

# LH Series

## 5 kW Regulated High Voltage DC Power Supplies

### 1 kV to 150 kV Rack Mount CE Compliant

## Semi S2-93 Compliant

## Fully RoHS Compliant

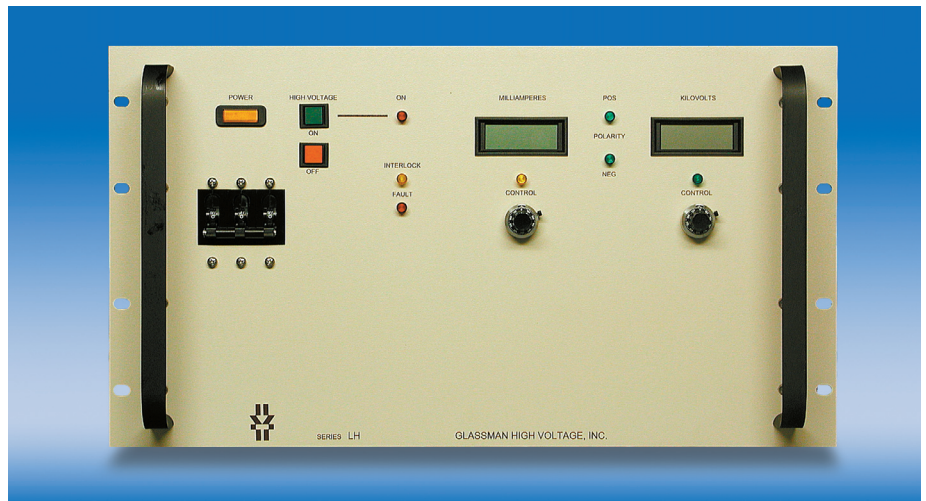
The LH family of power supplies are sophisticated, 5 kW, high voltage power supplies with low ripple and noise. They are air insulated, fast response units, with tight regulation.

Please refer to Technology > Applications page on our web site for typical applications.

The LH Series, when configured with the 400 VAC Input Option, is fully compliant with the following European Harmonized EMI Directives:

- EN61010/ IEC61010, Safety
- EN61000-6-4, Conducted and Radiated Emissions
- EN61000-6-2:2005, Conducted and Radiated Immunity
- 2011/65/EU, Restriction of the use of hazardous substances (RoHS)

CE (Meets all applicable directives), UKCA (Meets all applicable legislation)



Models from 0 to 1 kV through 0 to 150 kV, 10.50" H x 19" W x 24.0" D, 60 lbs.

## Features:

**Arc Quench.** The HV output is inhibited for a short period after each load arc to help extinguish the arc.

**Arc Count.** Internal circuitry constantly senses and integrates arcs that occur over a given time. In the event a system or load arcing problem develops and exceeds factory-set parameters, the power supply will cycle off in an attempt to clear the fault and then automatically restart after a preset "off dwell time".

**Pulse-Width Modulation.** Off-the-line pulse-width modulation provides high efficiency and a reduced parts count for improved reliability.

**Low Ripple.** Ripple is less than 0.05% RMS of rated voltage at full load.

**Air Insulated.** The LH Series features "air" as the primary dielectric medium. No oil or encapsulation is used to impede serviceability or increase weight.

**Constant Voltage/Constant Current Operation.** Automatic crossover from constant-voltage to constant-current regulation provides protection against overloads, arcs, and short circuits.

**Constant Current/Current Trip.** A rear panel switch allows selection of either current mode.

**Redundant Thermal Overload Protection.** Thermostats and fan RPM sensing shut down the power supply due to over temperature or reduced fan speeds.

**Tight Regulation.** Voltage regulation is better than 0.005% for allowable line variations and 0.01% for allowable load variations. Current regulation is typically better than 0.2% from short circuit to rated voltage.

**Differentially Coupled Analog Control Signals.** All voltage and current programming and monitoring signals are coupled to the user interface by true differential amplifiers. This provides for the ability to return the program and monitor commons to ground or system common at the source. This arrangement isolates the return wires and eliminates errors due to unwanted return currents flowing in these connections.

**Warranty.** All power supplies are warranted for three years. A formal warranty statement is available

# Specifications

(Specifications apply from 5% to 100% rated voltage. Operation is guaranteed down to zero voltage with a slight degradation of performance.)

**Input:** 187 - 228 V RMS, Three-Phase, 48-63 Hz, 6500 VA maximum at full load. Less than 20 A per phase at 208 VAC. A five position rear terminal block with protective cover is provided.

**Mains service must be protected with fuses or circuit breakers with a maximum rating of 100 A for 200/208 VAC models & 60 A for 400 VAC models.**

**Efficiency:** Typically greater than 85% at full load.

**Output:** Continuous, stable, adjustment from 0 to rated voltage or current by panel mounted 10-turn potentiometers with 0.05% resolution, or by external 0 to 10 V signals is provided. Voltage accuracy is 0.5% of setting + 0.2% of rated.

**Static Voltage Regulation:** Better than  $\pm 0.005\%$  for specified line variations and 0.01% for no load to full load variations. For 80-100kV models, V-Load regulation is 0.025%.

**Dynamic Voltage Regulation:** For load transients from 10% to 99% and 99% to 10%, typical deviation is less than 2% of rated output voltage with recovery to within 1% in 500  $\mu$ s and recovery to within 0.1% in 1 ms.

**Ripple:** Better than 0.05% RMS of rated voltage at full load.

**Current Regulation:** When in current regulation mode, 8-150 kV, better than 0.2%, 1-6 kV, better than 0.5% from short circuit to rated voltage at any load condition.

When in current trip mode the HV output will disable and latch off when the load current reaches the programmed current level. Reset is accomplished by either cycling the AC power or HV ON/OFF buttons, or by toggling the HV enable signal. A switch located on the rear panel allows the selection of current limit modes:

constant current, or current trip.

**Voltage Monitor:** 0 to +10 V equivalent to 0 to rated voltage. Accuracy: 0.5% of reading + 0.2% of rated. Impedance is 10K  $\Omega$ .

**Current Monitor:** 0 to +10 V equivalent to 0 to rated current. Accuracy:  
1 kV to 6 kV: 1.5% of reading plus 0.5% of rated output.  
8 kV to 150 kV: 1% of reading plus 0.2% of rated output.  
Impedance is 10K  $\Omega$ .

**Stability:** 0.01% per hour after 1/2 hour warm-up, 0.05% per 8 hours.

**Voltage Rise/Decay Time Constant:** (Typical using either HV enable or remote programming control and a resistive load.)  
1-6 kV:  $\tau = 50$  ms with 4% min. load.  
8-20 kV:  $\tau = 50$  ms with 9% min. load.  
25-100 kV:  $\tau = 200$  ms with 7% min load.  
125-150 kV:  $\tau = 400$  ms with 8% min load.

**Temperature Coefficient:** 0.01%/°C.

**Ambient Temperature:** -20 to +40°C, operating; -40 to +85°C, storage.

**Protection:** Automatic current regulation protects against all overloads, including arcs and short circuits. Thermal switches and RPM sensing fans protect against thermal overload. Fuses, surge-limiting resistors, and low energy components provide ultimate protection.

**Arc Quench:** Optional on models 1 kV through 6 kV; standard on models 8 kV through 150 kV. An arc quench feature provides sensing of each load arc and quickly inhibits the HV output for approximately 20 ms after each arc.

**Arc Count:** Optional on models 1 kV through 6 kV; standard on models 8 kV through 150 kV. Internal circuitry senses the number of arcs caused by external load discharges. If the rate of consecutive arcs exceeds approximately one arc per second for five arcs, the supply will turn off for approximately five seconds to allow clearance of the fault. After this period, the supply will return automatically to the programmed output voltage value with the

voltage rise time constant indicated. If the load fault still exists, the above cycle will be repeated

**External Interlock:** Open = off, closed = on. Normally latching except for blank front panel version where it is non-latching.

**Front Panel Elements.** The front panel contains all local control functions. These control functions are: AC power on/off circuit breaker and indicator light, separate 10-turn controls with locking vernier dials used to set voltage and current levels, HIGH VOLTAGE ON switch, and HIGH VOLTAGE OFF/RESET switch. LED's indicate: when high voltage is on, output polarity, interlock, fault status, and whether the supply is operating in a voltage or current regulating mode. Output levels are indicated by voltage and current digital meters.

**Rear Panel Elements.** AC power entry terminal strip, power on indicator, ground stud, HV output connector, current limit/current trip switch, remote interface terminal strip and connector.

The remote interface terminal strip provides connections for the interlock circuit. In addition, jumpers on the terminal strip select local or remote operation of current program, voltage program and HV enable. Signal common and ground reference terminals are also provided.

The remote interface connector provides differential voltage and current program signals, high voltage enable, differential output voltage and current monitor signals, HV enable status, I/V regulation mode status, fault status, and a +10 V reference source. Signal common and ground reference terminals are also provided.

**Remote HV Enable/Disable:**  
0 - 1.5 V = OFF,  
2.5 - 15 V = ON.

**Accessories:** Remote interface mating connector and detachable, 8 foot, shielded high voltage coaxial cable provided. See Model Chart for cable type.

**Weight:** 60 pounds.

# Options

Symbol	Description
200	180 to 220 VRMS, three phase input, 48-63 Hz, derate output current by 10%.
400	340 to 460 VRMS, three phase, 48-63Hz. (Required for CE compliance.)
NC	Blank front panel, power switch only.
ZR	Zero start interlock. Voltage control, local or remote, must be at zero before HV will enable.
SS	Slow start ramp. Specify standard times of 5, 10, 15, 20, or 30 seconds $\pm$ 20% .

Symbol	Description
5VC	0-5 V voltage and current program/monitor.
ARC	For 1 to 6 kV models. Arc quench and arc count are provided as described in specifications for 8 to 150 kV models.
FG	Common to ground isolation for 1 to 6 kV models. (Standard on 8 to 150 kV models.)
K01	RS-232/USB control and monitor
K02	RS-232/USB/Ethernet control and monitor

Please consult factory for special requirements.

# Models

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage	Output Current	Stored Energy (J)	Output Cable	
Reversible Polarity Only			LH1R5.0	0 - 1 kV	0 - 5.0 A	3.5	RG-8U
			LH1.5R3.3	0 - 1.5 kV	0 - 3.3 A	5.5	RG-8U
			LH2R2.5	0 - 2 kV	0 - 2.5 A	3.8	RG-8U
			LH3R1.7	0 - 3 kV	0 - 1.7 A	5.5	RG-8U
			LH5R1.0	0 - 5 kV	0 - 1.0 A	3.5	RG-8U
			LH6R850	0 - 6 kV	0 - 850 mA	5	RG-8U
LH6P630	LH8N630	LH8R630	0 - 8 kV	0 - 630 mA	6	RG-8U	
LH10P500	LH10N500	LH10R500	0 - 10 kV	0 - 500 mA	7.5	RG-8U	
LH12P420	LH12N420	LH12R420	0 - 12 kV	0 - 420 mA	11	RG-8U	
LH15P330	LH15N330	LH15R330	0 - 15 kV	0 - 330 mA	7	RG-8U	
LH20P250	LH20N250	LH20R250	0 - 20 kV	0 - 250 mA	10	RG-8U	
LH25P200	LH25N200	LH25R200	0 - 25 kV	0 - 200 mA	7	DS2124	
LH30P170	LH30N170	LH30R170	0 - 30 kV	0 - 170 mA	11	DS2124	
LH40P125	LH40N125	LH40R125	0 - 40 kV	0 - 125 mA	14	DS2124	
LH50P100	LH50N100	LH50R100	0 - 50 kV	0 - 100 mA	18	DS2124	
LH60P85	LH60N85	LH60R85	0 - 60 kV	0 - 85 mA	21	DS2124	
LH70P72	LH70N72	LH70R72	0 - 70 kV	0 - 72 mA	25	DS2124	
LH80P63	LH80N63	LH80R63	0 - 80 kV	0 - 63 mA	28	DS2124	
LH100P50	LH100N50	LH100R50	0 - 100 kV	0 - 50 mA	35	DS2124	
LH125P32	LH125N32	LH125R32	0 - 125 kV	0 - 32 mA	40	DS2121	
LH150P25	LH150N25	LH150R25	0 - 150 kV	0 - 25 mA	58	DS2121	

