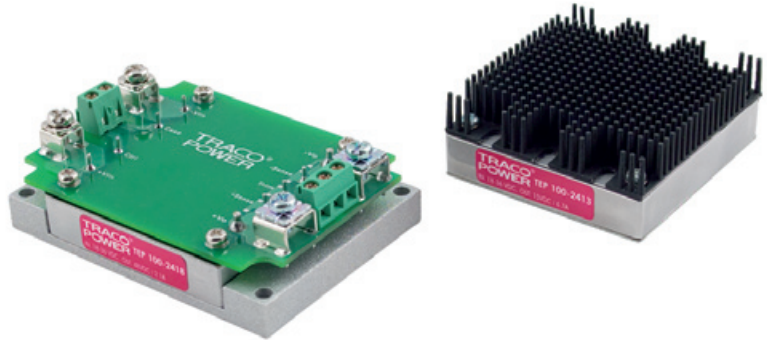


### Features

- ◆ Rugged, compact metal case
- ◆ Easy chassis mount
- ◆ Screw terminal adaptor available for easy connection
- ◆ Wide 2:1 input voltage range
- ◆ Full load operation up to 60°C with convection cooling
- ◆ Soft start
- ◆ Reverse input voltage protection
- ◆ Input protection filter
- ◆ 3-year product warranty



(Models pictured with chassis mount adaptor and optional heatsink)

The TEP-100 Series is a family of isolated high performance dc-dc converter modules with ultra-wide 2:1 input voltage ranges which come in a rugged, sealed metal case.

These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. Four threaded M3 inserts in the module makes chassis mount or attachment of a heatsink for optimal thermal management very simple.

For easy connection there is also a unique adaptor available with screw terminals. A very high efficiency allows an operating temperature up to +60°C with natural convection cooling without power derating. Further features include output voltage trimming, Remote On/Off and under voltage lockout. The very wide input voltage range and reverse input voltage protection make these converters also an interesting solution for battery operated systems.

### Models

| Order code*  | Input voltage                   | Output voltage | Output current max. | Efficiency typ. |
|--------------|---------------------------------|----------------|---------------------|-----------------|
| TEP 100-2411 | 18 – 36 VDC<br>(24 VDC nominal) | 5.0 VDC        | 20.0 A              | 93 %            |
| TEP 100-2412 |                                 | 12 VDC         | 8.4 A               | 93 %            |
| TEP 100-2413 |                                 | 15 VDC         | 6.7 A               | 93 %            |
| TEP 100-2415 |                                 | 24 VDC         | 4.2 A               | 92 %            |
| TEP 100-2416 |                                 | 28 VDC         | 3.6 A               | 92 %            |
| TEP 100-2418 |                                 | 48 VDC         | 2.1 A               | 92 %            |
| TEP 100-4811 | 36 – 75 VDC<br>(48 VDC nominal) | 5.0 VDC        | 20.0 A              | 93 %            |
| TEP 100-4812 |                                 | 12 VDC         | 8.4 A               | 93 %            |
| TEP 100-4813 |                                 | 15 VDC         | 6.7 A               | 93 %            |
| TEP 100-4815 |                                 | 24 VDC         | 4.2 A               | 92 %            |
| TEP 100-4816 |                                 | 28 VDC         | 3.6 A               | 92 %            |
| TEP 100-4818 |                                 | 48 VDC         | 2.1 A               | 92 %            |

\* – add suffix **-CM**, **-CMF** for models with chassis mount adaptor, see last page.

– add suffix **-N** for negative remote control, see page 3 -> Remote On/Off

### Input Specifications

|  |  |
|--|--|
| Input current at no load                   | 24 Vin; 5 – 15 VDC models: 185 mA typ.<br>24 Vin; 24 – 48 VDC models: 85 mA typ.<br>48 Vin; 5 – 15 VDC models: 90 mA typ.<br>48 Vin; 24 – 48 VDC models: 40 mA typ.  |
| Input current at full load                 | 24 Vin models: 4.6 A typ.<br>48 Vin models: 2.3 A typ.   |
| Start-up voltage / under voltage shut down | 24 Vin models: 17.5 VDC / 16 VDC typ.<br>48 Vin models: 35.5 VDC / 34 VDC typ.   |
| Surge voltage (100 msec. max.)             | 24 Vin models: 50 V max.<br>48 Vin models: 100 V max.  |
| Conducted noise                            | EN 55022 level A, FCC part 15, level A<br>(chassis mount option –CFM required)   |
| ESD (electrostatic discharge)              | EN 61000-4-2, air ±8 kV, contact ± 6 kV,<br>perf. criteria A   |
| Radiated immunity                          | EN 61000-4-3, 10 V/m, perf. criteria A   |
| Fast transient / Surge                     | EN 61000-4-4, ± 2 kV, perf. criteria A<br>EN 61000-4-5, ± 1 kV perf. criteria A<br>With external input capacitor e.g. Nippon<br>chemi-con KY 200 µF, 100 V, ESR 48 mOhm<br>or with chassis mount option –CFM |
| Conducted immunity                         | EN 61000-4-3, 10 Vrms, perf. criteria A  |
| Reverse voltage protection                 | parallel diode   |
| Recommended input fuse (slow blow)         | 24 Vin models: 10 A<br>48 Vin models: 5 A  |

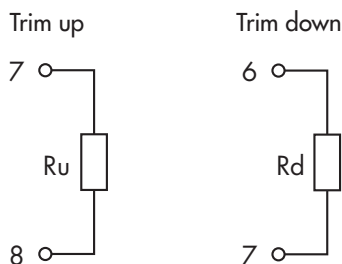
### Output Specifications

|   |   |
|---|---|
| Voltage set accuracy                                    | ±1 %  |
| Output voltage adjustment                               | +10% / -20% by external resistor<br>(see table page 3)  |
| Regulation  | – Input variation Vin min. to Vin max. 0.2 % max.<br>– Load variation (0 – 100 %) 5 – 15 VDC models: 0.3 % max.<br>24 – 48 VDC models: 0.3 % max. |
| Temperature coefficient                                 | ± 0.02 %/K  |
| Minimum load  | not required  |
| Remote sense  | 10 % max. of Vout nom.<br>(including trim up value)   |
| Ripple and noise (20 MHz Bandwidth)                     | 5 VDC models: 75 mVpk-pk max.<br>12 & 15 VDC models: 100 mVpk-pk max.<br>24 & 28 VDC models: 200 mVpk-pk max.<br>48 VDC models: 300 mVpk-pk max.  |
| Start up time (nominal Vin and constant resistive load) | 25 ms typ. (at power On or remote On)   |
| Transient response (25% load step change)               | 200 µs typ.   |
| Output current limitation                               | at 110 -140 % of Iout max.  |
| Over voltage protection                                 | at 115 -130 % of Vout nom.  |
| Short circuit protection                                | indefinite, automatic recovery  |
| Capacitive load   | 1000 µF max.  |

**General Specifications**

|   |  |  |
|---|--|--|
| Temperature ranges  | - Operating<br>- Case temperature<br>- Storage   | - 40 °C to +75 °C<br>+ 105 °C max.<br>- 55 °C to + 125 °C  |
| Thermal impedance   | - without Heatsink<br>- with Heatsink  | 6.7 °C/W<br>4.7 °C/W   |
| Derating  |  | See derating graphs page 4   |
| Over temperature protection                                       |  | at 115 °C  |
| Thermal shock   |  | acc. MIL-STD-810F  |
| Humidity (non condensing)   |  | 95 % rel H max.  |
| Reliability, calculated MTBF (MIL-HDBK-217F, 25°C, ground benign) |  | 75'000 h   |
| Isolation voltage (60sec.)  | - Input/Output<br>- Input/Case   | 2'250 VDC (basic insulation)<br>1'500 VDC  |
| Isolation capacity  | - Input/Output   | 2500 pF max.   |
| Isolation resistance  | - Input/Output (500 VDC)   | >1 GOhm min.   |
| Switching frequency   |  | 300 kHz typ. (puls width modulation)   |
| Safety standards  |  | UL 60950-1 , IEC 60950-1, EN 60950-1   |
| Safety approvals (pending)  |  | UL 60950-1, CB- test report  |
| Remote On/Off   | - positive logic (standard)<br><br>- negative logic (option -N)<br><br>- Off idle current: | - On: 3 to 12 VDC or open circuit<br>- Off: 0 to 1.2 VDC or short circuit pin 1 and 2<br>- On: 0 to 1.2 VDC or short circuit pin 1 and 2<br>- Off: 3 to 12 VDC or open circuit<br>3 mA |

**External output trimming:**



| Rd     | 5 VDC | 12 VDC | 15 VDC | 24 VDC | 28 VDC | 48 VDC |
|--------|-------|--------|--------|--------|--------|--------|
| + 5 %  | 62    | 180    | 240    | 390    | 470    | 820    |
| + 10 % | 33    | 91     | 120    | 200    | 240    | 430    |

| Rd     | any output |
|--------|------------|
| - 10 % | 8.2        |
| - 20 % | 3.0        |

closest resistor out of the E24 array [kOhm]

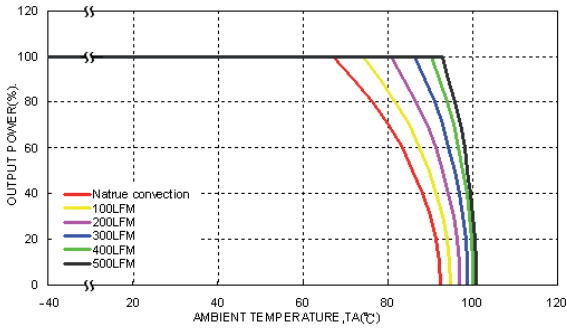
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Output Power Derating**

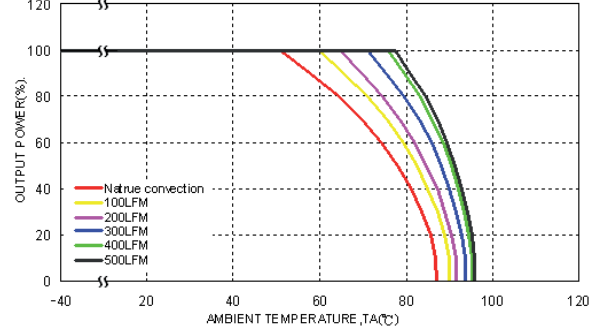
Models with heatsink

Models with without heatsink

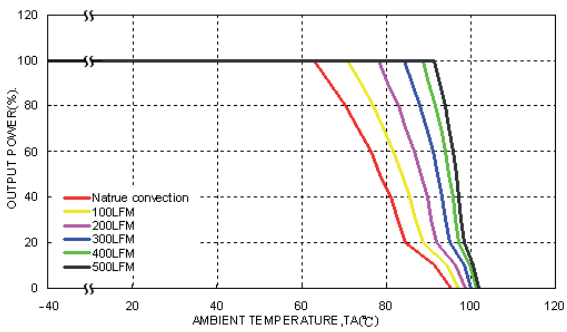
24 Vin models: Output 5-15 VDC



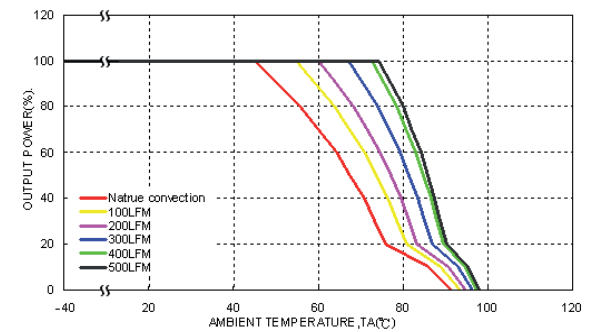
24 Vin models: Output 5-15 VDC



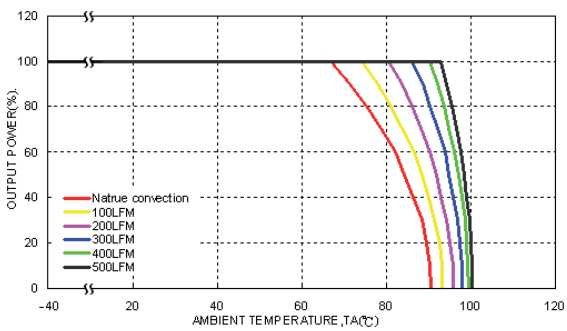
24 Vin models: Output 24-48 VDC



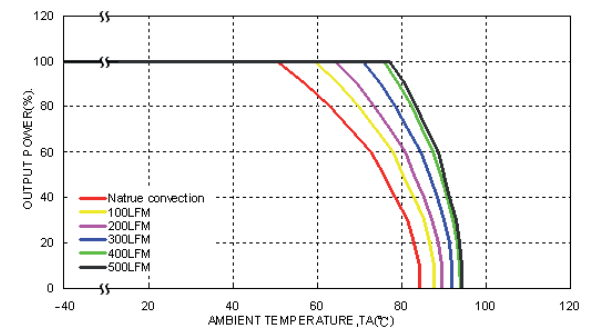
24 Vin models: Output 24-48 VDC



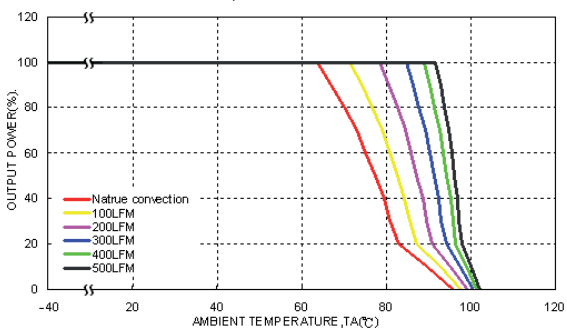
48 Vin models: Output 5-15 VDC



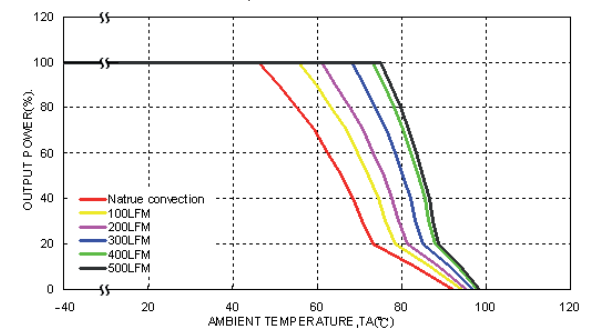
48 Vin models: Output 5-15 VDC



48 Vin models: Output 24-48 VDC



48 Vin models: Output 24-48 VDC

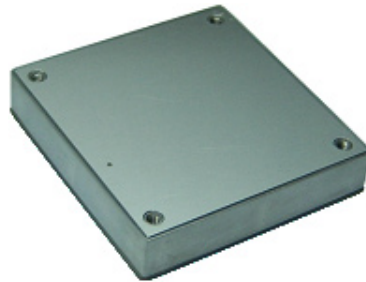
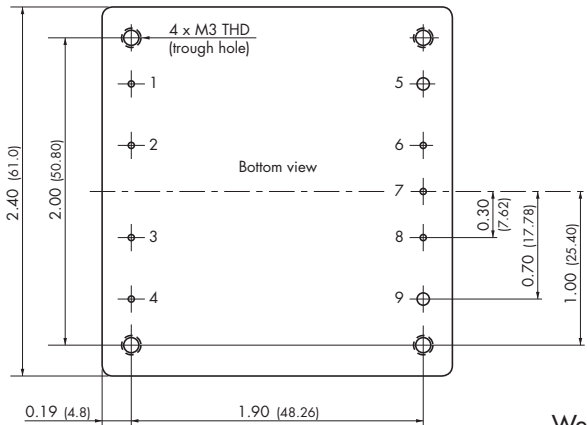


**General Specifications**

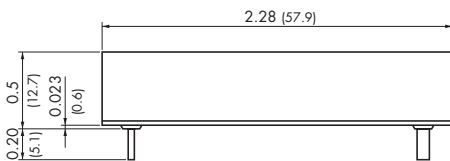
|                  |                         |
|------------------|-------------------------|
| Case material    | metal                   |
| Potting material | silicon (UL94V-0 rated) |
| Base material    | FR4                     |
| Vibration        | acc. MIL-STD-810F       |

**Dimensions**

TEP 100 module



Weight: 97g (3.42 oz)

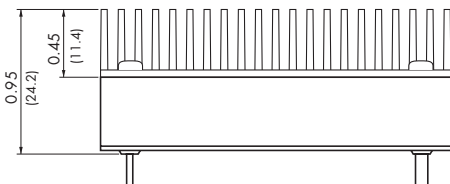


Pin diameter pin 5 & 9: 0.08 (2.0)  
Pin diameter other pins: 0.04 (1.0)

| Pin-Out |               |
|---------|---------------|
| Pin     |               |
| 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.

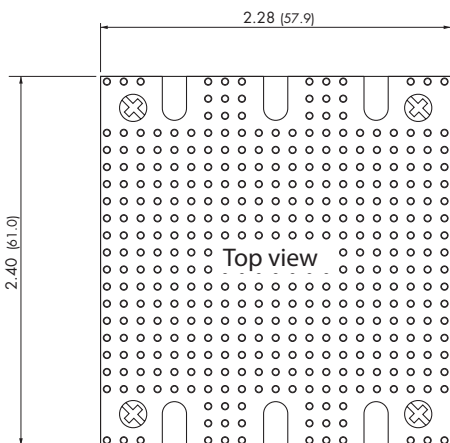
**TEP-HS1 Heatsink (pictured with heatsink mounted)**



Order code: TEP-HS1

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

Weight: 135g (4.76 oz)  
(Heatsin + Converter)



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

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

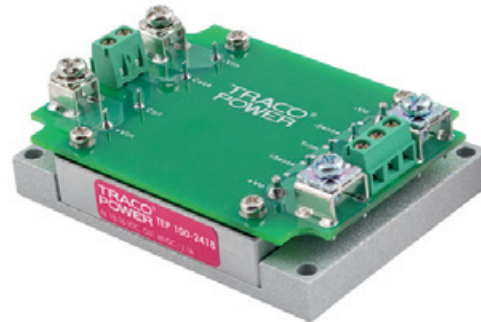
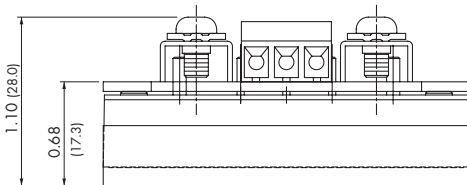
**Chassis Mount Adaptor**

TEP 100 module with chassis mount adaptor (suffix -CM or -CMF)

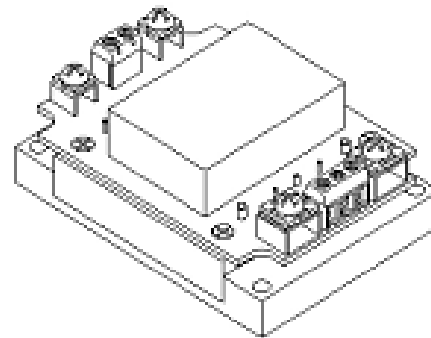
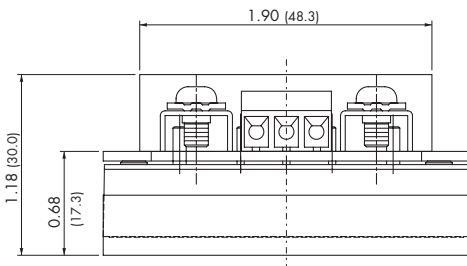
For easy chassis mounting the converter modules can be supplied with an adaptor option consisting of a screw terminal connection board (soldered to converter pins) and a chassis mount adaptor.

In addition this Chassis mount option is available with an EMI-filter (see EMI specification)

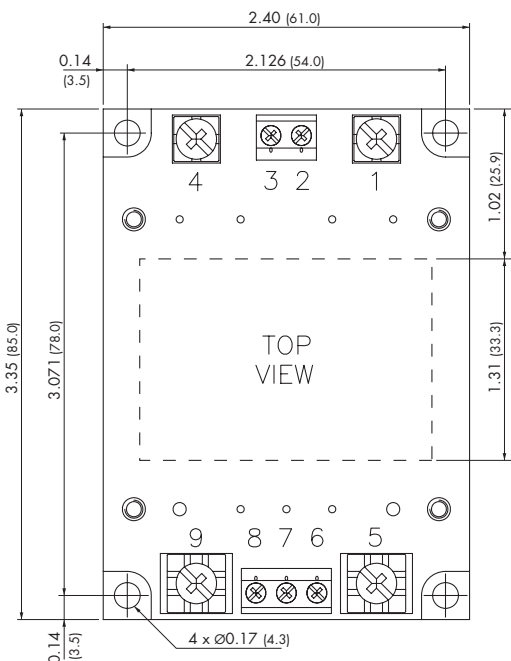
Suffix -CM: Chassis mount adaptor



Suffix -CMF: Chassis mount adaptor with EMI filter



Please note that adaptors cannot be ordered as separate items but are factory assembled.



| Connection |               |
|------------|---------------|
| Pin        |               |
| 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.

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

Specifications can be changed any time without notice.