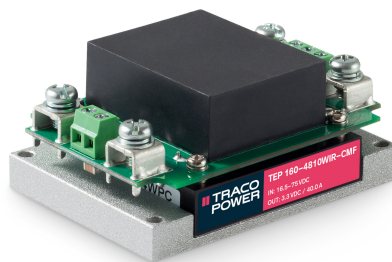


- Including EMI filter to meet EN 55032, class A
- Ultra wide 4:1 input voltage ranges
9–36, 18–75, 43–160 VDC
- EN 50155 approval for railway applications
- Very high efficiency up to 91%
- No minimum load
- Soft start
- Adjustable output voltage +10 / -20%
- Sense line
- Remote On/Off input
- Under voltage lock-out circuit



The TEP 160WIRCMF Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges. They come in chassis mount version with screw terminal block. A very high efficiency allows full power operation without forced air cooling at 25°C. 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.

Options	
TEP-MK1	- Optional DIN-Rail Mounting Kit: www.tracopower.com/products/tep-mk1.pdf
on demand (backorder with MOQ non stocking item)	- Optional model with 3.3 VDC / 40'000 mA Output and 9 - 36 VDC Input - Optional model with 5 VDC / 28'000 mA Output and 9 - 36 VDC Input - Optional model with 12 VDC / 12'000 mA Output and 9 - 36 VDC Input - Optional model with 15 VDC / 9'500 mA Output and 9 - 36 VDC Input - Optional model with 24 VDC / 6'000 mA Output and 9 - 36 VDC Input - Optional model with 28 VDC / 5'000 mA Output and 9 - 36 VDC Input - Optional model with 48 VDC / 3'000 mA Output and 9 - 36 VDC Input - Optional model with 3.3 VDC / 40'000 mA Output and 18 - 75 VDC Input - Optional model with 5 VDC / 30'000 mA Output and 18 - 75 VDC Input - Optional model with 12 VDC / 13'000 mA Output and 18 - 75 VDC Input - Optional model with 15 VDC / 10'000 mA Output and 18 - 75 VDC Input - Optional model with 24 VDC / 6'500 mA Output and 18 - 75 VDC Input - Optional model with 28 VDC / 5'500 mA Output and 18 - 75 VDC Input - Optional model with 48 VDC / 3'200 mA Output and 18 - 75 VDC Input - Optional model with 3.3 VDC / 43'000 mA Output and 43 - 160 VDC Input - Optional model with 5 VDC / 32'000 mA Output and 43 - 160 VDC Input - Optional model with 12 VDC / 15'000 mA Output and 43 - 160 VDC Input - Optional model with 15 VDC / 12'000 mA Output and 43 - 160 VDC Input - Optional model with 24 VDC / 7'500 mA Output and 43 - 160 VDC Input - Optional model with 28 VDC / 6'500 mA Output and 43 - 160 VDC Input - Optional model with 48 VDC / 3'800 mA Output and 43 - 160 VDC Input - Negative (passive = Off) Remote On/Off function

Input Specifications

Input Current	- At no load	24 Vin models:	20 mA typ.
		48 Vin models:	15 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/tep160wircmf 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)
Capacitive Load	- 24 Vin input - 48 Vin input - 110 Vin input	3.3 Vout models: 121'000 µF max. 5 Vout models: 56'000 µF max. 12 Vout models: 10'000 µF max. 15 Vout models: 6'300 µF max. 24 Vout models: 2'500 µF max. 28 Vout models: 1'700 µF max. 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. 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.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		75 ms typ.
Short Circuit Protection		Continuous, Automatic recovery

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

Output Current Limitation	120 - 150% of I _{out} max.
Overvoltage Protection	115 - 130% of V _{out} nom.
Transient Response - Response Time	200 µs typ. / 250 µs max. (25% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 EN 50155
	- Railway Applications	
	- Certification Documents	www.tracopower.com/overview/tep160wircmf
Pollution Degree		PD 2
Over Voltage Category		OVC II

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55011 class A (internal filter) EN 55032 class A (internal filter)
	- Radiated Emissions	EN 55011 class A (internal filter) EN 55032 class A (internal filter)
EMS Immunity		EN 50155 (Railway Applications) EN 50121-3-2 (EMC for Rolling Stock)
	- Electrostatic Discharge	Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±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, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV, perf. criteria A
	- Conducted RF Disturbances	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	+105°C max.
	- Storage Temperature	-40°C to +105°C
Power Derating	- High Temperature	See application note: www.tracopower.com/overview/tep160wircmf
Over Temperature Protection Switch Off	- Protection Mode	115°C typ. (Automatic recovery at 105°C typ.)
	- Measurement Point	Base-Plate
Cooling System		Natural convection (20 LFM)
Sense Function		10% max. of V _{out} nom. (Sense line to be connected to the output either at the module or at the load under regard of polarity.)
Remote Control	- Voltage Controlled Remote	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		2'000 m max. (for reinforced insulation) 5'000 m max. (for functional insulation)
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Reinforced Insulation (110 Vin models) Functional Insulation (other models)

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

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 (110 Vin models) 2'250 VDC (other models) 1'500 VAC (110 Vin models) 1'600 VDC (other models) 1'500 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	350'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration - Mechanical Shock - Thermal Shock	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F EN 50155
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)
Housing Type		Metal Case (24 and 48 Vin models) Plastic Case (110 Vin models)
Mounting Type		Chassis Mount
Connection Type		Screw Terminal
Weight		287 g
Thermal Impedance		6.1 K/W
Environmental Compliance	- REACH Declaration - RoHS Declaration - Flammability (EN 45545-2)	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). The SCIP number is provided on request.) www.tracopower.com/info/en45545-declaration.pdf

Supporting Documents

Overview Link (for additional Documents)

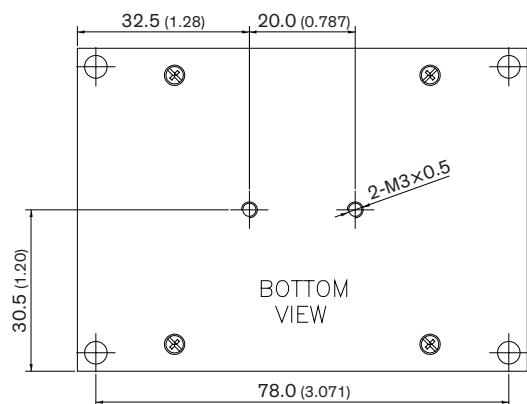
www.tracopower.com/overview/tep160wircmf

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

Technical drawing showing the top view of a rectangular plate. The overall dimensions are 85.0 (3.35) in width and 61.0 (2.40) in height. The inner dimensions are 78.0 (3.071) in width and 50.8 (2.00) in height. The plate features four corner fasteners labeled screw1, screw2, screw3, and screw4. The distance from the left edge to the center of the fasteners is 22.2 (0.874). The distance from the center of the fasteners to the right edge is 40.6 (1.598). The distance from the top edge to the center of the fasteners is 54.0 (2.126). The distance from the center of the fasteners to the bottom edge is 50.8 (2.00). The plate has a central rectangular area with a dashed border. The text "TOP VIEW" is centered in the middle of the plate.

Pinout	
Pin	Function
1	−Vin (GND)
2	NC
3	Remote
4	+Vin (Vcc)
5	−Vout
6	−Sense
7	Trim
8	+Sense
9	+Vout

NC: No Connection



The screw1 locked torque
MAX 11.2kgf-cm/1.10N-m

The screw2 locked torque
MAX 5.2kgf-cm/0.51N-m

The screw3 locked torque
MAX 16.8kgf-cm/1.65N-m

Dimensions in mm (inch)
Tolerances $x.x \pm 0.5$ ($x.xx \pm 0.02$)
Tolerances $x.xx \pm 0.25$ ($x.xxx \pm 0.01$)

Screw 3:
Type M5
Head diameter 8.9 (0.350)
Rated current: 65 A