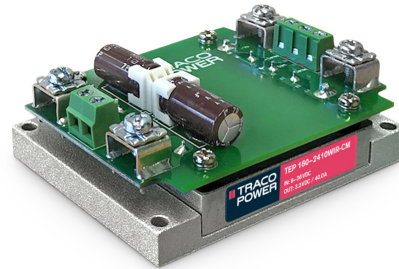


- Chassis mount with screw terminal block
- Ultra wide 4:1 input voltage ranges 9–36, 18–75, 43–160 VDC
- EN 50155 approval for railway applications
- Very high efficiency up to 91%
- No minimum load
- Soft start
- Adjustable output voltage +10 / -20%
- Sense line
- Remote On/Off input
- Under voltage lock-out circuit



The TEP 160WIRCM 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 - Optional models with inverse Remote On/Off function (passive = off)

Input Specifications

Input Current	- At no load	110 Vin models: 10 mA typ. 24 Vin models: 20 mA typ. (3.3 Vout model) 25 mA typ. (5 Vout model) 25 mA typ. (12 Vout model) 25 mA typ. (15 Vout model) 25 mA typ. (24 Vout model) 25 mA typ. (28 Vout model) 35 mA typ. (48 Vout model) 48 Vin models: 15 mA typ. (3.3 Vout model) 15 mA typ. (5 Vout model) 20 mA typ. (12 Vout model) 20 mA typ. (15 Vout model) 20 mA typ. (24 Vout model) 20 mA typ. (28 Vout model) 25 mA typ. (48 Vout model)
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/tep160wircm 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)

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.
		24 Vout models: 2'500 µF max.
		28 Vout models: 1'700 µF max.
	- 48 Vin input	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.	
- 110 Vin input	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: www.tracopower.com/info/holdup_en50155.pdf)
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

Safety 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	www.tracopower.com/overview/tep160wircm
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 B (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
		EN 55011 class B (with external filter)
		EN 55032 class B (with external filter)
		External filter proposal: www.tracopower.com/overview/tep160wircm

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

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
	Ext. input component:	24 & 48 Vin models: 2x KY 220 μ F 110 Vin models: 2x KXJ 150 μ F
- Conducted RF Disturbances	Continuous:	EN 61000-4-6, 10 Vrms, perf. criteria A
- PF Magnetic Field	1 s:	EN 61000-4-8, 100 A/m, perf. criteria A 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	-40°C to +105°C
Power Derating	- High Temperature	Depending on model
		See application note: www.tracopower.com/overview/tep160wircm
Over Temperature Protection Switch Off	- Protection Mode	120°C typ. (Automatic recovery at 105°C typ.)
	- Measurement Point	Base-Plate
Cooling System		Natural convection (20 LFM)
Sense Function		10% max. of Vout 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 (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)
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	- Input to Output, 60 s	3'000 VAC
	- Input to Case, 60 s	1'500 VAC
	- Output to Case, 60 s	1'500 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω 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	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	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)

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

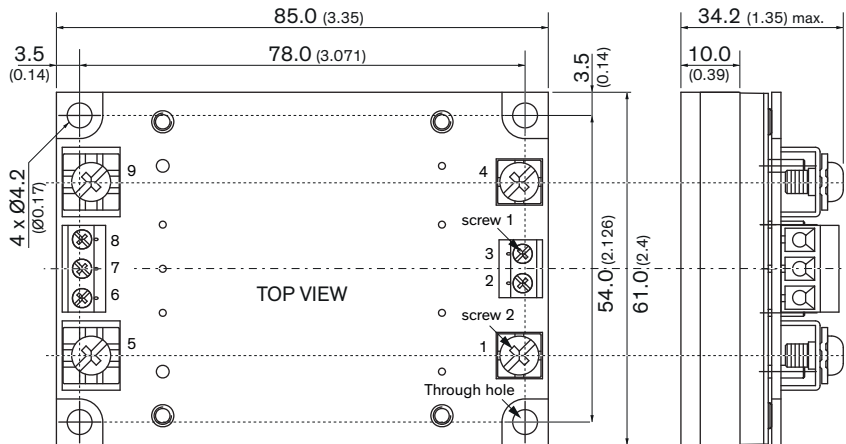
Base Material	Non-conductive FR4 (UL 94 V-0 rated) (24 and 48 Vin models only)
Potting Material	Silicone (UL 94 V-0 rated)
Housing Type	Metal Case (24 and 48 Vin models) Plastic Case (110 Vin models)
Mounting Type	Chassis Mount
Connection Type	Screw Terminal
Weight	235 g
Thermal Impedance - Case to Ambient	6.1 K/W typ.
Environmental Compliance - REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
- RoHS Declaration	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))
- SCIP Reference Number	c550d5a2-b5a2-4f2f-b9ea-01f7202e60dd
- Flammability (EN 45545-2)	www.tracopower.com/info/en45545-declaration.pdf

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tep160wircm

Outline Dimensions



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

NC: Not connected

Dimensions in mm (inch)
Tolerances $x.x \pm 0.5$ ($x.xx \pm 0.02$)
 $x.xx \pm 0.25$ ($x.xxx \pm 0.01$)
Mounting hole pitch tolerances ± 0.25 (± 0.01)

Screw 2:
Type M5
Head diameter 8.9 (0.350)
Rated current: 65 A

The screw 1 locked torque: max. 5.2 kgfcm / 0.51 Nm
The screw 2 locked torque: max. 16.8 kgfcm / 1.65 Nm

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