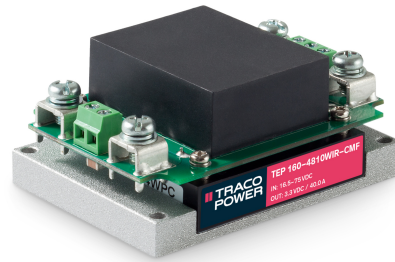


- Including EMI filter to meet EN 55032, class A
- Ultra wide 4:1 input voltage ranges 9–36, 18–75, 43–160 VDC
- EN 50155 approval for railway applications
- Very high efficiency up to 91%
- No minimum load
- Soft start
- Adjustable output voltage +10 / -20%
- Sense line
- Remote On/Off input
- Under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



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 makes 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: <a href="http://www.tracopower.com/overview/tep-mk1">www.tracopower.com/overview/tep-mk1</a>
<p><b>on demand</b> (backorder with MOQ non stocking item)</p>	<ul style="list-style-type: none"> <li>- Optional model with 3.3 VDC and 40'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 5 VDC and 28'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 12 VDC and 12'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 15 VDC and 9'500 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 24 VDC and 6'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 28 VDC and 5'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 48 VDC and 3'000 mA Output, and 9 - 36 VDC Input</li> <li>- Optional model with 3.3 VDC and 40'000 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 5 VDC and 30'000 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 12 VDC and 13'000 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 15 VDC and 10'000 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 24 VDC and 6'500 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 28 VDC and 5'500 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 48 VDC and 3'200 mA Output, and 18 - 75 VDC Input</li> <li>- Optional model with 3.3 VDC and 43'000 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 5 VDC and 32'000 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 12 VDC and 15'000 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 15 VDC and 12'000 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 24 VDC and 7'500 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 28 VDC and 6'500 mA Output, and 43 - 160 VDC Input</li> <li>- Optional model with 48 VDC and 3'800 mA Output, and 43 - 160 VDC Input</li> <li>- Optional models with inverse Remote On/Off function (passive = off)</li> </ul>

## Input Specifications

Input Current	- At no load	110 Vin models: <b>10 mA typ.</b> 24 Vin models: <b>20 mA typ.</b> (3.3 Vout model) <b>25 mA typ.</b> (5 Vout model) <b>25 mA typ.</b> (12 Vout model) <b>25 mA typ.</b> (15 Vout model) <b>25 mA typ.</b> (24 Vout model) <b>25 mA typ.</b> (28 Vout model) <b>35 mA typ.</b> (48 Vout model) 48 Vin models: <b>15 mA typ.</b> (3.3 Vout model) <b>15 mA typ.</b> (5 Vout model) <b>20 mA typ.</b> (12 Vout model) <b>20 mA typ.</b> (15 Vout model) <b>20 mA typ.</b> (24 Vout model) <b>20 mA typ.</b> (28 Vout model) <b>25 mA typ.</b> (48 Vout model)
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.) 110 Vin models: <b>185 VDC max.</b> (1 s max.)
Under Voltage Lockout		24 Vin models: <b>7.3 VDC min. / 7.7 VDC typ. / 8.1 VDC max.</b> 48 Vin models: <b>15.5 VDC min. / 16 VDC typ. / 16.3 VDC max.</b> 110 Vin models: <b>33 VDC min. / 34.5 VDC typ. / 36 VDC max.</b>
Recommended Input Fuse		24 Vin models: <b>25'000 mA</b> (fast acting) 48 Vin models: <b>15'000 mA</b> (fast acting) 110 Vin models: <b>8'000 mA</b> (fast acting) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>

## Output Specifications

Output Voltage Adjustment		<b>-20% to +10%</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tep160wircmf">www.tracopower.com/overview/tep160wircmf</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.1% max.</b> <b>0.1% max.</b>
Ripple and Noise (20 MHz Bandwidth)		3.3 Vout models: <b>75 mVp-p max.</b> (w/ 1 µF X7R    25 µF poscap) 5 Vout models: <b>75 mVp-p max.</b> (w/ 1 µF X7R    25 µF poscap) 12 Vout models: <b>100 mVp-p max.</b> (w/ 1 µF X7R    25 µF poscap) 15 Vout models: <b>100 mVp-p max.</b> (w/ 1 µF X7R    25 µF poscap) 24 Vout models: <b>200 mVp-p max.</b> (w/ 4.7 µF X7R) 28 Vout models: <b>200 mVp-p max.</b> (w/ 4.7 µF X7R) 48 Vout models: <b>300 mVp-p max.</b> (w/ 2.2 µF X7R)

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

Capacitive Load	- 24 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.
	- 48 Vin input	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.
	- 110 Vin input	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.
	Hold-up Time	10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: <a href="http://www.tracopower.com/info/holdup_en50155.pdf">www.tracopower.com/info/holdup_en50155.pdf</a> )
Start-up Time	75 ms typ.	
Short Circuit Protection	Continuous, Automatic recovery	
Output Current Limitation	120 - 150% of Iout max.	
Overvoltage Protection	115 - 130% of Vout nom.	
Transient Response	- Response Time	200 µs typ. / 250 µs max. (25% Load Step)

### Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1
		EN 62368-1
		IEC 60950-1
		IEC 62368-1
		UL 60950-1
		UL 62368-1
	- Railway Applications	EN 50155
	- Certification Documents	<a href="http://www.tracopower.com/overview/tep160wircmf">www.tracopower.com/overview/tep160wircmf</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 50121-3-2 (EMC for Rolling Stock)
		EN 55011 class A (internal filter)
	- Radiated Emissions	EN 55032 class A (internal filter)
		EN 55011 class A (internal filter)
		EN 55032 class A (internal filter)

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

EMS (Immunity)	<ul style="list-style-type: none"> <li>- Electrostatic Discharge</li> <li>- RF Electromagnetic Field</li> <li>- EFT (Burst) / Surge</li> <li>- Conducted RF Disturbances</li> <li>- PF Magnetic Field</li> </ul>	EN 50121-3-2 (EMC for Rolling Stock) Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A EN 61000-4-6, 10 Vrms, perf. criteria A Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A
EMC / Environmental	- Certification Documents	<a href="http://www.tracopower.com/overview/tep160wircmf">www.tracopower.com/overview/tep160wircmf</a>

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	<ul style="list-style-type: none"> <li>- Operating Temperature</li> <li>- Case Temperature</li> <li>- Storage Temperature</li> </ul>	-40°C to +75°C +115°C max. -40°C to +105°C
Power Derating	<ul style="list-style-type: none"> <li>- High Temperature</li> </ul>	Depending on model See application note: <a href="http://www.tracopower.com/overview/tep160wircmf">www.tracopower.com/overview/tep160wircmf</a>
Over Temperature Protection Switch Off	<ul style="list-style-type: none"> <li>- Protection Mode</li> <li>- Measurement Point</li> </ul>	120°C typ. (Automatic recovery at 105°C typ.) Base-Plate
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	<ul style="list-style-type: none"> <li>- Voltage Controlled Remote (passive = on)</li> <li>- Off Idle Input Current</li> <li>- Remote Pin Input Current</li> </ul>	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 3 mA typ. -0.5 to 1.0 mA (Optional models with inverse Remote On/Off function (passive = off))
Altitude During Operation		2'000 m max. (for reinforced insulation) 5'000 m max. (for functional 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 (4.8 Vout models) 172 VAC (other output models)
Isolation Test Voltage	<ul style="list-style-type: none"> <li>- Input to Output, 60 s</li> <li>- Input to Case, 60 s</li> <li>- Output to Case, 60 s</li> </ul>	3'000 VAC 1'500 VAC 1'500 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ 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	<ul style="list-style-type: none"> <li>- Vibration</li> <li>- Mechanical Shock</li> <li>- Thermal Shock</li> <li>- Flammability</li> </ul>	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F EN 45545-2 <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>
Housing Material		Alu base-plate w. metal case (24 and 48 Vin models) Alu base-plate w. plastic case (110 Vin models)

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

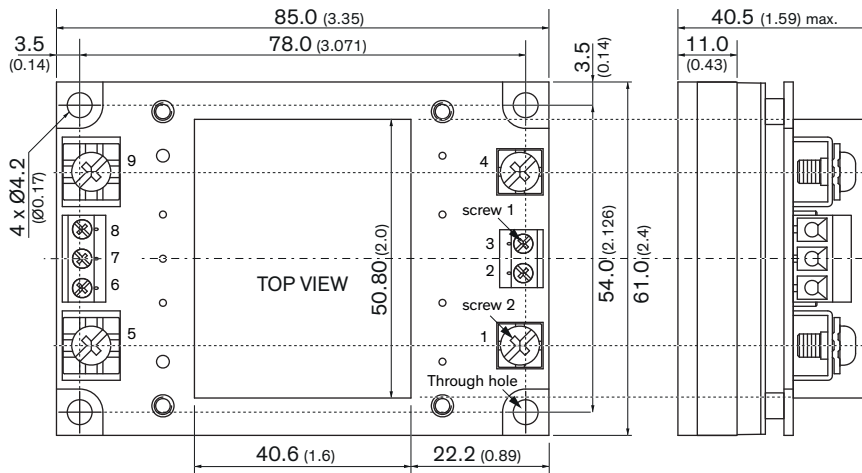
Base Material	Non-conductive FR4 (UL 94 V-0 rated) (24 and 48 Vin models only)
Potting Material	Silicone (UL 94 V-0 rated)
Housing Type	Metal Case (24 and 48 Vin models) Plastic Case (110 Vin models)
Mounting Type	Chassis Mount
Connection Type	Screw Terminal
Weight	287 g
Thermal Impedance - Case to Ambient	6.1 K/W typ.
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	50acc1a9-e38b-4509-8921-bfa0568ea954

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tep160wircmf](http://www.tracopower.com/overview/tep160wircmf)

### Outline Dimensions



Pinout	
Pin	Single
1	-Vin (GND)
2	Case
3	Remote On/Off
4	+Vin (Vcc)
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

Dimensions in mm (inch)

Tolerances x.x ±0.5 (x.xx ±0.02)

x.xx ±0.25 (x.xxx ±0.01)

Mounting hole pitch tolerances ±0.25 (±0.01)

Screw 2:

Type M5

Head diameter 8.9 (0.350)

Rated current: 65 A

Wire gauge range:

AWG 14 - 26

The screw 1 locked torque: max. 5.2 kgfcm / 0.51 Nm

The screw 2 locked torque: max. 16.5 kgfcm / 1.65 Nm

Mounting screw locked torque: max. 11.2 kgfcm / 1.10 Nm