

- 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 62368-1
- 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 60 Series of fully encapsulated 60 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 +60°C without 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 max.	Output Voltage nom.	Output Current max.	Efficiency typ.
TMM 60105	51 W	5.1 VDC	10'000 mA	84 %
TMM 60112	60 W	12 VDC	5'000 mA	87 %
TMM 60115		15 VDC	4'000 mA	87 %
TMM 60124		24 VDC	2'500 mA	87 %
TMM 60148		48 VDC	1'250 mA	88 %

### 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	5.1 VDC model: <b>530 mA max.</b> 12 VDC model: <b>600 mA max.</b> 15 VDC model: <b>600 mA max.</b> 24 VDC model: <b>600 mA max.</b> 48 VDC model: <b>600 mA max.</b>
	- Full Load & Vin = 115 VAC	5.1 VDC model: <b>880 mA max.</b> 12 VDC model: <b>1'000 mA max.</b> 15 VDC model: <b>1'000 mA max.</b> 24 VDC model: <b>1'000 mA max.</b> 48 VDC model: <b>990 mA max.</b>
Power Consumption	- No load & Vin = 230 VAC	<b>750 mW max.</b>
	- No load & Vin = 115 VAC	<b>500 mW max.</b>
Input Inrush Current	- At 230 VAC	<b>60 A max.</b>
	- At 115 VAC	<b>30 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)	<b>1% max.</b>
	- Load Variation (0 - 100%)	<b>1% max.</b>
Ripple and Noise (20 MHz Bandwidth)	5.1 VDC model:	<b>160 mVp-p max.</b>
	12 VDC model:	<b>180 mVp-p max.</b>
	15 VDC model:	<b>230 mVp-p max.</b>
	24 VDC model:	<b>360 mVp-p max.</b>
	48 VDC model:	<b>720 mVp-p max.</b>
	5.1 VDC model:	<b>110 mVp-p typ.</b>
Capacitive Load	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>
	48 VDC model:	<b>480 mVp-p typ.</b>
	5.1 VDC model:	<b>8'000 µF max.</b>
	12 VDC model:	<b>3'900 µF max.</b>
Minimum Load	15 VDC model:	<b>3'300 µF max.</b>
	24 VDC model:	<b>1'500 µF max.</b>
	48 VDC model:	<b>680 µF max.</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>
Output Current Limitation		<b>105% min. of Iout max.</b>
Overvoltage Protection		<b>120% typ. of Vout nom.</b> (By Zener diode)

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

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Industrial Control Equipment	UL 508
	- 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)
	- Certification Documents	<a href="http://www.tracopower.com/overview/tmm60">www.tracopower.com/overview/tmm60</a>
Protection Class		Class I & 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 (internal filter)
	- Radiated Emissions	EN 55011 class B (internal filter) EN 55032 class B (internal filter) FCC Part 15 class B (internal filter)
EMS Immunity		EN 55024 (IT Equipment) EN 55035 (Multimedia) 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 EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A
	- RF Electromagnetic Field	L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-6, 10 Vrms, perf. criteria A
	- Conducted RF Disturbances	Continuous: EN 61000-4-8, 30 A/m, perf. criteria A
	- PF Magnetic Field	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
	- Voltage Dips & Interruptions	

### 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	4.5 %/K above 60°C (5 Vin model) 3.8 %/K above 60°C (other models)
		See application note: <a href="http://www.tracopower.com/overview/tmm60">www.tracopower.com/overview/tmm60</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		100 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		240 VAC
Isolation Test Voltage	- Input to Output, 60 s	4'000 VAC

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

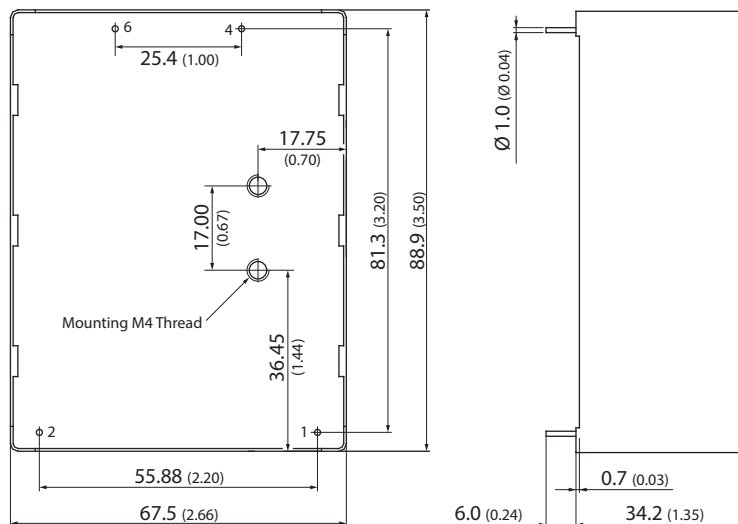
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.
Leakage Current	- Touch Current	100 $\mu$ A max.
Reliability	- Calculated MTBF	125'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
Housing Material		Plastic resin (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper Alloy (C6801)
Pin Foundation Plating		Nickel (2 - 4 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Soldering Profile		Wave Soldering 260°C / 10 s
Weight		360 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> Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
	- SCIP Reference Number	c6ed53f0-fc95-4fa6-bfd5-e2418d84fcd9

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmm60](http://www.tracopower.com/overview/tmm60)

### Outline Dimensions



Bottom View

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	Function
1	AC (N)
2	AC (L)
4	+Vout
6	-Vout