



**THE DATASHEET OF  
TMR 3-7223WIR**



- Compact SIP-8 metal case
- EN 50155 railway approval
- Ultra wide 4:1 Input: 9–36, 18–75 and 43–160 VDC
- I/O-isolation 3'000 VDC
- Fully regulated outputs
- Operating temperature range –40°C to +90°C
- Short circuit protection and current limitation
- Remote On/Off
- 3-year product warranty



The TMR 3WIR series is a set of 3 Watt DC/DC converters in a SIP-8 metal case. They operate up to 78°C environment temperature at full load and up to 90°C with a 50% load derating. With EN 50155 and UL 60950-1 certification, 3'000 VDC I/O-isolation voltage, external On/Off, current limitation and short circuit protection they cover a wide range of application when space is limited. The input of the converters is designed for a wide voltage range (4:1) and minimum load is not required.

| Models        |                                |          |                  |          |                  |                 |
|---------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code    | Input Voltage Range            | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|               |                                | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TMR 3-2410WIR | 9 - 36 VDC<br>(24 VDC nom.)    | 3.3 VDC  | 700 mA           |          |                  | 76 %            |
| TMR 3-2411WIR |                                | 5 VDC    | 600 mA           |          |                  | 81 %            |
| TMR 3-2419WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-2412WIR |                                | 12 VDC   | 250 mA           |          |                  | 83 %            |
| TMR 3-2413WIR |                                | 15 VDC   | 200 mA           |          |                  | 83 %            |
| TMR 3-2415WIR |                                | 24 VDC   | 125 mA           |          |                  | 82 %            |
| TMR 3-2421WIR |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TMR 3-2422WIR |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 82 %            |
| TMR 3-2423WIR |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 82 %            |
| TMR 3-4810WIR | 18 - 75 VDC<br>(48 VDC nom.)   | 3.3 VDC  | 700 mA           |          |                  | 75 %            |
| TMR 3-4811WIR |                                | 5 VDC    | 600 mA           |          |                  | 81 %            |
| TMR 3-4819WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-4812WIR |                                | 12 VDC   | 250 mA           |          |                  | 82 %            |
| TMR 3-4813WIR |                                | 15 VDC   | 200 mA           |          |                  | 82 %            |
| TMR 3-4815WIR |                                | 24 VDC   | 125 mA           |          |                  | 82 %            |
| TMR 3-4821WIR |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TMR 3-4822WIR |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 82 %            |
| TMR 3-4823WIR |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 82 %            |
| TMR 3-7210WIR | 43 - 160 VDC<br>(110 VDC nom.) | 3.3 VDC  | 700 mA           |          |                  | 76 %            |
| TMR 3-7211WIR |                                | 5 VDC    | 600 mA           |          |                  | 80 %            |
| TMR 3-7219WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-7212WIR |                                | 12 VDC   | 250 mA           |          |                  | 82 %            |
| TMR 3-7213WIR |                                | 15 VDC   | 200 mA           |          |                  | 83 %            |
| TMR 3-7215WIR |                                | 24 VDC   | 125 mA           |          |                  | 83 %            |
| TMR 3-7221WIR |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TMR 3-7222WIR |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 83 %            |
| TMR 3-7223WIR |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 81 %            |

### Input Specifications

|                        |              |  |
|------------------------|--------------|--|
| Input Current          | - At no load | 24 Vin models: <b>4 mA typ.</b><br>48 Vin models: <b>4 mA typ.</b><br>110 Vin models: <b>2 mA typ.</b>   |
| Surge Voltage          |              | 24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)<br>110 Vin models: <b>185 VDC max.</b> (1 s max.)  |
| Recommended Input Fuse |              | 24 Vin models: <b>800 mA</b> (slow blow)<br>48 Vin models: <b>500 mA</b> (slow blow)<br>110 Vin models: <b>160 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.) |
| Input Filter           |              | <b>Internal Capacitor</b>  |

### Output Specifications

|                           |  |   |
|---------------------------|--|---|
| Voltage Set Accuracy      |  | <b>±1% max.</b>   |
| Regulation                | - Input Variation (Vmin - Vmax)<br>- Load Variation (0 - 100%)<br>- Cross Regulation (25% / 100% asym. load) | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b><br>single output models: <b>0.5% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)<br>dual output models: <b>5% max.</b>  |
| Ripple and Noise          | - 20 MHz Bandwidth   | <b>75 mVp-p max.</b> (w/ 1 $\mu$ F)<br><b>50 mVp-p typ.</b> (w/ 1 $\mu$ F)  |
| Capacitive Load           | - single output<br><br>- dual output   | 3.3 Vout models: <b>1'100 <math>\mu</math>F max.</b><br>5 Vout models: <b>550 <math>\mu</math>F max.</b><br>9 Vout models: <b>340 <math>\mu</math>F max.</b><br>12 Vout models: <b>240 <math>\mu</math>F max.</b><br>15 Vout models: <b>240 <math>\mu</math>F max.</b><br>24 Vout models: <b>90 <math>\mu</math>F max.</b><br>5 / -5 Vout models: <b>340 / 340 <math>\mu</math>F max.</b><br>12 / -12 Vout models: <b>170 / 170 <math>\mu</math>F max.</b><br>15 / -15 Vout models: <b>90 / 90 <math>\mu</math>F max.</b> |
| Minimum Load              |  | <b>Not required</b>   |
| Temperature Coefficient   |  | <b>±0.02 %/K max.</b>   |
| Hold-up Time              |  | <b>10 ms min.</b> (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation:<br><a href="http://www.tracopower.com/info/holdup_en50155.pdf">www.tracopower.com/info/holdup_en50155.pdf</a> )  |
| Start-up Time             |  | <b>75 ms max.</b>   |
| Short Circuit Protection  |  | <b>Continuous, Automatic recovery</b>   |
| Output Current Limitation |  | <b>180% typ. of Iout max.</b>   |
| Transient Response        | - Response Time  | <b>250 <math>\mu</math>s typ.</b> (25% Load Step)   |

### Safety Specifications

|                  |  |   |
|------------------|--|---|
| Standards        | - IT / Multimedia Equipment<br><br>- Railway Applications<br>- Certification Documents | <b>EN 62368-1</b><br><b>IEC 62368-1</b><br><b>UL 62368-1</b><br><b>EN 50155</b><br><a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a> |
| Pollution Degree |  | <b>PD 2</b>   |

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

## EMC Specifications

|                             |                           |  |
|-----------------------------|---------------------------|--|
| <b>EMI Emissions</b>        |                           | 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: | <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>   |
| <b>EMS Immunity</b>         |                           | 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<br>EN 61000-4-3, 20 V/m, perf. criteria A<br>EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±2 kV, perf. criteria A        |
| - RF Electromagnetic Field  | Ext. input component:     | 24 Vin models: KY 220 µF    TVS SMDJ70A<br>48 Vin models: KY 220 µF    TVS SMDJ120A<br>110 Vin models: KY 150 µF    TVS SMDJ250A   |
| - EFT (Burst) / Surge       |                           | EN 61000-4-6, 10 Vrms, perf. criteria A  |
|                             | Continuous:               | EN 61000-4-8, 100 A/m, perf. criteria A  |
| - Conducted RF Disturbances | 1 s:                      | EN 61000-4-8, 1000 A/m, perf. criteria A   |
| - PF Magnetic Field         |                           |  |

## General Specifications



|                                  |  |  |
|----------------------------------|--|--|
| <b>Relative Humidity</b>         |  | 95% max. (non condensing)  |
| <b>Temperature Ranges</b>        | - Operating Temperature                    | -40°C to +90°C   |
|                                  | - Case Temperature                         | +100°C max.  |
|                                  | - Storage Temperature                      | -55°C to +125°C  |
| <b>Power Derating</b>            | - High Temperature                         | 4.55 %/K above 78°C  |
|                                  | See application note:                      | <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>                                       |
| <b>Cooling System</b>            |  | Natural convection (20 LFM)  |
| <b>Remote Control</b>            | - Voltage Controlled Remote (passive = on) | On: 0 to 0.5 VDC or open circuit<br>Off: 3 to 12 VDC<br>Refers to 'Remote' and '-Vin' Pin  |
|                                  | - Off Idle Input Current                   | 2.5 mA typ.  |
|                                  | - Remote Pin Input Current                 | 0.5 to 3.5 mA  |
| <b>Altitude During Operation</b> |  | 5'000 m max.   |
| <b>Switching Frequency</b>       |  | 270 - 330 kHz (PWM) (110 Vin model)<br>360 - 440 kHz (PWM) (other input models)  |
| <b>Insulation System</b>         |  | Functional Insulation  |
| <b>Isolation Test Voltage</b>    | - Input to Output, 60 s                    | 3'000 VDC  |
|                                  | - Input to Case, 60 s                      | 1'500 VDC  |
|                                  | - Output to Case, 60 s                     | 1'500 VDC  |
| <b>Isolation Resistance</b>      | - Input to Output, 500 VDC                 | 1'000 MΩ min.  |
| <b>Isolation Capacitance</b>     | - Input to Output, 100 kHz, 1 V            | 100 pF max.  |
| <b>Reliability</b>               | - Calculated MTBF                          | 5'535'000 h (MIL-HDBK-217F, ground benign)   |
| <b>Washing Process</b>           |  | According to Cleaning Guideline<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>  |
| <b>Environment</b>               | - 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><a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a> |
| <b>Housing Material</b>          |  | Copper   |

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



## Looking for pricing, stock, or lifecycle information?

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