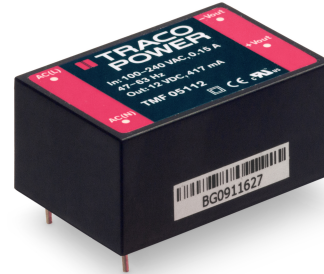


- Fully encapsulated power supplies in plastic casing for PCB mount
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2xMOPP
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <100 µA rated for BF applications
- Operating temperature range: -25°C to +70°C max.
- Protection against short-circuit, over load and over voltage
- Protection class II prepared
- 5-year product warranty



The TMF 05 Series AC/DC power supply modules are designed and manufactured based on workmanship standards and risk management to comply with the requirements for quality, reliability and safety of medical equipment. The units are approved to IEC/EN/ES 60601-1 edition 3.1 for 2 x MOPP (Means Of Patient Protection) and come along with an ISO 14971 risk management file. These fully encapsulated modules are for PCB mount. They are designed for protection class II applications (no earth connection) and feature a low leakage current (<100 µA). A compact design and excellent EMC considerations facilitate the design in. The thermal management enables an operation within a wide temperature range of -25 to +70°C and the isolation system is designed and approved for an altitude of 5000 m (AMSL). This makes the power supplies suitable not only for stationary applications but also for transportable medical equipment.

Models				
Order Code	Output Power max.	Output Voltage nom.	Output Current max.	Efficiency typ.
TMF 05105	5 W	5 VDC	1'000 mA	77 %
TMF 05112		12 VDC	417 mA	82 %
TMF 05115		15 VDC	333 mA	82 %
TMF 05124		24 VDC	208 mA	82 %

### Input Specifications

Input Voltage	- AC Range	Operational Range: <b>90 - 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>+DC: L / -DC: N</b>
Input Frequency		Operational Range: <b>47 - 440 Hz</b> Certified: <b>50/60 Hz</b>
Power Consumption	- No load & Vin = 230 VAC - No load & Vin = 115 VAC	<b>100 mW max.</b> (Ready to meet ErP directive) <b>100 mW max.</b>
Input Current	- Full load & Vin = 230 VAC - Full load & Vin = 115 VAC	<b>80 mA max.</b> <b>150 mA max.</b>
Input Inrush Current	- At 230 VAC - At 115 VAC	<b>20 A max.</b> <b>10 A max.</b>
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) - Load Variation (0 - 100%)	<b>0.5% max.</b> <b>1% max.</b>
Ripple and Noise (20 MHz Bandwidth)	5 VDC model: 12 VDC model: 15 VDC model: 24 VDC model:	<b>100 mVp-p max.</b> <b>120 mVp-p max.</b> <b>150 mVp-p max.</b> <b>240 mVp-p max.</b>
Capacitive Load	5 VDC model: 12 VDC model: 15 VDC model: 24 VDC model:	<b>8'000 µF max.</b> <b>1'200 µF max.</b> <b>820 µF max.</b> <b>330 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.05 %/K max.</b>
Hold-up Time	- At 230 VAC - At 115 VAC	<b>90 ms min.</b> <b>20 ms min.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>160 - 240% of Iout max.</b>
Overvoltage Protection		<b>105 - 145% of Vout nom.</b> (By Zener diode)

### Safety Specifications

Standards	- Medical Equipment	<b>EN 60601-1</b> <b>IEC 60601-1</b> <b>ANSI/AAMI ES 60601-1</b> <b>CSA-C22.2, No 60601-1</b> <b>2 x MOPP</b> (Means Of Patient Protection) <a href="http://www.tracopower.com/overview/tmf05">www.tracopower.com/overview/tmf05</a>
	- Certification Documents	
Protection Class		<b>Class I &amp; II (Prepared): Reinforced Insulation</b>
Pollution Degree		<b>PD 2</b>
Over Voltage Category		<b>OVC II</b>

### EMC Specifications

EMI (Emissions)	- Conducted Emissions - Radiated Emissions	<b>EN 60601-1-2 edition 4</b> (Medical Devices) <b>EN 55011 class B</b> (internal filter) <b>EN 55011 class B</b> (internal filter)
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

<b>EMS (Immunity)</b>		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
- RF Electromagnetic Field	Contact:	EN 61000-4-2, $\pm 8$ kV, perf. criteria A
- EFT (Burst) / Surge		EN 61000-4-3, 3 V/m, perf. criteria A
		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, $\pm 2$ kV, perf. criteria A
- Conducted RF Disturbances		EN 61000-4-6, 3 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 A
	115 VAC / 60 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 A
<b>EMC / Environmental</b>	- Certification Documents	<a href="http://www.tracopower.com/overview/tmf05">www.tracopower.com/overview/tmf05</a>

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-25°C to +70°C
	- Storage Temperature	-40°C to +85°C
Power Derating	- High Temperature	4 %/K above 55°C
	- Low Input Voltage	2 %/V below 100 VAC
		See application note: <a href="http://www.tracopower.com/overview/tmf05">www.tracopower.com/overview/tmf05</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		40 - 140 kHz (PWM)
		66 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s	4'000 VAC
Leakage Current	- Touch Current	100 $\mu$ A max.
Reliability	- Calculated MTBF	450'000 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) (Hermetical sealed structure, dust-proof only non water-proof)
Pin Material		Brass
Pin Surface Plating		Tin (120 $\mu$ m min.), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Soldering Profile		Lead-Free Wave Soldering
		270°C / 3 s max.
Weight		30 g

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

Environmental Compliance - REACH Declaration

[www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

[www.tracopower.com/info/rohs-declaration.pdf](http://www.tracopower.com/info/rohs-declaration.pdf)

Exemptions: 7c-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))

- SCIP Reference Number

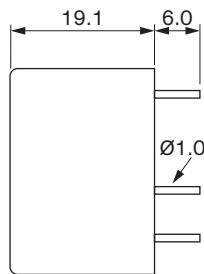
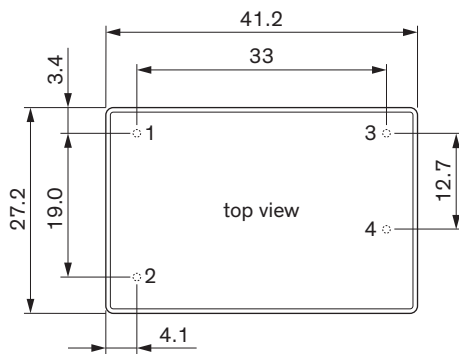
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### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmf05](http://www.tracopower.com/overview/tmf05)

### Outline Dimensions



Dimensions in mm  
Tolerances  $\pm 0.5$  mm  
Pin tolerances  $\pm 0.1$  mm

Pinout	
Pin	Function
1	AC (L)
2	AC (N)
3	-Vout
4	+Vout