

### 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 (72 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. 72 V models: 10 mA typ.
Start-up voltage	24 V models: 9.0 VDC max. 48 V models: 18 VDC max. 72 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 72 V models: 33.0 – 36.0 VDC
Surge voltage (1 sec. max.)	24 V models: 50 VDC 48 V models: 100 VDC 72 V models: 185 VDC
Conducted noise	EN 55022 class A/B with external components see application note
ESD (electrostatic discharge)	EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A
Radiated immunity	EN 61000-4-3, 20 V/m, perf. criteria A
Fast transient / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV perf. criteria A With external input capacitor: 24/48V models: chemi-con KY 200 $\mu$ F, 100 V, ESR 48 mOhm 72 V models: ruby-con BXF 100 $\mu$ F, 250 V
Conducted immunity	EN 61000-4-6, 10 Vrms, perf. criteria A
Reverse voltage protection	parallel diode
Recommended input fuse (slow blow)	24 V models: 20 A 48/72 V models: 10 A

### Output Specifications

Voltage set accuracy (at full load, nominal input)	$\pm 1$ %
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	$\pm 0.02$ %/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 $\mu$ 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"> <li>- Operating</li> <li>- Case temperature</li> <li>- Storage</li> </ul>	-40°C to +75°C +115°C max. -55°C to +125°C
Thermal impedance	<ul style="list-style-type: none"> <li>- without heat-sink</li> <li>- with heat-sink</li> </ul>	6.1°C/W 5.1°C/W
Power Derating	<ul style="list-style-type: none"> <li>- without heat-sink</li> <li>- with heat-sink</li> <li>- with iron base plate (19" x 3.5" x 0.063")</li> </ul>	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"> <li>- Test conditions</li> </ul>	EN 61373, MIL-STD-810F <a href="http://www.tracopower.com/products/mil810.pdf">www.tracopower.com/products/mil810.pdf</a>
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)		75'000 h
Isolation voltage (60sec.)	<ul style="list-style-type: none"> <li>- Input/Output</li> <li>- Input/Case</li> </ul>	2'250 VDC (basic insulation) 1'600 VDC
Isolation capacitance	- Input/Output	2500 pF max.
Isolation resistance	- Input/Output (500 VDC)	>1 GOhm min.
Switching frequency		250 kHz typ. (puls width modulation)
Safety standards		EN 50155, UL 60950-1, IEC/EN 60950-1
Safety approvals	<ul style="list-style-type: none"> <li>- UL/cUL (entry pending)</li> <li>- Railway</li> </ul>	<a href="http://www.ul.com">www.ul.com</a> -> certifications -> File e188913 <a href="http://www.tracopower.com/products/tep-coc.pdf">www.tracopower.com/products/tep-coc.pdf</a>
Remote On/Off	<ul style="list-style-type: none"> <li>- positive logic (standard)</li> <li>- negative logic (option)</li> <li>- Off idle current:</li> </ul>	<ul style="list-style-type: none"> <li>- On: 3 to 12 VDC or open circuit</li> <li>- Off: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- On: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- Off: 3 to 12 VDC or open circuit</li> <li>3 mA</li> </ul>
Environmental compliance	<ul style="list-style-type: none"> <li>- Reach</li> <li>- RoHS</li> </ul>	<a href="http://www.tracopower.com/products/tep160wir-reach.pdf">www.tracopower.com/products/tep160wir-reach.pdf</a> RoHS directive 2002/95/EC

**Application note:** [www.tracopower.com/products/tep160wir-application.pdf](http://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

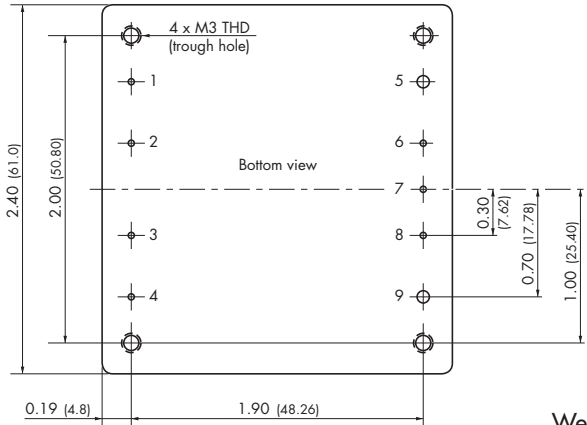
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**General Specifications**

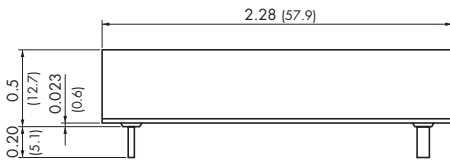
Casing material	metal
Potting material	silicon (UL94V-0 rated)
Base material	FR4

**Dimensions**

TEP 160WIR module

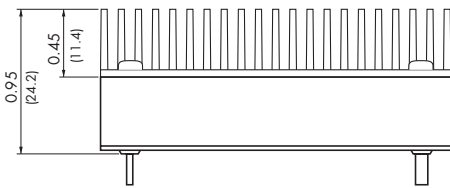


Weight: 105g (3.70oz)



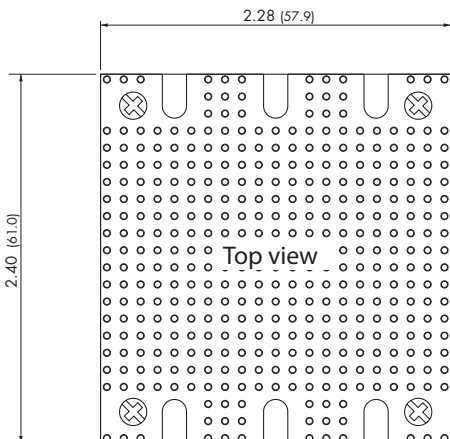
Pin diameter pin 5 & 9: 0.08 (2.0)  
Pin diameter other pins: 0.04 (1.0)

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



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.

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

**Options (on demand)**

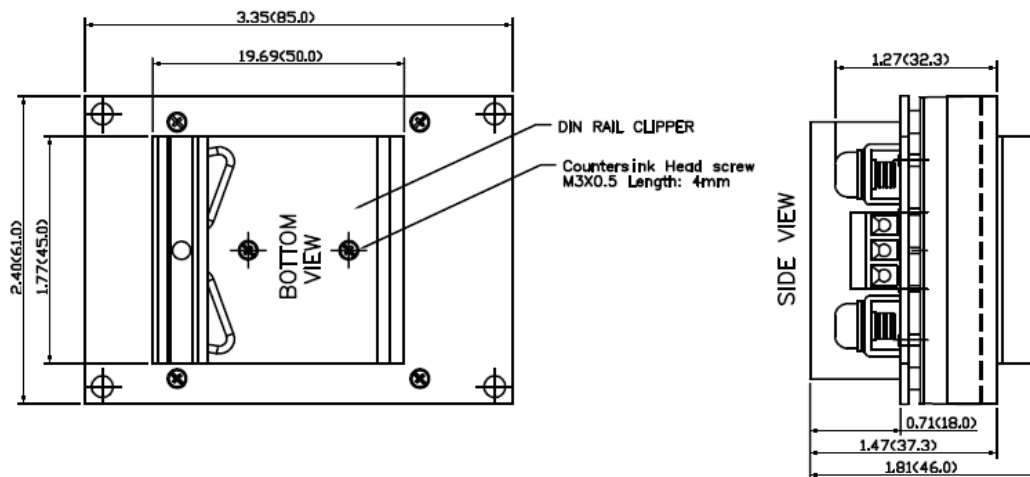
Chassis mount models with screw terminal block



Chassis mount models with screw terminal block and input filter to meet EN 55022 class A



DIN-rail clip for chassis mount models



Specifications can be changed any time without notice.