DC/DC Railway Converter

- High power block with excellent thermal convection
- Operating temperature -40°C to +93°C
- Ultra wide 4:1 input voltage range
- EN 50155 approval for railway applications
- Excellent efficiency up to 88%
- Input filter meet EN 55032 class B
- I/O isolation up to 1591 VAC
- Under voltage lock-out circuit
- Protection against overvoltage, overtemperature and short circuit
- Output LED indicator

The TEQ 20WIR Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges which come in a rugged metal case. These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. A very high efficiency and the heatsink construction allows an operating temperature up to +83°C with natural convection cooling without power derating and up to +93°C with power derating. Further features include under voltage lockout, over temperature protection and short circuit protection.

<table>
<thead>
<tr>
<th>Models</th>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order Code</td>
<td>Range</td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2411WIR</td>
<td>9 - 36 VDC</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2412WIR</td>
<td>(24 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2413WIR</td>
<td></td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2415WIR</td>
<td></td>
<td>24 VDC</td>
<td>833 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2422WIR</td>
<td></td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>−12 VDC</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-2423WIR</td>
<td></td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>−15 VDC</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-4811WIR</td>
<td>18 - 75 VDC</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
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<tr>
<td></td>
<td>TEQ 20-4812WIR</td>
<td>(48 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
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<tr>
<td></td>
<td>TEQ 20-4813WIR</td>
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<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-4815WIR</td>
<td></td>
<td>24 VDC</td>
<td>833 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-4822WIR</td>
<td></td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>−12 VDC</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-4823WIR</td>
<td></td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>−15 VDC</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-7211WIR</td>
<td>43 - 160 VDC</td>
<td>5 VDC</td>
<td>4'000 mA</td>
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</tr>
<tr>
<td></td>
<td>TEQ 20-7212WIR</td>
<td>(110 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-7213WIR</td>
<td></td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-7215WIR</td>
<td></td>
<td>24 VDC</td>
<td>833 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEQ 20-7222WIR</td>
<td></td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>−12 VDC</td>
</tr>
<tr>
<td></td>
<td>TEQ 20-7223WIR</td>
<td></td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>−15 VDC</td>
</tr>
</tbody>
</table>
## Input Specifications

<table>
<thead>
<tr>
<th>Input Current</th>
<th>24 Vin models: 10 mA typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>At no load</td>
<td>48 Vin models: 8 mA typ.</td>
</tr>
<tr>
<td></td>
<td>110 Vin models: 6 mA typ.</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>24 Vin models: 50 VDC max. (1 s max)</td>
</tr>
<tr>
<td></td>
<td>48 Vin models: 100 VDC max. (1 s max)</td>
</tr>
<tr>
<td></td>
<td>110 Vin models: 170 VDC max. (1 s max)</td>
</tr>
<tr>
<td>Input Inrush Current</td>
<td>15 A typ.</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>24 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max.</td>
</tr>
<tr>
<td></td>
<td>48 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max.</td>
</tr>
<tr>
<td></td>
<td>110 Vin models: 37 VDC min. / 40 VDC typ. / 42 VDC max.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>24 Vin models: 4'000 mA (Slow blow)</td>
</tr>
<tr>
<td></td>
<td>48 Vin models: 2'000 mA (Slow blow)</td>
</tr>
<tr>
<td></td>
<td>110 Vin models: 1'000 mA (Slow blow)</td>
</tr>
</tbody>
</table>

(The need of an external fuse has to be assessed in the final application.)

## Output Specifications

### Voltage Set Accuracy

- ±1% max. (Single Output)
- +1% / -1.2% (Dual Output)

### Regulation

- Input Variation (Vmin - Vmax)
  - Single output models: 0.5% max.
  - Dual output models: 0.5% max.
- Load Variation (0 - 100%)
  - Single output models: 1.5% max. (5 VDC models)
  - Dual output models: 1% max. (Output 1)
  - 1% max. (Output 2)

### Ripple and Noise

- Single output
  - 5 Vout models: 75 mVp-p max.
  - 12 Vout models: 100 mVp-p max.
  - 15 Vout models: 100 mVp-p max.
  - 24 Vout models: 150 mVp-p max.
- Dual output
  - 12 / -12 Vout models: 100 / 100 mVp-p max.
  - 15 / -15 Vout models: 100 / 100 mVp-p max.

### Capacitive Load

- Single output
  - 5 Vout models: 5'000 µF max.
  - 12 Vout models: 850 µF max.
  - 15 Vout models: 700 µF max.
  - 24 Vout models: 250 µF max.
- Dual output
  - 12 / -12 Vout models: 500 / 500 µF max.
  - 15 / -15 Vout models: 350 / 350 µF max.

### Minimum Load

- Not required

### Temperature Coefficient

- ±0.02 %/K max.

### Hold-up Time

- 10 ms min. (acc. EN50155 class S2, without external components)

### Start-up Time

- 100 ms typ.

### Short Circuit Protection

- Continuous, Automatic recovery

### Output Current Limitation

- 150% typ. of Iout max.

### Overvoltage Protection

- 125% typ. of Vout nom.

### Transient Response

- Response Time
  - 250 µs typ. (20% Load Step)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Standards - IT / Multimedia Equipment
- Industrial Control Equipment
- Railway Applications
- Certification Documents

Pollution Degree
PD 2

EMC Specifications

EMI Emissions
- Conducted Emissions
- Radiated Emissions

EMS Immunity
- 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
- EFT (Burst) / Surge
- Conducted RF Disturbances
- PF Magnetic Field

General Specifications

Relative Humidity
95% max. (non-condensing)

Temperature Ranges
- Operating Temperature
  −40°C to +93°C
- Storage Temperature
  −40°C to +105°C

Power Derating
- High Temperature
  See application note: Depending on model
  www.tracopower.com/overview/teq20wir

Cooling System
Natural convection (20 LFM)

Altitude During Operation
2'000 m max.

Switching Frequency
297 - 363 kHz (PWM)
330 kHz typ. (PWM)

Insulation System
Functional Insulation

Isolation Test Voltage
- Input to Output, 60 s
  2'250 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
  6'000 pF typ.

Reliability
- Calculated MTBF
  1'600'000 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 45545-2

Housing Material
Aluminum

Housing Type
Metal Case

Mounting Type
Chassis Mount

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Connection Type | Spring Clamps
Weight | 122 g
Status Indicator | Indicated by green LED
REACH SVHC list compliant
Exemptions: 7a, 7c-1
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (OE5A rule))
- SCIP Reference Number: 3ad2da4c-14d8-4a79-a38b-1b0447f15324

Supporting Documents
Overview Link (for additional Documents) [www.tracopower.com/overview/teq20wir](http://www.tracopower.com/overview/teq20wir)

Outline Dimensions

Terminals connection

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin</td>
<td>+Vin</td>
</tr>
<tr>
<td>2</td>
<td>-Vin (GND)</td>
<td>-Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>-Vout</td>
</tr>
<tr>
<td>5</td>
<td>-Vout</td>
<td>Common</td>
</tr>
<tr>
<td>6</td>
<td>+Vout</td>
<td>Common</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

NC: Not connected

Dimensions in mm, ( ) = inch
Tolerances: x.x ±0.5 (±0.02)
            x.xx ±0.25 (±0.01)
Screw max. torque: 5.0 kgf - cm (0.49 Nm)
Spring terminals: 12 - 18 AWG