

- **Ultra-wide 12:1 input voltage range: 9–75, 14–160 VDC**
- **EN 50155 and EN 61373 certified**
- **Encapsulated quarter-brick (2.3"x1.45"x0.5") package**
- **Extended holdup time with lowest capacitor volume**
- **EN 45545-2 fire behavior**
- **-40°C to +85°C operating temperature**
- **Up to 3'000 VAC I/O-isolation**
- **Remote on/off and trim function**
- **Adjustable undervoltage lockout (UVLO), short-circuit protection (SCP), overvoltage protection (OVP) and overtemperature protection (OTP)**
- **3-year product warranty**



The TEP 100UIR is a series of high-performance 100 Watt DC/DC converters with an ultra-wide 12:1 input voltage range. The TEP 100UIR comes in a compact, fully encapsulated quarter-brick (2.3"x1.45"x0.5") package for highest reliability. The ultra-wide input voltage range lets system builders reduce the number of design channels where otherwise multiple input voltage configurations would be required. Thanks to its dedicated holdup circuit, the TEP 100UIR complies with extended holdup-time requirements without the need for bulky capacitors. The TEP 100UIR is EN 50155 certified for rolling stock applications, EN 61373 certified for mechanical shock and vibration and EN 45545-2 certified for fire behavior. It comes with IEC/EN/UL 62368-1 safety approvals.

Models				
Order Code	Input Voltage Range	Output Voltage nom. (adjustable)	Output Current max.	Efficiency typ.
TEP 100-3611UIR	9 - 75 VDC (36 VDC nom.)	5 VDC (4.0 - 5.5 VDC)	20'000 mA	88 %
TEP 100-3612UIR		12 VDC (9.6 - 13.2 VDC)	8'350 mA	88 %
TEP 100-3613UIR		15 VDC (12.0 - 16.5 VDC)	6'700 mA	89 %
TEP 100-3615UIR		24 VDC (19.2 - 26.4 VDC)	4'200 mA	88 %
TEP 100-3618UIR		48 VDC (38.4 - 52.8 VDC)	2'100 mA	90 %
TEP 100-7211UIR	14 - 160 VDC (72 VDC nom.)	5 VDC (4.0 - 5.5 VDC)	20'000 mA	88 %
TEP 100-7212UIR		12 VDC (9.6 - 13.2 VDC)	8'350 mA	88 %
TEP 100-7213UIR		15 VDC (12.0 - 16.5 VDC)	6'700 mA	88 %
TEP 100-7215UIR		24 VDC (19.2 - 26.4 VDC)	4'200 mA	88 %
TEP 100-7218UIR		48 VDC (38.4 - 52.8 VDC)	2'100 mA	89 %

Options	
<b>TEP-HS2</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/overview/tep-hs2">www.tracopower.com/overview/tep-hs2</a>
<b>TEP-HS4</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/overview/tep-hs4">www.tracopower.com/overview/tep-hs4</a>
<b>on demand</b> (backorder with MOQ non stocking item)	<ul style="list-style-type: none"> <li>- Optional Heat Sink with large profile: <a href="http://www.tracopower.com/overview/tep-hs3">www.tracopower.com/overview/tep-hs3</a></li> <li>- Optional Heat Sink with large profile: <a href="http://www.tracopower.com/overview/tep-hs5">www.tracopower.com/overview/tep-hs5</a></li> <li>- Optional model with 28 VDC and 3'600 mA Output, and 9 - 75 VDC Input</li> <li>- Optional model with 53 VDC and 1'920 mA Output, and 9 - 75 VDC Input</li> <li>- Optional model with 28 VDC and 3'600 mA Output, and 14 - 160 VDC Input</li> <li>- Optional model with 53 VDC and 1'920 mA Output, and 14 - 160 VDC Input</li> <li>- Optional models with inverse Remote On/Off function (passive = off)</li> </ul>

Input Specifications	
Input Current	- At no load
Surge Voltage	36 Vin models: 20 mA typ. (5 Vout model) 30 mA typ. (12 Vout model) 30 mA typ. (15 Vout model) 20 mA typ. (24 Vout model) 20 mA typ. (28 Vout model) 20 mA typ. (48 Vout model) 20 mA typ. (53 Vout model) 72 Vin models: 15 mA typ. (5 Vout model) 20 mA typ. (12 Vout model) 20 mA typ. (15 Vout model) 15 mA typ. (24 Vout model) 15 mA typ. (28 Vout model) 15 mA typ. (48 Vout model) 15 mA typ. (53 Vout model)
Start-up Voltage	36 Vin models: 100 VDC max. (1 s max.) 72 Vin models: 185 VDC max. (1 s max.)
Under Voltage Lockout	36 Vin models: 8.1 VDC min. / 8.5 VDC typ. / 9 VDC max. 72 Vin models: 12 VDC min. / 13.2 VDC typ. / 14 VDC max. (These are the Start-up Voltage values without an external resistor between the UVLO and -Vin pin. With an external resistor between these pins, the Start-up Voltage can be widely adjusted, see application note: <a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a> )
Recommended Input Fuse	36 Vin models: 7.3 VDC min. / 7.7 VDC typ. / 8.1 VDC max. 72 Vin models: 10 VDC min. / 11 VDC typ. / 12 VDC max. (These are the Shutdown Voltage values without an external resistor between the UVLO and -Vin pin. With an external resistor between these pins, the Shutdown Voltage can be widely adjusted, see application note: <a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a> )
Input Filter	36 Vin models: 20'000 mA (fast acting) 72 Vin models: 13'000 mA (fast acting) (The need of an external fuse has to be assessed in the final application.) <b>Internal Pi-Type</b> (By the use of following input capacitor, the input ripple can be further reduced: 36 Vin models: 220 µF / 100 V KY 72 Vin models: 150 µF / 200 V KXJ)

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

## Output Specifications

Output Voltage Adjustment		-20% to +10% (By external trim resistor)
	See application note:	<a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a> 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)		5 Vout models: 75 mVp-p typ. (w/ 10 µF    47 µF) 12 Vout models: 100 mVp-p typ. (w/ 22 µF) 15 Vout models: 100 mVp-p typ. (w/ 22 µF) 24 Vout models: 200 mVp-p typ. (w/ 4.7 µF) 28 Vout models: 200 mVp-p typ. (w/ 4.7 µF) 48 Vout models: 300 mVp-p typ. (w/ 2.2 µF) 53 Vout models: 300 mVp-p typ. (w/ 2.2 µF)
Capacitive Load		5 Vout models: 40'000 µF max. 12 Vout models: 7'000 µF max. 15 Vout models: 4'500 µF max. 24 Vout models: 1'800 µF max. 28 Vout models: 1'300 µF max. 48 Vout models: 430 µF max. 53 Vout models: 370 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 BUS connection: <a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a> )
Start-up Time		75 ms typ. / 100 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		110 - 130% of Iout max.
Overvoltage Protection		120 - 135% of Vout nom.
Transient Response	- Response Deviation - Response Time	25% typ. (25% Load Step) 250 µs typ. (25% Load Step)

## Safety Specifications

Standards	- IT / Multimedia Equipment  - Railway Applications - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 EN 50155 <a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

## EMC Specifications

EMI (Emissions)	- Conducted Emissions  - Radiated Emissions	EN 50121-3-2 (EMC for Rolling Stock) EN 55032 class A (with external filter) EN 55032 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a>

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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) EN 55024 (IT Equipment) EN 55035 (Multimedia) 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, $\pm 1$ kV, perf. criteria A Ext. input component: 36 Vin models: 2x KY 220 $\mu$ F / 100 V 72 Vin models: 2x KXJ 150 $\mu$ F / 200 V 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/tep100uir">www.tracopower.com/overview/tep100uir</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 +85°C +105°C max. -55°C to +125°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/tep100uir">www.tracopower.com/overview/tep100uir</a>
Over Temperature Protection Switch Off	<ul style="list-style-type: none"> <li>- Protection Mode</li> <li>- Measurement Point</li> </ul>	110°C typ. (Automatic recovery at 95°C typ.) Base-Plate
Cooling System		Forced air cooling (with external fan, 400 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		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		160 - 200 kHz (PWM) 180 kHz typ. (PWM)
Insulation System		Reinforced Insulation (72 Vin models) Basic Insulation (36 Vin models)
Working Voltage (rated)		220 VAC
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 (72 Vin models) 2'250 VDC (36 Vin models) 1'500 VAC (72 Vin models) 1'600 VDC (36 Vin models) 1'500 VAC (72 Vin models) 1'600 VDC (36 Vin models)
Creepage	- Input to Output	3.2 mm min.
Clearance	- Input to Output	3 mm min.
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'000 pF max.
Distance Through Isolation		0.4 mm
Reliability	- Calculated MTBF	420'800 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>

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

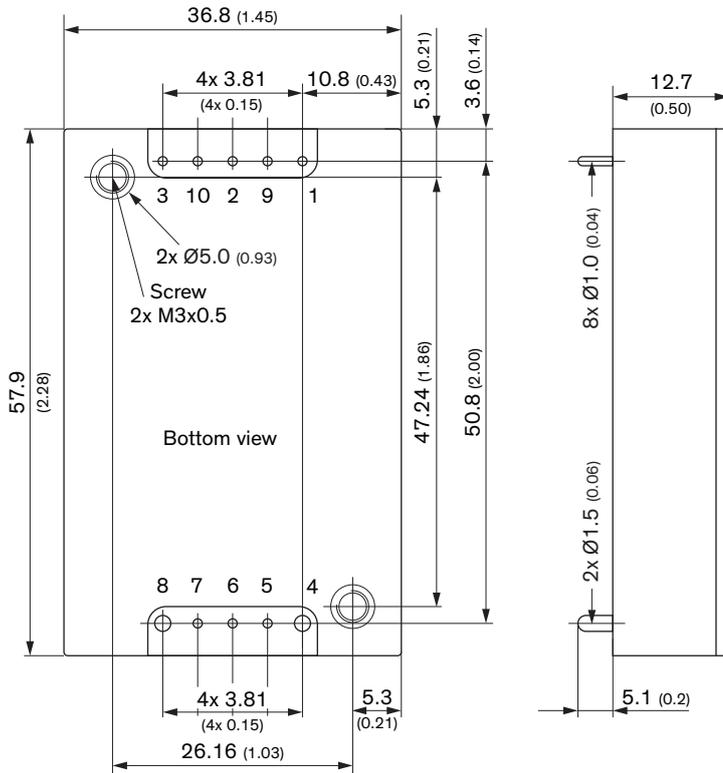
Environment	- Vibration	MIL-STD-810F EN 61373 7.6 g, 3 axis, 60 min, 20-2000 Hz
	- Mechanical Shock	MIL-STD-810F EN 61373 50 g, 3 axis, 11 ms
	- Thermal Shock	MIL-STD-810F -55°C to +125°C, 72 cycles, 30 min each
	- Flammability	EN 45545-2 <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>
Housing Material		Alu base-plate w. plastic case
Isolation Frame Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Copper (1 - 1.5 µm)
Pin Surface Plating		Nickel (4 - 6 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		Quarter-Brick
Soldering Profile		Lead-Free Wave Soldering 260°C / 6 s max.
Weight		64 g
Thermal Impedance	- Case to Ambient	8.3 K/W typ. (without heatsink)
		7.4 K/W typ. (with heatsink TEP-HS2)
		7.4 K/W typ. (with heatsink TEP-HS4)
		6.2 K/W typ. (with heatsink TEP-HS3)
		6.2 K/W typ. (with heatsink TEP-HS5)
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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
	- SCIP Reference Number	4c43d2ec-eeb1-4604-8504-a554f06eead4

### Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/tep100uir">www.tracopower.com/overview/tep100uir</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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**Outline Dimensions**



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

Dimensions in mm (inch)  
 Tolerances: x.x ±0.5 (±0.02)  
 x.xx ±0.25 (±0.01)  
 Pin diameter tolerances: ±0.1 (±0.004)  
 Screw lock torque: Max. 0.34 N·m (3.5 kgf·cm)

