

1 keV to 50 keV
Focusable Small Spot Size, High Energy Electron Beams

FOR USE IN:

- General Vacuum Physics
- Radiation Studies
- Surface Bombardment
- Semiconductor Research
- Biological Specimen Irradiation
- X-ray Generation
- Plasma Excitation
- Fluorescence Studies
- Surface Physics Studies

FEATURES / OPTIONS:

- Medium Beam Currents
- Small Spot Sizes
- Magnetostatic Focusing
- Magnetostatic Deflection
- Pulse Capability
- Internal Alignment while Operating
- User-Replaceable Firing Units
- 4.5" or 6.0" inch CF Mounting
- UHV Technology / Bakeable
- Computer / Remote Control



EGH-6002 Electron Gun

The Kimball Physics EGH-6002 Electron Gun with its matching EGPS-6002 Power Supply is a complete subsystem ready to attach to the user's vacuum system and turn on. It can deliver electrons over a very broad range of energies, currents, and power. The EGH-6002 can be used in many different applications from semiconductor research to secondary electron emission studies.

The gun can generate a high energy, focusable, small spot electron beam. Both beam energy and beam current are independently adjustable over wide ranges; energies from 1 keV to 50 keV and currents from 10nA to 100µA are standard. The electron beam can be pulsed by an input signal to the control grid.

The adjustable optics of the gun can adapt to different divergences and different working distances. The spot size can be varied from 0.5 mm to 10 cm. A magnetic focusing lens and

magnetic centering deflection provide beam control with low aberration. In addition, the cathode to anode spacing is internally adjustable to change perveance.

The gun features an adjustable cathode feedthrough assembly that allows the mechanical alignment of the firing unit with respect to the anode and the column. This alignment can be done in real time while the gun is operating at full voltage with beam on. The firing unit cartridge (including the cathode, cathode-mount, and Wehnelt aperture) is user-replaceable without even removing the gun from the vacuum chamber. Used firing units may be returned to the factory for rebuild.

Several cathode types and sizes are available: tantalum disc cathodes, yttria-coated (Y_2O_3) iridium cathodes, or single-crystal lanthanum hexaboride (LaB_6) cathodes. These cathodes are not damaged by repeated exposure to atmospheric gases or water vapor when cold.

UHV technology is used throughout. The gun can be run in vacuums from 10^{-11} torr to 10^{-6} torr for the metal cathodes, or to 10^{-7} torr for LaB₆ cathodes. The yttria-coated iridium cathode can survive a total vacuum dump.

The electron gun is bakeable to 200°C with cables and electronics box removed; bakeout is limited by the magnetic focus and deflection coils. The Source region separately is bakeable to 350°C.

The gun can be mounted on a 4.5" inch or 6.0" inch CF flange and has zero insertion distance into the vacuum chamber. Various stand-alone Faraday cup designs are available.

The EGPS-6002 Power Supply System contains all necessary power supplies to run the EGH-6002 Electron Gun. The Power Supply System design includes a separate High Voltage Supply.

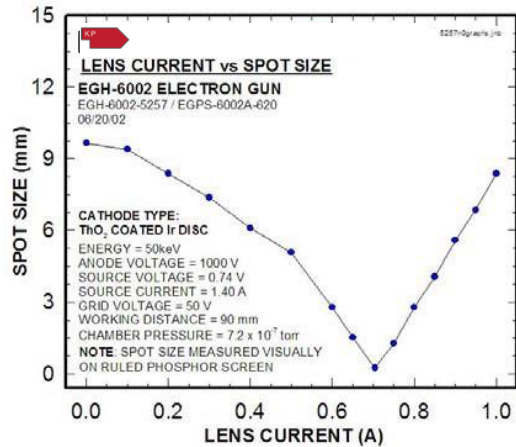
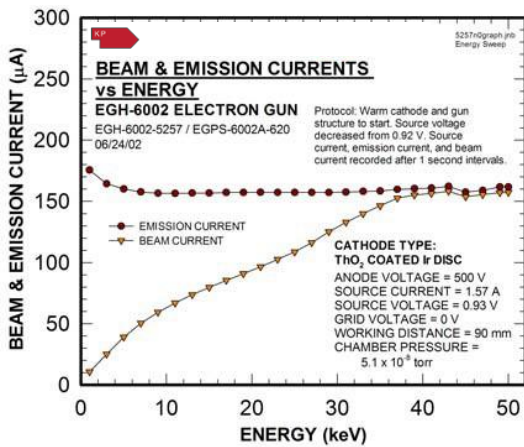
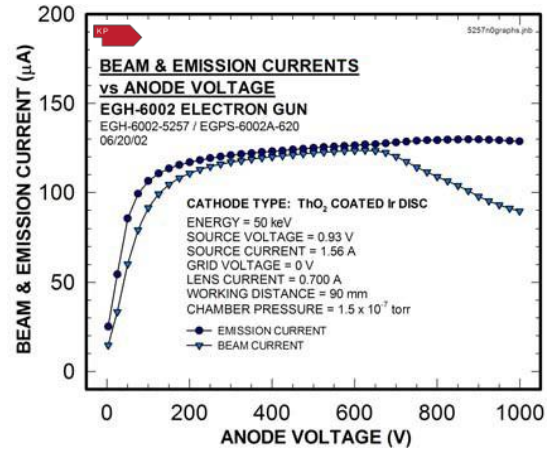
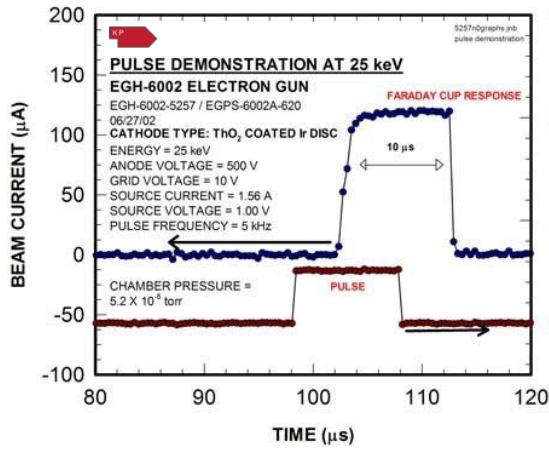
An optional LabVIEW™ computer program designed for the EGH-6002 is available for remote computer control and metering. Software is available in two options: 1) using National Instrument DAQ modules and the 50-pin connector on the EGPS-6002, or 2) via a simple mini-USB or RS-232 serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

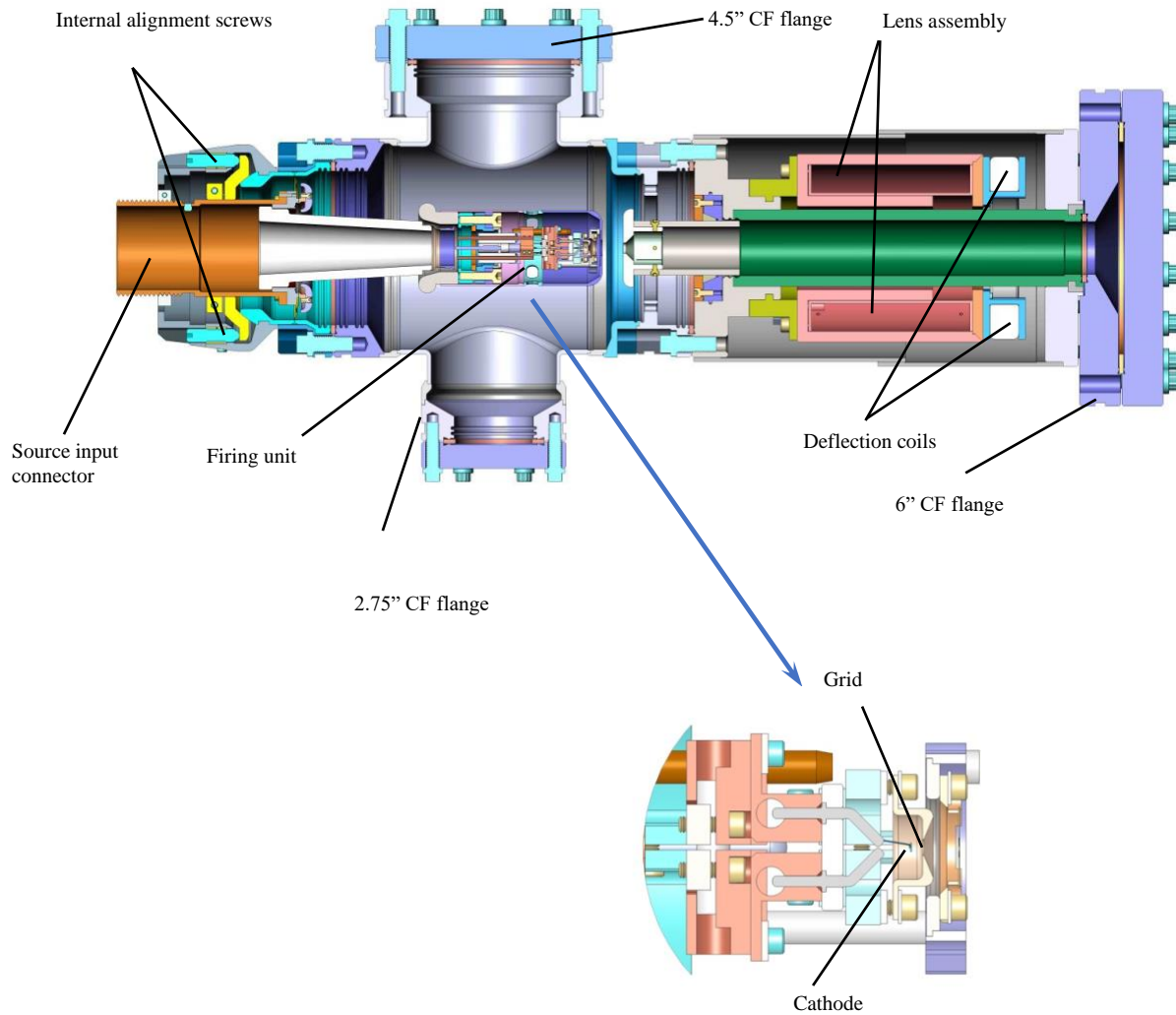


A typical lab set-up of a complete Kimball Physics system with power supplies, electron gun, and optional computer control system.

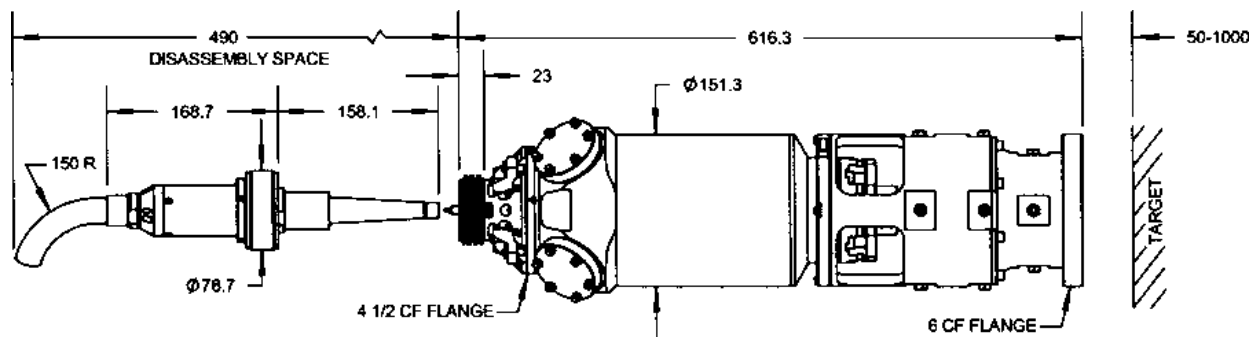
EGH-6002 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	1 keV to 50 keV (Independently adjustable)
BEAM CURRENT	10 nA to 100 μ A (Independently adjustable) High Current option: 10 nA to 10 mA Low Current option: 100 pA to 100 nA
ENERGY SPREAD	Approx. cathode thermal spread, calculated Ta - 0.5eV Y ₂ O ₃ - 0.4eV LaB ₆ - 0.4eV
BEAM FOCUSING	Magnetostatic
BEAM DIVERGENCE	Variable. Adjustable optics to adapt to different divergences and working distances
SPOT SIZE	0.5 mm to 100 mm
WORKING DISTANCE	50 mm to 1000 mm; Typical: 100 mm
BEAM DEFLECTION	Magnetostatic $\pm 0.5^\circ$
PULSE CAPABILITY (using appropriate pulse generator, not included)	Optional Dual Grid Power Supply: pulse width 2 μ s to DC, rep rates to 1 kHz, 500 ns rise/fall, using appropriate pulse generator, not furnished
BEAM UNIFORMITY	Gaussian
FIRING UNIT	Customer-replaceable Firing Unit Cartridge includes precision-aligned cathode, and Wehnelt (G-1) assembly Entire firing unit also includes first anode
CATHODE TYPE	Tantalum disc, Yttrium oxide (Y ₂ O ₃), or Lanthanum hexaboride (LaB ₆) Cathodes not harmed by repeated exposure to atmospheric gases while cold
BEAM ALIGNMENT	Adjustable Feedthrough for mechanical alignment of firing unit while gun is operating
MOUNTING	4½ inch or 6 inch CF Flange
INSERTION LENGTH	Zero mm
GUN DIMENSIONS	Gun length: 636 mm, sealing surface to end of cable connector, Gun diameter: 151 mm for most of length Gun with electronics box & H.V. cable: approx. 745 mm x 415 mm x 220 mm overall (30 in x 16 in x 9 in)
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded stainless steel shell
CABLES / CONNECTORS	Multi-conductor high voltage fully ground-shielded, with mating aluminum connector to connect gun and power supply. Standard lengths: 3m Optional: 5 m
MAXIMUM BAKEOUT	200°C with cables and floating electronics box removed (200°C for magnetic Lens and Deflection coils, 350°C for Source chamber region)

EGPS-6002 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGH-6002 Electron Gun.
ENERGY SUPPLY STABILITY	<0.01% per hour with 0.05% RMS ripple at full output
BEAM STABILITY	$\pm 1.0\%$ per hour with Emission Current Control or $\pm 10\%$ per hour after warm-up without ECC
CONTROLS	Energy, Lens, Anode, Grid, Source, Emission Current Control, X and Y Deflection
METERING	Digital: Energy, Lens, Anode, Emission, Grid, Source Volts, Source Amps, optional X and Y Deflection
COMPUTER/REMOTE CONTROL & METER	All power supplies: 0 to +10 volts or -10 to +10 volts All meters: 0 to +2 volts
SOFTWARE	Standard configuration designed for RS-232 and mini-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, 100 W
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)	Two units, total approximately: 17 in. x 9 in. x 22 in. (432 mm x 180 mm x 560 mm); with rack mount kits, overall width is 19.5 in. (495 mm)





EGH-6002 ELECTRON GUN Solid Model cross-section.



EGH-6002 ELECTRON GUN (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 11/21/2022

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