

- Fully encapsulated 2"x1" package
- 3000 VAC I/O isolation (reinforced)
- 4:1 input voltage range: 36 – 160 VDC
- EN 50155 and EN 61373 certified
- Internal class A EMI filter
- -40°C up to +70°C operating temperature
- EN 45545-2 fire behavior
- Remote on/off function
- Undervoltage lockout (UVLO), short-circuit protection (SCP), overtemperature protection (OTP), and overvoltage protection (OVP)
- 3-year product warranty



The TEN 40WIRH is a series of 40 watt railway-certified DC/DC converters with reinforced I/O isolation for highest reliability in harsh environments. The proven and certified design guarantees highest resistance against thermal shocks, moisture, mechanical shocks, and vibration. The TEN 40WIRH comes with additional EN 62368-1 safety approvals for IT equipment and EN 45545-2 certification for fire behavior. Thanks to its favorable operating temperature range of -40°C up to +70°C (depending on the model), the TEN 40WIRH presents a first choice for demanding applications.

| Models | | | | | | |
|------------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TEN 40-11011WIRH | 36 - 160 VDC (110 VDC nom.) | 5.1 VDC | 8'000 mA | | | 88 % |
| TEN 40-11012WIRH | | 12 VDC | 3'330 mA | | | 89 % |
| TEN 40-11013WIRH | | 15 VDC | 2'666 mA | | | 90 % |
| TEN 40-11015WIRH | | 24 VDC | 1'666 mA | | | 89 % |
| TEN 40-11022WIRH | | +12 VDC | 1.666 mA | -12 VDC | 1.666 mA | 88 % |
| TEN 40-11023WIRH | | +15 VDC | 1.333 mA | -15 VDC | 1.333 mA | 89 % |

| Options | |
|---|--|
| on demand (backorder with MOQ non stocking item) | - Optional models with inverse remote on/off function (passiv = off) |

Input Specifications

| | | |
|------------------------|--------------|---|
| Input Current | - At no load | 10 mA typ. |
| Surge Voltage | | 200 VDC max. (1 s max.) |
| Input Inrush Current | | 55 A typ. |
| Under Voltage Lockout | | 32 VDC min. / 34 VDC typ. / 35.8 VDC max. |
| Recommended Input Fuse | | 3'150 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Pi-Type |

Output Specifications

| | | |
|--|--|--|
| Output Voltage Adjustment | | ±10% (5.1, 12 Vout single models) -10% to +20% (15, 24 Vout single models) (By external trim resistor) See application note: www.tracopower.com/overview/ten40wirh Output power must not exceed rated power! |
| Voltage Set Accuracy | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Voltage Balance (symmetrical load) - Cross Regulation (25% / 100% asym. load) | single output models: 0.2% max. dual output models: 0.5% max. single output models: 0.5% max. dual output models: 1% max. (Output 1) 1% max. (Output 2) dual output models: 2% max. dual output models: 5% max. |
| Ripple and Noise (20 MHz Bandwidth) | - single output - dual output | 5.1 Vout models: 75 mVp-p typ. (w/ 1 µF, 50 V, X7R) 12 Vout models: 100 mVp-p typ. (w/ 1 µF, 50 V, X7R) 15 Vout models: 100 mVp-p typ. (w/ 1 µF, 50 V, X7R) 24 Vout models: 150 mVp-p typ. (w/ 1 µF, 50 V, X7R) 12 / -12 Vout models: 100 / 100 mVp-p typ. (w/ 1 µF, 50 V, X7R) 15 / -15 Vout models: 100 / 100 mVp-p typ. (w/ 1 µF, 50 V, X7R) |
| Capacitive Load | - single output - dual output | 5.1 Vout models: 9'600 µF max. 12 Vout models: 1'667 µF max. 15 Vout models: 1'066 µF max. 24 Vout models: 417 µF max. 12 / -12 Vout models: 833 / 833 µF max. 15 / -15 Vout models: 533 / 533 µF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 30 ms typ. / 60 ms max. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Output Current Limitation | | 150% typ. of Iout max. |
| Overvoltage Protection | | 126% typ. of Vout nom. (depending on model) 6.2 VDC typ. (5.1 Vout model) 15 VDC typ. (12 Vout model) 20 VDC typ. (15 Vout model) 30 VDC typ. (24 Vout model) (by Zener diode) |
| Transient Response | - Peak Variation - Response Time | 450 mV typ. / 650 mV max. (75% to 100% Load Step) 250 µs typ. / 300 µs max. (75% to 100% 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 | EN 62368-1 IEC 62368-1 UL 62368-1 |
| | - Railway Applications | EN 50155 |
| | - Certification Documents | www.tracopower.com/overview/ten40wirh |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | OVC II |

EMC Specifications

| | | |
|---------------|-----------------------------|---|
| EMI Emissions | - Conducted Emissions | EN 50121-3-2 (EMC for Rolling Stock) EN 55032 class A (internal filter) EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55032 class A (internal filter) EN 55032 class B (with external filter) |
| | External filter proposal: | www.tracopower.com/overview/ten40wirh |
| EMS Immunity | - Electrostatic Discharge | EN 50155 (Railway Applications) EN 50121-3-2 (EMC for Rolling Stock) EN 55024 (IT Equipment) |
| | - RF Electromagnetic Field | Air: EN 61000-4-2, ± 8 kV, perf. criteria A |
| | - EFT (Burst) / Surge | Contact: EN 61000-4-2, ± 6 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 2 kV, perf. criteria A |
| | - Conducted RF Disturbances | Ext. input component: 2x 220 μ F, 200 V, KXJ // SMDJ170A 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 +70°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | See application note: www.tracopower.com/overview/ten40wirh |
| Over Temperature Protection Switch Off | - Protection Mode | 115°C min. (Automatic recovery) |
| | - Measurement Point | Case |
| Cooling System | | Natural convection (20 LFM) |
| 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 3 mA typ. / 3.5 mA max. (Optional models with inverse logic (passiv = off) available) |
| | - Off Idle Input Current | |
| Altitude During Operation | | 5'000 m max. |
| Switching Frequency | | 250 - 310 kHz (PWM) 275 kHz typ. (PWM) |
| Insulation System | | Reinforced Insulation |
| Working Voltage (rated) | | 161 VAC |
| Isolation Test Voltage | - Input to Output, 60 s | 3'000 VAC |
| | - Input to Case, 60 s | 3'000 VAC |
| | - Output to Case, 60 s | 2'000 VAC |
| Creepage | - Input to Output | 4.5 mm min. |
| Clearance | - Input to Output | 4.5 mm min. |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 M Ω 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 | 650 pF typ. 1'000 pF max. |
| Reliability | - Calculated MTBF | 1'253'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | See Cleaning Guideline: | Allowed (hermetical product) www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration - Mechanical Shock - Thermal Shock | MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F EN 50155 |
| Housing Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Base Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | Silicone (UL 94 V-0 rated) |
| Pin Material | | Tinned Copper |
| Pin Foundation Plating | | Nickel (2 - 3 µm) |
| Pin Surface Plating | | Tin (3 - 5 µm), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | 2" x 1" |
| Soldering Profile | | Wave Soldering 260°C / 6 s max. |
| Weight | | 32 g |
| Thermal Impedance | | 11.3 K/W |
| Environmental Compliance | - REACH Declaration - RoHS Declaration - Flammability (EN 45545-2) | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant 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). The SCIP number is provided on request.) www.tracopower.com/info/en45545-declaration.pdf |

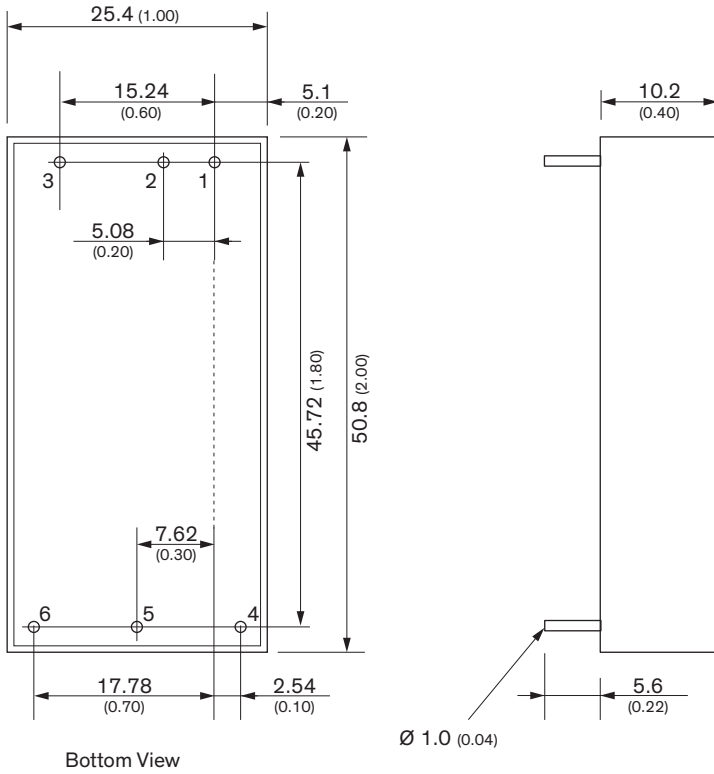
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/ten40wirh

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 | + Vin | + Vin |
| 2 | - Vin | - Vin |
| 3 | Ctrl | Ctrl |
| 4 | + Vout | + Vout |
| 5 | - Vout | Common |
| 6 | Trim | - Vout |

NC = not connected

All dimension in mm (inch)
 Tolerance: X.X ±0.5 (X.XX ±0.02)
 X.XX ±0.25 (X.XXX ±0.010)
 Pin dimension tolerance ±0.10 (±0.004)

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