

PRECISION ELECTRON BEAM POWER SUPPLY

MODEL EBL-03-50E ACCELERATION VOLTAGE -50kV 500uA, ENHANCED

DESCRIPTION

The Model EBL-03-50E is a flagship model of acceleration power supply, specifically designed for research and development applications in electron beam lithography, electron beam and negative ion beam sources, and production testing of Schottky electron sources. It features sophisticated high-precision ultra-low-noise power sources with enhanced control, feedback, and monitoring features and was specifically designed for R&D and testing environment.

Unique features of EBL-03 series of high-voltage power supplies specially designed for operating Schottky Field Emission source in Electron Beam Lithography (EBL) application include single-clock operation and fully linear regulation, resulting in extremely low ripple and noise, no clock-beat ripple, and no bit hopping artifacts with acceleration voltage up to -50kV. The integrated power supply consists of three independently-operated sources: Accelerator (Beam) voltage, Suppressor (Wehnelt or Bias) voltage, and Filament power. Filament power supply can operate as voltage or current source and in power control mode; rest of the supplies are voltage sources. Suppressor voltage and central tap of Filament power supply are referenced to the Accelerator potential.

Fully analog internal feedback loop is provided to linearly stabilize emission current by controlling the Suppressor voltage without any digital artifacts. Output voltages and currents are precisely controlled and monitored through a microprocessor interface using front-panel controls or commands sent to the power supply over a remote interface.

In local mode all adjustable parameters can be controlled by knobs located on the front panel of the power supply. In remote control mode all adjustable parameters are set through the remote interface. Indication of current operational parameters is provided by digital displays on the front panel of the power supply, and available for readback with 16-bit resolution and 0.1% accuracy through the remote interface.

Buffered ground-referenced outputs with analog voltage signals also available for direct monitoring of acceleration voltage, emission current, ripple and micro-discharge events.

Power supply supports remote interface with RS-232 serial protocol as standard and optional support for Ethernet and/or USB communication.



Electron Beam High Voltage Power Supply

! DANGER !

High voltage power supply generates extreme electrical tension and may output current or store electrical charge at levels which are inherently hazardous. Improper installation or usage could result in electrical discharge or sustainable arc, and may cause fire, burns, shock, electrocution, and death. User is solely responsible for high voltage safety and fully accepts all liability for any damages or harm sustained, caused, or inflicted while handling, installing, or operating high voltage modules, power supplies, and other instrumentation, systems, or components.

Particle Beam Systems & Technology

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OUTPUT SPECIFICATIONS

Accelerator (Beam) voltage source:

- 0 to -50kV @ 500 μ A operational mode - **referenced to Ground**
- 0 to -55kV @ 500 μ A short-term “curing” mode
- 50V p-p absolute accuracy over entire range
- < 100mV p-p ripple and noise in 1Hz to 100kHz range, including common mode
- 100mV p-p line and load regulation
- 500mV p-p short term stability over 1 Hour period (after 60min warm-up)
- 1V p-p long-term stability over 8 Hour period (after 60min warm-up)
- 5ppm/⁰C temperature coefficient (0 to 50⁰C range after 60 min warm-up)
- Programming via remote interface 0 to -50kV with 16 bit resolution
- Voltage and current monitor via remote interface with 16 bit resolution 0.1% accuracy
- Buffered, ground-referenced voltage and current monitor signals 0 to +5V, 0.1% accuracy
- Output should ramp up to -50kV \pm 100V within 30 Sec after power up and enable
- Short-circuit and over-current protected with auto-recovery

Suppressor (Wehnelt or Bias) voltage source:

- -200V to -1.1kV @ 10 μ A - **referenced to Accelerator**
- \pm 100mV absolute accuracy
- < 10mV p-p ripple and noise
- 10mV line and load regulation
- \pm 100mV long term stability over 8 hours period (after 20 min warm-up)
- 100ppm/⁰C temperature coefficient (after 60 min warm-up)
- Programming via remote interface -220V to -1.1kV with 16 bit resolution
- Voltage and current monitor via remote interface with 16 bit resolution, 0.1% accuracy
- Short-circuit and over-current protected with auto-recovery

Filament power source:

- Central tap is referenced to accelerator
- 0 to 4A DC limited to 8V 32W in current source mode
- 0 to 8V DC limited to 4A 32W in voltage source mode
- 0 to 32W limited to 8V 4A in power control mode
- 5mA / 25mV p-p line and load regulation
- 3mA / 12mV p-p ripple and noise
- Remote programming 0 to 4A with 16 bit resolution
- Remote programming 0 to 8V with 16 bit resolution
- Remote programming 0 to 32W with 16 bit resolution
- Remote current and voltage monitors with 16 bit resolution, 0.1% accuracy

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GENERAL SPECIFICATIONS

- AC powered: 120-240 V AC \pm 10%; @ 1.5A; 3A fuse protected
- 19" rack mount with rails; 5U modular design with access for repair and service
- All outputs can be enabled and disabled through remote interface and by hardware interlock switch via relay contact (separate connector). After the power supply is deactivated via hardware interlock, outputs of all power sources are switched off. The power supply should not be reactivated until it is explicitly re-enabled by a command through remote interface, even if the interlock is restored.
- Remote control via RS232 interface for floating and ground-referenced supplies is provided through separate fiber-optics channels.
- Optional control via Ethernet or USB interface for floating and ground-referenced supplies is provided through single ground-referenced communication channel.
- Zero corona operation at all times
- Without HV cable connection all output voltages should drop below 200V in 10 seconds when interlock opens or "zero output" signal is sent via remote control interface.
- Fault, interlock, and normal operation indicators should be provided on the front panel.
- All voltage supplies should go into current limit mode when maximum current is reached.
- All current supplies should go into voltage limit mode when maximum voltage is reached
- Short circuit and arc protection are provided, recovery is automatic.
- Units must be non-microphonic as measured at any output within frequency range 0.1 to 1000 Hz

Front panel controls and indicators:

- Power ON/OFF switch
- High (acceleration) voltage ON/OFF switch (overrides remote "enable")
- Interlock LED indicator
- High Voltage Enabled LED indicator
- Knobs adjustments for output parameters
- LCD indicators for controlled output parameters

Rear panel connectors:

- Three-pin high voltage connector
- Standard power connector
- Interlock connector, DB-9M pins 5 and 6 should have +5V to enable HV output
- Remote monitors connector DB-9F: acceleration voltage, emission current.
- Remote microdischarge monitor, BNC connector standard TNC optional
- Remote beam ripple monitor, BNC connector standard TNC optional

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Remote monitor signals:

- Acceleration voltage monitor signal: 0 to +5.0V output for 50kV acceleration voltage with 0.1% accuracy. Monitor output impedance 10k Ω .
- Emission current monitor signal: 0 to +5.0v output for 0 to 500 μ A emission current with 0.1% accuracy. Monitor output impedance 10k Ω .
- Arc monitor: buffered 1:1 AC output
- Beam ripple monitor: buffered 1:1 AC output

MECHANICAL SPECIFICATIONS

Dimensions:

17"W x 5 1/4"H x 22"D, max. Rack mount

Temperature Range:

10°C to 40°C operating, -30°C to 70°C non-condensing humidity storage

Weight:

Below 50lbs (25kg)

Accessories:

- Two fiber optic cables. Length 3meter;
 - Two Fiber optic convertors with 25 pin RS-232 connector;
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