

- Compact metal package
- Wide 2:1 input voltage ranges 16.5–36, 33–75 VDC
- Very high efficiency up to 93%
- No minimum load
- Soft start
- Adjustable output voltage +10/-20%
- Sense line
- Remote On/Off input
- Over temperature protection
- 3-year product warranty



The TEP 160 Series is a family of isolated high performance DC/DC converter modules with wide 2:1 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 an interesting solution for battery operated systems. Typical applications are in telecom/datacom, industry control and railway systems for on board power distribution. This 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 160-2412	16.5 - 36 VDC (24 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	13'000 mA	92 %
TEP 160-2413		15 VDC (12.0 - 16.5 VDC)	10'000 mA	92 %
TEP 160-2415		24 VDC (19.2 - 26.4 VDC)	6'500 mA	93 %
TEP 160-2416		28 VDC (22.4 - 30.8 VDC)	5'500 mA	93 %
TEP 160-2418		48 VDC (38.4 - 52.8 VDC)	3'300 mA	92 %
TEP 160-4812	33 - 75 VDC (48 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	16'000 mA	92 %
TEP 160-4813		15 VDC (12.0 - 16.5 VDC)	13'000 mA	93 %
TEP 160-4815		24 VDC (19.2 - 26.4 VDC)	8'000 mA	92 %
TEP 160-4816		28 VDC (22.4 - 30.8 VDC)	7'000 mA	92 %
TEP 160-4818		48 VDC (38.4 - 52.8 VDC)	4'000 mA	92 %
TEP 160-48153		53 VDC (42.4 - 58.3 VDC)	3'700 mA	92 %

Options	
<b>Suffix -CM</b>	- Chassis mount models w/o filter: <a href="http://www.tracopower.com/overview/tep160cm">www.tracopower.com/overview/tep160cm</a>
<b>Suffix -CMF</b>	- Chassis mount models w/ filter to meet EN 55032 class A: <a href="http://www.tracopower.com/overview/tep160cmf">www.tracopower.com/overview/tep160cmf</a>
<b>TEP-HS1</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/overview/tep-hs1">www.tracopower.com/overview/tep-hs1</a>
<b>on demand</b> (backorder with MOQ non stocking item)	- Optional model with 3.3 VDC and 40'000 mA Output, and 16.5 - 36 VDC Input - Optional model with 5 VDC and 30'000 mA Output, and 16.5 - 36 VDC Input - Optional model with 3.3 VDC and 45'000 mA Output, and 33 - 75 VDC Input - Optional model with 5 VDC and 34'000 mA Output, and 33 - 75 VDC Input - Optional models with Sync pin to synchronize switching frequency of up to 3 units (EMC reason)



## Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/tep160">www.tracopower.com/overview/tep160</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

## EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	- Radiated Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	External filter proposal:	<a href="http://www.tracopower.com/overview/tep160">www.tracopower.com/overview/tep160</a>
EMS (Immunity)		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 2x KY 200 $\mu$ F EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	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	- Operating Temperature	-40°C to +75°C
	- Case Temperature	+115°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: <a href="http://www.tracopower.com/overview/tep160">www.tracopower.com/overview/tep160</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	120°C typ. (Automatic recovery at 105°C typ.) Case
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)	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	3 mA typ.
	- Remote Pin Input Current	-0.5 to 1.0 mA
Altitude During Operation		5'000 m max. (for basic insulation) 2'000 m max. (for reinforced 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)

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

Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC
	- Input to Case, 60 s	1'600 VAC
	- Output to Case, 60 s	1'600 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'500 pF max.
Reliability	- Calculated MTBF	380'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Metal
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
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
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	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
	- SCIP Reference Number	931b6944-928b-4cea-8bfa-21644d000430

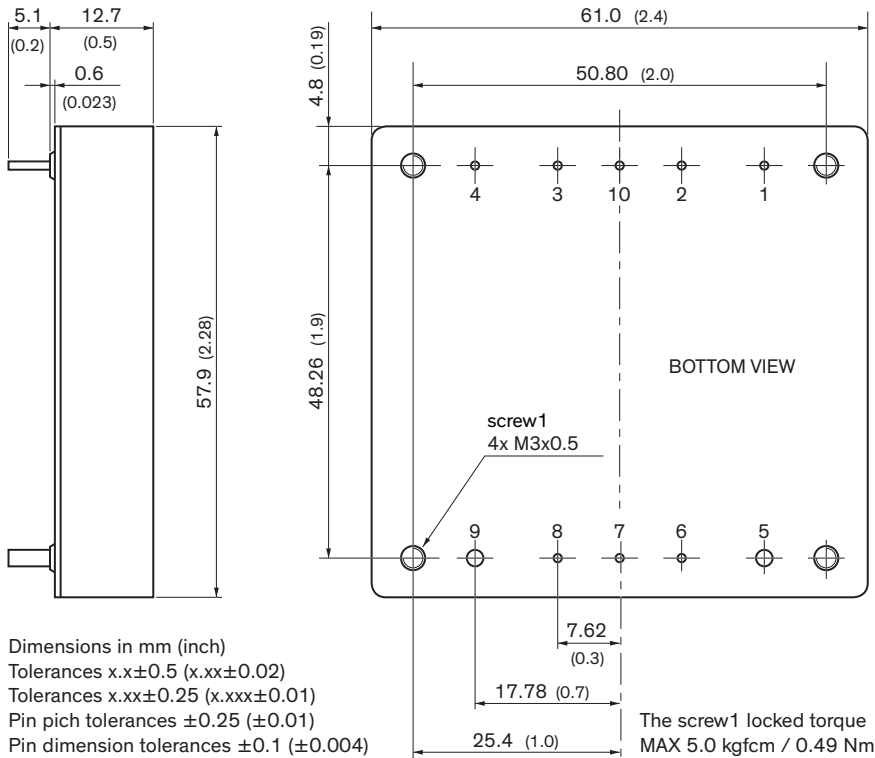
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tep160](http://www.tracopower.com/overview/tep160)

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

### 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)