



### AUTORANGING INPUT

## FEATURES

- ◆ Low safety ground leakage current
- ◆ Power Fail Detect ( PFD ) signal
- ◆ Remote inhibit input disables DC output. Remote sense (Out-1,-2)
- ◆ Meets EN55011, FCC Class B, EN60601-1-2, EN61000 Class A,D
- ◆ Compact size 4" x 7" PCB x 1.5" height
- ◆ Optional cover-and-fan assembly
- ◆ 100% burn-in at full rated load
- ◆ Wide range input 90 to 264VAC
- ◆ Overcurrent, Short-circuit, Overvoltage, Thermal protections
- ◆ Power Factor 0.98 typical
- ◆ Compliant with RoHS requirements

## DESCRIPTION

This series of switching power supplies are specially designed for non-patient contact medical applications. They are capable of delivering 450 to 480 watts of continuous DC output power. Construction is open PCB construction with a U-bracket for mechanical support and heat sinking. They operate at 90 to 264VAC input voltage without the need for voltage selection. All auxiliary outputs are equipped with magnetic amplifiers or linear regulators for keeping regulation. A cover-and-fan assembly can be added during manufacturing.

## INPUT SPECIFICATIONS

|                                        |                                                                   |
|----------------------------------------|-------------------------------------------------------------------|
| Input Voltage                          | 90 to 264 VAC (auto select).                                      |
| Input Frequency                        | 47 to 63 Hz                                                       |
| Input Current                          | 7.1A rms @ 115VAC<br>3.5A rms @ 230 VAC                           |
| Inrush Current<br>(at 25°C cold start) | 40 amps @ 115VAC<br>80 amps @ 230VAC                              |
| Leakage Current<br>(Touch current)     | 100µA max @ 115VAC 60Hz<br>165µA max @ 230VAC 50Hz                |
| Internal Fuse Protection               | Included                                                          |
| Remote Inhibit                         | TTL 'high' external input to inhibit outputs for standard models. |

## ENVIRONMENTAL

|                       |                                                                                                                                                             |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Temperature | 0 °C to +70 °C.                                                                                                                                             |
| Storage Temperature   | -40 °C to +85 °C                                                                                                                                            |
| Operating Humidity    | 5% to 95% RH, non-condensing                                                                                                                                |
| Cooling               | Continuous output 100% rated power for "C" version (cover/fan). 50% rated power version "B" (convection air flow). Refer to Rating Chart notes for details. |

# SM450P SERIES 450-480 WATT MEDICAL SWITCHING POWER SUPPLIES

## GENERAL SPECIFICATIONS

|                             |                                                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------|
| Construction                | PCB open frame, cover-and-fan option                                                         |
| Connectors / Terminals      | PCB header pins                                                                              |
| Switching Frequency         | 60KHz ±10KHz                                                                                 |
| Efficiency                  | 80% minimum all models                                                                       |
| Dielectric Isolation        | 4000VAC from input to output<br>1500VAC from input to ground<br>500VAC from output to ground |
| MTBF<br>(per MIL-HDBK-217F) | 300,000 hours minimum at full load<br>at 25 °C ambient                                       |

## OUTPUT SPECIFICATIONS

|                                                          |                                                                                                                                                                                       |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Output Power                                       | Refer to Rating Chart for each model                                                                                                                                                  |
| Derating Output Power                                    | Derate from 100% @ +50 °C<br>linearly to 50% @ +70 °C                                                                                                                                 |
| Output Voltage / Current,<br>Adjustability, Peak Current | Refer to Rating Chart for each model                                                                                                                                                  |
| Minimum Load                                             | No minimum load required                                                                                                                                                              |
| Hold Up Time                                             | 12 mSec min @ 110 VAC                                                                                                                                                                 |
| Line Regulation                                          | ±0.2% max at full load                                                                                                                                                                |
| Over / Undershoot                                        | None at turn on or turn off                                                                                                                                                           |
| Ripple and Noise                                         | 2% peak to peak max                                                                                                                                                                   |
| Overvoltage Protection                                   | Only on Output #1. Setting at 115-140%<br>of Vnom output voltage.                                                                                                                     |
| Overcurrent / Short Circuit<br>Protection                | Continuous protection with automatic<br>recovery.                                                                                                                                     |
| Temperature Coefficient                                  | ±0.04% / °C max for all outputs                                                                                                                                                       |
| Transient Response                                       | Maximum excursion of 4% or better on<br>all models, recovering to 1% of final<br>value within 500 uS after a 25% step load<br>change.                                                 |
| PFD Signal                                               | TTL 'high' for normal or 'low' upon loss<br>of input power. Valid < 1mS before +5V<br>output drops 5% below nominal value.<br>Valid 100 mS delayed after +5V is within<br>regulation. |

## EMC and SAFETY (1)

|                                    |                                                              |
|------------------------------------|--------------------------------------------------------------|
| EMC Performance Standard           | EN60601-1-2: 2001                                            |
|                                    | EN61000-3-2, -3-3, -4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11 |
| EN55011, FCC-15, VCCI              | Class-B Conducted, Radiated                                  |
| Safety Standards<br>(certified to) | UL508, EN60950-1 (TUV), CE,<br>UL60601-1, CSA C22.2 No 601.1 |

(1) Products are rated for industrial environments and are not to be used nor are warranted in aerospace or life-support medical applications.



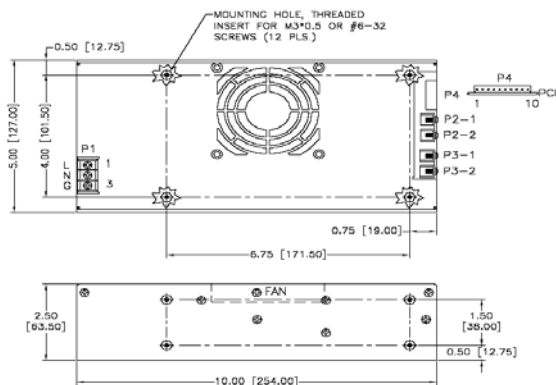
## OUTPUT VOLTAGE / CURRENT RATINGS

| MODEL      | Output # 1 |       |        |      | Output # 2 |       |       |      | Output # 3 |       |       |      | Max Output Power |
|------------|------------|-------|--------|------|------------|-------|-------|------|------------|-------|-------|------|------------------|
|            | Vnom.      | Imin. | Imax.  | Tol. | Vnom.      | Imin. | Imax. | Tol. | Vnom.      | Imin. | Imax. | Tol. |                  |
| SM450P12   | 12V        | 0A    | 37.5A  | 2%   |            |       |       |      |            |       |       |      | 450W             |
| SM450P13   | 15V        | 0A    | 30A    | 2%   |            |       |       |      |            |       |       |      | 450W             |
| SM450P14   | 24V        | 0A    | 18.75A | 2%   |            |       |       |      |            |       |       |      | 450W             |
| SM450P15   | 27V        | 0A    | 16.7A  | 2%   |            |       |       |      |            |       |       |      | 450W             |
| SM450P16   | 30V        | 0A    | 15A    | 2%   |            |       |       |      |            |       |       |      | 450W             |
| SM450P17-1 | 40V        | 0A    | 12A    | 2%   |            |       |       |      |            |       |       |      | 480W             |
| SM450P18   | 48V        | 0A    | 10A    | 2%   |            |       |       |      |            |       |       |      | 480W             |
| SM450P19   | 55V        | 0A    | 8.73A  | 2%   |            |       |       |      |            |       |       |      | 480W             |
| SM450P20   | 24V        | 1.0A  | 12A    | 2%   | 12V        | 1.0A  | 17A   | 5%   |            |       |       |      | 450W             |
| SM450P21   | 24V        | 1.0A  | 12A    | 2%   | 15V        | 0.75A | 15A   | 5%   |            |       |       |      | 450W             |
| SM450P22   | 48V        | 0.5A  | 6A     | 2%   | 24V        | 0.5A  | 10A   | 5%   |            |       |       |      | 450W             |
| SM450P23   | 48V        | 0.5A  | 6A     | 2%   | 12V        | 1.0A  | 17A   | 5%   |            |       |       |      | 450W             |
| SM450P24   | 48V        | 0.5A  | 6A     | 2%   | 15V        | 0.75A | 15A   | 5%   |            |       |       |      | 450W             |
| SM450P30   | 24V        | 1.0A  | 12A    | 2%   | 12V        | 1.0A  | 17A   | 5%   | 3.3V       | 0A    | 8A    | 3%   | 450W             |
| SM450P31   | 24V        | 1.0A  | 12A    | 2%   | 15V        | 0.75A | 15A   | 5%   | 3.3V       | 0A    | 8A    | 3%   | 450W             |
| SM450P32   | 24V        | 1.0A  | 12A    | 2%   | 12V        | 1.0A  | 17A   | 5%   | 5.1V       | 0A    | 8A    | 3%   | 450W             |
| SM450P33   | 24V        | 1.0A  | 12A    | 2%   | 15V        | 0.75A | 15A   | 5%   | 5.1V       | 0A    | 8A    | 3%   | 450W             |
| SM450P34   | 48V        | 0.5A  | 6A     | 2%   | 12V        | 1.0A  | 17A   | 5%   | 3.3V       | 0A    | 8A    | 3%   | 450W             |
| SM450P35   | 48V        | 0.5A  | 6A     | 2%   | 15V        | 0.75A | 15A   | 5%   | 3.3V       | 0A    | 8A    | 3%   | 450W             |
| SM450P36   | 48V        | 0.5A  | 6A     | 2%   | 12V        | 1.0A  | 17A   | 5%   | 5.1V       | 0A    | 8A    | 3%   | 450W             |
| SM450P37   | 48V        | 0.5A  | 6A     | 2%   | 15V        | 0.75A | 15A   | 5%   | 5.1V       | 0A    | 8A    | 3%   | 450W             |

### NOTES

- Add suffix "B" for U-bracket format or "C" for enclosed format with fan control function, e.g. SM450-14C.
- All outputs are floating. It can be connected externally for positive or negative output.
- Output #1 can be adjusted within  $\pm 5\%$  of their nominal voltage.
- Output #3 can be adjusted within  $\pm 15\%$  of their nominal voltage.
- Derating:  
450~480 watts for "C" version with cover-and-fan assembly.  
225~240 watts for "B" version without moving air (maximum current of output #1 & 2 derated to 50%), or 450 watts with 40 CFM forced air provided by user.
- All models may operate at no-load. At no-load, output voltage tolerance increases to 10%.

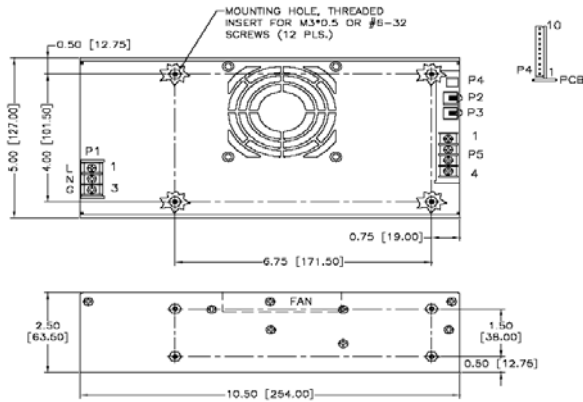
### MECHANICAL SPECIFICATIONS (mm / inches)



### Single Output Models

#### NOTES:

- Dimensions shown in inch [mm].
- Tolerance 0.02 [0.5] maximum.
- Input connector P1 is Dinkle DT-35-B01W-03 screws are M3, Nickel plated.
- Connector P4 mates with Molex housing 50-37-5103 and pins 5263.
- P2-1, P2-2, P3-1 & P3-2: M3\*0.5 screw connections.
- Weight: 1,800 grams.



## Multiple Output Models

### NOTES:

1. Dimensions shown in inch [mm].
2. Tolerance 0.02 [0.5] maximum.
3. Input connector P1 is Dinkle DT-35-B01W-03 screws are M3, Nickel plated.
4. Connector P4 mates with Molex housing 50-37-5103 and pins 5263.
5. P2, P3: M\*0.05 screw connections.
6. Output connector P5 is Dinkle DT-35-B01W-04 screws are M3, Nickel plated.
7. Weight: 1,900 grams.

## PIN ASSIGNMENTS

All Models: P1 is AC INPUT: (1) L-Line, (2) N-Neutral, (3) G-Ground.

### Single Output Models

| MODEL                                        | CONN.:                                         |    | P 2 | P 3                   | P 4    |        |     |                |                |      |      |             |     |    |
|----------------------------------------------|------------------------------------------------|----|-----|-----------------------|--------|--------|-----|----------------|----------------|------|------|-------------|-----|----|
|                                              | PIN:                                           |    |     |                       | 1      | 2      | 3   | 4              | 5              | 6    | 7    | 8           | 9   | 10 |
| SM450P12<br>SM450P14<br>SM450P16<br>SM450P18 | SM450P13<br>SM450P15<br>SM450P17-1<br>SM450P19 | +V | -V  | SIGNAL<br>GND<br>(-V) | +S (V) | -S (V) | PFD | INHIBIT<br>+Ve | INHIBIT<br>+Ve | N.C. | N.C. | 0V<br>(FAN) | FAN |    |

### Multiple Output Models

| MODEL                                                                            | CONN.:                                                               |     | P 2 | P 3                   | P 4        |            |     |                |                |            |            |             |     |    |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------|-----|-----|-----------------------|------------|------------|-----|----------------|----------------|------------|------------|-------------|-----|----|
|                                                                                  | PIN:                                                                 |     |     |                       | 1          | 2          | 3   | 4              | 5              | 6          | 7          | 8           | 9   | 10 |
| SM450P20<br>SM450P22<br>SM450P24<br>SM450P31<br>SM450P33<br>SM450P35<br>SM450P37 | SM450P21<br>SM450P23<br>SM450P30<br>SM450P32<br>SM450P34<br>SM450P36 | +V1 | -V1 | SIGNAL<br>GND<br>(-V) | +S<br>(V1) | -S<br>(V1) | PFD | INHIBIT<br>+Ve | INHIBIT<br>+Ve | +S<br>(V2) | -S<br>(V2) | 0V<br>(FAN) | FAN |    |

| MODEL                                        | CONN.:                                       |     | P 5 |      |      |   |
|----------------------------------------------|----------------------------------------------|-----|-----|------|------|---|
|                                              | PIN:                                         |     | 1   | 2    | 3    | 4 |
| SM450P20<br>SM450P22<br>SM450P24             | SM450P21<br>SM450P23                         | +V2 | -V2 | N.C. | N.C. |   |
| SM450P30<br>SM450P32<br>SM450P34<br>SM450P36 | SM450P31<br>SM450P33<br>SM450P35<br>SM450P37 | +V2 | -V2 | +V3  | -V3  |   |