

LHC Series, 250 Watt

AC-DC Power Supply

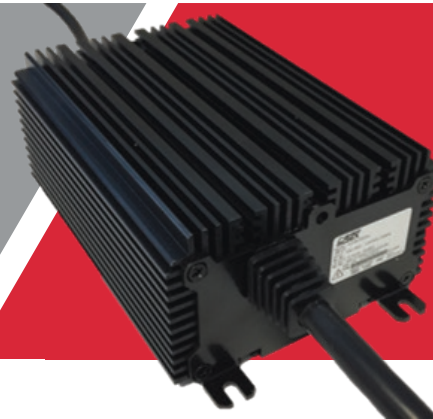


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The LHC is a series of ruggedized IP67 (sealed enclosure) convection cooled AC-DC power modules intended for harsh environment deployments and provide a single regulated Constant Voltage (CV) or Constant Current (CC) mode output designed as voltage sources for general industrial applications.

The power module is encapsulated in a thermally conductive material that transfers internal heat into the extruded aluminum chassis for environmental management.

Features

- Universal AC input with active PFC
- 12V, 24V & 48V constant voltage with constant current overload protection characteristic
- IP67 Enclosure
- 250W convection cooled
- True zero load operation of the Main (V1)
- 6.29" x 3.90" x 2.24" (159.8mm x 99mm x 57mm) footprint
- High efficiency 93% nominal, 100% load
- RoHS2 & REACH compliant
- Two Year Standard Warranty



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Part Number Selection Table

Output Control Characteristic	Nominal Output Voltage (Vdc)	Output Current (A _{dc})	Power Capability (W)	Model Number
CV	12	20.8	250	ACS12.250LHC
CV	24	10.4	250	ACS24.250LHC
CV	48	5.2	250	ACS48.250LHC

Input Characteristics

Parameter	Conditions	Min	Typ	Max	Units
Input Voltage AC Operating Range	AC single phase from utility outlet	90	100V-240V	264	Vac
Turn-on input voltage	Input rising	75		90	
Turn-off input voltage	Input falling	65		80	
Input Frequency	Standard utility supply	47	50/60	63	Hz
Input Current	100 – 240Vac Nom.			3.2	
Inrush Current	230Vac; cold start, 25°C		40		A _{pk}
Input Fuse	Single fuse in AC "Line" time lag; high breaking capacity		6.3		A _{rms}
Efficiency ¹	230Vac; 100% full load, 25°C	93			%
Hold-Up Time	90VAC; Full Load; 50/60Hz; 25°C	10			msec

¹ 48V Model

Output Characteristics

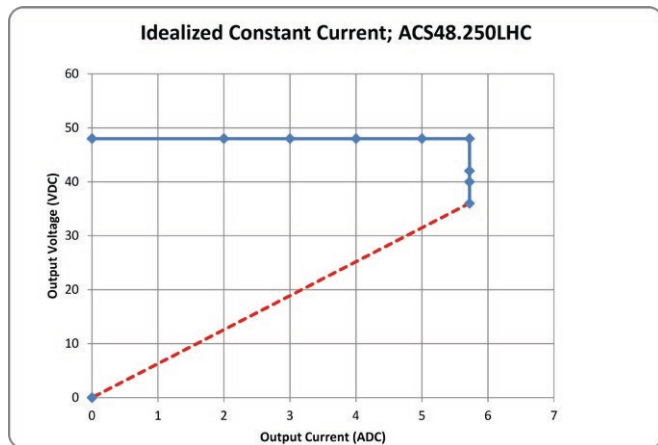
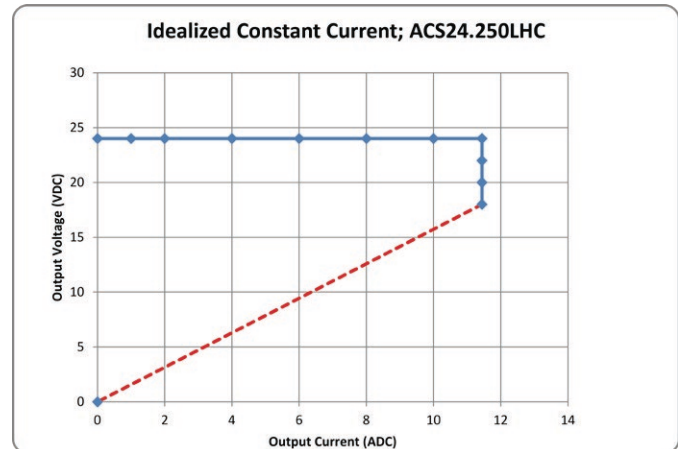
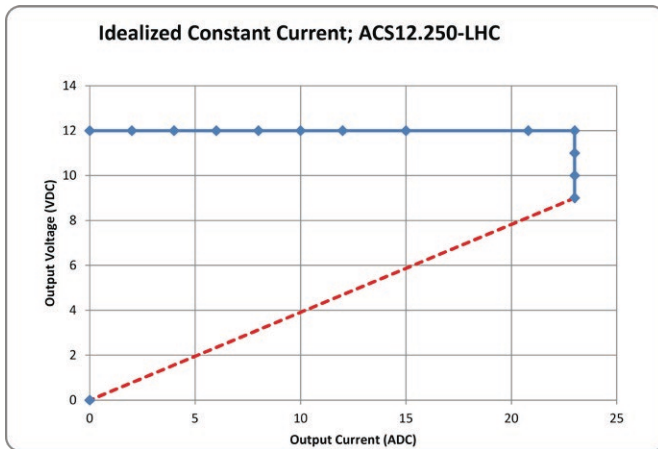
Parameter	Conditions	Min	Typ	Max	Units
Output Regulation Window ¹ (includes set point, line, load temperature)	50% loading; 90-264Vac input source	ACS12.250LHC	11.88	12.00	12.12
		ACS24.250LHC	23.76	24.00	24.24
		ACS48.250LHC	47.52	48.00	48.48
DC Output Current		ACS12.250LHC	0		20.8
		ACS24.250LHC	0		10.4
		ACS48.250LHC	0		5.2
Minimum Load Capability	Stable Operation down to 0 Adc, no minimum load required.	0			
Overload Protection	Constant Current "brick wall" 100% to approximately 75% of V Nom; hiccup protection <75% of V Nom. See curves for additional details.				
Output Ripple & Noise	Voltage Zero to Full Load; 20MHz bandwidth ²			1.5	% of V Nom
Transient Response ³	50% load step, from 10% minimum load 1A/μsec slew rate			± 5	%
Settling Time to 1% of Nominal			2	msec	
Turn-On Delay	After application of input power to rise of output voltage			3	sec
Output Voltage Rise	Monotonic between 10% to 90% of output voltage				
Capacitive Loading	ACS12.250LHC			6,000	μF
	ACS24.250LHC			1,200	
	ACS48.250LHC			750	

¹ measured at stripped ends of output cable

² measured with a parallel combination of ceramic and OSCON capacitors at the power module output cables. A short coaxial cable connected directly to the input of a scope is required

³ min. 1 second time between consecutive transients.

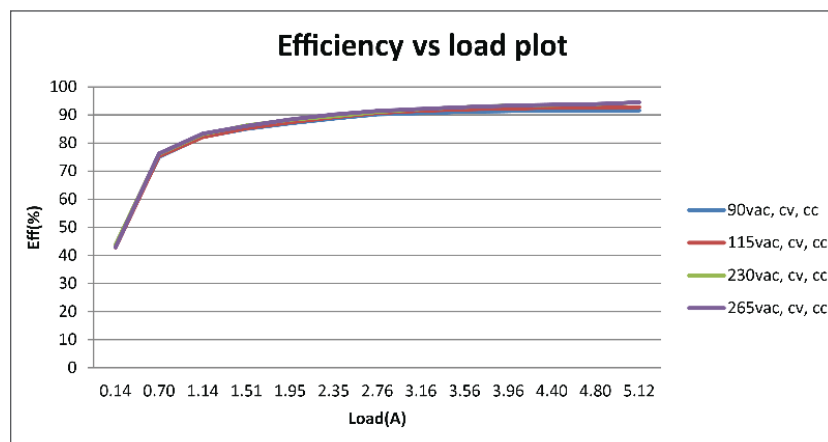
Constant Voltage Overload Performance Curves



1. Curves based on an incremental load (constant resistance) current equivalent to 1Adc increments between 0A and 50A dc.
2. The resultant curve shows current limited to an initial constant “brick wall” shown by the blue portion of the curves.
3. If the overload current exceeds the maximum controlled constant current then the power supply shall enter “hiccup”(recycling) operation mode (red portion of the curve). Additionally If the overload (abnormal) current is maintained above maximum load (in the brick wall blue portion of the curve) for an extended period then, dependent on the prevailing operating temperature, internal over temperature protection may shut down the output to prevent thermal overstress of components (to maintain safe and reliable operation).

Efficiency Performance Curves (25°C Ambient Temperature)

Typical example; ACS48.250CEV Model



Environmental Characteristics

Parameter	Conditions	Min.	Typ	Max.	Units
Storage Temperature Range		-40		85	°C
Operating Temperature Range	External local temperature (ambient) surrounding case. Refer to Thermal Considerations	-20		50	
Operating Humidity	Non-condensing	10		95	%
MTBF	Telcordia SR-332 Issue 3; M1C3 @ 40°C Telcordia SR-332 Issue 3; M1C3 @ 25°C		2,145K 4,500K		Hours
Shock	30G, non-operating	Complies			
Operational Vibration	Sine Sweep; 5-150Hz, 2G Random Vibration, 5-500Hz, 1.11G	Complies			
ITE Standards Audio/ Video & Consumer Standards (Planned submissions):	CB: IEC 60950-1:2005; IEC 60950-1:2005/AMD1:2009; IEC 60950-1:2005/AMD2:2013 CSA: CAN/CSA-C22.2 No. 60950-1-07, Amendment 1:2011, Amendment 2:2014 (MOD); ANSI/UL 60950-1-2014 IEC 62368-1 (pending) CAN/CSA-C22.2 No. 62368-1 (pending) UL 62368-1 (pending)CE Marking per LVD				
Fuse	Single 6.3A time lag; 250V, high breaking capacity				
Outside Dimensions	6.29" x 3.90" x 2.24" (159.8mm x 99mm x 57mm) nominal				
Weight (typ.)	1.57				kg

Protection Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Over Voltage Protection ² ; ACSxx.250LHC (Constant Voltage) models; latching requires recycle of AC source to reset.		110		140	% ¹
Short Circuit Current Protection; all variants	V1, hiccup	140		150	% ²
Over Temperature Protection (Chassis Temperature); Auto-recovery (approximately 18°C hysteresis); refer to Thermal Considerations		105	110	120	°C

¹ Percentage of nominal output voltage

² Percentage of max CC level.

Isolation Characteristics

Parameter	Conditions	Min.	Typ	Max.	Units
Isolation	Primary to Chassis (basic)	2680			Vdc
	Primary to Secondary (reinforced)	4242			
	Secondary to Chassis	500			
Earth Leakage Current	264Vac, 60Hz, 25°C	single fault condition	300		µA
		normal conditions	150		

Emissions and Immunity

Characteristic	Standard	Compliance
Input Current Harmonics	IEC/EN 61000-3-2	Class A
Voltage Fluctuation and Flicker	IEC/EN 61000-3-3	Complies
Conducted Emissions ¹	CISPR32/EN 55032	Class B
	FCC Part 15	Class B
Radiated Emissions ¹	CISPR 22 -3 meter	Class B
	FCC 15.109 - 3 meter	Class B
ESD Immunity	IEC/EN 61000-4-2	Level 4, ±8kV Contact; ±15kV air discharge; Criteria A
Radiated Field Immunity	IEC/EN 61000-4-3	Level 3, Criterion A
Electrical Fast Transient Immunity	IEC/EN 61000-4-4	Level 4, 2kV, Criterion A
Surge Immunity	IEC/EN 61000-4-5	Level 3, Criterion B (1kV CM, 2kV DM)
Radiated Field Conducted Immunity	IEC/EN 61000-4-6	Level 3, 10V/m, Criterion A
Magnetic Field Immunity	IEC/EN 61000-4-8	Level 3, Criterion A
Voltage dips, interruptions	IEC/EN 61000-4-11	Level 3, Criterion B

¹ Requires a common mode choke on the blue and black wires of output cable. Four (4) turns of these wires need to be wound in same direction around a toroid (such as FAIR-RITE#5943001801) See additional "EMI considerations"

Status and Control Signals

Parameter	Conditions
PRESENT_x	A passive signal line directly connected to the Main Output V1 DC Output return “-VE”. Offers a convenient means to verify that the output connector has been correctly connected
PS_ON_x	This signal is intended to turn on/off (enable/disable) the main output for the following purposes: For general deployments in the industrial sector Reset the output following abrupt disconnection of a charging battery (load dump). There are two possible options for the “logic” of this signal:
	PS_ON_H (Default) Active “high”; this signal can be left unterminated to enable (turn on) the main output. If it is desired to turn off the Main Output (during normal operation) then this pin can be pulled “low” to the Main output ground “-VE”. Signal is pulled up to internal +5V bias supply via 10kOhm; when pulled low (externally) sink current approx. 2mA.
	PS_ON_L Active “low” i.e. externally pulled “low” to the main output ground “-VE” to enable (turn on) the main output. Signal is pulled up to +5V internally via 10kOhm. When pulled low (externally) sink current approx. 2mA.

Input & Output Connections

Two permanently attached SJTW, VW-1 type cables are provided for the input and output connections

Input Wires: 3x17AWG

Wire Colour:	Function:
Brown	AC Line 1
Blue	AC Line 2 Neutral
Green/ Yellow	PE/Ground

Output Wires: 4x17AWG

Wire Colour:	Function:
Blue	Main Output “+VE”
Black	Main Output Return “-VE”
Brown	PRESENT
Green/ Yellow	PS_ON

Application Notes



This series of power modules have been evaluated as components for building-in. A suitable electrical and fire enclosure shall be provided in the end use equipment and shall be installed in compliance with the enclosure, mounting, clearances, creepage distances and segregation requirements of the ultimate application.

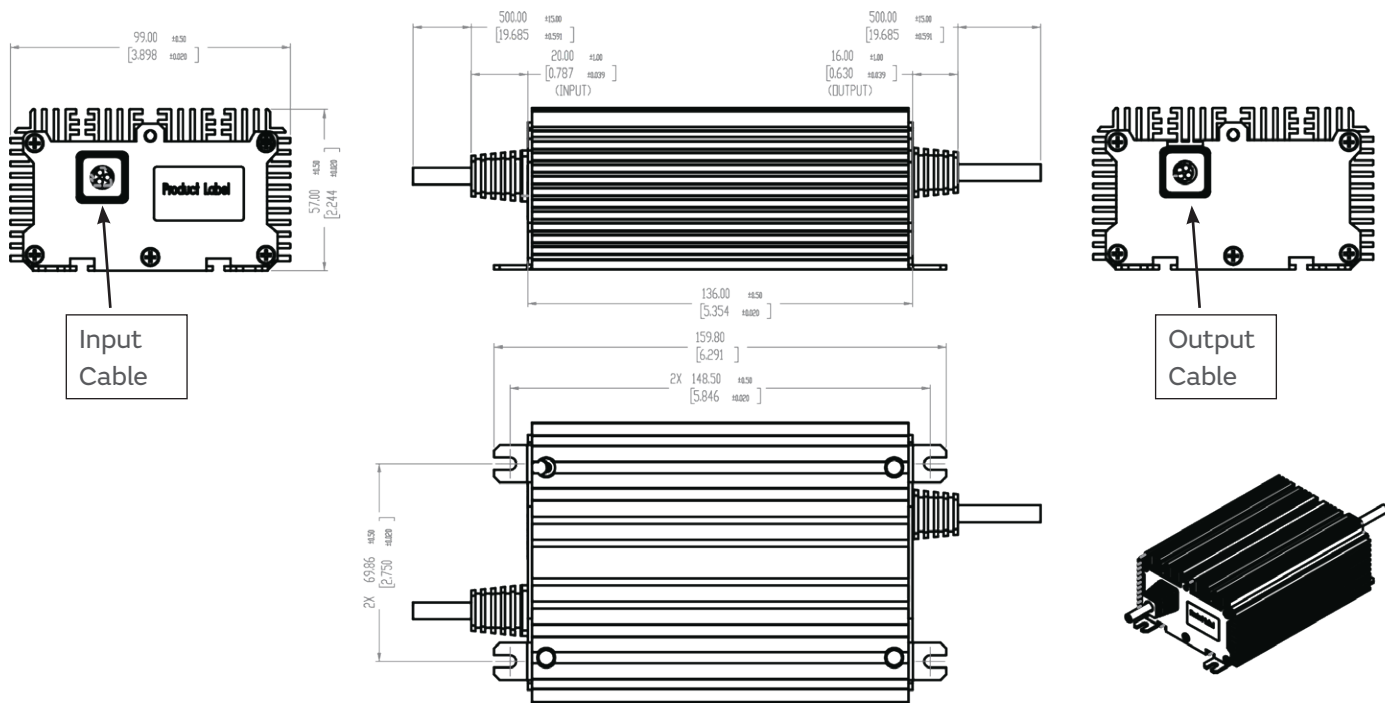
EMI Considerations

For optimum EMI performance, the power supply should be mounted to a metal plate grounded to all 4 mounting holes of the power supply. To comply with safety standards, this plate must be properly grounded to protective earth (see mechanical dimension notes). Pre-compliance testing has shown the stand-alone power supply to comply with EN55022 class B radiated emissions with a metal enclosure with grounded base plate. Radiated emission results vary with system enclosure and cable routing paths.

Thermal Considerations

- System thermal management is critical to the performance of this series. Performance is not derated provided that the power module's chassis/case temperature does not exceed the maximum rated temperature.
- The power module may be capable of operation above the maximum operating temperature however doing so may shorten the life of the power module. Such operating conditions are considered "abnormal" and are not recommended.
- The power module contains several electrolytic capacitors within the encapsulated assembly and can be considered to be the same temperature as the power module's external case temperature. Because life expectancy of the power module is inversely proportional to case temperature of the electrolytic capacitors, it is incumbent upon the end user to provide adequate thermal management in deployment of this power module in respective application.
- The surfaces of the power supply may be hot to the touch and system/host design, including special installation instructions shall make necessary provisions and precautions..

Mechanical Dimensions (Nominal)



NOTES:

1. THE DRAWING IS A GRAPHIC REPRESENTATION OF THE REAL PRODUCT. THE PATTERNS OF FEATURE MAY NOT SHOW ALL FINE DETAILS OR CORRECT PATTERNS. FOR EXAMPLE, THE SCREW FACE PATTERNS OR FAN PATTERNS OR CONNECTORS MAY LOOK DIFFERENT THAN REAL PART. QA USES THIS DRAWING FOR MEASUREMENTS & QUALIFICATION OF OUTGOING PRODUCTS.