

## HITEK POWER® OLSIOK SERIES 10 KW HIGH-VOLTAGE POWER SUPPLIES



# AC-to-HVDC single-output rack-mount high-voltage power supplies

The <u>OLS10K series</u> range of single-output high-voltage power supplies meets the exacting requirements found in electron beam, ion beam, and x-ray systems, as well as ion and chemical vapor deposition, electrostatic precipitation, and other 24/7 production processes.

## Features

- High packing density:
   10 kW output power in 6 U rack mounted chassis
- Output voltages from 1 to 80 kV
- Parallel option to give 20 to 100 kW
- › High stability
- Exceptional reliability in severe electrical environments
- Arc Count and Extinguish (ACE)
- Full local and remote control and monitoring
- Analog or RS232 remote control
- › Voltage or current control
- CE marked for EU LV directive 2006/95/EC
- RoHS compliant to EU directive 2011/65/EU
- Custom options available

# **Typical Applications**

- Electron beam
- › Ion beam
- › X-ray
- > Lasers
- HV pulse generator bias
- > HV amplifier bias
- Electrostatic precipitation
- Chemical purification



Designed using the latest power-switching IGBTs to ensure efficient and reliable operation over the full operating range, the OLS10K will give exemplary performance in the most severe of electrical environments. The OLS10K series achieves an exceptionally high packing density for high-voltage power supplies of this power level, giving 169 W per Liter, 2.7 W per inch<sup>3</sup>. The 6 U construction allows operation at full power when close mounted in a standard equipment rack, giving significant savings in rack space in large systems. Featuring a proprietary Arc Count and Extinguish (ACE) system for managing systems where load arcing is endemic, the OLS10K series protects both itself and the load from damage that may be caused by excessive arcing while allowing normal operation to continue. The OLS10K series features both analog and remote control (optional RS232) interfaces. A full set of commands is available over the optional RS232 interface to control and monitor the operation of the power supply.

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Output Power     10 k/m ax at full rated output voltage from T to B0 k/       Output Voltage     Units available with max output voltages from T to B0 k/       Output Current     Up to 10 A for 1k van 125 mA for B k/ (see table)       Model     OLSIOK     ISO WAC ±10K (S107 to 229 VAC)       Big VAC ±10K (S107 to 229 VAC)     S00 VAC ±10K (S107 to 239 VAC)     VAC ±10K (S107 to 239 VAC)       Voltage Ripple: Voltage     C 0.05% of rated voltage repair     VAC ±10K (S107 to 239 VAC)       Voltage Ripple: Voltage     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Voltage Ripple: Voltage     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Voltage Ripple: Current     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Voltage Ripple: Current     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair     C 0.05% of rated voltage repair       Line Voltage Repair     C 0.05% of rated voltage repair	PHYSICAL SPECIFICATION	S				
Output Voltage         Units available with max output voltages from 1 to 80 VV           Output Current         Up to 0 A for 1 kV and 125 mA for 80 VK (see table)           Model         OLSIOKC         OLSIOKC         OLSIOKE           Input Voltage         208 VAC :10% (187 to 229 VAC) 47 to 53 k2 is phase plus arotective worth arotective worth         350 VAC :10% (342 to 418 VAC) 47 to 53 k2 is phase plus arotective worth         OLSIOKC         OLSIOKE           Voltage Rippis: Voltage Model         208 K or fasted voltage +2V, peak to peak to 7 0.0% of rated voltage +2V, peak to peak to 7 0.0% of rated voltage +2V, peak to peak to 7 0.0% of rated voltage +2V, peak to peak to 7 0.0% of rated voltage rest (s 0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s 0.5% of rated voltage rest)         <0.5% of rated voltage rest (s rest) of ra	Output Power	10 kW max at full rated output volta	ge and current			
Output Current         Up to 10 A for 1kV and 125 m A for 80 kV (see table)           Model         OLSTOK         OLSTOKC         OLSTOKC         OLSTOKC           Input Voltage         208 VAC ±10% (187 to 229 VAC) protective earth protective earth protective earth protective earth         360 VAC ±10% (247 to 351 V3C) protective earth         400 VAC ±10% (250 to 400 VAC) 47 to 351 V3C append plus protective earth         400 VAC ±10% (250 to 400 VAC) 47 to 351 V3C append plus protective earth         400 VAC ±10% (250 to 400 VAC) 47 to 351 V3C append plus protective earth         400 VAC ±10% (250 to 400 VAC) 47 to 351 V3C append plus protective earth         400 VAC ±10% (250 to 400 VAC) 47 to 351 V3C append plus protective earth         400 VAC ±10% (250 VAC ±	Output Voltage	Units available with max output voltages from 1 to 80 kV				
Model         OLSTOKC         OLSTOKC         OLSTOKE           Input Voltage         208 VAC ±10% (187 to 229 VAC) d7 to 53 Hz 3 phase plus protective earth         380 VAC ±10% (324 to 48 VAC) 47 to 53 Hz 3 phase plus protective earth         470 to 53 Hz 3 phase plus protective earth         422 A per phase         423 K or rated voltage rate peak or < 0.0% of rated voltage peak to peak or < 0.0% of rated voltage peak to peak or < 0.1% of rated voltage peak to peak or < 0.1% of rated voltage peak to peak or < 0.1% of rated voltage rate peak or < 0.1% of rate voltage rate peak or < 0.1% of rated voltage rate peak or < 0.1% of rated voltage rate peak or < 0.1% of rated vo	Output Current	Up to 10 A for 1 kV and 125 mA for 80 kV (see table)				
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Line Voltage Regulation< 0.01% + 0.5 V change in output voltage for a 10% change in line voltageLoad Voltage Regulation< 0.01% + 0.5 V change in output voltage for 0 to 100% change in load currentLine Current Regulation< 0.5% of rated current for 0 to 100% change in outputPolarityPositive or negative to orderSpecification RangeSpecifications apply above 5% of rated output voltage. The output can be controlled down to < 0.25%CalibrationCalibration between voltage demand, output voltage, and voltage monitor ±0.2% of setting or ±0.05%Recovery Time< 200 ms to within 0.1% of previous operating level following a short circuit or arc. Max overshoot 2% of rated output voltage.	Voltage Ripple: Current Mode	< 0.5% of rated voltage peak to peak or < 0.1% of rated voltage rms	< 0.5% of rated voltage peak to peak or < 0.1% of rated voltage rms	< 0.5% of rated voltage peak to peak or < 0.1% of rated voltage rms		
Load Voltage Regulation< 0.01% + 0.5 V change in output voltage for 0 to 100% change in load currentLine Current Regulation< 0.5% of rated current for 0 to 100% change in outputPolaritySolitive or negative to orderSpecification RangeSpecifications apply above 5% of rated output voltage. The output can be controlled down to < 0.25% of rated output voltage.CalibrationCalibration between voltage demand, output voltage, and voltage monitor ±0.2% of setting or ±0.05% of rating, whichever is greaterRecovery Timec200 ms to within 0.1% of previous operating level following a short circuit or arc. Max overshoot 2% of rated output voltage.Operating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01% per hour after 1 h warnup, typically < 0.02% per 8 h after 1 h warnup, at constant load, line and temperatureOperating Temperature< 0.01	Line Voltage Regulation	< 0.01% +0.5V change in output volt	age for a 10% change in line voltage			
Line Current Regulation       < 0.5% of rated current for 0 100% change in output         Polarity       Positive or negative to order         Specification Range       Specifications apply above 5% of rated output voltage. The output can be controlled down to < 0.25% of rated output voltage.         Calibration       Calibration between voltage demand, output voltage, and voltage monitor ±0.2% of setting or ±0.05% of rated output voltage.         Recovery Time       Calibration between voltage demand, output voltage, and voltage monitor ±0.2% of setting or ±0.05% of rated output voltage.         Temperature Coefficient       < 100 pm/°C         Operating Temperature       0 to 40°C (32 to 140°F)         Storage Temperature       0 to 47°C (4 to 158°F)         Humidity       80% max relative humidity up to 31°C (88°F), reducing linearly to 50% at 40°C (104°F). Non-condensing         Altitude       Sea level to 2000 m (6500')         Installation Category       I (85 EN61010-1)         Usage       Provided as part of an alpha-numeric display. Voltages are displayed with a resolution of > 0.5% of rated output. Voltage and current set values can be applayed by pressing the relevancy or voltage, over temperature, fan failure, and current limit. Peak arc current is resistively limited.         Status Indication       Uses the alpha-numeric display. Voltages are counted to determine the arc cate; if this exceeds a sea level to 2000 to recover. If more arcs accur they are counted to determine the arc cate; if this exceeds a sea level to the orcever. If more arcs accu	Load Voltage Regulation	< 0.01% +0.5 V change in output vol	tage for 0 to 100% change in load cu	rrent		
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	Safety Class	Equipment Class 1				

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PHYSICAL SPECIFICATION	S		
Cooling	The unit utilizes forced air cooling. Air is drawn in via the front panel slotted opening and through side panel vents. Ensure that within the rack there is a free air opening with a minimum effective area of 195 cm <sup>2</sup> directly in front of the unit front panel slots. An additional free air opening with a minimum effective area of 195 cm <sup>2</sup> is required for the side vents. Air flow from this additional free air opening to the side vents of the power converter must not be restricted. The expected air flow for each opening is approximately 50 liters per second. The maximum temperature of the air entering the unit must not exceed 40°C. The unit can dissipate up to 2 kW, therefore provision must be made to extract the exhaust air from the rack in order to prevent possible overheating.		
EMC	Intended for installation as a component of a system and designed to meet:		
	EN55022 class B for conducted and radiated emissions		
	EN61000-4-2 ESD - levels ±4 kV contact, 8 kV air discharge		
	EN61000-4-4 fast transients on mains input - levels ±2 kV		
	EN61000-4-5 surges - levels $\pm 2 \text{ kV}$ line to earth, $\pm 1 \text{ kV}$ line to line		
	EN61000-4-8 magnetic fields - levels 30 A/m at 50/60 Hz		
	EN61000-4-11 voltage dips, interruptions		
	The unit will not trip and recovers to normal operation after a disturbance as defined in SEMI F47-0706.		
	The EMC performance of the power supply can only be fully assessed when installed within, and as part of, the final system.		
RoHS	The OLS10K series meets the requirements of EU Directive 2011/65/EU on the Restriction of use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.		
Mechanical Specifications			
Dimensions	See outline drawing		
Weight	45 kg (99 lb)		
Connections	All connections are mounted on the rear panel		
Mains	Harting HAN C, 3 m cable provided		
Safety Earth	M6 stud		
HV Output	Proprietary coaxial connector, 3 m cable provided		
Front Panel	Stoving enamel trimite full gloss S60/9 color blue RAL5011 as standard		
	Blank front panel available to order (see below)		

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## **REMOTE CONTROL INTERFACE CONNECTIONS:**

The OLS10K series is fitted with an analog remote control interface as standard, control is via a 25-way female D-type connector:

	1	
14	· ·	V STATUS INDICATOR
10	2	I STATUS INDICATOR
15	3	HV OUTPUT VOLTAGE MONITOR
10	4	FAULT INDICATOR
1/	5	LOCAL INDICATOR
18	6	HV ON INDICATOR
19	7	VOLTAGE DEMAND MONITOR
20	8	HV ON/OFF CONTROL LO
21	9	HV ON/OFF CONTROL HI
22	10	VOLTAGE DEMAND HI
23	11	VOLTAGE DEMAND LO
24	12	0 V
25	1.7	
/	13	MONITOR 0 V

2

3

- HV OUTPUT CURRENT MONITOR
- 5 HV OFF INDICATOR
- REMOTE INDICATOR
- 17 ARC MONITOR INDICATOR
- 18 +10 V REFERENCE VOLTAGE
- 9 NO CONNECTION
- 0 NO CONNECTION 21 HV ENABLE LO
- 2 HV ENABLE HI
- 3 CURRENT DEMAND LO
- 4 CURRENT DEMAND HI
- NO CONNECTION

All logical indicators are open collector outputs rated at 16 V (max) in the off state. An internal 100  $\Omega$  resistor is connected in series with the open collector transistor. The pull down voltage is 0.9 V plus the internal resistor drop.

All analog voltage and current monitors are 0 to +10 V  $\pm$ 0.5%  $\pm$ 20 mV, with respect to pin 13, representing 0 to rated output. Signal impedance is < 100  $\Omega$  and minimum external load resistance is 2 k $\Omega$ .

All analog voltage and current inputs are 0 to +10 V on the HI input with respect to the LO input representing 0 V to rated output  $\pm 0.2\%$  of setting  $\pm 0.1\%$  of rating. Input impedance is better than 50 k $\Omega$ .

### DIGITAL RS232 REMOTE CONTROL 9-WAY FEMALE D-TYPE CONNECTOR:

- NO CONNECTION TXD TRANSMIT DATA RXD RECEIVE DATA NO CONNECTION SIGNAL GROUND
- 6 NO CONNECTION
  7 NO CONNECTION
  8 NO CONNECTION
  9 NO CONNECTION

The OLS10K series is configured as a DCE device. To connect to a PC or other DTE device, use a pin to pin DB9 female to male serial cable.

The communication is set to 9600 Baud, one start bit, one stop bit, and no parity.

The connector shell can be connected to earth and cable screen.

A comprehensive set of commands is available for the control and monitoring of the power supply.

- These component power supplies meet the requirements of EC Directive 2006/95/EC (LVD).



Note: Drawing dimensions are in mm (")

#### **OUTPUT AND ORDERING INFORMATION**

MODEL NO 208 VAC INPUT	MODEL NO 380 VAC INPUT	MODEL NO 400 VAC INPUT	OUTPUT VOLTAGE	OUTPUT CURRENT
OLS10K-102*	OLS10KC-102*	OLS10KE-102*	1 kV	10 A
OLS10K-202*	OLS10KC-202*	OLS10KE-202*	2 kV	5 A
OLS10K-502*	OLS10KC-502*	OLS10KE-502*	5 kV	2 A
OLS10K-103*	OLS10KC-103*	OLSK10E-103*	10 kV	1 A
OLS10K-203*	OLS10KC-203*	OLS10KE-203*	20 kV	500 mA
OLS10K-303*	OLS10KC-303*	OLS10KE-303*	30 kV	333 mA
OLS10K-403*	OLS10KC-403*	OLS10KE-403*	40 kV	250 mA
OLS10K-503*	OLS10KC-503*	OLSK10E-503*	50 kV	200 mA
OLS10K-603*	OLS10KC-603*	OLSK10E-603*	60 kV	166 mA
OLS10K-803*	OLS10KC-803*	OLS10KE-803*	80 kV	125 mA
A1040958-3M0	OLS10K 3M HV Cables			
A1040958-5M0	OLS10K 5M HV Cables			
A1040958-10M	OLS10K 10M HV Cables			

\* Please choose the input voltage required, then add the required suffixes to the appropriate model number (in the order given) to indicate polarity and type of front panel required, as well as whether RS232 control is required:

- P Positive polarity
- N Negative polarity (80 kV maximum)
- *B* Blank front panel (remote control only)
- C RS232 control interface

e.g. OLS10KC-203PBC for a 380 VAC input voltage unit with 20 kV positive polarity with no display or front panel controls (blank front panel), with an RS232 interface.

See separate datasheet on our OLS10KD series for dual voltage range capability with accurate control and low ripple down to 1% of maximum rated output. Other voltages and combinations are available to special order.

For voltages not listed above, please contact our sales team.



For international contact information, visit advanced-energy.com.

ENG-HV-OLS10K-230-02 2.17