

- 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	24 W	12 VDC	2'000 mA			83 %
TMM 24115		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	85 - 264 VAC
	- DC Range	120 - 370 VDC (Designed for, no certification)
Input Frequency		47 - 440 Hz
Input Current	- Full Load & Vin = 230 VAC	5 VDC model: 170 mA max. 12 VDC model: 255 mA max. 15 VDC model: 255 mA max. 24 VDC model: 250 mA max. dual output models: 250 mA max.
	- Full Load & Vin = 115 VAC	5 VDC model: 285 mA max. 12 VDC model: 420 mA max. 15 VDC model: 425 mA max. 24 VDC model: 410 mA max. dual output models: 415 mA max.
Power Consumption	- At no load	300 mW max. (Ready to meet ErP directive)
Input Inrush Current	- at 230 VAC	40 A max.
	- at 115 VAC	20 A max.
Input Protection		T 2 A / 250 VAC (Internal Fuse in L & N)

### Output Specifications

Voltage Set Accuracy		±2% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.5% max.
	- Load Variation (0 - 100%)	single output models: 1% max.
		dual output models: 3% max. (Output 1) 3% max. (Output 2)
Ripple and Noise (20 MHz Bandwidth)	- single output	5 VDC model: 90 mVp-p max.
		12 VDC model: 155 mVp-p max.
		15 VDC model: 195 mVp-p max.
		24 VDC model: 310 mVp-p max.
	- dual output	12 / -12 VDC model: 155 / 155 mVp-p max. 15 / -15 VDC model: 195 / 195 mVp-p max.
	- single output	5 VDC model: 80 mVp-p typ.
		12 VDC model: 120 mVp-p typ.
		15 VDC model: 150 mVp-p typ.
24 VDC model: 240 mVp-p typ.		
- dual output	12 / -12 VDC model: 120 / 120 mVp-p typ. 15 / -15 VDC model: 150 / 150 mVp-p typ.	
Capacitive Load	- single output	5 VDC model: 2'200 µF max.
		12 VDC model: 1'000 µF max.
		15 VDC model: 680 µF max.
		24 VDC model: 470 µF max.
	- dual output	12 / -12 VDC model: 470 / 470 µF max. 15 / -15 VDC model: 330 / 330 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Hold-up Time	- at 230 VAC	50 ms min.
	- at 115 VAC	10 ms min.
Start-up Overshoot Voltage		5% max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		105% min. of Iout max.
Overvoltage Protection		120% typ. of Vout nom. (By Zener diode)

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

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	IEC 60950-1 EN 60950-1 UL 60950-1
	- Medical Equipment	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>
	- Certification Documents	
Protection Class		Class II (Prepared): Reinforced Insulation
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI Emissions		EN 61000-6-3 (Generic Residential) EN 61000-6-4 (Generic Industrial)
	- Conducted Emissions	EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 15, class B
	- Radiated Emissions	EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 15, class B
EMS Immunity		EN 55024 (IT Equipment) EN 61000-6-1 (Generic Residential) EN 61000-6-2 (Generic Industrial) EN 60601-1-2 edition 4 (Medical Devices)
	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 15$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 8$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A L to PE: EN 61000-4-5, $\pm 1$ kV, perf. criteria A
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous: EN 61000-4-8, 30 A/m, perf. criteria A
	- Voltage Dips & Interruptions	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	-40°C to +80°C
	- Storage Temperature	-40°C to +95°C
Power Derating	- High Temperature	3.13 %/K above 65°C (5 Vin model) 5 %/K above 65°C (other models)
Over Temperature	- Protection Mode	142°C typ. (Automatic recovery at 67°C)
Protection Switch Off	- Measurement Point	Internal IC temperature
Cooling System		Natural convection (20 LFM)
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 MOhm min.
Leakage Current	- Touch Current	100 $\mu$ A max.

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

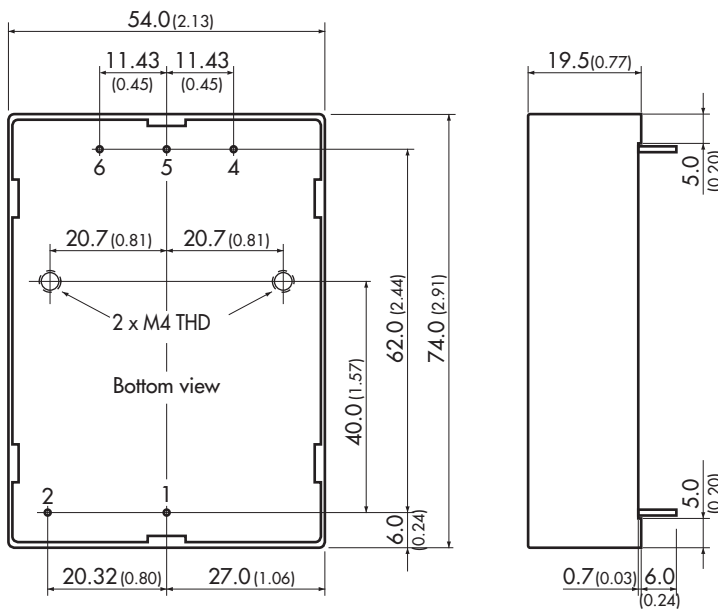
Reliability	- Calculated MTBF	400'000 h (MIL-HDBK-217F, ground benign)
Housing Material		Plastic resin (UL 94 V-0 rated)
Pin Material		Copper alloy w. gold plate over nickel subplate
Soldering Profile		Wave Soldering (1.5mm from casing) 260°C / 10 s
Connection Type		THD (Through-Hole Device)
Weight		137 g
Environmental Compliance	- Reach - RoHS	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>

### Supporting Documents

Overview Link (for additional Documents)

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

### 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	NC	Common
6	+Vout	+Vout

NC: Not connected