

## 50 eV to 5 keV

### Energy Sweeping: Constant Beam Current and Approximately Constant Spot

#### FOR USE IN:

- ▶ Surface Physics Studies
- ▶ Ionization Experiments
- ▶ Charge neutralization

#### FEATURES / OPTIONS:

- ▶ Wide Energy range
- ▶ Constant Beam Current
- ▶ Constant Spot Size
- ▶ Zoom Lens Focusing
- ▶ High Speed Pulsing
- ▶ Deflection, Rastering
- ▶ Computer / Remote Control



*EGL-2022 Electron Gun Mounted on 2 1/2 CF Flange Multiplexer*

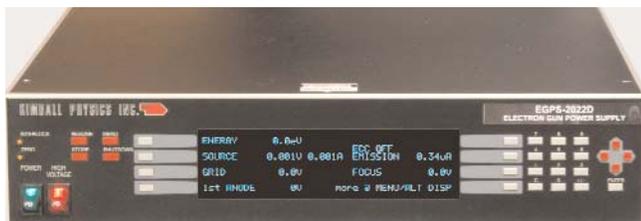
The Kimball Physics EGL-2022 Electron Gun, with its matching EGPS-2022 Power Supply, has applications in a variety of surface physics, ionization, charge neutralization, and other vacuum physics studies. It is a complete subsystem ready to attach and turn on.

Beam energy, beam current, and spot size are independently adjustable over wide ranges. The energy is variable from 50 eV to 5 keV, and the beam current from 1 nA to 100  $\mu$ A. By use of multi-staging and a computer-designed electron zoom lens, a constant beam current is maintained over a two-order-of-magnitude change in energy, with a spot size also roughly constant. The electron gun uses a unipotential cathode to generate a beam of low energy spread.

The gun design can include a positively biased acceleration grid to enhance emission and collimate the beam. A negative potential is typically applied to this grid element to collimate the beam, suppress emission and cut off the beam.

UHV technology is used throughout. The gun can be run in vacuums from  $10^{-11}$  torr up to  $10^{-5}$  torr for the standard Ta disc cathode. The electron gun is bakable to 350°C with cables removed.

Optional cathodes include: barium oxide discs (BaO, low light, low energy spread, min. vacuum  $1 \times 10^{-7}$  torr), single-crystal lanthanum hexaboride (LaB<sub>6</sub>, small spot, high brightness, min. vacuum  $1 \times 10^{-7}$  torr) and yttria-coated iridium discs (Y<sub>2</sub>O<sub>3</sub> - Ir, rugged, vacuum up to  $10^{-4}$  torr, may survive brief loss of vacuum). With the exception of BaO, the cathodes are not damaged by repeated exposure to atmospheric gases or water vapor when cold. Cathode lifetime is a function of vacuum conditions and beam current as related to cathode temperature. Cathode lifetime at low currents in good vacuum may be in the many hundreds of hours, or even over a thousand hours.



*EGPS-2022 Electron Gun Power Supply with FlexPanel controller*

Firing units are user-replaceable; spare firing units can be purchased new, and used firing units may be returned to the factory for rebuild. Alternatively, the entire electron gun can be sent back to the factory for complete cleaning, rebuild, cathode replacement, and optional in-vacuum testing. Stand-alone Faraday cups designs are available.

The extraction grid allows pulsing options: either fast capacitive beam pulsing or dual grid pulsing. Capacitive beam pulsing, using a Pulse Junction Box, permits fast beam pulsing down to 20 ns with 20% maximum duty cycle. Capacitive pulsing requires an external, variable-voltage pulse generator (not included). Pulsing of the electron beam can also be accomplished with dual grid supplies (variable and fixed), requiring only a TTL pulse input.

A rastering option can be provided by an on-board power supply module or as an additional feature in a LabVIEW™ software package.

The EGPS-2022 Power Supply features a modular design with miniaturized power supply clusters, optically isolated signals, and the new FlexPanel digital interface controller. The included power supplies are Beam Energy and X,Y Deflection, as well as floating Source/ECC, Grid, First Anode and Focus supplies.

The FlexPanel provides a digital display screen and a keypad for programming control on the front panel. Rear panel connectors allow remote /computer control and metering of all gun power supplies. An RS-232 serial port and an analog input/output connector are included on standard power supply units. All common computer interface bus types can be accommodated, by use of appropriate digital to analog converters. RS-422/485 conversion is possible.

An optional LabVIEW™ computer program designed for the EGL-2022 is available for remote computer control and metering. Software is available in two types: Standard configuration is via a simple serial connector interface. An alternative is using National Instrument DAQ boards and SCSI connectors on the EGPS-2022. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

### EGL-2022 ELECTRON GUN SPECIFICATIONS

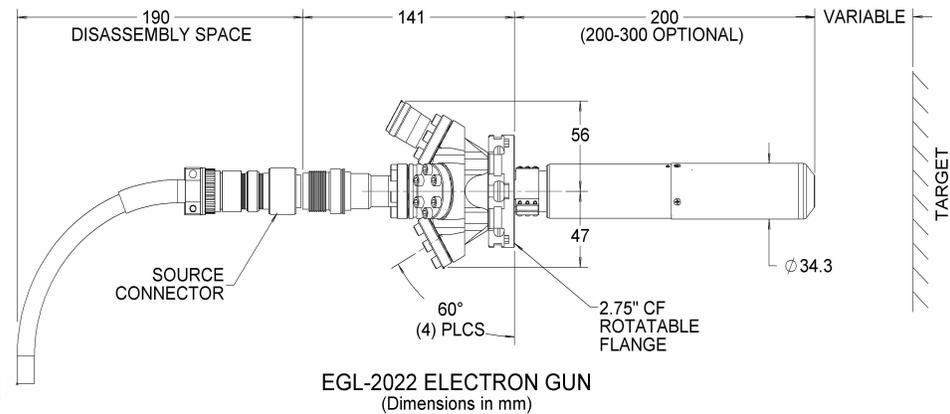
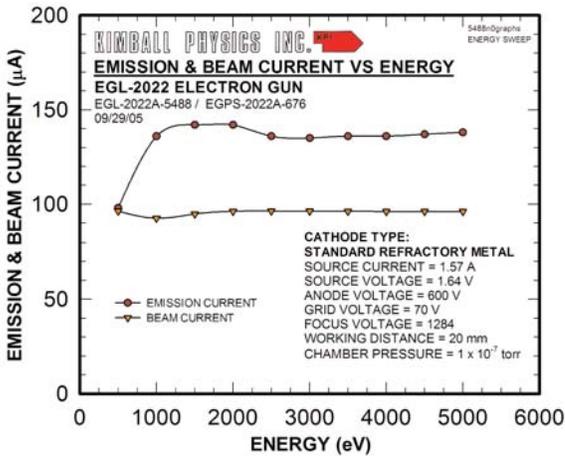
BEAM ENERGY	50 eV to 5 keV (Independently adjustable)
BEAM CURRENT	Standard: 1 nA to 100 $\mu$ A (Independently adjustable)
ENERGY SPREAD	Approx. cathode thermal spread, calculated Ta - 0.5eV $Y_2O_3$ - 0.4eV BaO - 0.3eV LaB <sub>6</sub> - 0.4eV
SPOT SIZE	1 mm to 10 mm (Independently adjustable)
WORKING DISTANCE	Variable: 20 mm to 100 mm
BEAM DEFLECTION	4 pole electrostatic: $\pm 2^\circ$ approx at 5 keV. Scales larger at lower energies
PULSE CAPABILITY (using appropriate pulse generator, not included)	Optional capacitive Pulse Junction Box: pulse width 20 ns to 100 $\mu$ s, rise/fall 10 ns, 50 $\Omega$ impedance, 1 W standard (higher power available) Optional Dual Grid Power Supply: pulse width 2 $\mu$ s to DC, rise/fall 500 ns, rep rates to 5kHz (TTL required)
BEAM UNIFORMITY	Gaussian
FIRING UNIT	Customer-replaceable Firing Unit includes precision-aligned cathode and Wehnelt (G-1) assembly, with insulators and connectors
CATHODE TYPES	Standard: Tantalum disc Optional: Lanthanum hexaboride (LaB <sub>6</sub> ), Barium oxide (BaO), or Yttrium oxide (Y <sub>2</sub> O <sub>3</sub> ) With the exception of Barium oxide, cathodes not harmed by repeated exposure to atmospheric gases while cold
MOUNTING	Flange Multiplexer with a 2 3/4 inch rotatable CF, including both tapped and clear mounting holes. Optional unmounted model with 9 in-vacuum leads.
BEAM ALIGNMENT	Optional: Mechanical alignment with $\pm 2^\circ$ Port Aligner Standard: 200 mm, Range: 200 mm to 300 mm. Custom lengths available. Gun manufactured at standard length unless otherwise specified at time of order.
INSERTION LENGTH	
GUN DIAMETER	34 mm, gun tube in vacuum
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded stainless steel shell
CABLES / CONNECTORS	Multi-conductor high voltage fully ground-shielded cable, coaxial grid cable, low voltage deflection cable, with mating aluminum shell connectors, to connect gun and power supply. Standard lengths: 3 m Optional: 5 m
MAXIMUM BAKEOUT	350°C with cables removed

### EGPS-2022 ELECTRON GUN POWER SUPPLY SPECIFICATIONS

OUTPUT	All necessary voltages to drive the EGL-2022 Electron Gun
ENERGY STABILITY	$\pm 0.01\%$ per hour; $\pm 0.02\%$ per 8 hours at full output
BEAM STABILITY	$\pm 0.1\%$ per hour with Emission Current Control or $\pm 10\%$ per hour after warm up without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid, First Anode, Focus, X and Y Deflection, Emission Current Control
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Emission Current, Grid, First Anode Voltage, Focus, X and Y Deflection
COMPUTER/REMOTE CONTROL & METER	Power supplies: 0 to +10 V (-10 V to +10 V, deflection) Metering: 0 to +2 V (-2 V to +2 V, deflection) Standard 50-pin connector for analog input/output and RS-232 serial port (RS-422 or RS-485 available, if specified at time of order) Optional: SCSI metering and programming connectors
SOFTWARE	Standard configuration designed for RS-232 connections. Optional: National Instruments LabVIEW™ file, designed to run with computer DAQ boards NI PCI-6733 and PCIe-6341. SCSI connections.
INPUT	115 VAC or 230 VAC, 50 to 60 Hz single phase, 250 VA
ENVIRONMENT	Temperature: 0 to 40°C, Relative humidity: 0 to 75% RH non condensing, Classified as a pollution degree 2, installation category (overvoltage category) II environment unit
DIMENSIONS (width x height x depth)	17 in. x 3.5 in. x 22 in. excluding handles (425 mm x 90 mm x 560 mm); 19 in. rack mountable

### OPTIONAL HARDWARE RASTER SPECIFICATIONS

RASTER GENERATOR	Continuous control of X & Y Raster Amplitude, variable offset (Centering) and Frequency, with 0-10 kHz (X) and 0-100 Hz (Y) standard. All parameters controllable via RS-232, RS-422, RS-485, analog input, or computer control with LabVIEW™ software option.
------------------	--



Typical performance; data for guidance only.

