

10 keV to 100 keV

Focusable, High Energy Electron Beams, High Currents up to 20 mA pulsed

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:

HIGH BEAM CURRENTS, TO 20 mA PULSED
SPOT SIZE, DOWN TO 1 mm
MAGNETOSTATIC FOCUSING
MAGNETOSTATIC DEFLECTION
PULSE CAPABILITY
INTERNAL ALIGNMENT WHILE OPERATING
USER-REPLACEABLE FIRING UNITS
COMPUTER SYSTEM AVAILABLE

The Kimball Physics EGH-8201 Electron Gun with its matching EGPS-8201 Power Supplies 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-8201 has high current, pulsed applications in space materials testing, radiation studies, semiconductor research x-ray generation and plasma excitation.

The gun uses a refractory metal disc cathode to generate a high energy, high current, focusable 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 and up to 20 mA pulsed. The electron beam is 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 1 mm to 100 mm. 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. 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.

The EGH 8201 usually employs a high current, rugged thoria or yttria-coated iridium disc cathode. (ThO_2 or $\text{Y}_2\text{O}_3 - \text{Ir}$). The cathode is not damaged by repeated exposure to atmospheric gases or water vapor when cold. In addition, the iridium cathode may survive a brief accidental loss of vacuum.

The gun design provides for differential pumping of the Source region with a $4\frac{1}{2}$ CF flange on the source chamber for attachment for a Turbo pump and a $2\frac{3}{4}$ CF flange for an ionization gauge. The gun is usually mounted on a 6 inch CF flange and has zero insertion distance, i.e. does not extend into the vacuum chamber. Due to the high power beam produced by the EGH-8201, X-ray shielding is essential.



EGH-8201 Electron Gun Mounted on 6CF Flange

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.

The Power Supply System for the EGH-8201 is composed of four separate units: the EGPS-8201 Electron Gun Power Supply, a H.V. Floating Supply Box and a separate H.V. Driver Unit / H. V. Unit controlled by the EGPS-8102. The EGPS-8201 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 supplies.

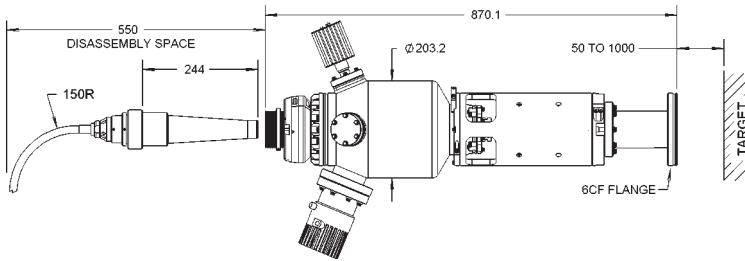
The power supply design includes a unique optically controlled floating electronics box that is mounted close to the gun. Among other advantages, this design reduces voltage loss due to cable length and reduces the possibility of arc damage due to excess stored energy in the high voltage cable. The fiber optics control permits the EGPS-8103 to be located at a distance from the gun for safety.

The new FlexPanel provides a digital display screen and an encoder wheel 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.

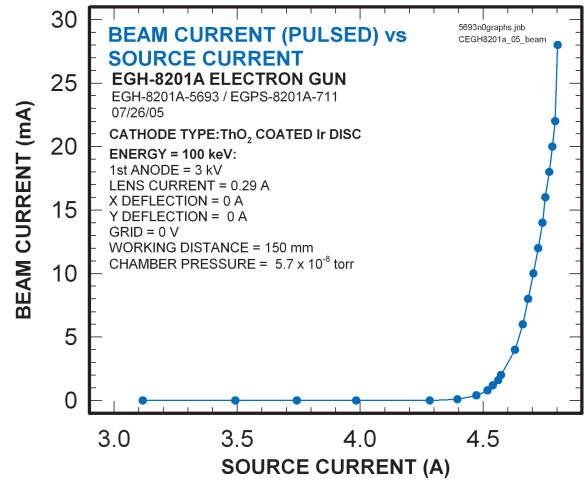
An optional LabVIEW™ computer program designed for the EGH-8201 is available for remote computer control and metering using National Instrument DAQ boards and SCSI connectors on the EGPS-8201. The program provides a virtual panel of controls and meters on the user's computer screen. A complete computer system is also available with the software and DAQ hardware installed.

EGH-8201 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	10 keV to 100 keV (Independently adjustable)
BEAM CURRENT	10 nA to 1 mA (Independently adjustable) Pulsed beam up to 20 mA
ENERGY SPREAD	Approx. 0.4 eV cathode thermal spread, calculated
BEAM FOCUSING	Magnetostatic
BEAM DIVERGENCE	Variable. Adjustable optics to adapt to different divergences and different working distances
SPOT SIZE	1 mm to 100 mm
WORKING DISTANCE	50 mm to 1000 mm
BEAM DEFLECTION	Magnetostatic: $\pm 0.5^\circ$ at 100 keV
PULSE CAPABILITY	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
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 TYPES	Thorium oxide (ThO ₂) or Yttrium oxide (Y ₂ O ₃) 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 2¾ CF ports for small pumps and ionization gauges 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: 1000 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	Multipin 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: 5 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-8201 ELECTRON GUN POWER SUPPLY SPECIFICATIONS	
OUTPUTS	All necessary voltages to drive the EGH-8201 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	$\pm 10\%$ per hour after warm up without ECC (Emission Current Control not possible with pulsing)
CONTROLS	FlexPanel controls: Energy, Source, Grid, First Anode, Lens, X and Y Deflection
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) On/off switches: 0 or +5 V 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	Optional: National Instruments LabVIEW™ file, designed to run with computer DAQ boards NI 6034E and NI 6703 with optional computer generated pulsing signal
COMPUTER SYSTEM	Optional: Industrial computer system including data acquisition and control hardware DAQ.
DIMENSIONS (width x height x depth)	Two units, total approx: 17 in. x 10.3 in. x 22 in. excluding handles (425 mm x 260 mm x 560 mm); 19 in. rack mountable
DIMENSIONS H.V. Floating Supply	7 in. x 17 in. x 25 in. (180 mm x 430 mm x 635 mm) placed near electron gun



EGH-8201 ELECTRON GUN
shown with optional turbo pump and ion gauge
(Dimensions in mm)



Typical performance;
data for guidance only.

