

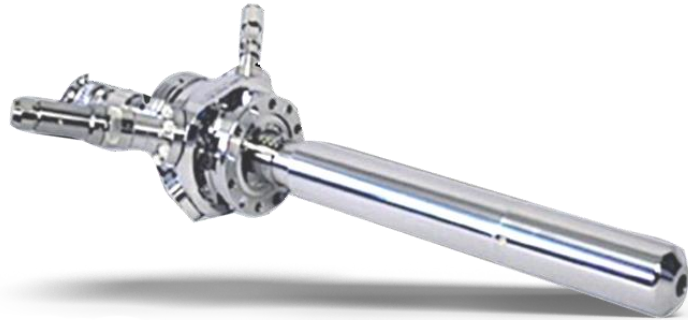
50 eV to 5 keV
Energy Sweeping: Constant Beam Current and Approximately
Constant Spot Size Electron Beam

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 2.75" CF 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 to the user's vacuum system 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 μ 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: 1) barium oxide discs (BaO, low light, low energy spread, min. vacuum 1×10^{-7} torr), 2) single-crystal lanthanum hexaboride (LaB6, small spot, high brightness, minimum vacuum 1×10^{-7} torr) and 3) yttria-coated iridium discs (Y_2O_3 - Ir, rugged, vacuum up to 10^{-4} torr, may survive brief loss of vacuum). Except for 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.

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 cup 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.

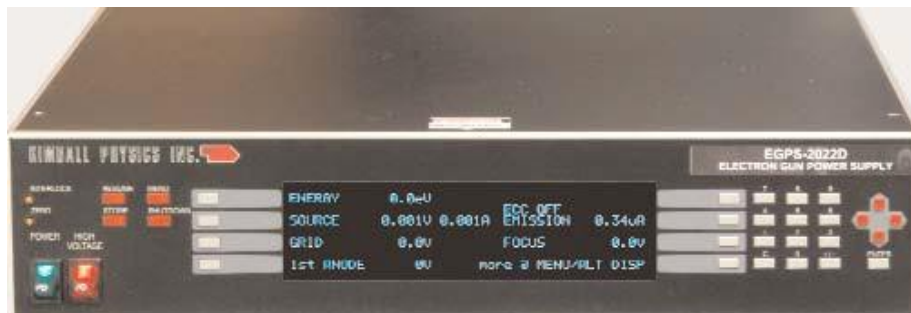
A rastering option can be provided by an on-board power supply module or as an additional feature in a LabVIEW™ software package.

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/Emission

Current Control (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 and mini-USB 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 options: 1) standard configuration via a simple serial connector interface, 2) using National Instrument DAQ modules and the 50-pin connector on the EGPS-2022. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

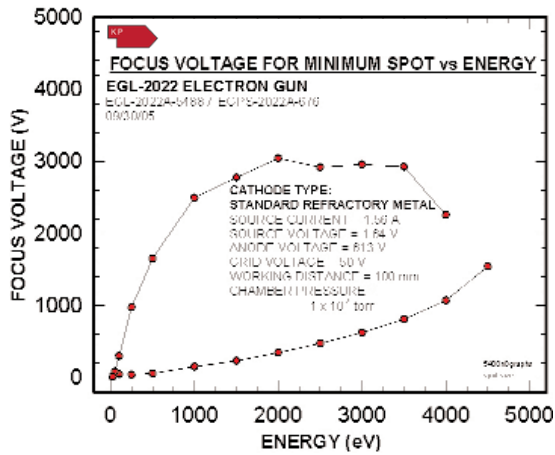
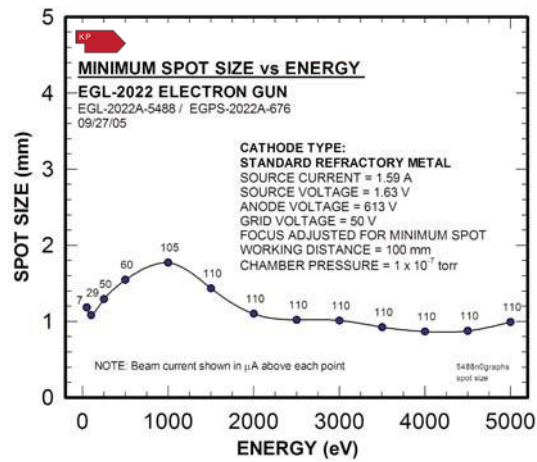
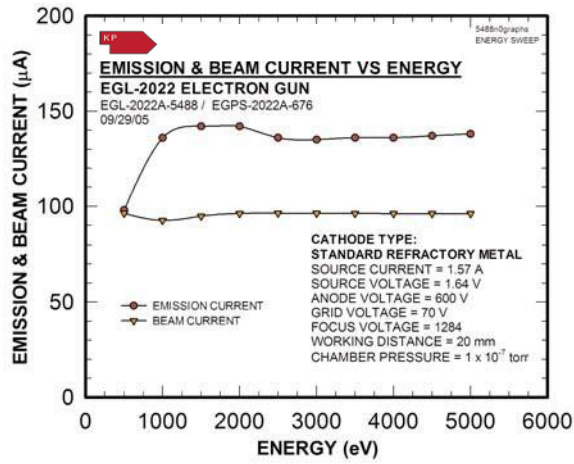


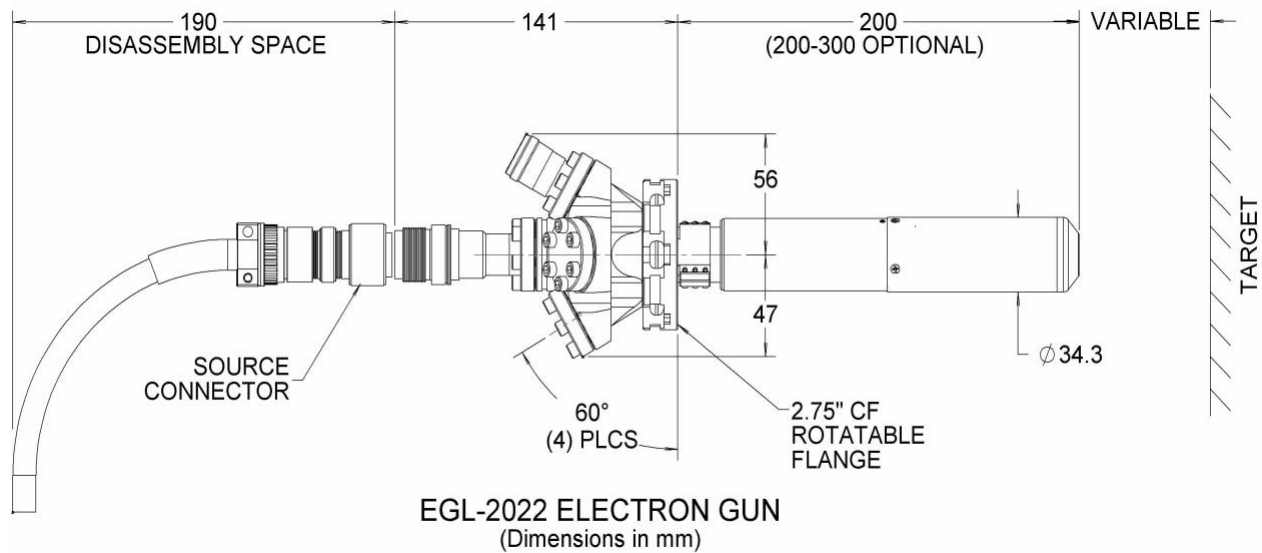
EGPS-2022 Electron Gun Power Supply with FlexPanel controller system.

| EGL-2022 ELECTRON GUN SPECIFICATIONS | |
|--|---|
| BEAM ENERGY | 50 eV to 5 keV (Independently adjustable) |
| BEAM CURRENT | Standard: 1 nA to 100 μ A (Independently adjustable) |
| ENERGY SPREAD | Approx. cathode thermal spread, calculated: Ta - 0.5eV Y ₂ O ₃ - 0.4eV BaO - 0.3eV LaB ₆ - 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 μ s, rise/ fall 10 ns, 50 ohms impedance, 1 W standard (higher power available) Optional Dual Grid Power Supply: pulse width 2 μ 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 TYPE | Standard: Tantalum disc Optional: Lanthanum hexaboride (LaB ₆), Barium oxide (BaO), or Yttrium oxide (Y ₂ O ₃) Except for Barium oxide, cathodes not harmed by repeated exposure to atmospheric gases while cold |
| BEAM ALIGNMENT | Optional: Mechanical alignment with $\pm 2^\circ$ Port Aligner |
| MOUNTING | Flange Multiplexer with a 2 $\frac{3}{4}$ inch rotatable CF, including both tapped and clear mounting holes. Optional unmounted model with 9 in-vacuum leads. |
| INSERTION LENGTH | Standard: 200 mm, Range: 200 mm to 300 mm. Custom lengths available. Gun manufactured at standard length unless otherwise specified at time of order. |
| GUN DIMENSIONS | 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 POWER SUPPLY SPECIFICATIONS | |
|---------------------------------------|---|
| OUTPUT | All necessary voltages to drive the EGL-2022 Electron Gun |
| ENERGY SUPPLY 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 (ECC) 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 and mini-USB serial port (RS-422 or RS-485 available, if specified at time of order) |
| SOFTWARE | Standard configuration designed for RS-232 and USB serial connections. Optional: National Instruments LabVIEW™ file, designed to run with NI DAQ modules |
| 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 serial interface, analog input, or computer control with LabVIEW™ software option. |





References

For more information on electron sources / gun operations (and the technical bulletins and additional documents listed below), please visit the Resources and Documents section of our website.

General Operating Hints

Operating Instructions, Typical LabVIEW™ Electron Gun Systems

Beam Pulsing Options

Note: A comprehensive custom manual is supplied with each system.

Notes:

1. Charts /graphs show typical performance, data is for guidance only
2. It is not necessarily possible to achieve all maximum specifications simultaneously.
3. Specifications Subject to Change Without Notice.
4. DE Altobelli, DT Taylor 04/18/2025

Document EGL-2022_EGPS-2022_2025_0418
COPYRIGHT KIMBALL PHYSICS 2025, ALL RIGHTS RESERVED