TRACO POWER

AC/DC Power Supply

TMM 60 Series, 60 Watt

- **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**



UL 508 ES 60601-1 IEC 60601-1
UL 62368-1 IEC 62368-1

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:	85 - 264 VAC (Full Range)
		Rated Range:	100 - 240 VAC (Full Range)
	- DC Range	Operational Range:	120 - 370 VDC (Designed for, no certification)
		Polarity:	irrelevant
Input Frequency		Operational Range:	47 - 440 Hz
		Certified:	50/60 Hz
Power Consumption	- No load & Vin = 230 VAC		750 mW max.
	- No load & Vin = 115 VAC		500 mW max.
Input Current	- Full load & Vin = 230 VAC	5.1 VDC model:	530 mA max.
		12 VDC model:	600 mA max.
		15 VDC model:	600 mA max.
		24 VDC model:	600 mA max.
		48 VDC model:	600 mA max.
	- Full load & Vin = 115 VAC	5.1 VDC model:	880 mA max.
		12 VDC model:	1'000 mA max.
		15 VDC model:	1'000 mA max.
		24 VDC model:	1'000 mA max.
		48 VDC model:	990 mA max.
Input Inrush Current	- At 230 VAC		60 A max.
	- At 115 VAC		30 A max.
Input Protection			T 2 A / 250 VAC (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			±2% max.
Regulation	- Input Variation (Vmin - Vmax)		1% max.
	- Load Variation (0 - 100%)		1% max.
Ripple and Noise (20 MHz Bandwidth)		5.1 VDC model:	160 mVp-p max.
		12 VDC model:	180 mVp-p max.
		15 VDC model:	230 mVp-p max.
		24 VDC model:	360 mVp-p max.
		48 VDC model:	720 mVp-p max.
		5.1 VDC model:	110 mVp-p typ.
		12 VDC model:	120 mVp-p typ.
		15 VDC model:	150 mVp-p typ.
		24 VDC model:	240 mVp-p typ.
		48 VDC model:	480 mVp-p typ.
Capacitive Load		5.1 VDC model:	8'000 µF max.
		12 VDC model:	3'900 µF max.
		15 VDC model:	3'300 µF max.
		24 VDC model:	1'500 µF max.
		48 VDC model:	680 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 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

Safety Specifications

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		www.tracopower.com/tmm60-safety-cert
Protection Class			Class I & II (Prepared): Reinforced Insulation
		See application note:	www.tracopower.com/info/protection-class.pdf
Energy Source	- Output, acc. to 62368-1		ES1 (5.1, 12 & 15 Vout model) ES2 (24 Vout model) ES3 (48 Vout model)
Power Source	- Output, acc. to 62368-1		PS3
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 A (internal filter) EN 55011 class B (internal filter) EN 55032 class A (internal filter) EN 55032 class B (internal filter) FCC 47 Part 15 class A (internal filter) FCC 47 Part 15 class B (internal filter)
	- Radiated Emissions		EN 55011 class A (internal filter) EN 55011 class B (internal filter) EN 55032 class A (internal filter) EN 55032 class B (internal filter) FCC 47 Part 15 class A (internal filter) FCC 47 Part 15 class B (internal filter)
EMS (Immunity)			EN 61000-6-1 (Generic Residential) EN 61000-6-2 (Generic Industrial) EN 60601-1-2 edition 4 (Medical Devices) EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air:	EN 61000-4-2, ±15 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±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, ±2 kV, perf. criteria A
		L to L:	EN 61000-4-5, ±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:	EN 61000-4-11 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
EMC / Environmental	- Certification Documents		www.tracopower.com/tmm60-emc-cert

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

General Specifications

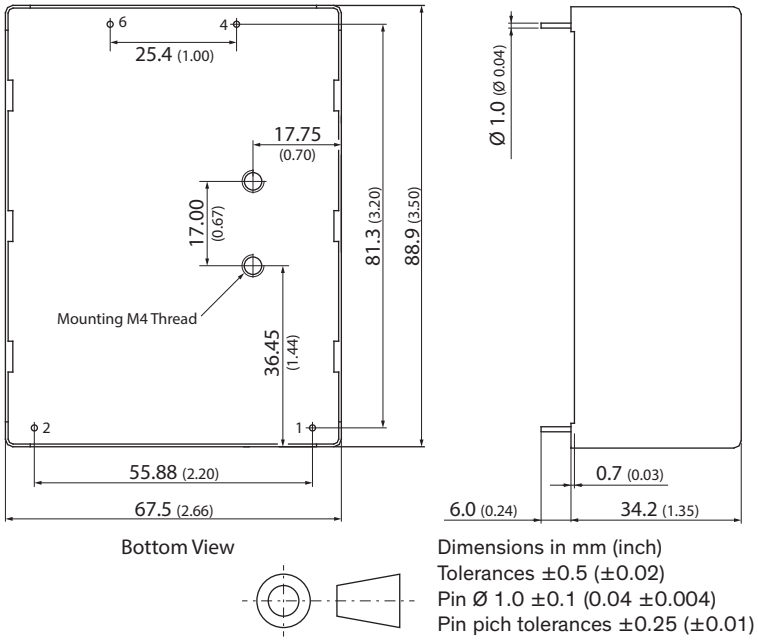
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +80°C
	- Storage Temperature	–40°C to +95°C
Power Derating	- High Temperature	4.5 %/K above 60°C (5 Vout model)
		3.8 %/K above 60°C (other models)
		See application note: www.tracopower.com/tmm60-cc
Cooling 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
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Leakage Current	- Touch Current	100 µA 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 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		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		360 g
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf
		REACH SVHC list compliant
		REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf
		Exemptions: 7(a) (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

Additional Information

Supporting Documents	www.tracopower.com/overview/tmm60
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

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Outline Dimensions



Bottom View

Dimensions in mm (inch)
Tolerances ±0.5 (±0.02)
Pin Ø 1.0 ±0.1 (0.04 ±0.004)
Pin pich tolerances ±0.25 (±0.01)

Pinout	
Pin	**Function**
1	AC (N)
2	AC (L)
4	+Vout
6	–Vout

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