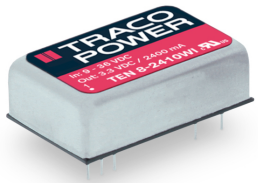
# TRACO POWER

## DC/DC Railway Converter

## TEN 8WI Series, 8 Watt

- **Ultra wide 4:1 input range up to 160 VDC**
- **Certified for Railway applications (EN 50155)**
- **Operating temperature range -40°C to + 85°C**
- **Input under voltage lockout**
- **I/O isolation 1500 VDC**
- **Input filter to meet EN 55022 class A**
- **Remote On/Off**
- **3-year product warranty**




UL 62368-1 IEC 62368-1

The TEN 8WI series is a family of high performance 8 Watt dc/dc converter modules featuring ultra wide 4:1 input voltage ranges in a DIP-24 package with industry- standard footprint. Input voltages up to 160 VDC, excellent EMC characteristics and EN 50155 approval make this product the best choice for many demanding applications in railroad and transportation systems. Further standard features include remote On/Off, over voltage protection, under voltage lockout and short circuit protection. Typical applications for these converters are also in wireless networks, telecom/datacom, industry control systems and measurement equipment.

## Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency |
|---|---|---|---|---|---|---|
| | | Vnom | Imax | Vnom | Imax | typ. |
| **TEN 8-2410WI** | 9 - 36 VDC (24 VDC nom.) | 3.3 VDC | 2'400 mA | | | 85 % |
| **TEN 8-2411WI** | | 5 VDC | 1'600 mA | | | 87 % |
| **TEN 8-2412WI** | | 12 VDC | 666 mA | | | 86 % |
| **TEN 8-2413WI** | | 15 VDC | 533 mA | | | 86 % |
| **TEN 8-2421WI** | | +5 VDC | 800 mA | –5 VDC | 800 mA | 84 % |
| **TEN 8-2422WI** | | +12 VDC | 333 mA | –12 VDC | 333 mA | 86 % |
| **TEN 8-2423WI** | | +15 VDC | 267 mA | –15 VDC | 267 mA | 86 % |
| **TEN 8-4810WI** | 18 - 75 VDC (48 VDC nom.) | 3.3 VDC | 2'400 mA | | | 85 % |
| **TEN 8-4811WI** | | 5 VDC | 1'600 mA | | | 87 % |
| **TEN 8-4812WI** | | 12 VDC | 666 mA | | | 87 % |
| **TEN 8-4813WI** | | 15 VDC | 533 mA | | | 88 % |
| **TEN 8-4821WI** | | +5 VDC | 800 mA | –5 VDC | 800 mA | 84 % |
| **TEN 8-4822WI** | | +12 VDC | 333 mA | –12 VDC | 333 mA | 87 % |
| **TEN 8-4823WI** | | +15 VDC | 267 mA | –15 VDC | 267 mA | 87 % |
| **TEN 8-7210WI** | 43 - 160 VDC (110 VDC nom.) | 3.3 VDC | 2'400 mA | | | 84 % |
| **TEN 8-7211WI** | | 5 VDC | 1'600 mA | | | 85 % |
| **TEN 8-7212WI** | | 12 VDC | 666 mA | | | 86 % |
| **TEN 8-7213WI** | | 15 VDC | 533 mA | | | 86 % |
| **TEN 8-7221WI** | | +5 VDC | 800 mA | –5 VDC | 800 mA | 82 % |
| **TEN 8-7222WI** | | +12 VDC | 333 mA | –12 VDC | 333 mA | 85 % |
| **TEN 8-7223WI** | | +15 VDC | 267 mA | –15 VDC | 267 mA | 85 % |

## Input Specifications

| | | | |
|---|---|---|---|
| Input Current | - At no load | 24 Vin models: | 30 mA typ. |
| | | 48 Vin models: | 15 mA typ. |
| | | 110 Vin models: | 6 mA typ. |
| | - At full load | 24 Vin models: | 390 mA typ. / 1'400 mA max. |
| | | 48 Vin models: | 190 mA typ. / 700 mA max. |
| | | 110 Vin models: | 90 mA typ. / 300 mA max. |
| Surge Voltage | | 24 Vin models: | 50 VDC max. (100 ms max.) |
| | | 48 Vin models: | 100 VDC max. (100 ms max.) |
| | | 110 Vin models: | 170 VDC max. (100 ms max.) |
| Under Voltage Lockout | | 24 Vin models: | 7 VDC min. / 8 VDC typ. / 8.8 VDC max. |
| | | 48 Vin models: | 15 VDC min. / 16 VDC typ. / 17.5 VDC max. |
| | | 110 Vin models: | 37 VDC min. / 40 VDC typ. / 42 VDC max. |
| Reflected Ripple Current | | 24 Vin models: | 22 mA typ. |
| | | 48 Vin models: | 13 mA typ. |
| | | 110 Vin models: | 19 mA typ. |
| Recommended Input Fuse | | 24 Vin models: | 2'000 mA (slow blow) |
| | | 48 Vin models: | 1'000 mA (slow blow) |
| | | 110 Vin models: | 500 mA (slow blow) |
| | | | (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | | Internal Pi-Type |

## Output Specifications

| | | | |
|---|---|---|---|
| Voltage Set Accuracy | | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) | single output models: | 0.2% max. |
| | | dual output models: | 0.2% max. |
| | - Load Variation (10 - 90%) | single output models: | 0.3% max. |
| | | dual output models: | 0.8% max. (Output 1) |
| | | | 0.8% max. (Output 2) |
| | - Cross Regulation (25% / 100% asym. load) | dual output models: | 5% max. |
| Ripple and Noise (20 MHz Bandwidth) | | 24 Vin models: | 50 mVp-p typ. |
| | | 48 Vin models: | 50 mVp-p typ. |
| | | 110 Vin models: | 75 mVp-p typ. |
| Capacitive Load | - single output | 3.3 Vout models: | 1'330 µF max. |
| | | 5 Vout models: | 1'330 µF max. |
| | | 12 Vout models: | 288 µF max. |
| | | 15 Vout models: | 200 µF max. |
| | - dual output | 5 / -5 Vout models: | 900 / 900 µF max. |
| | | 12 / -12 Vout models: | 133 / 133 µF max. |
| | | 15 / -15 Vout models: | 90 / 90 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 | | | 450 ms typ. (Power On) |
| | | | 5 ms typ. (Remote On) |
| Short Circuit Protection | | | Continuous, Automatic recovery |
| Output Current Limitation | | | 150% typ. of Iout max. |

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

| | | |
|---|---|---|
| Overvoltage Protection | | 118 - 125% of Vout nom.<br>(depending on model)<br>3.9 VDC typ. (3.3 VDC single model)<br>6.2 VDC typ. (5 VDC single model)<br>15 VDC typ. (12 VDC single model)<br>18 VDC typ. (15 VDC single model) |
| Transient Response | - Response Time | 250 µs typ. (25% Load Step) |

## Safety Specifications

| | | |
|---|---|---|
| Standards | - IT / Multimedia Equipment | EN 62368-1<br>IEC 62368-1<br>UL 62368-1 |
| | - Railway Applications | EN 50155 |
| | - Certification Documents | www.tracopower.com/overview/ten8wi |
| Pollution Degree | | PD 2 |

## EMC Specifications

| | | | |
|---|---|---|---|
| EMI Emissions | | | EN 50121-3-2 (EMC for Rolling Stock) |
| | - Conducted Emissions | | EN 55011 class A (with external filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
| | - Radiated Emissions | | EN 55011 class A (with external filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
| | | External filter proposal: | www.tracopower.com/overview/ten8wi |
| EMS Immunity | | | 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: KY 220 µF, 100 V<br>110 Vin models: KX J 150 µF, 200 V |
| | - 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 +85°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | –55°C to +125°C |
| Power Derating | - High Temperature | Depending on model |
| | See application note: | www.tracopower.com/overview/ten8wi |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote (passive = on) | On: 3.0 to 12 VDC or open circuit<br>Off: 0 to 1.2 VDC or short circuit<br>Refers to 'Remote' and '-Vin' Pin |
| | - Off Idle Input Current | 2.5 mA typ. |
| | - Remote Pin Input Current | -0.5 to 0.5 mA |
| Altitude During Operation | | 4'000 m max. |
| Switching Frequency | | 270 - 330 kHz (PWM)<br>300 kHz typ. (PWM) |
| Insulation System | | Functional Insulation |

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

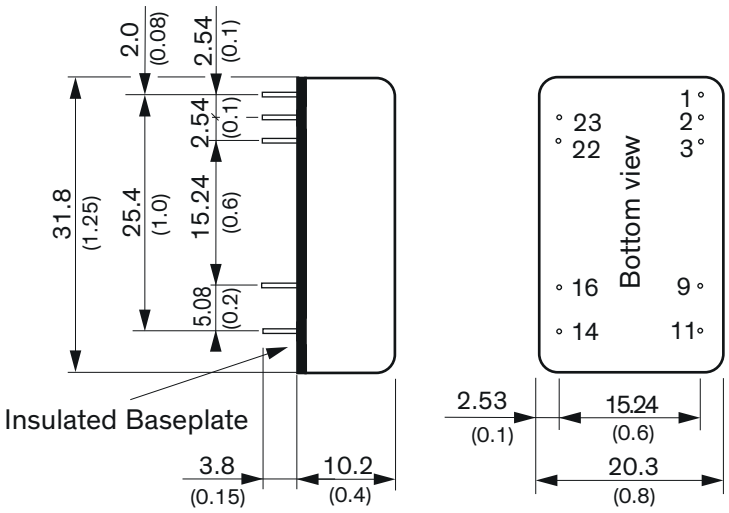
| | | |
|---|---|---|
| Isolation Test Voltage | - Input to Output, 60 s | 1'600 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 MΩ min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 1'500 pF max. |
| Reliability | - Calculated MTBF | 2'800'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline<br>www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration | MIL-STD-810F<br>EN 61373 |
| | - Mechanical Shock | MIL-STD-810F<br>EN 61373 |
| | - Thermal Shock | MIL-STD-810F |
| | - Flammability | EN 45545-2<br>www.tracopower.com/info/en45545-declaration.pdf |
| Housing Material | | Copper, Nickel plated |
| Base Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | Epoxy (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (2 - 3 µm) |
| Pin Surface Plating | | Tin (3 - 5 µm), matte |
| Housing Type | | Metal Case |
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | DIP24 |
| Soldering Profile | | Lead-Free Wave Soldering<br>265°C / 10 s max. |
| Weight | | 18 g |
| Thermal Impedance | - Case to Ambient | 20 K/W typ. |
| Environmental Compliance | - REACH Declaration | www.tracopower.com/info/reach-declaration.pdf<br>REACH SVHC list compliant<br>REACH Annex XVII compliant |
| | - RoHS Declaration | www.tracopower.com/info/rohs-declaration.pdf<br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
| | - SCIP Reference Number | 573c65ce-31ac-421a-90aa-64b9b97fa7de |

## Supporting Documents

| | |
|---|---|
| Overview Link (for additional Documents) | www.tracopower.com/overview/ten8wi |

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

## Outline Dimensions




| Pinout | | |
|---|---|---|
| **Pin** | **Single** | **Dual** |
| **1** | Remote On/Off | |
| **2** | –Vin | |
| **3** | –Vin | |
| **9** | NC | Common |
| **11** | NC | –Vout |
| **14** | +Vout | |
| **16** | –Vout | Common |
| **22** | +Vin | |
| **23** | +Vin | |

NC: Not connected

Dimensions in mm (inch)
Pin diameter Ø 0.5 ±0.05 (0.02 ±0.002)
Tolerances ±0.5 (±0.02)
Pin pich tolerances ±0.25 (±0.001)

© Copyright 2024 Traco Electronic AG