

**200 eV to 20 keV**  
**Medium Energy, Uniform Flood Electron Beam**

**FOR USE IN:**

- Spacecraft Charge-up Studies
- Surface Charging Studies
- Beta Decay Simulation
- Surface Physics Studies
- Vacuum Physics Experiments

**FEATURES / OPTIONS:**

- Energy Range 200 eV to 20 keV
- Beam Currents to 1 mA
- Wide Angle Uniform Beam
- Divergence Control
- Rotatable 2.75" CF Mounting
- User-replaceable Firing Units
- Computer / Remote Control
- Custom Apertures



*EGF-3104 Electron Flood Gun Mounted  
2.75" CF Flange*

The Kimball Physics EGF-3104 Electron Gun, with its matching EGPS-3104 Power Supply, is intended for use in a variety of UHV charging, space physics, vacuum physics, surface physics, and nuclear simulation applications. It is a complete subsystem ready to attach and turn on. Maximum flexibility is achieved in a minimum of space; the entire unit mounts through a single standard 2.75" inch CF port.

Electrons are generated at negative high potential, and the user's target is typically set at ground potential. Both beam energy and beam current are adjustable over wide ranges. The gun uses a space-charge-limited refractory-metal cathode to generate a uniform flood beam and the design allows generation of the beam down to low energies, and very low currents. A high current option provides beam currents up to 1 mA. Beam divergence is partially controllable electronically over the full range of the electron energy.

Optional cathodes include barium oxide discs (BaO, low light, low energy spread) or Yttria-coated iridium discs ( $Y_2O_3$  - Ir, rugged, may survive brief loss of vacuum). Except for barium oxide, 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.

UHV technology is used throughout. The gun may be completely disassembled for cleaning and repair. The cathode firing unit assembly (which includes the cathode, cathode mount, apertures, and Wehnelt) is user-replaceable; and the firing unit assemblies may be sent back to Kimball Physics for rebuilding. The gun can be run in vacuums from  $10^{-11}$  torr to  $10^{-5}$  torr. The gun may be baked up to  $350^\circ\text{C}$  with cables removed. With the magnetic deflection option, maximum bakeout is  $150^\circ\text{C}$ . Non-standard mountings are available. Various designs of stand-alone Faraday cups are available.

The EGPS-3104 Power Supply contains all power supplies necessary to generate the required voltages to run an EGF-3104 Electron Flood Gun, including the Energy, Focus, Source, Grid, Anode, and optional Deflection supplies. All power supplies are electronically regulated. A computer control option allows for control of all potentials from an interface at ground potential, via 0 to 10 V analog inputs.

The FlexPanel provides a digital display screen and a keypad controller for programming control on the front panel. Rear panel connectors allow remote/computer control and metering of all gun power supplies. An RS-232 or 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 EGF-3104 is available for remote computer control and metering. Software is available in two options: 1) using National Instrument DAQ modules and the 50-pin connector on the EGPS-3104, or 2) via a mini-USB or simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

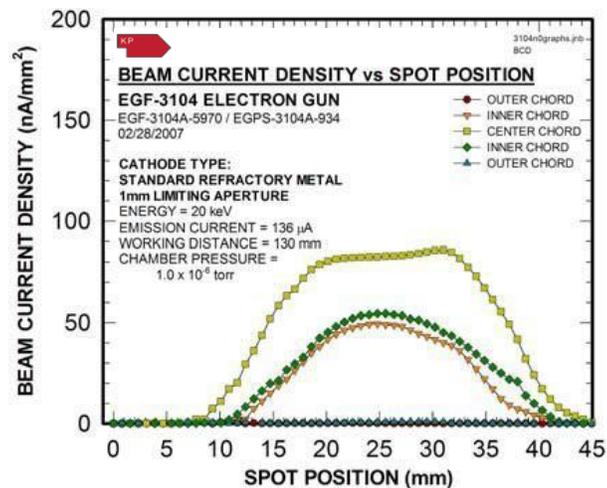
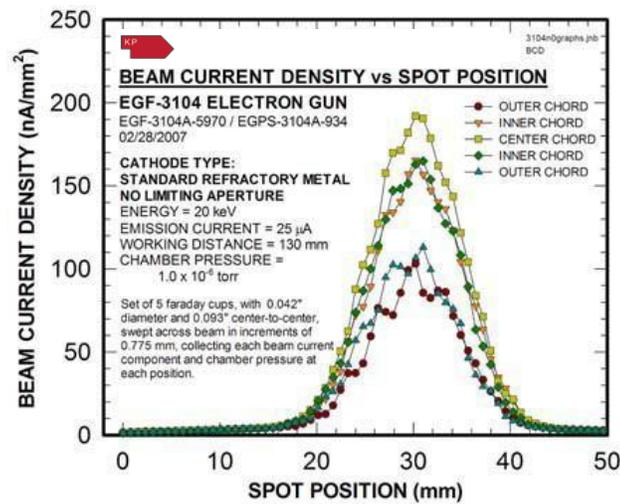
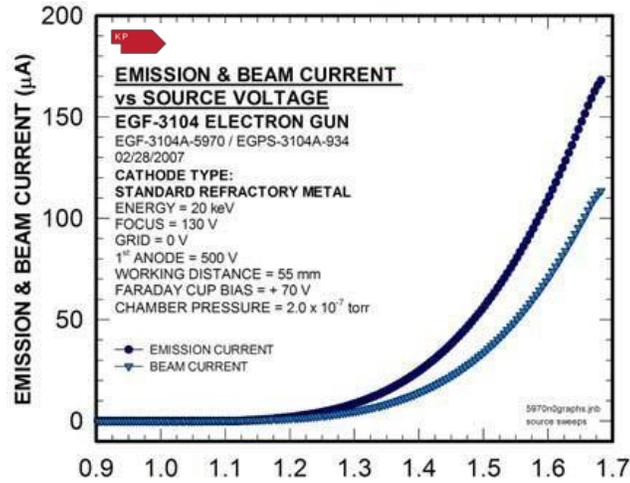


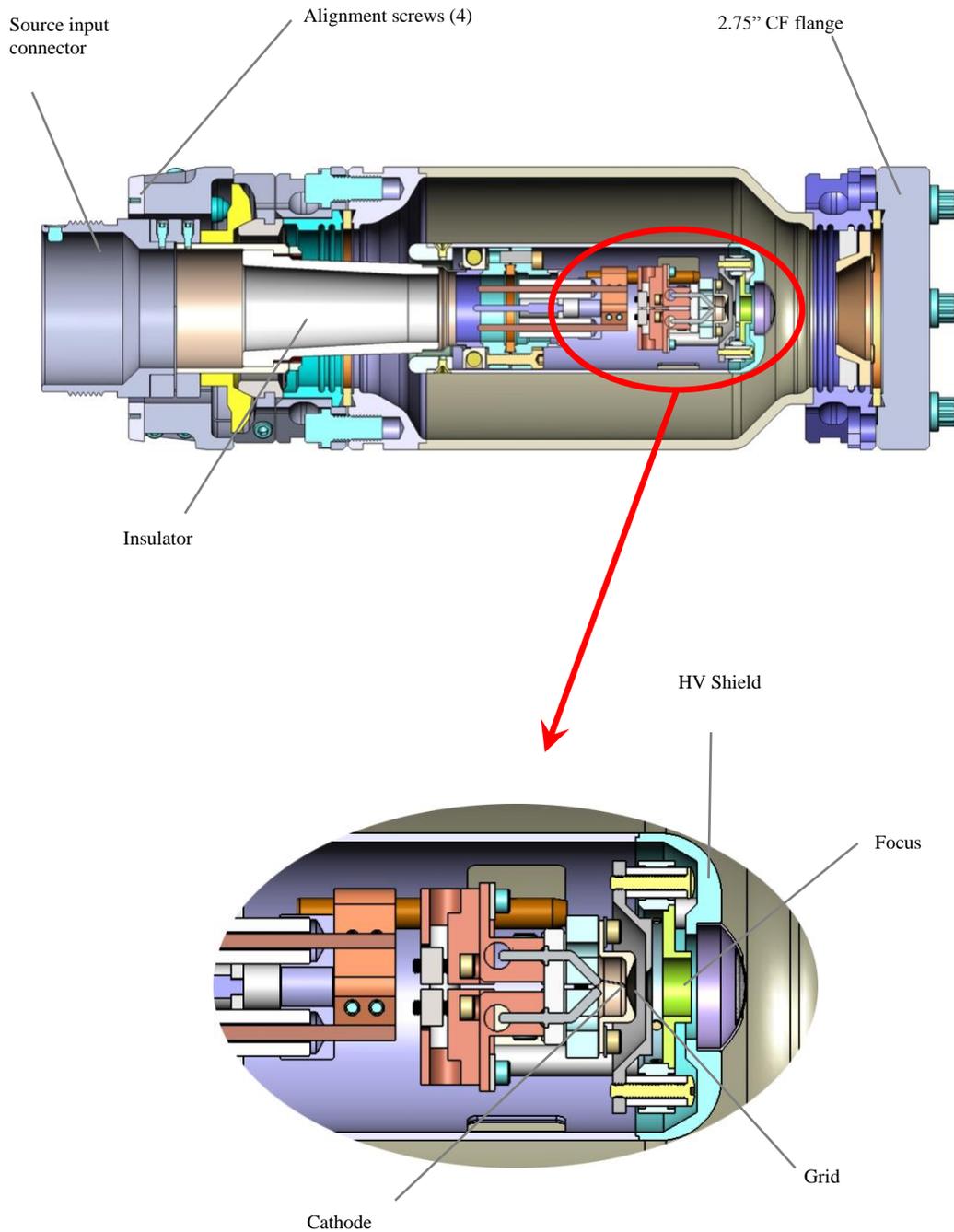
*EGPS-3104B Electron Gun Power Supply with FlexPanel controller.*

EGG-3101 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	200 eV to 20 keV (Independently adjustable)
BEAM CURRENT	Standard: 1 nA to 100 $\mu$ A (Independently adjustable) High current option: 10 nA to 1 mA*
ENERGY SPREAD	Approx. cathode thermal spread, calculated Ta - 0.5eV Y <sub>2</sub> O <sub>3</sub> - 0.4eV BaO - 0.3eV
SPOT SIZE	Typical: 15 to 450+ mm
WORKING DISTANCE	Variable
BEAM DEFLECTION	Optional: Magnetic quadrupole (outside vacuum)
PULSE CAPABILITY (using appropriate pulse generator, not included)	Dual Grid Power Supply: pulse width ~2 $\mu$ s to DC rise/fall ~500 ns, rep rate to 5 kHz (TTL required)
BEAM UNIFORMITY	Variable. Also depends on optional mask aperture
FIRING UNIT	User-replaceable Firing Unit Cartridge includes cathode and Wehnelt (G-1) assembly
CATHODE TYPE	Standard: Tantalum Optional: Low-light Barium Oxide Yttria-coated Iridium
BEAM ALIGNMENT	Mechanical alignment with internal firing unit alignment. Optional mechanical alignment with a $\pm 2^\circ$ Port Aligner.
MOUNTING	2 $\frac{3}{4}$ inch rotatable CF, including both tapped and clear mounting holes
INSERTION LENGTH	0 mm
GUN DIMENSIONS	70 mm OD x 205 mm length (without deflection)
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded stainless steel shell
CABLES / CONNECTORS	Multi-conductor high voltage fully ground-shielded cable with mating aluminum shell connector, to connect gun and power supply. Standard length: 3 m, Optional: 5 m
MAXIMUM BAKEOUT	350°C with cables removed. 150°C with magnetic deflection option.

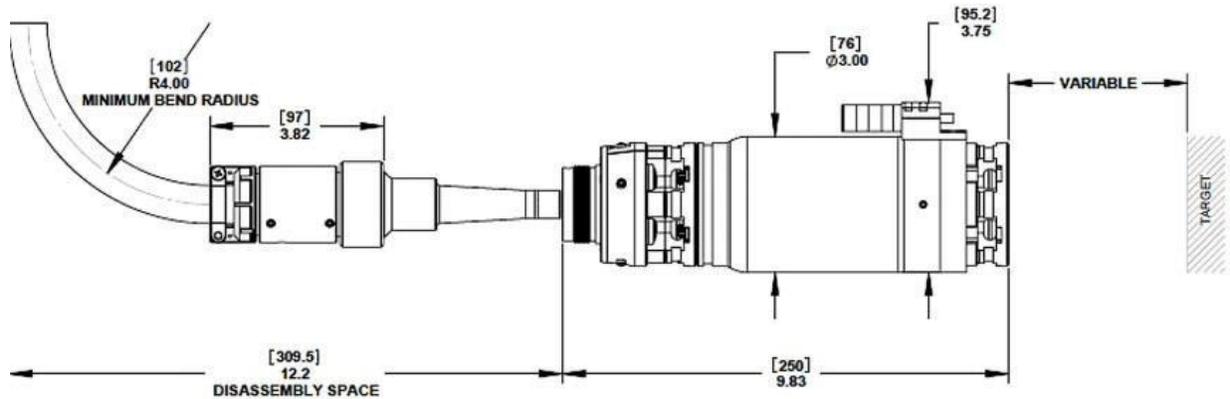
EGPS-3101 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGF-3104 Electron Gun (in combination with H.V. Power Supply*)
ENERGY SUPPLY STABILITY	$\pm 0.01\%$ per hour $\pm 0.02\%$ per 8 hours at full output
BEAM STABILITY	$\pm 0.1\%$ per hour with Emission Current Control (ECC) or $\pm 10\%$ per hour without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid (G-1), 1 <sup>st</sup> Anode, Focus, Emission Current Control (ECC), Optional X and Y Deflection.
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Grid Voltage, Anode Voltage, Focus Voltage, Emission Current, Optional X and Y Deflection
COMPUTER/REMOTE CONTROL & METER	Power supplies: 0 to +10V (-10V to +10V, for deflection) Metering: 0 to +2V (-2V to +2V, for deflection) Toggle switches: 0 or +5V
SOFTWARE	Standard configuration designed for RS-232 and/or mini-USB 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
DIMENSIONS (width x height x depth)	EGPS-3104: 17 in. x 7 in. x 22 in. excluding handles (432 mm x 178 mm x 560 mm); 19 in.(495 mm) rack mountable.
WEIGHT	Appx. 35 lbs. (15.9 kg)

OPTIONAL HARDWARE RASTER SPECIFICATIONS	
RASTER GENERATOR	Frequency in X and Y directions can be independently set. X freq. is up to 500 Hz, Y freq. 100Hz. When X freq. exceeds 100Hz, the raster angle is reduced by 25%. All parameters controllable via RS 232/RS 422-485/Mini- USB, analog input, or computer control with LabVIEW™ software option.





*EGF-3104 Electron Gun Solid Model Cross-section.*



*EGF-3104 Electron Gun and Source Cable assembly shown with optical deflection. (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 11/11/2022

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