

1 keV to 100 keV
High Energy, High Current, Flood Electron Beam

FOR USE IN:

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

FEATURES / OPTIONS:

- Beam Currents up to 1 mA (20 mA pulsed)
- Pulse Capability
- Internal Alignment During Operation
- User-Replaceable Firing Units
- Computer Control Available



EGH-8100 Electron Gun

The Kimball Physics EGH-8100 Electron Gun with its matching EGPS-8100 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-8100 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 (LaB_6) cathode to generate a high energy, high current electron beam. Both beam energy and beam current are independently adjustable over wide ranges; the energy from 1 keV to 100 keV, and current from 10 nA to 1 mA. (20 mA pulsed). The electron beam can be pulsed by an input signal to the control grid.

The gun features an adjustable cathode feedthrough assembly that allows the mechanical alignment of the firing unit with respect to the anode. 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 up to 10^{-7} torr for the refractory-metal cathode. The electron gun is bakable to 350°C with cables removed. Bakeout is limited to 200°C with magnetostatic focusing option.

Several cathode types and sizes are available: tantalum disc cathodes (Ta), single-crystal lanthanum hexaboride (LaB_6 , high brightness, min. vacuum 1×10^{-7} torr) and yttria coated iridium discs (Y_2O_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 4.5" CF flange on the source chamber for attachment of a turbo pump and three 2.75" CF flanges for an ionization gauge or other equipment. The gun is usually mounted on a 6.0" inch CF flange and has zero insertion length, i.e., does not extend into the vacuum chamber. Due to the high-power beam

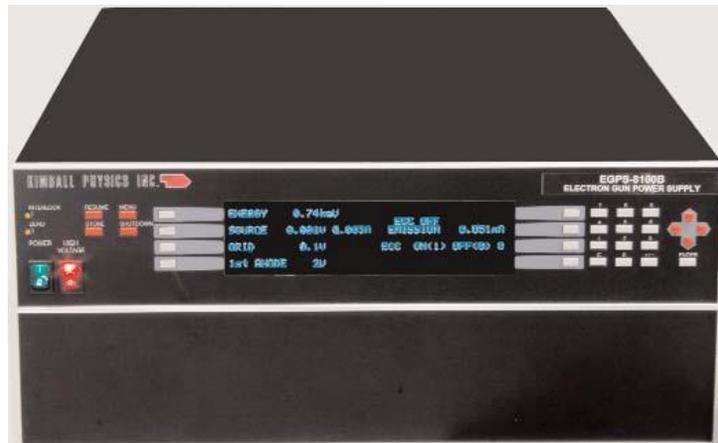
produced by the EGH-8100, *X-ray shielding is essential.*

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 designs of Faraday cups are available.

The Power Supply System for the EGH-8100 is composed of two separate units: the EGPS-8100 Electron Gun Power Supply and a separate HV (high voltage) Power Supply controlled by the EGPS-8100. The EGPS-8100 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, as well as the floating Source/ECC, Grid, and First Anode 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. A mini-USB, RS-232 or RS-422/485 serial ports 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.

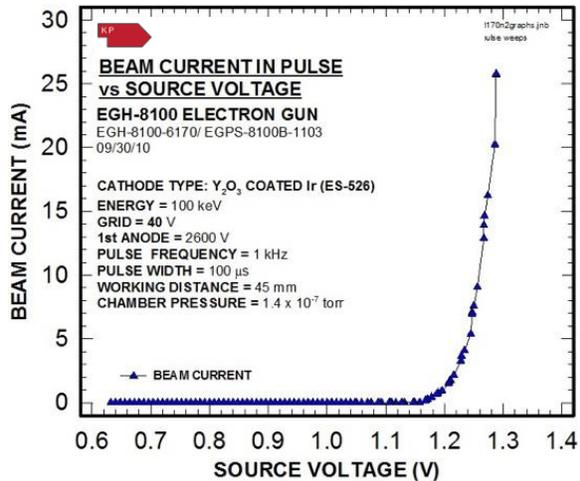
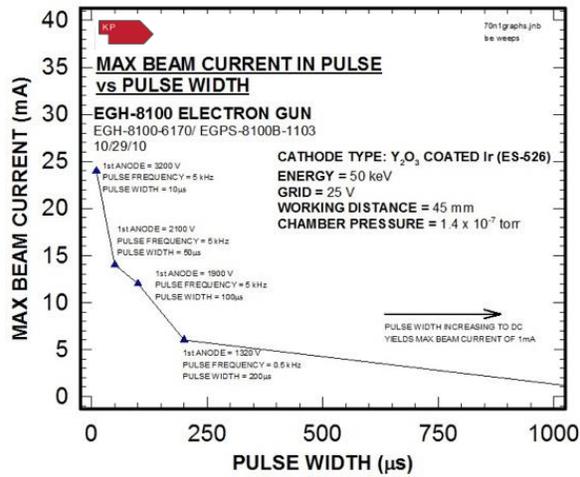
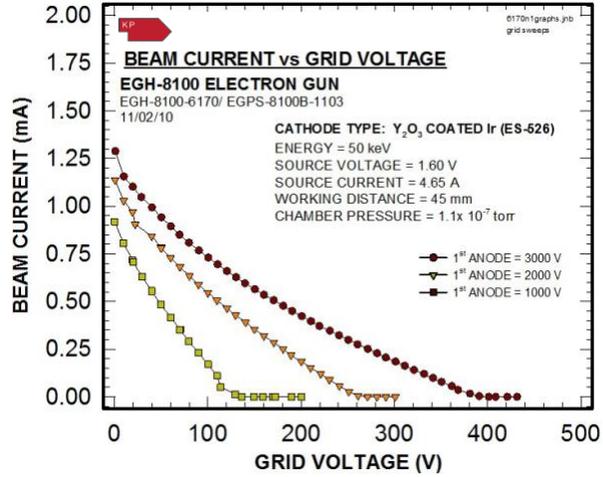
An optional LabVIEW™ computer program designed for the EGH-8100 is available for remote computer control and metering. Software is available in two options: 1) using National Instrument DAQ modules and the 50-pin connector on the EGPS-8100, or 2) via a simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

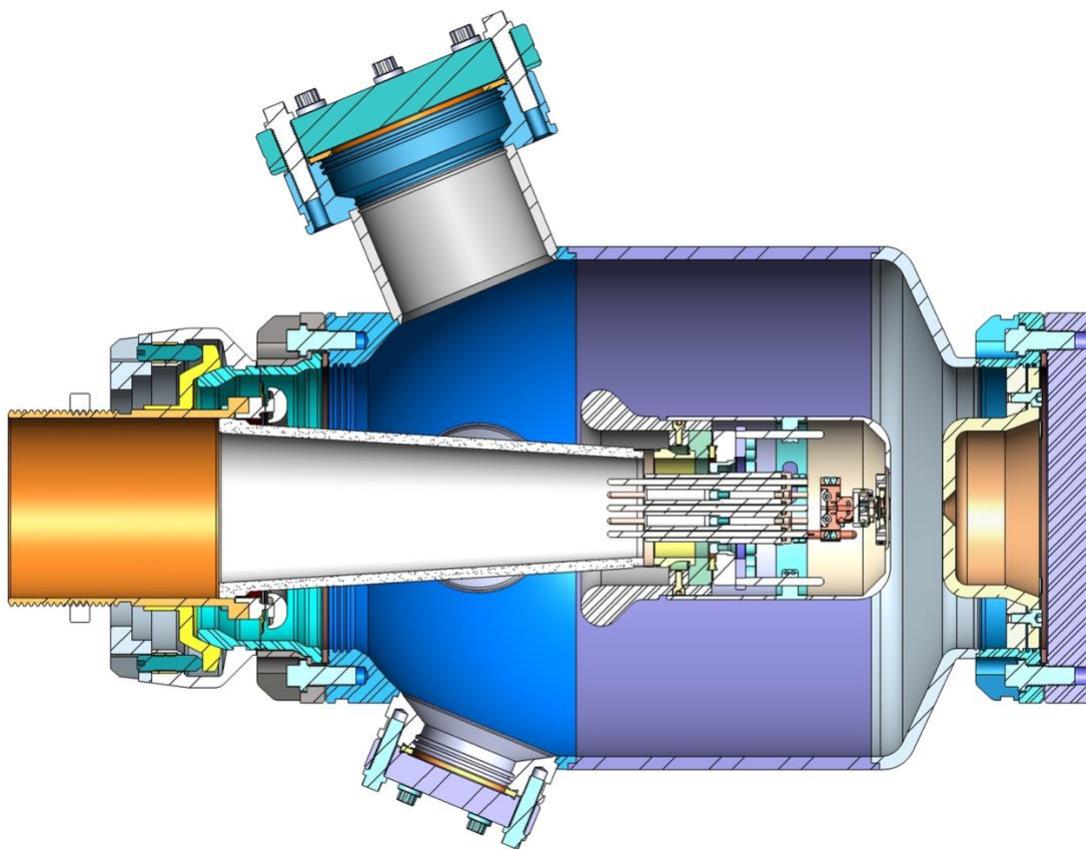


EGPS-8100 Power Supply

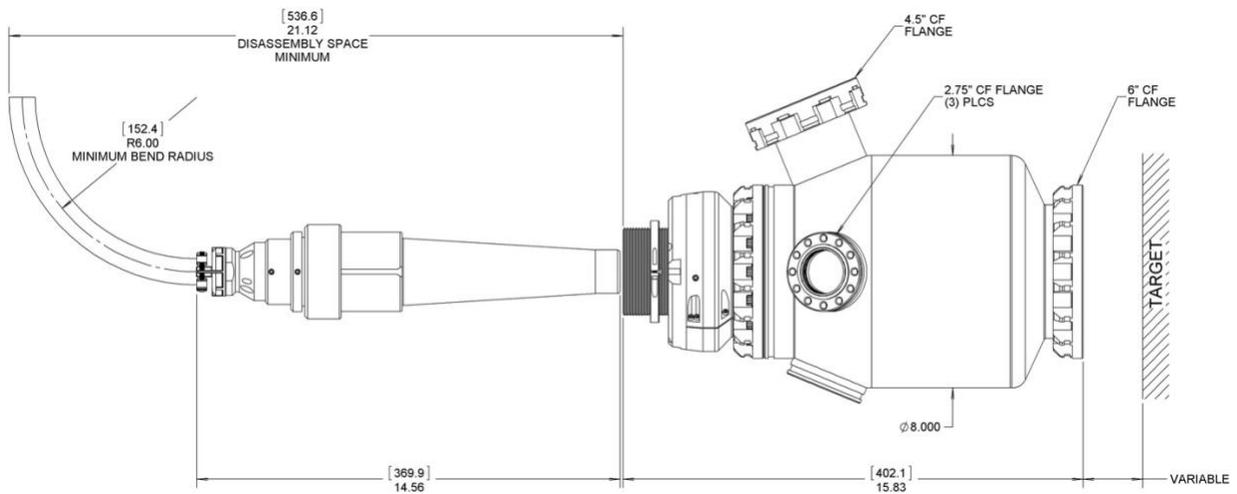
EGH-8100 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	1 keV to 100 keV (Independently adjustable)
BEAM CURRENT	Standard: 10 nA to 100 μ A (Independently adjustable) Optional: 10 nA to 1 mA (20mA pulsed)
ENERGY SPREAD	Approx. cathode thermal spread, calculated: Ta - 0.5eV. Y ₂ O ₃ - 0.4eV LaB ₆ - 0.4eV
BEAM FOCUSING	Magnetostatic
BEAM DIVERGENCE	Variable. Adjustable optics to adapt to different divergences and different working distances
SPOT SIZE	Standard: 3 mm to 100 mm.
WORKING DISTANCE	50 mm to 1000 mm
BEAM DEFLECTION	None
PULSE CAPABILITY (using appropriate pulse generator, not included)	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
CATHODE TYPE	Standard: Tantalum disc (Ta). Optional: Lanthanum hexaboride (LaB ₆) Yttrium oxide (Y ₂ O ₃) 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	Standard: 6- inch CF flange
INSERTION LENGTH	Zero mm
GUN DIMENSIONS	Gun length: 403 mm sealing surface to end of cable connector 285 mm max across flange cluster on source chamber (no pumps), 203 mm diameter source chamber
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: 5m
MAXIMUM BAKEOUT	350°C with cables removed. 200°C with magnetostatic focusing option.

EGPS-8100 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGH-8100 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 0.1% per hour with optional Emission Current Control (ECC) or \pm 10% per hour after warm-up without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid, First Anode, Emission Current Control (ECC).
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Emission Current, Grid, First Anode Voltage.
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 mini-USB and RS-232 serial ports (RS-232, RS-422 or RS-485 available, if specified at time of order)
SOFTWARE	Standard configuration designed for USB and RS-232 serial connections. Optional: National Instruments LabVIEW™ file, designed to run with NI DAQ modules
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
DIMENSIONS (width x height x depth)	Two units, total approximately: 17 in. x 20.3 in. x 22 in. excluding handles (425 mm x 515 mm x 560 mm); 19 in. rack mountable





EGH-8100 ELECTRON GUN Solid Model cross-section



EMG-8100 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

Document EGH-8100 _EGPS-8100_2022_1121
 COPYRIGHT KIMBALL PHYSICS 2022, ALL RIGHTS RESERVED