



**THE DATASHEET OF
TMR 3-7213WIR**



- 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 _{max}	Vnom	I _{max}	
TMR 3-2410WIR	9 - 36 VDC (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 (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 (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: 4 mA typ. 48 Vin models: 4 mA typ. 110 Vin models: 2 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.)
Recommended Input Fuse		24 Vin models: 800 mA (slow blow) 48 Vin models: 500 mA (slow blow) 110 Vin models: 160 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

Output Specifications

Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	single output models: 0.2% max. dual output models: 0.2% max. single output models: 0.5% max. dual output models: 1% max. (Output 1) 1% max. (Output 2) dual output models: 5% max.
Ripple and Noise	- 20 MHz Bandwidth	75 mVp-p max. (w/ 1 μ F) 50 mVp-p typ. (w/ 1 μ F)
Capacitive Load	- single output - dual output	3.3 Vout models: 1'100 μF max. 5 Vout models: 550 μF max. 9 Vout models: 340 μF max. 12 Vout models: 240 μF max. 15 Vout models: 240 μF max. 24 Vout models: 90 μF max. 5 / -5 Vout models: 340 / 340 μF max. 12 / -12 Vout models: 170 / 170 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		75 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		180% typ. of Iout max.
Transient Response	- Response Time	250 μs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment - Railway Applications - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 EN 50155 www.tracopower.com/overview/tmr3wir
Pollution Degree		PD 2

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

EMC Specifications

EMI Emissions		EN 50121-3-2 (EMC for Rolling Stock)
- Conducted Emissions		EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
- Radiated Emissions		EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal: www.tracopower.com/overview/tmr3wir
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 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
- RF Electromagnetic Field		
- EFT (Burst) / Surge		
	Ext. input component:	24 Vin models: KY 220 µF TVS SMDJ70A 48 Vin models: KY 220 µF TVS SMDJ120A 110 Vin models: KY 150 µF TVS SMDJ250A EN 61000-4-6, 10 Vrms, perf. criteria A
- Conducted RF Disturbances	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
- PF Magnetic Field	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 +90°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	4.55 %/K above 78°C
		See application note: www.tracopower.com/overview/tmr3wir
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 0 to 0.5 VDC or open circuit Off: 3 to 12 VDC Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	2.5 mA typ.
	- Remote Pin Input Current	0.5 to 3.5 mA
Altitude During Operation		5'000 m max.
Switching Frequency		270 - 330 kHz (PWM) (110 Vin model) 360 - 440 kHz (PWM) (other input models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC
	- Input to Case, 60 s	1'500 VDC
	- Output to Case, 60 s	1'500 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	100 pF max.
Reliability	- Calculated MTBF	5'535'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F
	- Flammability	EN 45545-2 www.tracopower.com/info/en45545-declaration.pdf
Housing Material		Copper

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