Humidity (non condensing) | | 95 % rel H max. |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign) | | 350'000 h |
| Isolation voltage (60sec.) | <ul style="list-style-type: none"> - Input/Output - Input/Case | <ul style="list-style-type: none"> 2'250 VDC (basic insulation) 1'600 VDC |
| Isolation capacitance | <ul style="list-style-type: none"> - Input/Output | 2500 pF max. |
| Isolation resistance | <ul style="list-style-type: none"> - Input/Output (500 VDC) | >1 GOhm min. |
| Switching frequency | | 250 kHz typ. (puls width modulation) |
| Safety standards | <ul style="list-style-type: none"> - UL online certification E188913, QQQQ2 - Railway immunity - Flamability identified acc. - Certification documents | <ul style="list-style-type: none"> UL 60950-1 2nd edition + AM1 EN 50155 IEC/EN 60950-1 EN45545-2 www.tracopower.com/overview/tep160wir |
| Remote On/Off | <ul style="list-style-type: none"> - positive logic (standard) - negative logic (option) - Off idle current: | <ul style="list-style-type: none"> - On: 3 to 12 VDC or open circuit - Off: 0 to 1.2 VDC or short circuit pin 1 and 3 - On: 0 to 1.2 VDC or short circuit pin 1 and 3 - Off: 3 to 12 VDC or open circuit 3 mA |
| Environmental compliance | <ul style="list-style-type: none"> - Reach - RoHS | <ul style="list-style-type: none"> www.tracopower.com/overview/tep160wir.pdf RoHS directive 2011/65/EU |

Application note: www.tracopower.com/products/tep160wir-application.pdf

| Max. capacitive load [µF] | 12 VDC | 15 VDC | 24 VDC | 28 VDC | 48 VDC |
|---------------------------|--------|--------|--------|--------|--------|
| 24 VDC Input models | 10'000 | 6'300 | 2'500 | 1'700 | 620 |
| 48 VDC Input models | 10'800 | 6'600 | 2'700 | 1'900 | 660 |
| 110 VDC Input models | 12'500 | 8'000 | 3'100 | 2'300 | 790 |

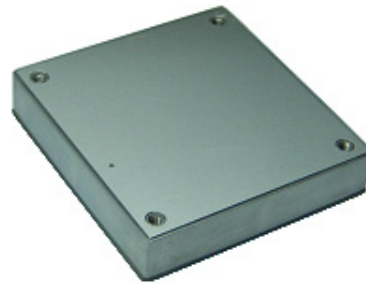
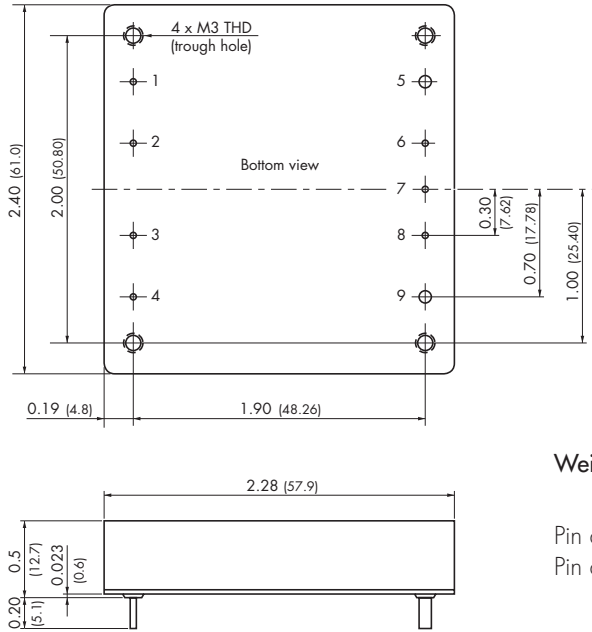
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

General Specifications

| | |
|------------------|--------------------------|
| Casing material | metal |
| Potting material | silicone (UL94V-0 rated) |
| Base material | FR4 |

Dimensions

TEP 160WIR module



Weight: 105 g (3.70oz)

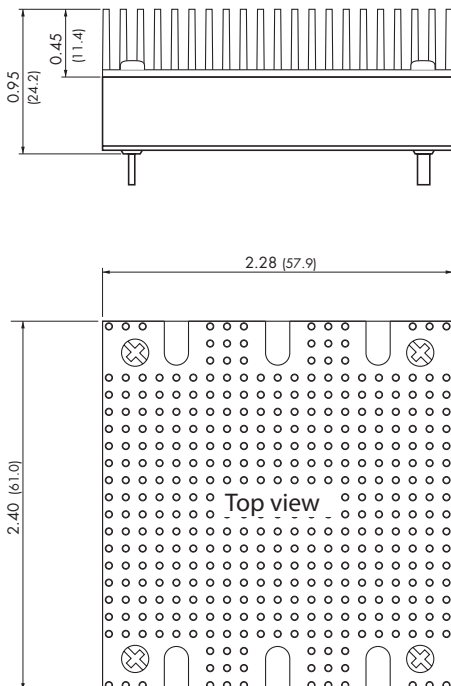
Pin diameter pin 5 & 9: 0.08 (2.0)
Pin diameter other pins: 0.04 (1.0)

Pin-Out

| Pin | Pin-Out |
|-----|---------------|
| 1 | - Vin |
| 2 | Case |
| 3 | Remote On/Off |
| 4 | + Vin |
| 5 | - Vout |
| 6 | - Sense* |
| 7 | Trim |
| 8 | + Sense* |
| 9 | + Vout |

*Sense line to be connected to the output either at the module or at the load under regard of polarity.

TEP-HS1 Heatsink (pictured with heatsink mounted)



Order code: TEP-HS1

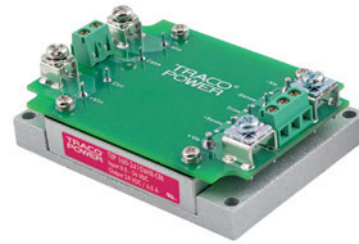
Includes heatsink with thermal pad and mounting screws
To order modules with mounted heatsink ask factory.

Weight: 142 g (5.01oz)
(Heatsink + Converter)

Dimensions in Inch, () = mm
Tolerances ± 0.02 (± 0.5)
Pin pitch tolerances ± 0.01 (± 0.25)
Mounting hole pitch tolerances ± 0.01 (± 0.25)

Options (on demand)

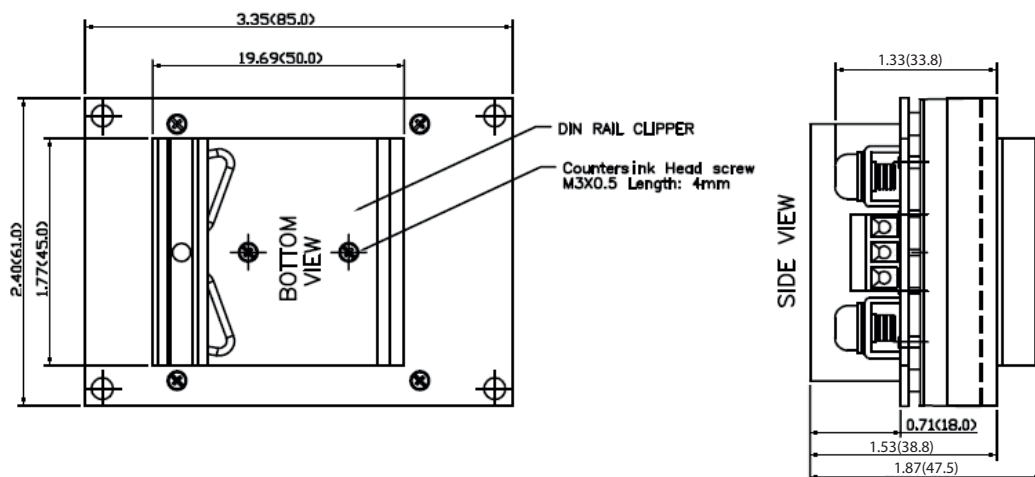
Chassis mount models with screw terminal block



Chassis mount models with screw terminal block and input filter to meet EN 555022 class A



TEP-MK1 DIN-rail clip for chassis mount models



Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.tracopower.com