

- Shielded metal case with screw terminals
- 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 89%
- Constant current output characteristic for battery load applications
- Optional with input filter to meet EN 55032 class B
- Wide Operating temperature range: –40°C to +75°C
- Under voltage lock-out, overtemperature & reverse input protection
- Easy chassis and wall mounting
- 3-year product warranty



The modules have originally been designed for harsh industrial environment. High EMC immunity against surge, burst, radiated and conducted disturbances and the shock/ vibration and thermal shock resistance make them very popular for stringent requirements. With the extended input voltage ranges that cover the nominal 24, 36, 72 and 110 VDC with  $\pm 40\%$  tolerance and the approval in accordance to EN 50155 standard they now also offer a reliable solution for mobile and stationary railway applications. At 100% load the current characteristics goes from constant voltage to constant current what makes the units also suitable for battery charger applications. With protection against over-temperature, overload, short-circuit, reverse input, overvoltage and input under-voltage lock-out they are hard to destroy.

### Models

Order Code	Input Voltage Range	Output Voltage nom. (adjustable)	Output Current max.	Efficiency typ.
TEP 150-2412WI	9 - 36 VDC (24 VDC nom.)	12 VDC (12.0 - 14.4 VDC)	12'500 mA	86 %
TEP 150-2413WI		15 VDC (15.0 - 18.0 VDC)	10'000 mA	86 %
TEP 150-2415WI		24 VDC (24.0 - 28.8 VDC)	6'300 mA	87 %
TEP 150-2416WI		28 VDC (28.0 - 33.6 VDC)	5'400 mA	87 %
TEP 150-2418WI		48 VDC (48.0 - 57.6 VDC)	3'200 mA	86 %
TEP 150-4812WI	18 - 75 VDC (48 VDC nom.)	12 VDC (12.0 - 14.4 VDC)	12'500 mA	88 %
TEP 150-4813WI		15 VDC (15.0 - 18.0 VDC)	10'000 mA	89 %
TEP 150-4815WI		24 VDC (24.0 - 28.8 VDC)	6'300 mA	89 %
TEP 150-4816WI		28 VDC (28.0 - 33.6 VDC)	5'400 mA	89 %
TEP 150-4818WI		48 VDC (48.0 - 57.6 VDC)	3'200 mA	88 %
TEP 150-7212WI	43 - 160 VDC (110 VDC nom.)	12 VDC (12.0 - 14.4 VDC)	12'500 mA	88 %
TEP 150-7213WI		15 VDC (15.0 - 18.0 VDC)	10'000 mA	89 %
TEP 150-7215WI		24 VDC (24.0 - 28.8 VDC)	6'300 mA	89 %
TEP 150-7216WI		28 VDC (28.0 - 33.6 VDC)	5'400 mA	89 %
TEP 150-7218WI		48 VDC (48.0 - 57.6 VDC)	3'200 mA	88 %

Options	
<b>Suffix -F</b>	- Optional models with input filter to meet EN 55032 class B: <a href="http://www.tracopower.com/products/tep150wi-f.pdf">www.tracopower.com/products/tep150wi-f.pdf</a>
<b>on demand</b> (backorder with MOQ non stocking item)	- Optional models with inverse remote on/off function (passiv = off)

Input Specifications	
Input Current	- At no load 24 Vin models: <b>100 mA typ.</b> 48 Vin models: <b>65 mA typ.</b> 110 Vin models: <b>30 mA typ.</b>
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>7.9 - 8.5 VDC</b> 48 Vin models: <b>15.6 - 16.8 VDC</b> 110 Vin models: <b>33 - 36 VDC</b>
Recommended Input Fuse	24 Vin models: <b>30'000 mA</b> (slow blow) 48 Vin models: <b>15'000 mA</b> (slow blow) 110 Vin models: <b>7'000 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Reverse Voltage Protection	<b>Parallel diode</b> (External input fuse required)
Input Filter	<b>Internal Pi-Type</b>

Output Specifications	
Output Voltage Adjustment	<b>0% to +20%</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tep150wi">www.tracopower.com/overview/tep150wi</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>0.2% max.</b> <b>0.4% max.</b>
Ripple and Noise (20 MHz Bandwidth)	12 Vout models: <b>100 mVp-p max.</b> 15 Vout models: <b>100 mVp-p max.</b> 24 Vout models: <b>200 mVp-p max.</b> 28 Vout models: <b>200 mVp-p max.</b> 48 Vout models: <b>300 mVp-p max.</b>
Capacitive Load	12 Vout models: <b>40'000 µF max.</b> 15 Vout models: <b>26'000 µF max.</b> 24 Vout models: <b>10'000 µF max.</b> 28 Vout models: <b>7'600 µF max.</b> 48 Vout models: <b>2'600 µF max.</b>
Minimum Load	<b>Not required</b>
Temperature Coefficient	<b>±0.02 %/K max.</b>
Start-up Time	<b>35 ms typ.</b>
Short Circuit Protection	<b>Continuous, Automatic recovery</b>
Overload Protection	<b>Constant Current Mode</b>
Output Current Limitation	<b>105 - 120% of Iout max.</b>
Overvoltage Protection	<b>125 - 140% of Vout nom.</b>
Transient Response	- Response Time <b>200 µs typ.</b> (25% Load Step)

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

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment  - Railway Applications - Certification Documents	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 EN 50155 <a href="http://www.tracopower.com/overview/tep150wi">www.tracopower.com/overview/tep150wi</a>
Pollution Degree		PD 2
Over Voltage Category		OVC I

## EMC Specifications

EMI Emissions	- Conducted Emissions  - Radiated Emissions	EN 50121-3-2 (EMC for Rolling Stock) EN 55032 class A (internal filter) FCC Part 15 class A (internal filter) EN 55032 class A (internal filter) FCC Part 15 class A (internal filter)
EMS Immunity	- Electrostatic Discharge  - RF Electromagnetic Field - EFT (Burst) / Surge  - Conducted RF Disturbances - PF Magnetic Field	EN 50155 (Railway Applications) 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, 10 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A Ext. input component: 24 Vin models: KY 470 $\mu$ F, ESR 45 mOhm 48 Vin models: KY 220 $\mu$ F, ESR 48 mOhm 110 Vin models: KXJ 150 $\mu$ F Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A 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 - Case Temperature - Storage Temperature	-40°C to +75°C +100°C max. -55°C to +125°C (Mount on conducting surface to optimize thermal coupling)
Power Derating	- High Temperature	See application note: <a href="http://www.tracopower.com/overview/tep150wi">www.tracopower.com/overview/tep150wi</a>
Over Temperature Protection Switch Off	- Protection Mode	110°C typ. (Automatic recovery)
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 3.5 mA typ. (Optional models with inverse logic (passiv = off) available)
Altitude During Operation		5'000 m max.
Switching Frequency		203 - 330 kHz (PWM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Case, 60 s - Output to Case, 60 s	2'250 VDC 1'600 VDC 1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.

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

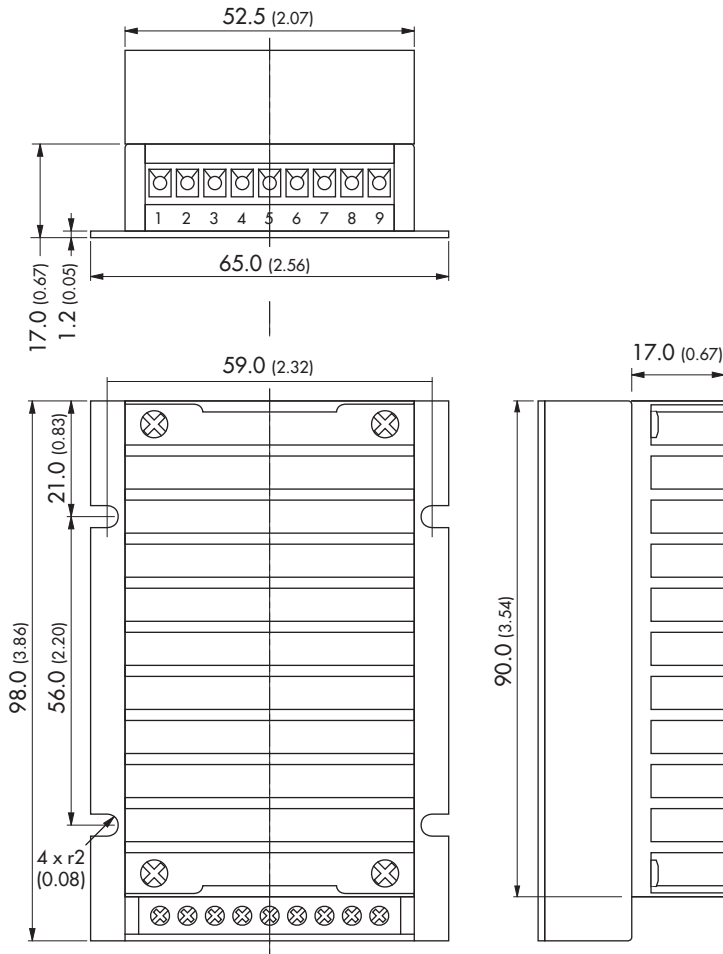
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	3'500 pF max.
Reliability	- Calculated MTBF	495'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration	MIL-STD-810F EN 61373 7.7 g, 3 axis, random waveform, 60 min
	- Mechanical Shock	MIL-STD-810F EN 61373 50 g, 3 axis, 11 ms
	- Thermal Shock	MIL-STD-810F EN 50155
Case Ingress Protection		IP 55 (acc. IEC 60529)
Housing Material		Aluminum
Potting Material		Silicone (UL 94 V-0 rated)
Housing Type		Metal Case
Mounting Type		Chassis Mount
Connection Type		Screw Terminal
Weight		300 g
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> <b>Exemptions: 7a, 7c-I</b> (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.)
	- Flammability (EN 45545-2)	<a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tep150wi">www.tracopower.com/overview/tep150wi</a>
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

### Outline Dimensions



Pinout		
Pin	Function	recommended wire
1	+ Vin	14 – 16 AWG
2	+ Vin	14 – 16 AWG
3	- Vin	14 – 16 AWG
4	- Vin	14 – 16 AWG
5	Remote	14 – 24 AWG
6	+ Vout	14 – 16 AWG
7	- Vout	14 – 16 AWG
8	Trim	14 – 24 AWG
9	Trim	14 – 24 AWG

Dimensions in mm (inch)  
 Mounting slot tolerance  $\pm 0.25$  ( $\pm 0.001$ )  
 case tolerance  $\pm 0.5$  ( $\pm 0.02$ )

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