

# CF RATED POWER SUPPLIES

Type CF is the most stringent medical safety classification and is essential for medical products that may come in direct contact with the heart, including dialysis machines, cardiac-related systems, and platforms for electrosurgery. Advanced Energy offers standard, products that combine the performance and reliability demanded by complex medical systems with the high isolation voltage and low leakage current essential to CF certification.

## Market Overview

Electrosurgical equipment usage is expected to increase at a rate of  $>5\%$ /year, led by increasing demand of minimally invasive electrosurgical procedures due to lower complication rates than standard surgery, increasing incident rates of cancer, cardiovascular illnesses, and other age related illnesses. Pulsed field ablation is a relatively newer technology that is expected to grow rapidly over the next few years specifically for cardiac ablation and oncology.

## Typical Applications

Increasing trends in critical medical applications are moving CF ratings / isolation to the AC/DC front end of the device. Applications in this market space are currently served by custom designs or limited and very expensive off-the-shelf products.

- Surgical generators
- Radio Frequency (RF) ablation
- Pulsed Field Ablation (PFA or PEF)
- Hemodialysis
- Cardiac assist devices
- Cardiac Monitors
- Cardiac mapping systems
- Defibrillators



## AEI CF Rated Power

- Patient Leakage Current Fig. 15: < 10 uA @264 Vac, NC; <50 uA SFC
- Patient Leakage Current Fig. 16: <50 uA @ 264 Vac, NC
- Meet Class B Conducted and Radiated Emissions
- 5 kV defibrillator pulse withstand protection and energy reduction test
- 2 MOPP (4500 Vac) input-output Isolation
- 1 MOPP (1500 Vac) input-ground and output to ground isolation
- 5 V standby output, DC OK signals, inhibit function

### NCF150 Series 150 Watts



- 150 W max output power
- 4.0" x 2.0" x 1.26"
- Medical safety - CF rated
- -40°C to 70°C with derating
- 5 V standby @ 0.5 A
- 12 V fan output @ 0.4 A
- High efficiency: 94% typ.
- ± 10% adjustment range

### NCF250 Series 250 Watts



- 250 W max output power
- 5" x 2.4" x 1.6"
- Medical safety - CF rated
- -40°C to 70°C with derating
- 5 V standby @ 1.0 A
- High efficiency: >93% typ.
- +-5% adjustment range

### NCF425 Series 425 Watts



- 425 W max output power
- 6" x 3.5" x 1.5"
- Medical safety - CF rated
- Universal 85-264 VAC Input
- 5 V standby @ 1.0 A
- Meets Class B Emissions levels
- 3 year warranty

### NCF660 Series 660 Watts



- 660 W max output power
- 4.0" x 7.0" x 1.6"
- Medical Safety CF rated
- -40°C to 70°C with derating
- 5 V standby @ 1.0 A
- High efficiency: >94% typ.
- ± 5% adjustment range

## Power Supply Considerations

- For a power supply to be suitable for CF rated applications, it must fulfill 2 key requirements:
  - Patient leakage current < 10 uA
  - Isolation between its secondary output and protective earth (>1500 Vac/1 MOPP) and between input to output >4500 Vac typ./ 2 MOPP
- Leakage currents are typically associated with capacitive coupling across power transformers and through Y-class filter capacitors, which are connected to ground to satisfy EMC regulations.
- To achieve single-digit leakage current values while maintaining compliance EMI and EMC standards, careful design various parts of the power supply are critical:
  - "Y" capacitors to ground
  - Novel main power transformer
  - PFC stage filtering, particularly inductance
  - Output filtering

**Note:** As the NCF series is classified as a component power supply, it cannot be declared an applied part, and therefore cannot be declared CF rated. However, the NCF Series has been evaluated for and meets the requirements related for use in CF applications.