



# EGH-8103 / EGPS-8103 ELECTRON GUN / POWER SUPPLY

## 10 keV to 100 keV

### Focusable, High Energy Electron Beams, Small Spot Option to 60 $\mu\text{m}$

#### 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:

SMALL SPOTS, DOWN TO 60  $\mu\text{m}$   
 BEAM CURRENTS, UP TO 1 mA  
 MAGNETOSTATIC FOCUSING  
 MAGNETOSTATIC DEFLECTION  
 PULSE CAPABILITY  
 INTERNAL ALIGNMENT WHILE OPERATING  
 USER-REPLACEABLE FIRING UNITS  
 COMPUTER CONTROL AVAILABLE



EGH-8103 Electron Gun Mounted on 6CF Flange, with optional Turbo Pump and Ion Gauge

The Kimball Physics EGH-8103 Electron Gun with its matching EGPS-8103 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-8103 has applications in space materials testing, radiation studies, semiconductor research x-ray generation and plasma excitation.

The gun uses a refractory metal or lanthanum hexaboride ( $\text{LaB}_6$ ) cathode to generate a high energy, focusable, small spot electron beam. Both beam energy and beam current are independently adjustable over wide ranges, the energy from 10 keV to 100 keV, and current from 10 nA to 1 mA. 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 500  $\mu\text{m}$  to 10 mm with a refractory metal disc cathode. With a small spot option using a lanthanum hexaboride ( $\text{LaB}_6$ ) cathode, the gun can deliver spots down to 60  $\mu\text{m}$ . 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 with beam on.

UHV technology is used throughout. The gun can be run in vacuums from  $10^{-11}$  torr to  $10^{-6}$  torr for the refractory metal cathodes. The electron gun is bakeable to 200°C with cables removed; bakeout is limited by the magnetic focus and deflection coils. The Source region separately is bakeable to 350°C.

Several cathode types and sizes are available: tantalum disc cathodes (Ta), single-crystal lanthanum hexaboride ( $\text{LaB}_6$ , small spot, high brightness, min. vacuum  $1 \times 10^{-7}$  torr) and yttria-coated iridium discs ( $\text{Y}_2\text{O}_3$  - Ir, rugged, may survive brief loss of vacuum). The cathodes are not damaged by repeated exposure to atmospheric gases or water vapor when cold.

The gun design provides for differential pumping of the Source region with a 4 1/2 CF flange on the source chamber for attachment for a Turbo

The gun has a 4 1/2" port for optional Turbo pump and 3 2 3/4 CF flanges for an ionization gauge and other options. The gun is usually mounted on a 6 inch CF flange and has zero insertion length, i.e. does not extend into the vacuum chamber. Due to the high power beam produced by the EGH-8103, X-ray shielding is essential.

Firing units are user-replaceable without removing the entire gun from the vacuum chamber; 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. Various stand-alone Faraday cup designs are available.

The Power Supply System for the EGH-8103 is composed of two separate units: the EGPS-8103 Electron Gun Power Supply and a separate H.V. Power Supply controlled by the EGPS-8103. The EGPS-8103 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, magnetic Lens, and magnetic X, Y Deflection, as well as the floating Source/ ECC, Grid, First Anode and supplies.

The FlexPanel 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. An RS-232 or RS-422/485 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.

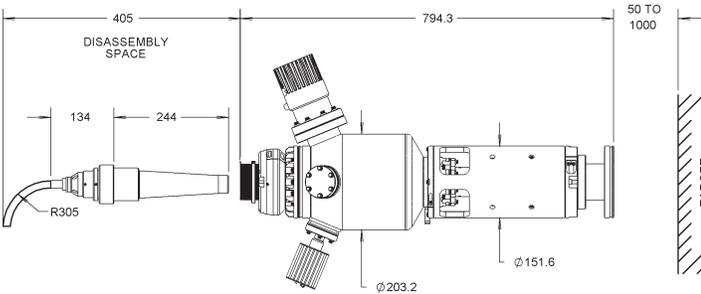
An optional LabVIEW™ computer program designed for the EGH-8103 is available for remote computer control and metering. Software is available in two types: Using National Instrument DAQ boards and SCSI connectors on the EGPS-8103, or via a simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.



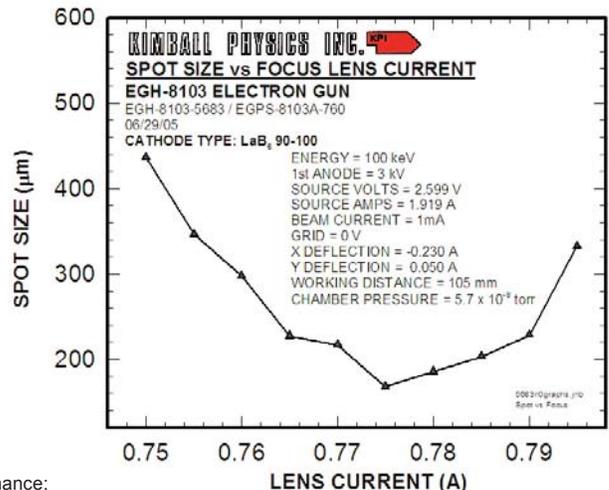
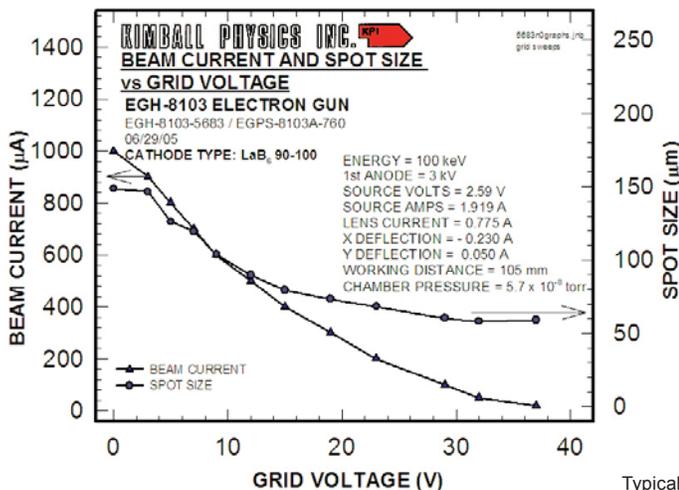
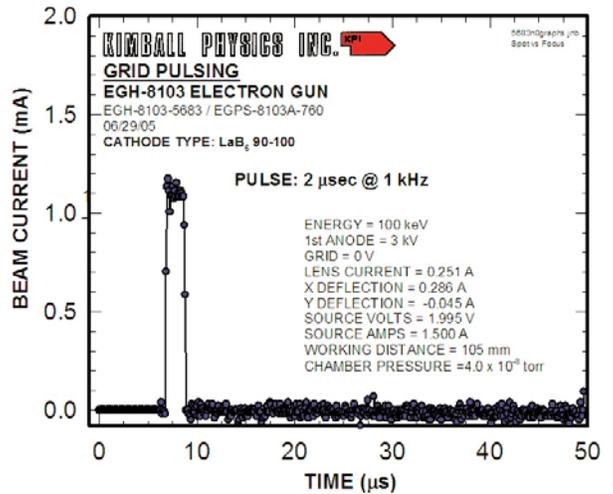
EGPS-8103 Electron Gun Power Supply with Flexpanel

EGH-8103 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	10 keV to 100 keV (Independently adjustable)
BEAM CURRENT	10 nA to 1 mA (Independently adjustable) Small spot option: 10nA to 100µA
ENERGY SPREAD	Approx. cathode thermal spread, calculated Ta - 0.5eV Y <sub>2</sub> O <sub>3</sub> - 0.4eV LaB <sub>6</sub> - 0.4eV
BEAM FOCUSING	Magnetostatic
BEAM DIVERGENCE	Variable. Adjustable optics to adapt to different divergences and different working distances
SPOT SIZE	Standard: 500 µm to 10 mm. Small spot option (LaB <sub>6</sub> cathode): 60 µm to 10 mm
WORKING DISTANCE	50 mm to 1000 mm
BEAM DEFLECTION	Magnetostatic: ± 0.5° at 100 keV
PULSE CAPABILITY	Optional Dual Grid Power Supply: pulse width 2 µs 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.
CATHODE TYPES	Standard: Tantalum disc (Ta). Optional: Lanthanum hexaboride (LaB <sub>6</sub> ) Yttrium oxide (Y <sub>2</sub> O <sub>3</sub> ) Cathodes not harmed by repeated exposure to atmospheric gases while cold
INTERNAL GUN ALIGNMENT	Adjustable Feedthrough for mechanical alignment of firing unit while gun is operating
MOUNTING	Standard: 6 inch CF flange
DIFFERENTIAL PUMPING	Source chamber with one 4½ CF port and three 2¼ CF ports for small pump and ionization gauge Optional pump: Varian Turbo-V70 LP with controller Optional gauge: Granville-Phillips 354 Micro-Ion Module
INSERTION LENGTH	Zero mm
GUN DIMENSIONS (outside vacuum)	Gun length: 955 mm sealing surface to end of cable connector Gun diameter: 362 mm max at flange cluster on source chamber (no pumps), 203 mm dia source chamber, 152 mm dia lens support tube
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded aluminum-plated shell for main cable and stainless steel shell for others
CABLES / CONNECTORS	All high voltage fully ground-shielded cables with mating metal to metal connectors, to connect gun and power supply. Standard lengths: 3 m, Optional: longer available
MAXIMUM BAKEOUT	200°C with cables removed. (200°C for magnetic Lens and Deflection coils, 350°C for Source chamber region)

EGPS-8103 ELECTRON GUN POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGH-8103 Electron Gun (in combination with H.V. Power Supply)
ENERGY SUPPLY STABILITY	<0.01% per hour with 0.05% rms ripple at full output
BEAM STABILITY	±0.1% per hour with optional Emission Current Control or ±10% per hour after warm up without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid, First Anode, Lens, X and Y Deflection. Optional: Emission Current Control (ECC)
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Emission Current, Grid, First Anode Voltage, First Anode Current, Lens Current, X and Y Deflection Currents
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 serial port (RS-232, RS-422 or RS-485 available, if specified at time of order) Optional: SCSI metering and programming connectors
INPUT	115 VAC or 230 VAC, (specify on order) 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
SOFTWARE	Standard configuration designed for RS-232 connections. Optional: National Instruments LabVIEW™ file, designed to run with computer DAQ boards NI-6733 and PCIe-6341. SCSI interface
DIMENSIONS (width x height x depth)	Two units, total approx: 17 in. x 20.3 in. x 22 in. excluding handles (425 mm x 515 mm x 560 mm); 19 in. rack mountable



EGH-8103 ELECTRON GUN  
shown with optional turbo pump and ion gauge  
(Dimensions in mm)



Typical performance;  
data for guidance only.