

- Fully encapsulated low profile plastic casing in PCB version
- 2 x MOPP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition
- IT and industrial safety according to IEC/EN/UL 60950-1
- Ready to meet ErP directive <0.3 W no load power consumption
- -40°C start-up temperature
- Safety class II prepared
- Protection against over-temperature, overload and short circuit
- 3-year product warranty



The TMM 24 Series of fully encapsulated 24 Watt AC/DC power supply modules feature a reinforced/double I/O isolation system according to latest medical safety standards 60601-3 3rd edition for 2 x MOPP (Means Of Patient Protection).

The high efficiency and the use of highest grade components make the units suitable for an operating temperature range of -40°C to +65°C while it goes up to 75°C with 50% load derating. EMI/EMC characteristics and the safety approval package qualify these modules not only for medical devices but also for demanding applications in transportation systems and for equipment in industrial an commercial environment.

### Models

Order Code	Output Power	Output 1		Output 2		Efficiency
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TMM 24105	15 W	5 VDC	3'000 mA			77 %
TMM 24112		12 VDC	2'000 mA			83 %
TMM 24115	24 W	15 VDC	1'600 mA			82 %
TMM 24124		24 VDC	1'000 mA			85 %
TMM 24212		+12 VDC	1'000 mA	-12 VDC	1'000 mA	84 %
TMM 24215		+15 VDC	800 mA	-15 VDC	800 mA	84 %

### Input Specifications

Input Voltage	- AC Range	Operational Range: <b>85 - 264 VAC</b> (Full Range) Rated Range: <b>100 - 240 VAC</b> (Full Range)
	- DC Range	Operational Range: <b>120 - 370 VDC</b> (Designed for, no certification) Polarity: <b>irrelevant</b>
Input Frequency		Operational Range: <b>47 - 440 Hz</b> Certified: <b>50/60 Hz</b>
Input Current	- Full Load & Vin = 230 VAC	5 VDC model: <b>170 mA max.</b> 12 VDC model: <b>255 mA max.</b> 15 VDC model: <b>255 mA max.</b> 24 VDC model: <b>250 mA max.</b> dual output models: <b>250 mA max.</b>
	- Full Load & Vin = 115 VAC	5 VDC model: <b>285 mA max.</b> 12 VDC model: <b>420 mA max.</b> 15 VDC model: <b>425 mA max.</b> 24 VDC model: <b>410 mA max.</b> dual output models: <b>415 mA max.</b>
Power Consumption	- No load & Vin = 230 VAC	<b>750 mW max.</b>
	- No load & Vin = 115 VAC	<b>300 mW max.</b>
Input Inrush Current	- At 230 VAC	<b>40 A max.</b>
	- At 115 VAC	<b>20 A max.</b>
Input Protection		<b>T 2 A / 250 VAC</b> (Internal Fuse in L & N)
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)

### Output Specifications

Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.5% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>3% max. (Output 1)</b> <b>3% max. (Output 2)</b>
Ripple and Noise (20 MHz Bandwidth)	- single output	5 VDC model: <b>90 mVp-p max.</b>
		12 VDC model: <b>155 mVp-p max.</b>
		15 VDC model: <b>195 mVp-p max.</b>
		24 VDC model: <b>310 mVp-p max.</b>
	- dual output	12 / -12 VDC model: <b>155 / 155 mVp-p max.</b>
	15 / -15 VDC model: <b>195 / 195 mVp-p max.</b>	
- single output	5 VDC model: <b>80 mVp-p typ.</b>	
	12 VDC model: <b>120 mVp-p typ.</b>	
	15 VDC model: <b>150 mVp-p typ.</b>	
	24 VDC model: <b>240 mVp-p typ.</b>	
- dual output	12 / -12 VDC model: <b>120 / 120 mVp-p typ.</b>	
15 / -15 VDC model: <b>150 / 150 mVp-p typ.</b>		
Capacitive Load	- single output	5 VDC model: <b>2'200 µF max.</b>
		12 VDC model: <b>1'000 µF max.</b>
15 VDC model: <b>680 µF max.</b>		
24 VDC model: <b>470 µF max.</b>		
- dual output	12 / -12 VDC model: <b>470 / 470 µF max.</b>	
15 / -15 VDC model: <b>330 / 330 µF max.</b>		
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Hold-up Time	- At 230 VAC	<b>50 ms min.</b>
	- At 115 VAC	<b>10 ms min.</b>
Start-up Overshoot Voltage		<b>5% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>

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

Output Current Limitation	105% min. of I <sub>out</sub> max.
Overvoltage Protection	120% typ. of V <sub>out</sub> nom. (By Zener diode)

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment  - Industrial Control Equipment - Medical Equipment  - Certification Documents	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 UL 508 EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 CSA-C22.2, No 60601-1 2 x MOPP (Means Of Patient Protection) <a href="http://www.tracopower.com/overview/tmm24">www.tracopower.com/overview/tmm24</a>
Protection Class		Class I & II (Prepared): Reinforced Insulation
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI Emissions	- Conducted Emissions  - Radiated Emissions	EN 61000-6-3 (Generic Residential) EN 61000-6-4 (Generic Industrial) EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 15 class B (internal filter) EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 15 class B (internal filter)
EMS Immunity	- Electrostatic Discharge  - RF Electromagnetic Field - EFT (Burst) / Surge  - Conducted RF Disturbances - PF Magnetic Field - Voltage Dips & Interruptions	EN 55024 (IT Equipment) EN 61000-6-1 (Generic Residential) EN 61000-6-2 (Generic Industrial) EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, ±15 kV, perf. criteria A Contact: EN 61000-4-2, ±8 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A L to L: EN 61000-4-5, ±1 kV, perf. criteria A L to PE: EN 61000-4-5, ±1 kV, perf. criteria A EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A Continuous: EN 61000-4-8, 30 A/m, perf. criteria A 230 VAC / 50 Hz: 30%, 25 periods, perf. criteria A >95%, 0.5 periods, perf. criteria A >95%, 1 period, perf. criteria A >95%, 250 periods, perf. criteria B

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Storage Temperature	-40°C to +80°C -40°C to +95°C
Power Derating	- High Temperature	3.13 %/K above 65°C (5 V <sub>in</sub> model) 5 %/K above 65°C (other models)
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	142°C typ. (Automatic recovery at 67°C typ.) Internal IC temperature
Cooling System		Natural convection (20 LFM)

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

Altitude During Operation	5'000 m max.
Switching Frequency	132 kHz typ. (PWM)
Insulation System	Reinforced Insulation
Working Voltage (rated)	240 VAC
Isolation Test Voltage	- Input to Output, 60 s 4'000 VAC
Isolation Resistance	- Input to Output, 500 VDC 1'000 MΩ min.
Leakage Current	- Touch Current 100 μA max.
Reliability	- Calculated MTBF 400'000 h (MIL-HDBK-217F, ground benign)
Washing Process	Not allowed
Housing Material	Plastic resin (UL 94 V-0 rated)
Potting Material	Silicone (UL 94 V-0 rated)
Pin Material	Copper Alloy (C6801)
Pin Foundation Plating	Nickel (2 - 4 μm)
Pin Surface Plating	Tin (3 - 5 μm), matte
Housing Type	Plastic Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Soldering Profile	Wave Soldering 260°C / 10 s
Weight	137 g
Environmental Compliance	- REACH Declaration <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> <b>Exemptions: 7a</b> (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.)

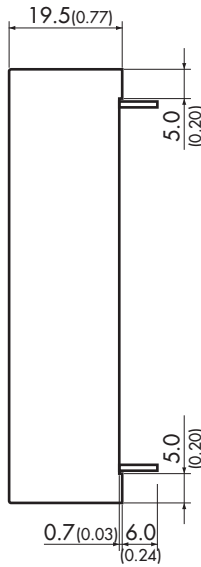
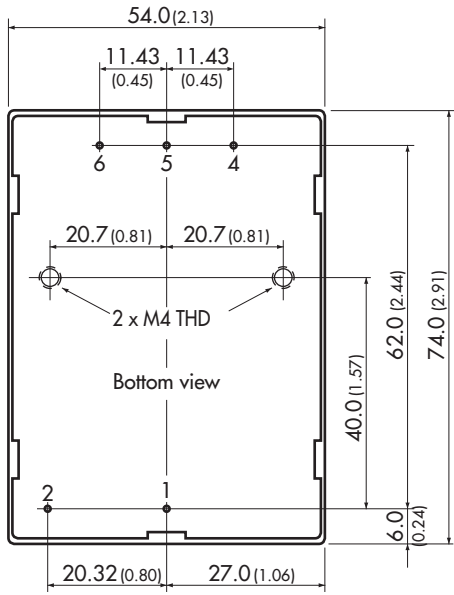
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmm24](http://www.tracopower.com/overview/tmm24)

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**Outline Dimensions**



Dimensions in mm (inch)  
 Tolerances  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin  $\varnothing 1.0 \pm 0.1$  ( $0.04 \pm 0.004$ )  
 Pin pitch tolerances  $\pm 0.25$  ( $\pm 0.01$ )

Pinout		
Pin	Single Output	Dual Output
1	AC (N)	AC (N)
2	AC (L)	AC (L)
4	-Vout	-Vout
5	No pin	Common
6	+Vout	+Vout

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