

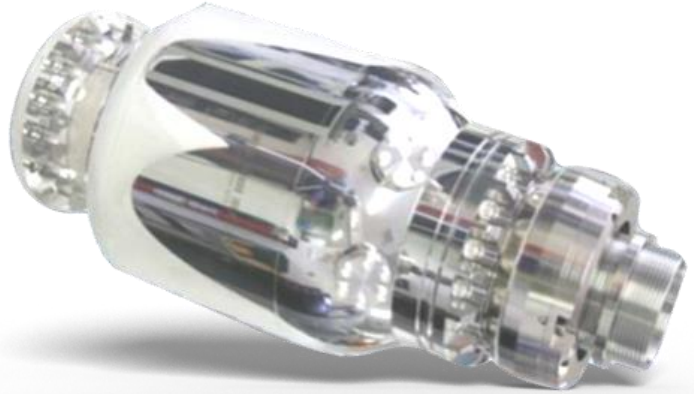
1 keV to 100 keV
Focusable Flood High Energy Electron Beams

FOR USE IN:

- General Vacuum Physics
- Spacecraft Materials Testing
- UHV Charging
- Surface Physics

FEATURES / OPTIONS:

- Uniform Flood Beam
- Beam Washing for Uniform Spot Size
- Electrostatic Focusing
- Instrumentation Ports (2 x 1.33")
- Internal Alignment During Operation
- User-Replaceable Firing Units
- 6" CF Flange Mounting
- UHV Technology and Bakeable
- Computer / Remote Control
- LabVIEW™ Computer / Programming



EGH-8105 Electron Gun

The Kimball Physics EGH-8105 Electron Gun, with its matching EGPS-8105 Power Supply is a complete subsystem ready to attach to the user's vacuum system and turn on. It can deliver electrons over a broad range of energies, currents, and power. The EGH-8105 is a high-power, focusable flood gun for use in spacecraft materials testing and other surface physics and general vacuum physics applications.

This is a high energy, focusable, flood electron beam system where both beam energy and beam current are independently adjustable over wide ranges. Energies from 1 keV to 100 keV and currents from picoamps (pA) to a milliamp (mA) can be achieved. 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. A magnetic beam washing option is available which provides significant improvement in beam uniformity. An

electrostatic focusing lens provides control of the flood beam spot size, which is typically in the tens of centimeters. However, as a flood-style gun, the spot size is also partially dependent on the grid, anode and working distance.

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 the beam on. The firing unit cartridge (including the cathode, cathode-mount, and Wehnelt aperture) is user-replaceable without the need to remove 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 (Ta) disc cathodes, yttria-coated (Y₂O₃) iridium cathodes, or Barium Oxide (BaO) cathodes. These cathodes (except for BaO) are not damaged by repeated exposure to atmospheric gases or water vapor when cold.

Various stand-alone Faraday cup designs are available.

UHV technology is used throughout. The gun can be run in vacuums from 10^{-11} torr to 10^{-6} torr for the Ta, to 10^{-4} for Y_2O_3 cathodes, or to 10^{-7} torr for BaO cathode. The yttria coated iridium cathode can survive a total vacuum dump. The electron gun is bakeable to 200°C with cables removed. The gun is usually mounted on a 6.0" inch CF flange and has zero insertion distance into the vacuum chamber.

The EGPS-8105 Power Supply contains all necessary power supplies to run the EGH-8105 Electron Gun. The Power Supply System design includes a separate HV (high voltage) Supply.

An optional LabVIEW™ computer program designed for the EGH-8105 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-8105, or 2) 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-8105 Electron Gun Power Supply with FlexPanel controller.

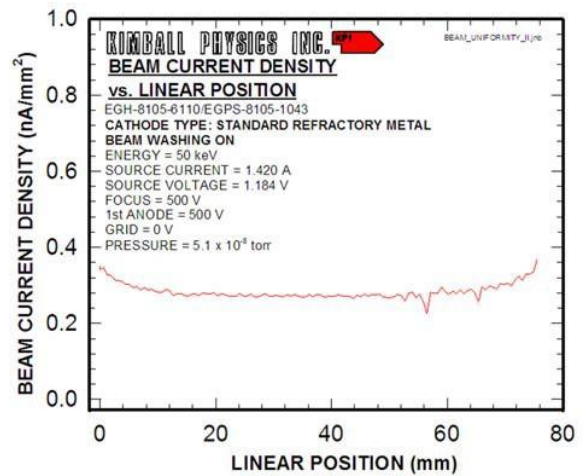
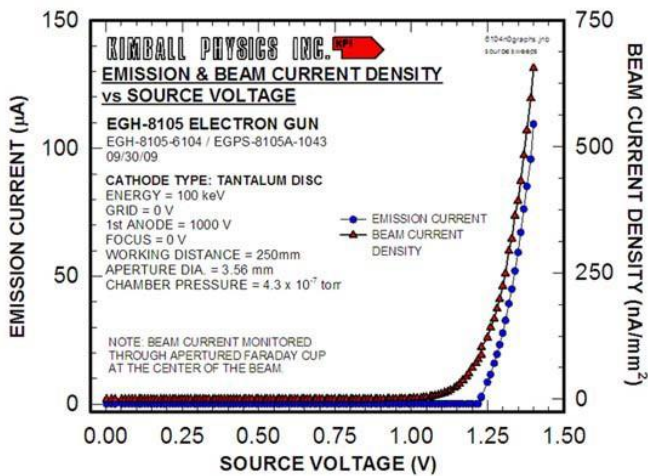
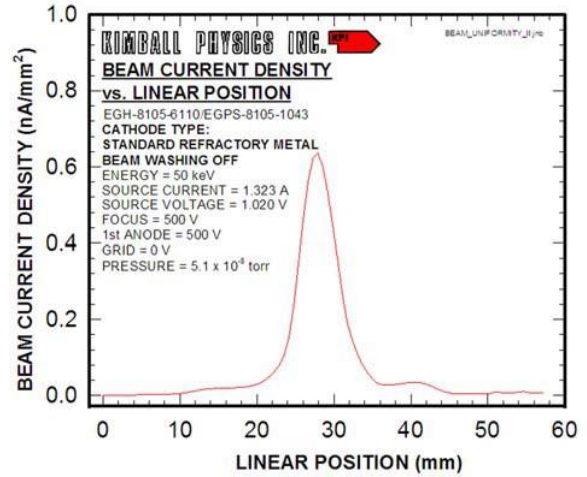
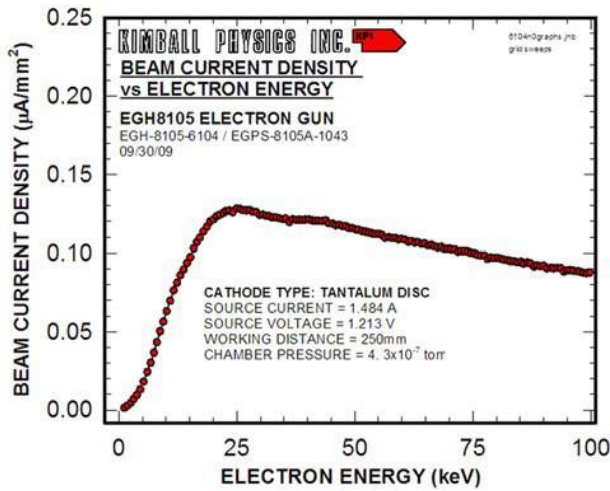


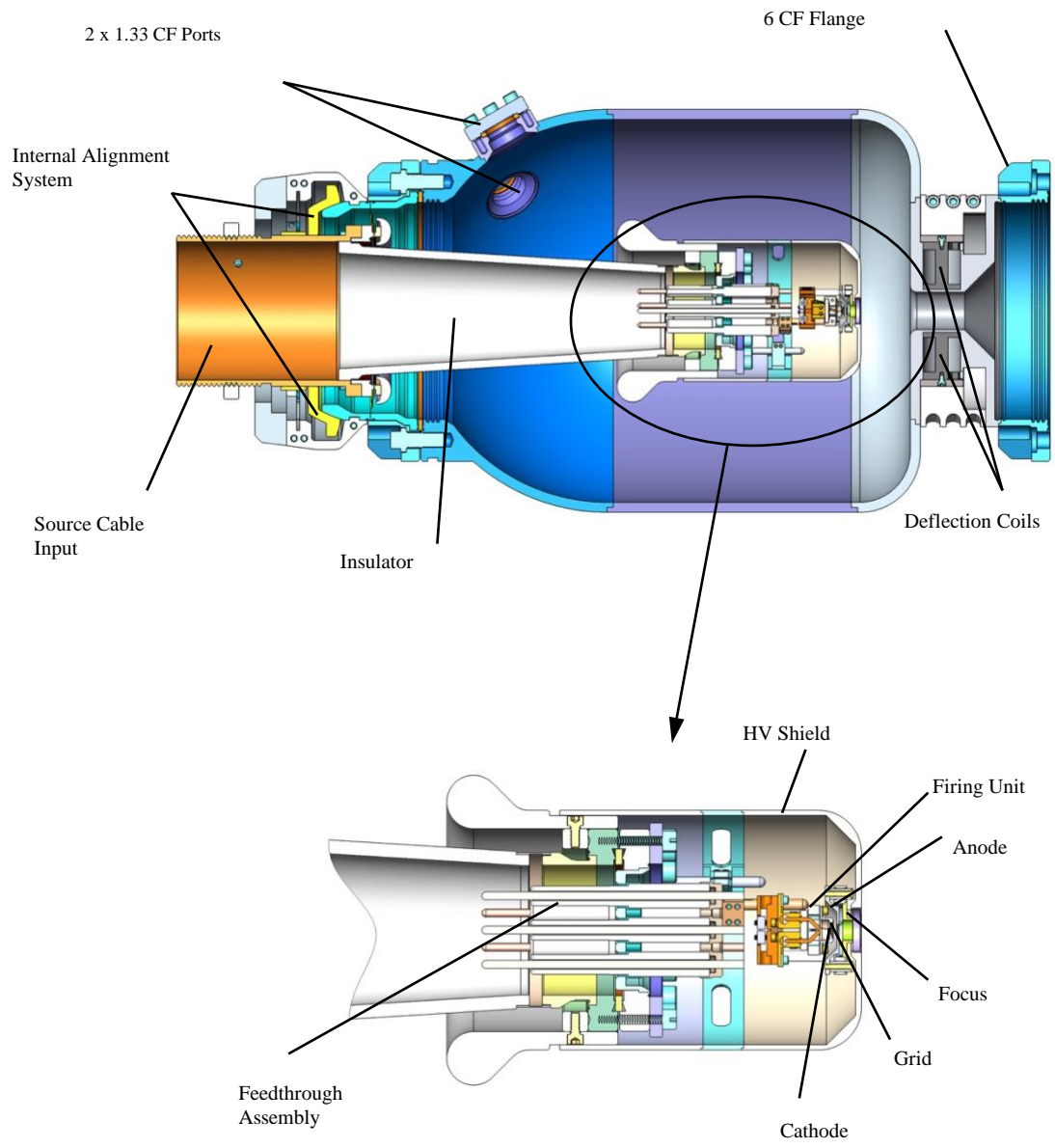
A typical lab set-up of a complete Kimball Physics system with power supplies, electron gun, and optional computer control system.

EGH-8105 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	Up to 100 keV (Independently adjustable)
BEAM CURRENT	50 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
BEAM FOCUSING	Electrostatic
BEAM DIVERGENCE	Variable. Adjustable optics to adapt to different divergences and different working distances
SPOT SIZE	Typical: 15 to 450+ mm
WORKING DISTANCE	Variable
BEAM DEFLECTION	Magnetostatic: $\pm 20^\circ$ at 100 keV
BEAM WASHING	Magnetic (optional): Improves beam uniformity and effective spot size
PULSE CAPABILITY	Pulsing with grid remote control. Optional Dual Grid Power Supply: pulse width 2 μ s to DC, rise/ fall 500 ns, rep rates to 5 kHz with optional LabVIEW™ program pulse generator or user's TTL pulser
BEAM UNIFORMITY	Gaussian
FIRING UNIT	Customer-replaceable Firing Unit Cartridge includes precision-aligned cathode, and Wehnelt (G-1) assembly Firing unit also includes first anode
CATHODE TYPE	Standard: Refractory metal cathode - Tantalum (Ta) Low-light barium oxide coated (BaO) Yttria coated iridium (Y ₂ O ₃)
BEAM ALIGNMENT	Mechanical alignment with internal firing unit adjustment
MOUNTING	Standard: 6.0" inch CF flange
INSERTION LENGTH	Zero mm
GUN DIMENSIONS	Gun length: 537 mm sealing surface to end of cable connector, Gun diameter: 203 mm
FEEDTHROUGHS	Multi-pin brazed ceramic with threaded stainless steel shell
CABLES / CONNECTORS	Multi-conductor high voltage fully ground-shielded Source cable, low voltage deflection cable
MAXIMUM BAKEOUT	200°C with cables removed

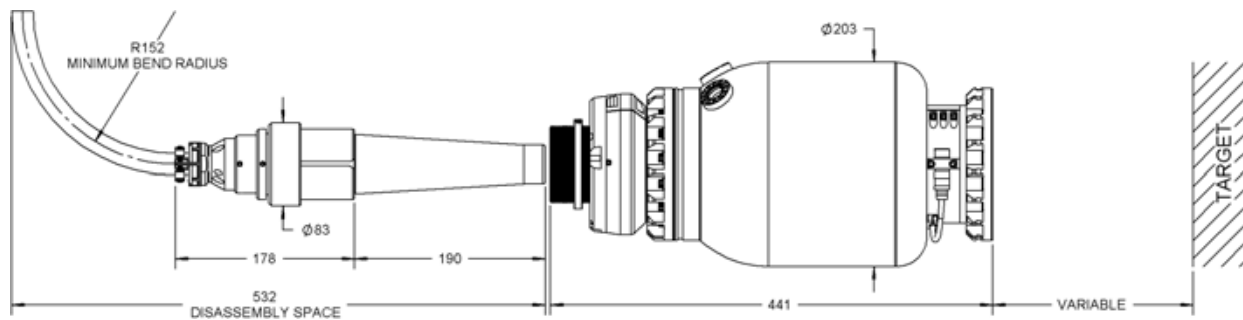
EGPS-8105 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGH-8105 Electron Gun.
ENERGY SUPPLY STABILITY	<0.01% per hour with 0.05% RMS ripple at full output
BEAM STABILITY	$\pm 1.0\%$ per hour with Emission Current Control (ECC) or $\pm 10\%$ per hour after warm-up without ECC
CONTROLS	Energy, Focus, Anode, Grid, Source, Emission Current Control, optional X & Y Deflection
METERING	Digital: Energy, Focus Anode, Emission, Grid, Source Volts, Source Amps, optional X & 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 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, (EGPS control unit and HV unit) total approximately: 17 in. x 12 in. x 22 in. excluding handles (432 mm x 305 mm x 560 mm); 19 in. rack mountable

OPTIONAL HARDWARE RASTER / BEAM WASHING	
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 serial, analog input, or computer control with LabVIEW™ software option.





EGH-8105 Electron Gun Solid Model cross-sections.



EGH-8105 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 12/13/2022

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