

# SL POWER NCF250 SERIES

250 W Single Output  
Medical Grade - CF Rated



Advanced Energy's SL Power NCF250 CF rated\* medically approved AC-DC power supplies are available with a nominal main output of 12 V, 15 V, 24 V, or 48 V. NCF250 series power supplies provide up to 250 W of output power with air flow. All models have output overvoltage, short circuit and overload protection and a 2.4 x 5.0 x 1.6 inch form factor.

## AT A GLANCE

### Total Power

250 W

### Input Voltage

85 to 264 VAC

### # of Outputs

Single

## SPECIAL FEATURES

- 5 kV Defibrillator Withstand
- Up to 250 W with Air Flow
- Up to 175 W Convection Cooled
- 2.4"W x 5.0"L x 1.6"H Size
- Universal Input 85 to 264 VAC
- Meets Class B Emissions Levels
- 7+ Years Electrolytic Capacitor Life
- Meets IEC60601-1-2 4th Edition EMC
- Less than 10  $\mu$ A Leakage Current
- Class I Input
- RoHS Compliant
- REACH Compliant
- 3 Years Warranty

## SAFETY

- IEC/UL/cUL/EN60601-1, Edition 3.2
- CF Rated\*



\* The NCF Series models are suitable for CF Rated applications as they provide the below features:

1. Clearance and creepage requirements between primary and ground for one MOPP, primary and secondary for two MOPP and secondary and ground for one MOPP.
2. Hi-pot tests between primary and ground, primary and secondary and secondary and ground.
3. Type CF patient leakage current <10  $\mu$ A under normal condition and <50  $\mu$ A under single fault condition.

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.

## ELECTRICAL SPECIFICATIONS

Input	
Input Range	85 to 264 VAC, 47 to 63 Hz, 1Ø Safety certified 100 to 240 VAC, $\pm 10\%$
Input Current	2.6 A max at 115 VAC, 1.3 A max at 230 VAC
Inrush Current	75 A max, cold start at 264 VAC input
Input Fuses	6.3 A, 250 VAC fuse provided in both line & neutral
Leakage Current - CF Rated	
Input to Earth	<500 $\mu$ A at 264 VAC, 60 Hz, NC; <1000 $\mu$ A SFC
Input to Output	<10/50 $\mu$ A at 264 VAC, 60 Hz, NC/SFC
Patient Leakage Current	<50 $\mu$ A (per fig.16 of IEC60601-1)
Efficiency	>90% typical
No Load Input Power	<2.0 W
Isolation Voltage	Input/Ground: 1500 VAC (1 MOPP) Input/Output: 4500 VAC (2 MOPP) Output/Ground: 1500 VAC (1 MOPP) 5 kV defibrillator pulse withstand
Output	
Maximum Power	See "Ordering Information" section
Ripple and Noise	1% of Vout on all models
Load Regulation	2% for main output, 3% for 5Vsb output
Line Regulation	1%
Total Regulation	5%
Minimum Load	Not required
Capacitive Load	1000 $\mu$ F
Adjustment Range	$\pm 5\%$ (optional)
Initial Set Point Tolerance	$\pm 1\%$
Overshoot	<5% overshoot at turn-on, <1% overshoot at turn-off, under all conditions
Reliability	
MTBF	>500 khrs per Telcordia 332, Issue 6, 25°C, full rated load at 110 VAC input
Warranty	3 years
Electrolytic Capacitor Lifetime	All specified electrolytic capacitors will exceed 7 years life based on operating at 25°C ambient temp., 24 hrs/day, 365 days/year
Protection	
Overvoltage Protection	110% to 130% of nominal output voltage, requires AC recycle to reset
Short circuit Protection	Short across the output terminals will not cause damage to the unit, hiccup mode
Thermal Protection	Will shutdown upon an over temperature condition, auto-recovery mode
Overload Protection	110% to 180% of rated output current value, hiccup mode
System Timing	
Turn-on Time - Main Output	< 1000 ms, 115 VAC and full load
Turn-on Time - 5Vsb Output	< 1000 ms
Rise Time	< 100 ms, 90 VAC, both 0% and full load. Measured from 10% of main output to main output within regulation
Hold-up Time - Main Output Stays within Regulation after Loss of AC	> 16 ms. Measured at 85% load (212 W) from 100 VAC, and main output reduces to 90% of original values before AC drop out > 20 ms at 170 W output
Hold up Time - 5Vsb Stays within Regulation after Loss of AC	> 30 ms

## DERATING SPECIFICATIONS

Ambient Temperature	12 V Model			15 V Model			24 V, 48 V Models		
	100 to 265 VAC	90 VAC	85 VAC	100 to 265 VAC	90 VAC	85 VAC	100 to 265 VAC	90 VAC	85 VAC
50°C-Convection	145 W	135 W	120 W	155 W	145 W	125 W	175 W	165 W	145 W
50°C-w/Airflow	230 W	220 W	200 W	230 W	220 W	200 W	250 W	250 W	250 W
60°C-Convection	116 W	108 W	96 W	124 W	116 W	100 W	140 W	132 W	116 W
60°C-w/Airflow	184 W	176 W	160 W	184 W	176 W	160 W	200 W	200 W	200 W
70°C-Convection	87 W	81 W	72 W	93 W	87 W	75 W	105 W	99 W	87 W
70°C-w/Airflow	138 W	132 W	120 W	138 W	132 W	120 W	150 W	150 W	150 W

Note: Contact Advanced Energy for availability of 15 V output models.

## EMI/EMC COMPLIANCE

Conducted Emissions	EN55011/32: Class B, CISPR11/32: Class B, FCC Part 15.107, Class B Measured at 10%, 50%, and 100% load steps; 3db margin typ, at 120 VAC and 230 VAC
Radiated Emissions	EN55011/32: Class B, CISPR11/32: Class B, FCC Part 15.107, Class B Measured at 10%, 50%, and 100% load steps; at 120 VAC and 230 VAC (added ferrite core may be required)
Harmonic Current Emissions	EN61000-3-2, Class A at 230 VAC, 100% load
Voltage Fluctuations & Flicker	IEC61000-3-3
Electro Static Discharge Immunity	IEC61000-4-2, Level 4: ±8 kV contact, ±15 kV air, Criteria A, IEC60601-1-2, 4th Edition, Table 4
Radiated RF EM Fields Susceptibility	EN61000-4-3, 10 V/m, 80 MHz to 2.7 GHz, 80% AM at 1 kHz IEC60601-1-2, 4th Edition, Table 4
Electrical Fast Transients/Bursts	IEC61000-4-4, Level 4, ±4 kV, 100 kHz rep rate, 40 A, Criteria A, IEC60601-1-2, 4th Edition, Table 5
Surges Line to Line (DM) and Line to Ground (CM)	IEC61000-4-5, Level 4, ±2 kV DM, ±4 kV CM, Criteria A Surpasses IEC60601-1-2, 4th Edition requirements
Conducted Disturbances Induced by RF Fields	IEC61000-4-6, 3 V/m – Level 4, 0.15 MHz to 80 MHz; and 12 V/m in ISM and amateur radio bands between 0.15 MHz and 80 MHz, 80% AM at 1 kHz IEC60601-1-2, 4th Edition, Table 5
Rated Power Frequency Magnetic Fields Test	IEC1000-4-8, Level 4: 30 A/m, 50 Hz/60 Hz IEC60601-1-2, 4th Edition, Table 4
Voltage Dips	IEC/EN61000-4-11: --100% dip for 10 ms, at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°, criteria B --100% dip for 20 ms, 0°, criteria B --100% dip for 5000 ms (250/300 cycles), criteria B --60% dip for 100 ms, criteria B --30% dip for 500 ms, criteria A IEC60601-1-2, 4th Edition, Table 5
Common Mode Noise: High Freq. (100 kHz to 20 MHz)	Contact Advanced Energy for details

## Notes:

Performance criteria are based on EN55024. According to the standards, performance criteria are decoded as following:

- A. Normal performance during and after the test
- B. Temporary degradation, self-recoverable
- C. Temporary degradation, operator intervention required to recover the operation
- D. Permanent damage

## ORDERING INFORMATION

Model Number <sup>2</sup>	Output Voltage	Output Current (fan) <sup>1</sup>	Output Power (fan) <sup>1</sup>	Output Current (convection)	Output Power (convection)	Auxiliary Output	Configuration	
							Input	Output
NCF250S12K	12 V	19.1 A	230 W	12.1 A	145 W	5 VDC/1 A	3-pin TE connectivity Type Conn	6-pin TE connectivity Type Conn
NCF250S15K	15 V	15.3 A	230 W	10.3 A	155 W			
NCF250S24K	24 V	10.4 A	250 W	7.3 A	175 W			
NCF250S48K	48 V	5.2 A	250 W	3.6 A	175 W			

Note: Contact Advanced Energy for availability of 15 V output models.

## ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to +70°C
Temperature Derating	Derate output power linearly from 50°C to 70°C, 50% load at 70°C
Cooling	Airflow: ≥400LFM; convection cooled
Storage Temperature	-40°C to +85°C
Altitude	Operating: -500 to 5,000 m. Non-operating: -500 to 12,192 m
Relative Humidity	5% to 95%, non-condensing
Vibration	Random Vibration: Operating: 0.003 g/Hz, 1.5 g overall, 3 axes, 10 min/axis, 5 to 500 Hz Non-operating: Random waveform, 3 mins/axis, 3 axes and sine waveform, Vib. frequency / acceleration: 10 Hz to 500 Hz/1 g, sweep rate of 1 octave/minutes, vibration time of 10 sweeps/axis, 3 axes per IEC60068-2 Transportation vibration: Random vib. per ISTA-1A
Shock	Operating: Half-sine, 20 gpk, 10 ms, 3 axes, 6 shocks total Non-operating: Half-sine waveform, impact acceleration of 50 g, pulse duration of 6 ms Number of shocks: 3 for each of the three axes
Audible Noise	<20 dBA

## SAFETY

UL	UL60601-1-1, Ed.3.2, complies with CF rated application requirements
CSA	CAN/CSA-C22.2 No. 60601-1, CF rated
IEC/EN (CB Report)	IEC/EN60601-1-1, Ed.3.2, complies with CF rated application requirements

## SIGNALS FEATURES

DC OK	Logic high when DC output is within regulation.
Inhibit	Short to RTN or logic low signal turns off main output. Open or Logic high turns on main output.
5Vsb (5 V/1 A Standby Output)	Is available whenever AC input is applied (not controlled by inhibit function)

## CONNECTORS

	Connector	Mating Connector
J1 (Input Connector)	TE# 640445-3 (middle pin removed)	AMP P/N 640250-3. Pins: 640252-1
J3 (DC Output Connector)	TE# 640445-6	AMP P/N 640250-6. Pins: 640252-1
G1 (GND)	0.187 quick disconnect terminal	-

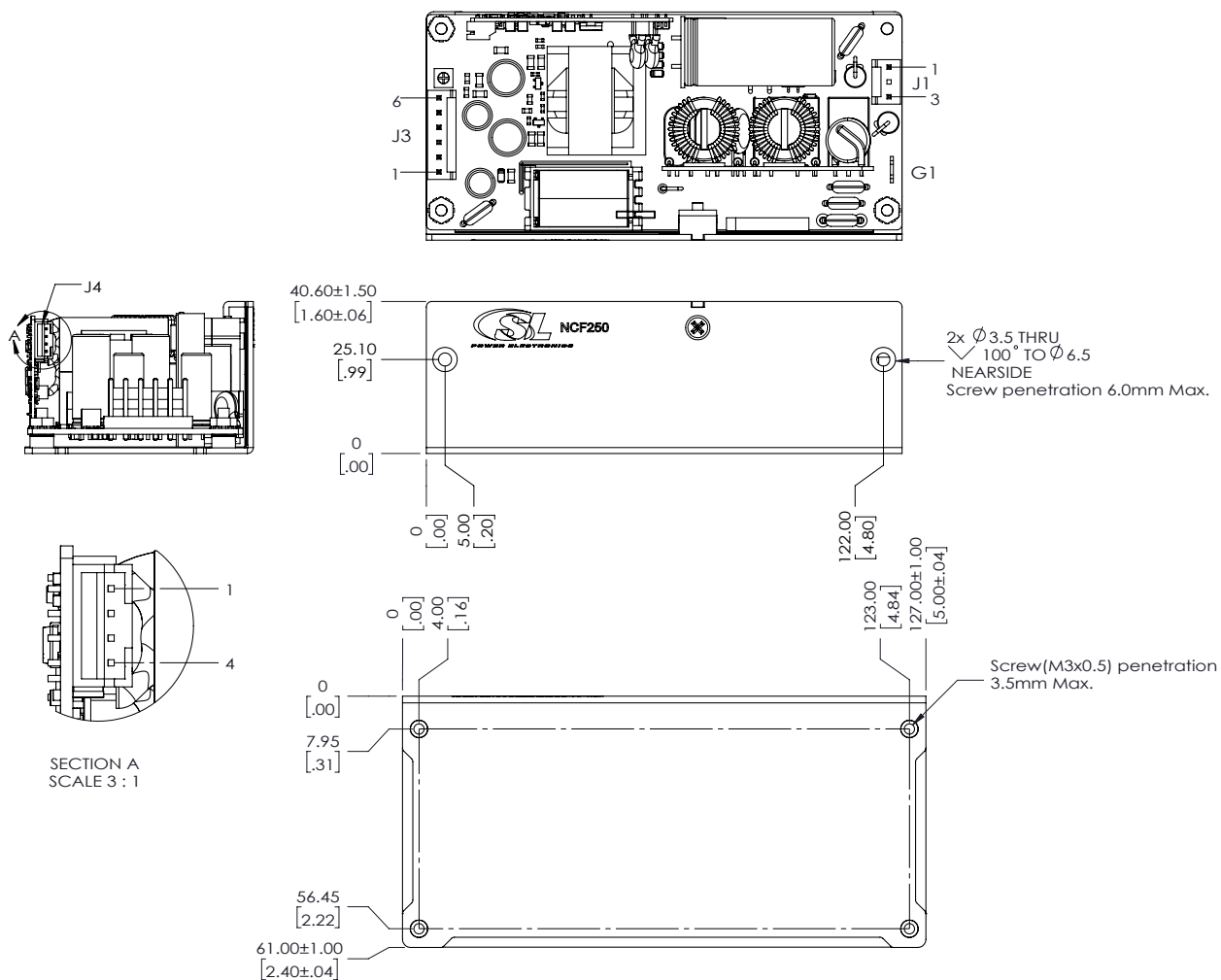
## UNIT PACKAGING REQUIREMENTS

Inserted Instructions	Instruction sheet to be provided with all units packaged in individual unit box if used.
Individual Unit Packing	Units can be packed in egg crate type cartons for production quantities. Individual product shipments include an individual unit box.
Master Carton Shipping Box	40 units per master carton. Unit packaged into carton must be protected such that it will sustain 1.4 m drop test onto hard surface. Only anti-static packing material may be used inside the box. Exterior box sealing tape is anti-static type.
Individual Carton Packing Box (when used)	Individual carton is labelled with RoHS sticker and individual label showing unit serial number, bar code, manufacturing date, bar code, and manufacturing part number, bar code, country of origin.

## PIN ASSIGNMENTS - TBD

Connector	NCF250	
J1 (Input Connector)	PIN 1	AC Neutral
	PIN 2	Empty
	PIN 3	AC Line
J3 (DC Output Connector)	PIN 1	RTN
	PIN 2	RTN
	PIN 3	RTN
	PIN 4	+Vo
	PIN 5	+Vo
	PIN 6	+Vo
J4 (Signal Connector)	PIN 1	5Vsb
	PIN 2	GND
	PIN 3	Inhibit
	PIN 4	DC OK

## MECHANICAL DRAWING



## Notes:

1. All dimensions in mm (inches).
2. Dimensions: W: 2.4" x L: 5.0" x H: 1.6".
3. Unit weight: 290 g.



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## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

**PRECISION | POWER | PERFORMANCE | TRUST**

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