# TRACO POWER

## DC/DC Railway Converter

## THN 15WIR Series, 15 Watt

- **Compact 1.0" x 1.0" x 0.4" standard package**
- **Ultra-wide 4:1 input voltage range 9–36, 18–75, 36–160 VDC**
- **EN 50155 and EN 61373 approval for railway applications**
- **Qualification for fire behaviour according to EN 45545-2**
- **3000 VDC I/O-isolation**
- **High efficiency up to 91%**
- **Operating temperature range –40°C to +90°C**
- **Under-voltage lock out circuit**
- **Adjustable output voltage & Remote On/Off**
- **3-year product warranty**




UL 62368-1 IEC 62368-1

The THN 15WIR series is a family of ruggedized 15 W DC/DC converters for highest reliability in harsh environments. The converters have an increased resistance against electromagnetic interference, shock/vibration and thermal shock. The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. The qualification for the fire behaviour of components according to EN 45545-2 and the safety approval according IEC/EN 60950-1, UL60950-1 support a potential compliance test of the application. Built-in EMI 55022 class A filter, input under-voltage-lockout, short circuit protection, remote On/Off and output voltage trim are further features which facilitate the design in.

## Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency |
|---|---|---|---|---|---|---|
| | | Vnom | Imax | Vnom | Imax | typ. |
| **THN 15-2410WIR** | 9 - 36 VDC (24 VDC nom.) | 3.3 VDC | 4'500 mA | | | 88 % |
| **THN 15-2411WIR** | | 5 VDC | 3'000 mA | | | 90 % |
| **THN 15-2412WIR** | | 12 VDC | 1'300 mA | | | 89 % |
| **THN 15-2413WIR** | | 15 VDC | 1'000 mA | | | 90 % |
| **THN 15-2415WIR** | | 24 VDC | 625 mA | | | 91 % |
| **THN 15-2421WIR** | | +5 VDC | 1'500 mA | –5 VDC | 1'500 mA | 87 % |
| **THN 15-2422WIR** | | +12 VDC | 625 mA | –12 VDC | 625 mA | 90 % |
| **THN 15-2423WIR** | | +15 VDC | 500 mA | –15 VDC | 500 mA | 90 % |
| **THN 15-2425WIR** | | +24 VDC | 315 mA | –24 VDC | 315 mA | 91 % |
| **THN 15-4810WIR** | 18 - 75 VDC (48 VDC nom.) | 3.3 VDC | 4'500 mA | | | 88 % |
| **THN 15-4811WIR** | | 5 VDC | 3'000 mA | | | 90 % |
| **THN 15-4812WIR** | | 12 VDC | 1'300 mA | | | 89 % |
| **THN 15-4813WIR** | | 15 VDC | 1'000 mA | | | 90 % |
| **THN 15-4815WIR** | | 24 VDC | 625 mA | | | 91 % |
| **THN 15-4821WIR** | | +5 VDC | 1'500 mA | –5 VDC | 1'500 mA | 87 % |
| **THN 15-4822WIR** | | +12 VDC | 625 mA | –12 VDC | 625 mA | 90 % |
| **THN 15-4823WIR** | | +15 VDC | 500 mA | –15 VDC | 500 mA | 90 % |
| **THN 15-4825WIR** | | +24 VDC | 315 mA | –24 VDC | 315 mA | 90 % |
| **THN 15-7210WIR** | 36 - 160 VDC (110 VDC nom.) | 3.3 VDC | 4'500 mA | | | 88 % |
| **THN 15-7211WIR** | | 5 VDC | 3'000 mA | | | 89 % |
| **THN 15-7212WIR** | | 12 VDC | 1'300 mA | | | 89 % |
| **THN 15-7213WIR** | | 15 VDC | 1'000 mA | | | 89 % |
| **THN 15-7215WIR** | | 24 VDC | 625 mA | | | 90 % |
| **THN 15-7221WIR** | | +5 VDC | 1'500 mA | –5 VDC | 1'500 mA | 86 % |
| **THN 15-7222WIR** | | +12 VDC | 625 mA | –12 VDC | 625 mA | 89 % |
| **THN 15-7223WIR** | | +15 VDC | 500 mA | –15 VDC | 500 mA | 89 % |
| **THN 15-7225WIR** | | +24 VDC | 315 mA | –24 VDC | 315 mA | 90 % |

## Options

| | |
|---|---|
| **THN-HS2** | - Optional Heat Sink: www.tracopower.com/overview/thn-hs2 |
| **on demand** (backorder with MOQ non stocking item) | - Optional Heat Sink: www.tracopower.com/overview/thn-hs3<br>- Optional Heat Sink: www.tracopower.com/overview/thn-hs4 |

## Input Specifications

| | | | |
|---|---|---|---|
| Input Current | - At no load | 24 Vin models: | 12 mA typ. |
| | | 48 Vin models: | 10 mA typ. |
| | | 110 Vin models: | 8 mA typ. |
| 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: | 7.5 VDC min. / 8 VDC typ. / 8.8 VDC max. |
| | | 48 Vin models: | 15.5 VDC min. / 16 VDC typ. / 17.5 VDC max. |
| | | 110 Vin models: | 32 VDC min. / 34 VDC typ. / 35.5 VDC max. |
| Reflected Ripple Current | | | 30 mAp-p typ. |
| Recommended Input Fuse | | 24 Vin models: | 3'150 mA (slow blow) |
| | | 48 Vin models: | 1'600 mA (slow blow) |
| | | 110 Vin models: | 1'000 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% to +20% (15 & 24 VDC models)<br>±10% (other models)<br>(single output models only)<br>(By external trim resistor) |
| | | See application note: | www.tracopower.com/thn15wir-adj |
| | | | Output power must not exceed rated power! |
| Voltage Set Accuracy | | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) | single output models: | 0.2% max. |
| | | dual output models: | 0.5% max. |
| | - Load Variation (0 - 100%) | single output models: | 0.2% max. |
| | | dual output models: | 1% max. (Output 1) |
| | | | 1% max. (Output 2) |
| | - Cross Regulation (25% / 100% asym. load) | dual output models: | 5% max. |
| Ripple and Noise (20 MHz Bandwidth) | - single output | 3.3 Vout models: | 75 mVp-p typ. (w/ 10 µF, 6.3 V X7R) |
| | | 5 Vout models: | 75 mVp-p typ. (w/ 10 µF, 6.3 V X7R) |
| | | 12 Vout models: | 100 mVp-p typ. (w/ 1 µF, 25 V X7R) |
| | | 15 Vout models: | 100 mVp-p typ. (w/ 1 µF, 25 V X7R) |
| | | 24 Vout models: | 125 mVp-p typ. (w/ 2.2 µF, 50 V X7R) |
| | - dual output | 5 / -5 Vout models: | 75 / 75 mVp-p typ. (w/ 10 µF, 6.3 V X7R) |
| | | 12 / -12 Vout models: | 100 / 100 mVp-p typ. (w/ 1 µF, 25 V X7R) |
| | | 15 / -15 Vout models: | 100 / 100 mVp-p typ. (w/ 1 µF, 25 V X7R) |
| | | 24 / -24 Vout models: | 125 / 125 mVp-p typ. (w/ 2.2 µF, 50 V X7R) |

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

| | | | |
|---|---|---|---|
| Capacitive Load | - single output | 3.3 Vout models: | 5'200 µF max. |
| | | 5 Vout models: | 3'600 µF max. |
| | | 12 Vout models: | 600 µF max. |
| | | 15 Vout models: | 500 µF max. |
| | | 24 Vout models: | 200 µF max. |
| | - dual output | 5 / -5 Vout models: | 1'500 / 1'500 µF max. |
| | | 12 / -12 Vout models: | 360 / 360 µF max. |
| | | 15 / -15 Vout models: | 250 / 250 µF max. |
| | | 24 / -24 Vout models: | 100 / 100 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 | | | 30 ms typ. / 40 ms max. |
| Short Circuit Protection | | | Continuous, Automatic recovery |
| Output Current Limitation | | | 145 - 212% of Iout max.<br>170% typ. of Iout max. |
| Overvoltage Protection | | | 112 - 164% of Vout nom. |
| Transient Response | - Response Time | | 250 µs typ. (25% Load Step) |

## Safety Specifications

| | | |
|---|---|---|
| Standards | - IT / Multimedia Equipment | EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1 |
| | - Railway Applications | EN 50155 |
| | - Certification Documents | www.tracopower.com/thn15wir-safety-cert |
| Energy Source | - Output, acc. to 62368-1 | ES1 |
| Power Source | - Output, acc. to 62368-1 | PS2 |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | Not mains connected |

## EMC Specifications

| | | |
|---|---|---|
| EMI (Emissions) | | EN 50121-3-2 (EMC for Rolling Stock) |
| | - Conducted Emissions | EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter) |
| | External filter proposal: | www.tracopower.com/thn15wir-emc-filter |

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

| | | | |
|---|---|---|---|
| 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 Vin models: 220 µF, 100 V \|\| TVS SMDJ58A<br>48 Vin models: 220 µF, 100 V<br>110 Vin models: 150 µF, 200 V \|\| TVS SMDJ300A |
| | - 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 |
| EMC / Environmental | - Certification Documents | | www.tracopower.com/thn15wir-emc-cert |

## General Specifications

| | | |
|---|---|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | –40°C to +90°C<br>–40°C to +94°C (with heatsink THN-HS2)<br>–40°C to +96°C (with heatsink THN-HS3)<br>–40°C to +97°C (with heatsink THN-HS4) |
| | - 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/thn15wir-cc |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote (passive = on) | On: 3.0 to 15 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 1.0 mA |
| Altitude During Operation | | 5'000 m max. |
| Regulator Topology | | Flyback Converter |
| Switching Frequency | | 245 kHz typ. (PWM) (±10%, 3.3 & 5 Vout model)<br>300 kHz typ. (PWM) (±10%, other models) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 3'000 VDC |
| | - Input to Case, 60 s | 1'600 VDC |
| | - Output to Case, 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 | 2'000 pF max. |
| Reliability | - Calculated MTBF | 1'600'000 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 |
| Base Material | | Non-conductive FR4 (UL 94 V-0 rated) |
| Potting Material | | Silicone (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 |

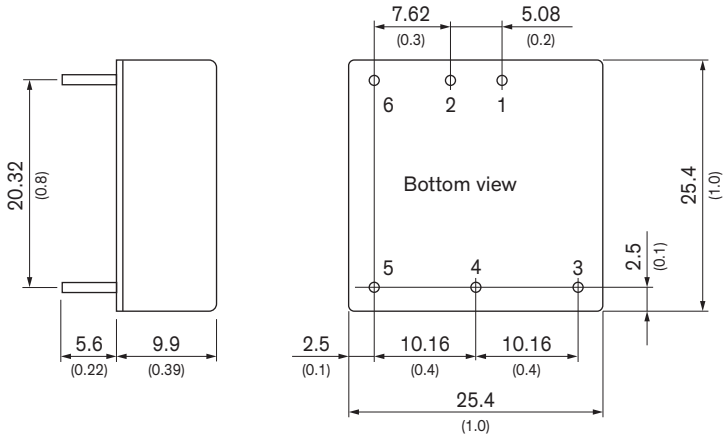
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

| | | |
|---|---|---|
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | 1" x 1" |
| Soldering Profile | | Lead-Free Wave Soldering<br>260°C / 10 s max. |
| Weight | | 16.5 g |
| Thermal Impedance | - Case to Ambient | 17.0 K/W typ.<br>12.9 K/W typ. (with heatsink THN-HS2)<br>10.9 K/W typ. (with heatsink THN-HS3)<br>9.3 K/W typ. (with heatsink THN-HS4) |
| 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: 7(a), 7(c)-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
| | - SCIP Reference Number | 2c3c7a28-9e94-434a-8f6a-2b37ff9fb2ae |

## Additional Information

| | |
|---|---|
| Supporting Documents | www.tracopower.com/overview/thn15wir |
| Frequently Asked Questions | www.tracopower.com/glossary-faq |
| Glossary | www.tracopower.com/info/glossary.pdf |

## Outline Dimensions




Dimensions in mm (inch)
Tolerances: ±0.5 (±0.02)
Pin pitch tolerances ±0.25 (±0.01)
Pin diameter Ø 1.0 (0.04)

| Pinout | | |
|---|---|---|
| **Pin** | **Single** | **Dual** |
| **1** | +Vin (Vcc) | +Vin (Vcc) |
| **2** | –Vin (GND) | –Vin (GND) |
| **3** | +Vout | +Vout |
| **4** | Trim | Common |
| **5** | –Vout | –Vout |
| **6** | Remote On/Off | Remote On/Off |

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