

200 eV to 30 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 30 keV
- ▶ Beam currents to 1 mA
- ▶ Wide angle uniform beam
- ▶ Divergence control
- ▶ Rotatable 2¾ CF mounting
- ▶ User-replaceable firing unit
- ▶ Computer / Remote control
- ▶ Custom apertures



EGF-4104 Electron Flood Gun (shown with Deflection option)

The Kimball Physics EGF-4104 Electron Gun, with its matching EGPS-4104 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 2¾ 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 (Y₂O₃ - Ir, rugged, may survive brief loss of vacuum). With the exception of 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°C with cables removed. Non-standard mountings are available. Various designs of stand-alone Faraday cups are available.

The EGPS-4104 Power Supply contains all power supplies necessary to generate the required voltages to run an EGF-4104 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 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-4104 is available for remote computer control and metering. Software is available in two types: Using National Instrument DAQ boards and SCSI connectors on the EGPS-4104, or via a simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.



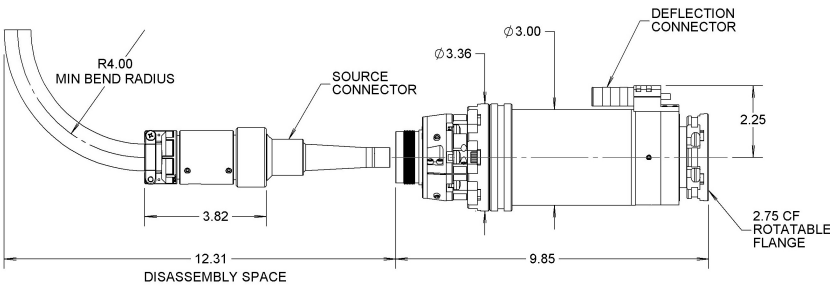
EGPS-4104B Electron Gun Power Supply with FlexPanel controller

| EGF-4104 ELECTRON GUN SPECIFICATIONS | |
|--|---|
| BEAM ENERGY | 200 eV to 30 keV (Independently adjustable) |
| BEAM CURRENT | Standard: 1 nA to 100 μ A (Independently adjustable) High current option: 10 nA to 1 mA* |
| ENERGY SPREAD | Approx. cathode thermal spread, calculated Ta - 0.5eV Y ₂ O ₃ - 0.4eV BaO - 0.3eV |
| SPOT SIZE | Typical - 15 to 450+ mm |
| WORKING DISTANCE | Typical - 100 to 1000 mm |
| BEAM DEFLECTION | Optional: Magnetic quadrupole (outside vacuum) |
| PULSE CAPABILITY (using appropriate pulse generator, not included) | Dual Grid Power Supply: pulse width ~2 μ s to DC rise/fall ~500 ns, rep rate to 5 kHz (TTL required) |
| BEAM UNIFORMITY | Variable. Optional beam washing or 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 |
| MOUNTING | 2 3/4 inch rotatable CF, including both tapped and clear mounting holes |
| BEAM ALIGNMENT | Mechanical alignment with internal firing unit alignment. Optional mechanical alignment with a $\pm 2^\circ$ Port Aligner. |
| INSERTION LENGTH | 0 mm |
| GUN DIMENSIONS | 85 mm OD (excluding Lemo connector) x 205 mm |
| 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 |

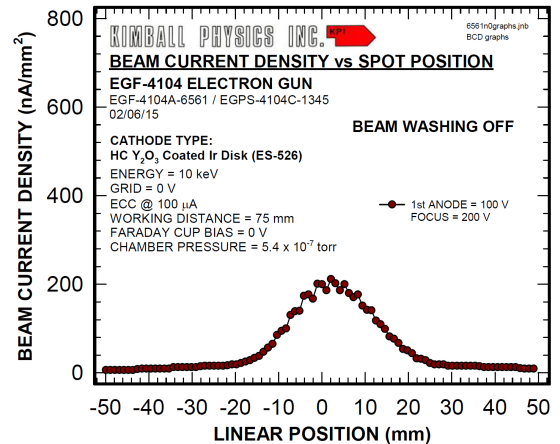
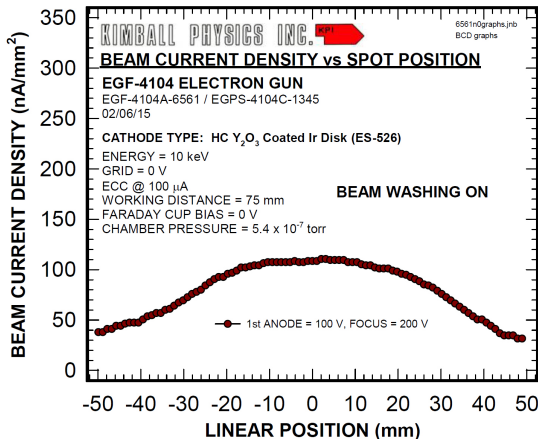
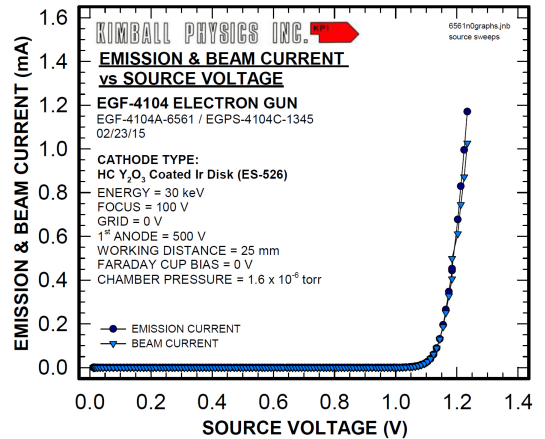
| EGPS-4104 ELECTRON GUN POWER SUPPLY SPECIFICATIONS | |
|--|---|
| OUTPUT | All necessary voltages to drive the EGF-4104 Electron Gun (in combination with H.V. Power Supply*) |
| ENERGY STABILITY | $\pm 0.01\%$ per hour $\pm 0.02\%$ per 8 hours at full output |
| BEAM STABILITY | $\pm 0.1\%$ per hour with Emission Current Control (ECC) or $\pm 10\%$ per hour without ECC |
| CONTROLS | FlexPanel controls: Energy, Source, Grid (G-1), 1 st 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 | Controls : 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 connections. Optional: National Instruments LabVIEW™ file, designed to run with computer DAQ boards NI PCI-6733 and PCIe-6341. SCSI interface |
| 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-4104: 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. (16 kg) |

* High current option requires separate HV supply (included with system), connected to EGPS power supply

| OPTIONAL RASTERING / BEAM WASHING 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, RS-485, analog input, or computer control with LabVIEW™ software option. |



EGF-4104 gun and source cable assembly shown with optional deflection



Typical performance; data for guidance only.