

## 1 eV to 2000 eV

### Energy Sweeping: Constant Beam Current and Approximately Constant Spot Size **NEW LOWER ENERGY RANGE FOR IMPROVED RESOLUTION**

#### FOR USE IN:

- Surface Physics Studies
- Electron Stimulated Desorption
- Inverse Photoelectron Emission
- Ionization Experiments
- Charge Neutralization

#### FEATURES / OPTIONS:

- Wide Energy Range
- Very Low Energies
- Constant Beam Current
- Constant Spot Size
- Zoom Lens Focusing
- Demountable Gun
- High Speed Pulsing
- Deflection, Rastering
- Computer/Remote Control



*ELG-2A Electron Gun Mounted on 2.75" CF  
Flange Multiplexer*

The Kimball Physics ELG-2 Electron Gun, with its matching EGPS-1022 Power Supply, is intended for use in electron stimulated desorption studies, secondary electron emission coefficient measurement studies, surface physics 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 1 eV to 2000 eV, with a low range included for improved resolution at the lowest energies. 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 gun can deliver 1  $\mu\text{A}$  into an approximately 1 mm spot, at a 2 cm working distance and 10 eV. The electron gun uses a unipotential refractory cathode to generate a beam of low energy spread.

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  $350^{\circ}\text{C}$  with cables removed. With Faraday cup, maximum is  $65^{\circ}\text{C}$  unless removed.

Optional cathodes include: 1) barium oxide discs (BaO, low light, low energy spread, min. vacuum  $1 \times 10^{-7}$  torr) and 2) 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). 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.

The ELG-2 Electron Gun is available in two different mounting configurations: 1) as a standard mounted gun with a 2.75" CF Flange Multiplexer, or 2) as a demountable gun. The Demountable ELG-2 can be used as mounted gun, or it can be removed by the user from its mounting and used as an unmounted gun with the Flange Multiplexer as a separate vacuum feedthrough.

The control grid allows either fast capacitive beam pulsing or optional 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, requiring only a TTL pulse input.

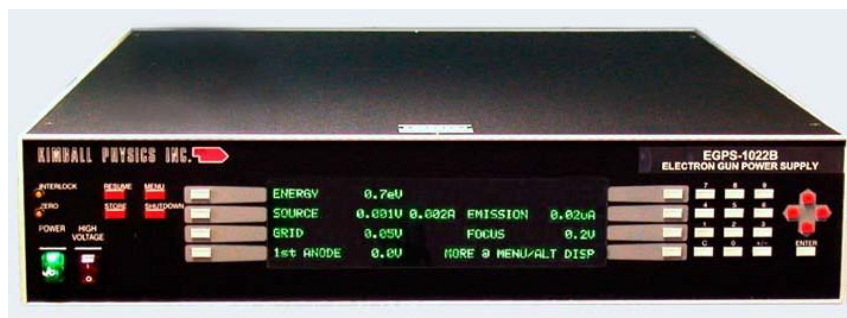
A rastering option can be provided by an on-board power supply module or as an additional feature in a LabVIEW™ software package.

The EGPS-1022 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 the floating Source/ECC, Grid, First Anode and Focus supplies.

The new Flex-Panel 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. A 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 ELG-2 is available for remote computer control and metering. Software is available in two options: 1) standard is via a simple serial connector interface, or 2) National Instrument DAQ modules and the 50-pin connector on the EGPS-1022. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

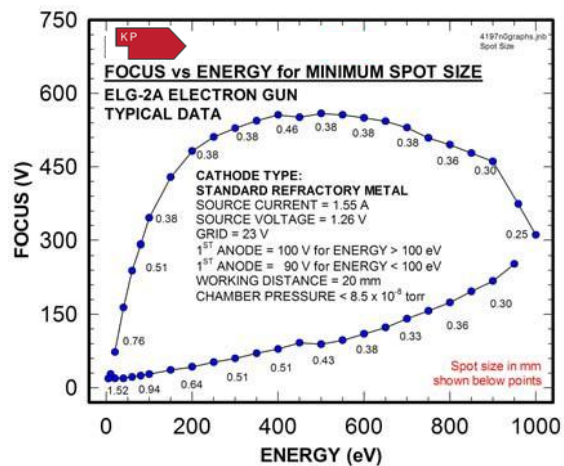
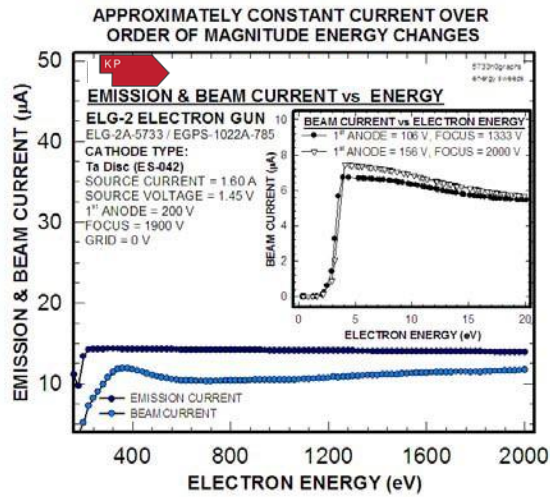
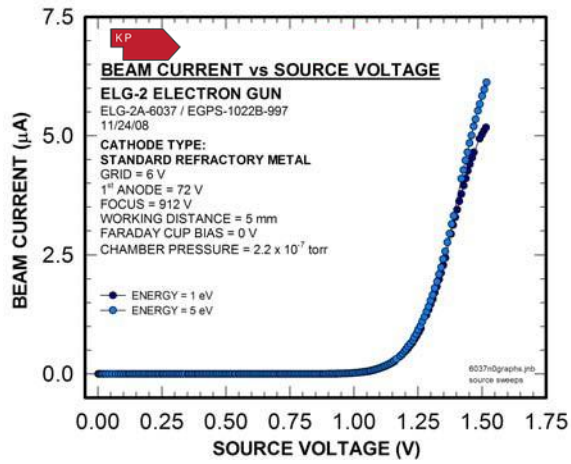


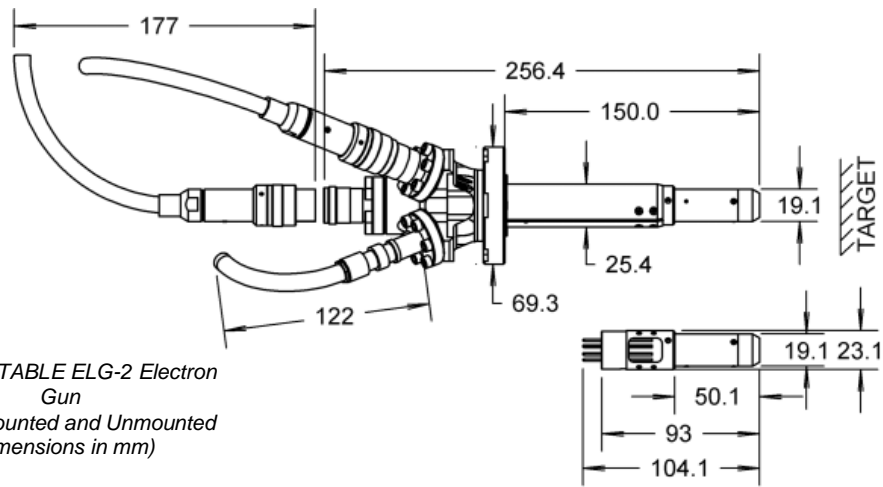
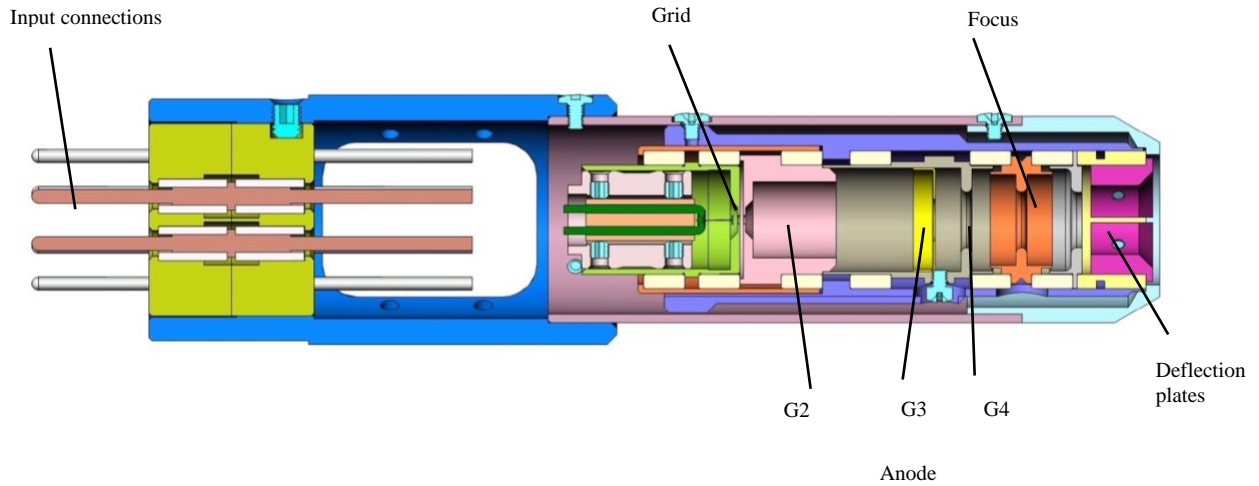
*EGPS-1022 Power Supply for use with the ELG-2A Electron Gun.*

<b>ELG-2 ELECTRON GUN SPECIFICATIONS</b>	
BEAM ENERGY	1 eV to 2 keV (Independently adjustable)
BEAM CURRENT	Standard: 1 nA to 10 $\mu$ A (Independently adjustable)
ENERGY SPREAD	Approximate Cathode Thermal Spread, calculated. Ta- 0.5 eV, Y <sub>2</sub> O <sub>3</sub> – 0.4 eV, BaO – 0.3 eV
SPOT SIZE	0.5 mm to 5 mm at 20 mm working distance (Independently adjustable)
WORKING DISTANCE	Range: 5 mm to 100 mm 20 mm recommended for very low energy operation
BEAM DEFLECTION	4 pole electrostatic: $\pm 2.5^\circ$ at 2000 eV; scales larger at lower energies
PULSE CAPABILITY (using appropriate pulse generator, not included)	Capacitive Pulse Junction Box: pulse width 20 ns to 100 $\mu$ s, rise/ fall 10 ns, 50 ohms 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 and first anode, with insulators and connectors
CATHODE TYPE	Standard: Tantalum disc Optional: Barium oxide (BaO) or Yttrium oxide (Y <sub>2</sub> O <sub>3</sub> ) Except for Barium Oxide, cathodes not harmed by repeated exposure to atmospheric gases while cold
FARADAY CUP	Gun mounted or stand-alone designs available
BEAM ALIGNMENT	Optional: Mechanical alignment with $\pm 2^\circ$ Port Aligner
MOUNTING	Flange Multiplexer with a 2.75" rotatable CF, including both tapped and clear mounting holes. Optional: Demountable (Unmounted / Mounted) with Flange Multiplexer 2.75" rotatable CF
INSERTION LENGTH	Standard: 150 mm, Range: 110 mm to 170 mm. Custom lengths available. Gun manufactured at standard length unless otherwise specified at time of order.
GUN DIMENSIONS	25.4 mm diameter at the gun flange, necks down to 19.1 mm at 100 mm from the flange
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 65°C max with Faraday cup (unless removed).

<b>EGPS-1022 POWER SUPPLY SPECIFICATIONS</b>	
OUTPUT	All necessary voltages to drive the ELG-2 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, Hi / Lo Range, Source Voltage, Source Current, Emission Current, Grid, First Anode, 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 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, added to main rack

<b>OPTIONAL HARDWARE RASTER SPECIFICATIONS</b>	
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.





DEMOUNTABLE ELG-2 Electron Gun  
Shown Mounted and Unmounted  
(Dimensions in mm)

## 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 12/13/2022

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