

- 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  | 24 W         | 5 VDC    | 3'000 mA         |          |                  | 77 %       |
| TMM 24112  |              | 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                  | <b>85 - 264 VAC</b> (Full Range)  |
|                        | - DC Range                  | <b>120 - 370 VDC</b> (Designed for, no certification)   |
| Input Frequency        |                             | <b>47 - 63 Hz</b> (designed to meet: 47 - 440 Hz)   |
| Input Current          | - Full Load & Vin = 230 VAC | 5 VDC model: <b>170 mA max.</b><br>12 VDC model: <b>255 mA max.</b><br>15 VDC model: <b>255 mA max.</b><br>24 VDC model: <b>250 mA max.</b><br>dual output models: <b>250 mA max.</b> |
|                        | - Full Load & Vin = 115 VAC | 5 VDC model: <b>285 mA max.</b><br>12 VDC model: <b>420 mA max.</b><br>15 VDC model: <b>425 mA max.</b><br>24 VDC model: <b>410 mA max.</b><br>dual output models: <b>415 mA max.</b> |
| Power Consumption      | - At no load                | <b>300 mW max.</b> (Ready to meet ErP directive)  |
| 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>   |   |
|  | - Load Variation (0 - 100%)     | single output models: <b>1% max.</b><br>dual output models: <b>3% max. (Output 1)</b><br><b>3% max. (Output 2)</b>                                     |   |
|  |                                 |  |   |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output                 | 5 VDC model: <b>90 mVp-p max.</b><br>12 VDC model: <b>155 mVp-p max.</b><br>15 VDC model: <b>195 mVp-p max.</b><br>24 VDC model: <b>310 mVp-p max.</b> |   |
|  | - dual output                   | 12 / -12 VDC model: <b>155 / 155 mVp-p max.</b><br>15 / -15 VDC model: <b>195 / 195 mVp-p max.</b>   |   |
|  | - single output                 | 5 VDC model: <b>80 mVp-p typ.</b><br>12 VDC model: <b>120 mVp-p typ.</b><br>15 VDC model: <b>150 mVp-p typ.</b><br>24 VDC model: <b>240 mVp-p typ.</b> |   |
|  | - dual output                   | 12 / -12 VDC model: <b>120 / 120 mVp-p typ.</b><br>15 / -15 VDC model: <b>150 / 150 mVp-p typ.</b>   |   |
|  | Capacitive Load                 | - single output  | 5 VDC model: <b>2'200 µF max.</b><br>12 VDC model: <b>1'000 µF max.</b><br>15 VDC model: <b>680 µF max.</b><br>24 VDC model: <b>470 µF max.</b> |
|  |                                 | - dual output  | 12 / -12 VDC model: <b>470 / 470 µF max.</b><br>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>  |   |
| Output Current Limitation              |                                 | <b>105% min. of Iout max.</b>  |   |
| Overvoltage Protection                 |                                 | <b>120% typ. of Vout nom.</b><br>(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    | EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1   |
|                       | - Industrial Control Equipment | UL 508   |
|                       | - Medical Equipment            | EN 60601-1<br>IEC 60601-1<br>ANSI/AAMI ES 60601-1<br>CSA-C22.2, No 60601-1<br>2 x MOPP (Means Of Patient Protection)<br><a href="http://www.tracopower.com/overview/tmm24">www.tracopower.com/overview/tmm24</a> |
|                       | - Certification Documents      |  |
| 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)<br>EN 61000-6-4 (Generic Industrial)  |
|               | - Conducted Emissions          | EN 55011 class B (internal filter)<br>EN 55032 class B (internal filter)<br>FCC Part 15 class B (internal filter)  |
|               | - Radiated Emissions           | EN 55011 class B (internal filter)<br>EN 55032 class B (internal filter)<br>FCC Part 15 class B (internal filter)  |
| EMS Immunity  |                                | EN 55024 (IT Equipment)<br>EN 61000-6-1 (Generic Residential)<br>EN 61000-6-2 (Generic Industrial)<br>EN 60601-1-2 edition 4 (Medical Devices)                       |
|               | - Electrostatic Discharge      | Air: EN 61000-4-2, $\pm 15$ kV, perf. criteria A<br>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<br>L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A<br>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<br>>95%, 0.5 periods, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>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)<br>5 %/K above 65°C (other models) |
| Over Temperature          | - Protection Mode       | 142°C typ. (Automatic recovery at 67°C typ.)                         |
| 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  |

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

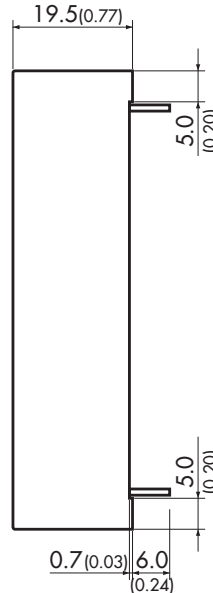
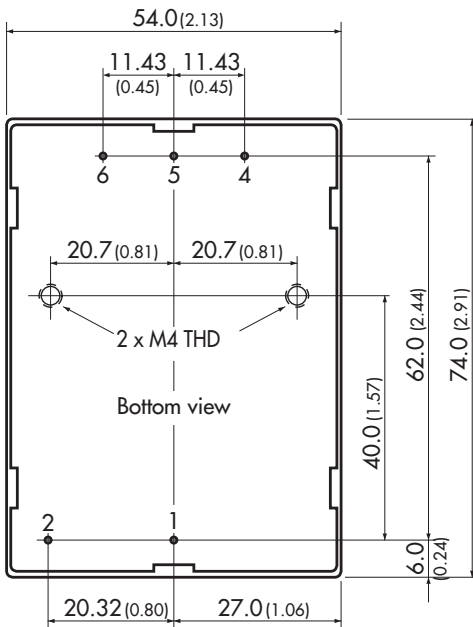
|                          |                            |   |
|--------------------------|----------------------------|---|
| Isolation Test Voltage   | - Input to Output, 60 s    | 4'000 VAC   |
| Isolation Resistance     | - Input to Output, 500 VDC | 1'000 MΩ min.   |
| Leakage Current          | - Touch Current            | 100 μA max.   |
| Reliability              | - Calculated MTBF          | 400'000 h (MIL-HDBK-217F, ground benign)  |
| Housing Material         |                            | Plastic resin (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   |
| Soldering Profile        |                            | Wave Soldering<br>260°C / 10 s  |
| Connection Type          |                            | THD (Through-Hole Device)   |
| 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><br>REACH SVHC list compliant<br>REACH Annex XVII compliant |
|                          | - RoHS Declaration         | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a  |

## 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 ±0.5 (±0.02)  
Pin Ø 1.0 ±0.1 (0.04 ±0.004)  
Pin pitch tolerances ±0.25 (±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