KIMBALL PHYSICS
Excellence in Electron and Ion Optics

EGG-3101 / EGPS-3101
ELECTRON SOURCE / POWER SUPPLY

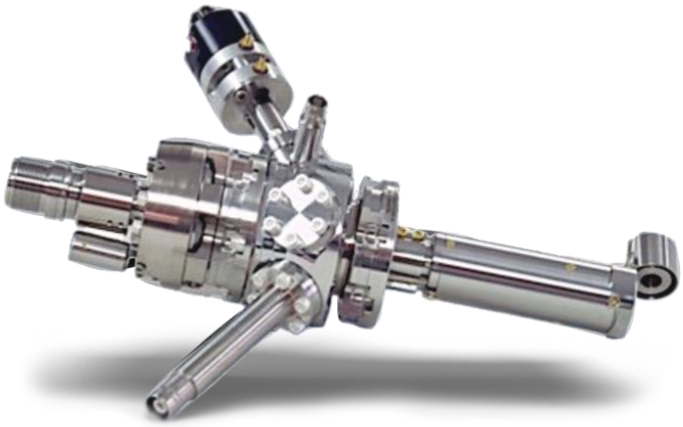
100 eV to 10 keV
Small Spot Collimated Beam, Alignment During Operation, Higher Current Option up to 1 mA

FOR USE IN:

- General Vacuum Physics Experiments
- Space Physics Experiments
- Specimen Heating
- Electron Diffraction
- Phosphor Studies
- MBE RHEED Studies

FEATURES / OPTIONS:

- New Modular Design
- Internal Alignment While Operating
- Collimated Beam
- Small Spot Option down to 60 µm
- Higher Current Option up to 1 mA
- Electrostatic Focus and Deflection
- Blanking, Pulsing, Rastering
- Rotatable 2.75" inch CF Mounting
- UHV Compatible and Bakeable
- Computer / Remote Control
- Flange Multiplexer Flexibility
- User-replaceable Firing Units



EGG-3101 Electron Gun with Optional Faraday Cup, and mounted on 2 ¾ inch Flange Multiplexer

The Kimball Physics EGG-3101 Electron Gun, with its matching EGPS-3101 Power Supply, is a multi-purpose modular Electron Gun with applications many areas. The EGG-3101 / EGPS-3101 is a complete subsystem ready to attach to a user's vacuum system and turn on.

With a small spot option using a lanthanum hexaboride cathode, the gun can deliver spots down to 60 μm. With a high current option, beam currents up to 1 mA can be obtained.

The gun has the capability of producing a collimated small spot or a flood electron beam. Beam current, beam energy, and spot size are all independently adjustable over wide ranges. The energy can be varied from 100 eV to 10 keV. The beam current and spot size range depend on the system option as shown in the specifications table. Pulsing, beam blanking and rastering are also available as options.

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, in real time while the gun is operating at full voltage with beam on.

The modular design of the EGG-3101 allows either the firing unit assembly or the lens assembly to be replaced by the user. The firing unit (including the cathode, cathode-mount, and Wehnelt aperture) is user-replaceable without removing the gun from the vacuum chamber. The anode is also easily replaceable. In addition, the cathode to anode spacing is internally adjustable to change the space charge effect or perveance of the electron beam.

UHV technology is used throughout. The gun can be run in vacuums from 10^{-11} torr up to 10^{-5} torr for the standard Ta disc cathode. The

electron gun is bakable to 350°C with cables removed. With Faraday cup and pneumatic actuator, maximum is 65ºC unless removed.

Many cathode types and sizes are available: tantalum disc cathodes (Ta), single-crystal lanthanum hexaboride (LaB_6, small spot, high brightness, min. vacuum $1x10^{-7}$ torr), barium oxide discs (BaO, low light, low energy spread, min. vacuum $1x10^{-7}$ torr) and yttria-coated iridium discs (Y2O3 - Ir, rugged, vacuum up to 10^{-4} torr). Except for BaO, the cathodes are not damaged by repeated exposure to atmospheric gases or water vapor when cold.

Firing units are user-replaceable; 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 EGPS-3101 Power Supply 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, Focus, X, Y Deflection, and optional Beam Blanker, as well as the floating Source/ECC and Grid supplies. For the high current option, a separate High Voltage Power Supply controlled by the EGPS-3101 is included as part of the system.

The FlexPanel provides a digital display screen, keypad, and up/ down arrows for programming control on the front panel. Rear panel connectors allow remote /computer control and metering of all gun power supplies. A mini-USB and RS-232 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. RS-422/485 conversion is possible.

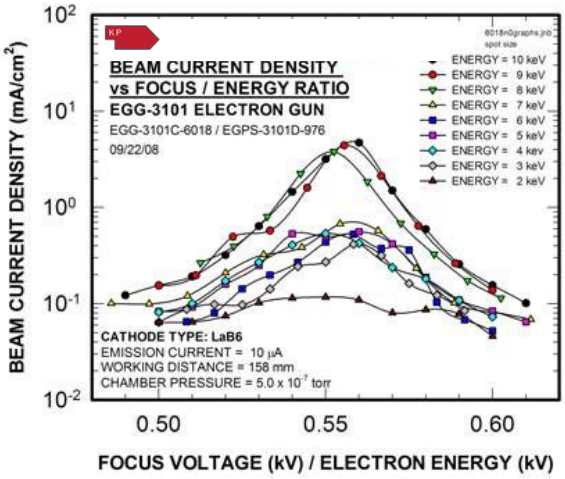
An optional LabVIEW™ computer program designed for the EGG-3101 is available for remote computer control and metering. Software is available in two options: 1) using National Instrument DAQ modules and the 50-pin connector on the EGPS-3101, or 2) via a simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.

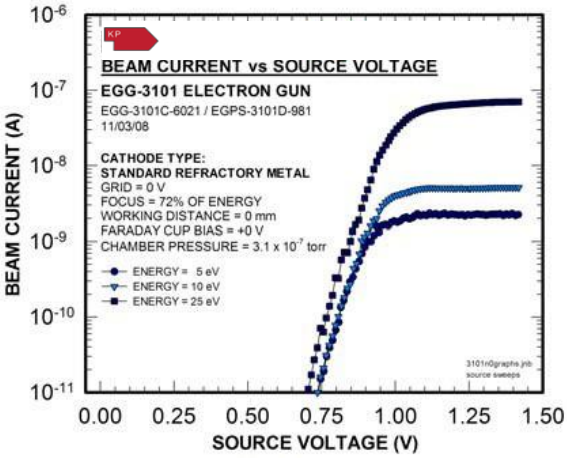
EGG-3101 Electron Gun, mounted on 2.75" inch Flange Multiplexer

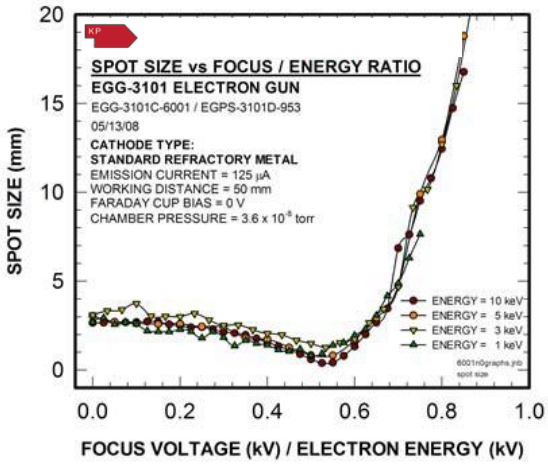
EGG-3101 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	100 eV to 10 keV (Independently adjustable)
BEAM CURRENT	Standard: 1 nA to 100 µA (Independently adjustable) Small Spot option: 1 nA to 10 µA High Current option: 1 µA to 1 mA
ENERGY SPREAD	Approx. cathode thermal spread, calculated: Ta - 0.5eV Y_2O_3-0.4eV, BaO - 0.3eV LaB_6 - 0.4eV
SPOT SIZE	Standard: 500 µm to 25 mm Small Spot option: 60 µm to 10 mm High Current option: 1.5 mm to 25 mm
WORKING DISTANCE	Typical: 200 mm. Range: 10 mm to 1000 mm
BEAM DEFLECTION	4 Pole Electrostatic: ± 6.0° at 10 keV; scales larger at lower energies
PULSE CAPABILITY (using appropriate pulse generator, not included)	Optional Dual Grid Power Supply: Pulse width 2 µs to DC, rise/ fall 500 ns, rep rates to 5 kHz (TTL required)
BEAM BLANKING	Optional: Pulse width 2 µs to DC, rep rates to 5 kHz (TTL required) Optional Capacitive Pulse Box: Pulse width 20 ns to 100 µs with appropriate pulse generator (not provided)
BEAM UNIFORMITY	Gaussian
FIRING UNIT	Customer-replaceable Firing Unit Cartridge includes precision-aligned cathode and Wehnelt (G-1) assembly, with insulators and connectors
CATHODE TYPE	Standard: Tantalum disc Optional: Barium oxide (BaO), Lanthanum hexaboride (LaB_6), Yttrium oxide (Y_2O_3). Except for barium oxide, cathodes not harmed by repeated exposure to atmospheric gases while cold
FARADAY CUP	Mounted on gun or stand-alone designs available
BEAM ALIGNMENT	Adjustable Feedthrough for mechanical alignment of firing unit while gun is operating
MOUNTING	Flange Multiplexer with a 2¾ inch CFF, including both tapped and clear mounting holes
INSERTION LENGTH	Standard: 109 mm, 163 mm with optional beam blanker
GUN DIMENSIONS	Gun Diameter- Standard: 35mm gun tube in vacuum
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded stainless steel shell
CABLES CONNECTORS	Multi-conductor 10 kV high voltage fully ground-shielded cable, coaxial focus cable, and low voltage deflection cable, with mating aluminum connectors, to connect gun and power supply. Standard lengths: 3 m, Optional: 5 m
MAXIMUM BAKEOUT	350°C with cables removed 65°C max with Faraday cup and pneumatic actuator, unless removed.

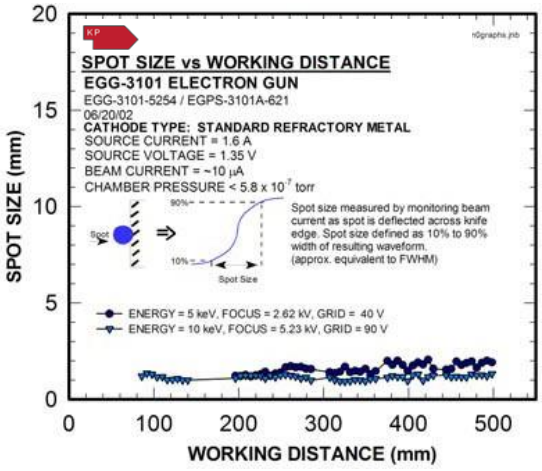
EGPS-3101 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGG-3101 Electron Gun
ENERGY SUPPLY STABILITY	±0.01% per hour; ±0.02% per 8 hours at full output
BEAM STABILITY	±0.1% per hour with Emission Current Control (ECC) or ±10% per hour after warm-up without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid, Focus, X and Y Deflection, Emission Current Control, optional Beam Blanker
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Emission Current, Grid, Focus, X and Y Deflection, optional Blanker 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 RS-232 or USB serial port (RS-422 or RS-485 available, if specified at time of order) Optional: SCSI metering and programming connectors
SOFTWARE	Standard configuration designed for RS-232 connections. Optional: National Instruments LabVIEW™ file, designed to run with NI DAQ modules
INPUT	115 VAC or 230 VAC, 50 to 60 Hz single phase, 250 VA. (Note: voltage changing is not possible with HC option)
ENVIRONMENT	Temperature: 0 to 40ºC, 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)	17 in. x 7 in. x 22 in. excluding handles (425 mm x 180 mm x 560 mm); 19 in. rack mountable
H.V. SUPPLY only (for High Current option)	Optional H.V. Supply: 17 in. x 1.75 in. x 20 in (425 mm x 44 mm x 508 mm) 19 in. rack mountable

OPTIONAL HARDWARE RASTER SPECIFICATIONS	
RASTER GENERATOR	Continuous control of X & Y Raster Amplitude, variable offset (Centering) and Frequency, with 0-10 kHz (X) and 0-100 Hz (Y) standard. All parameters controllable via serial, analog input, or computer control with LabVIEW™ software option.









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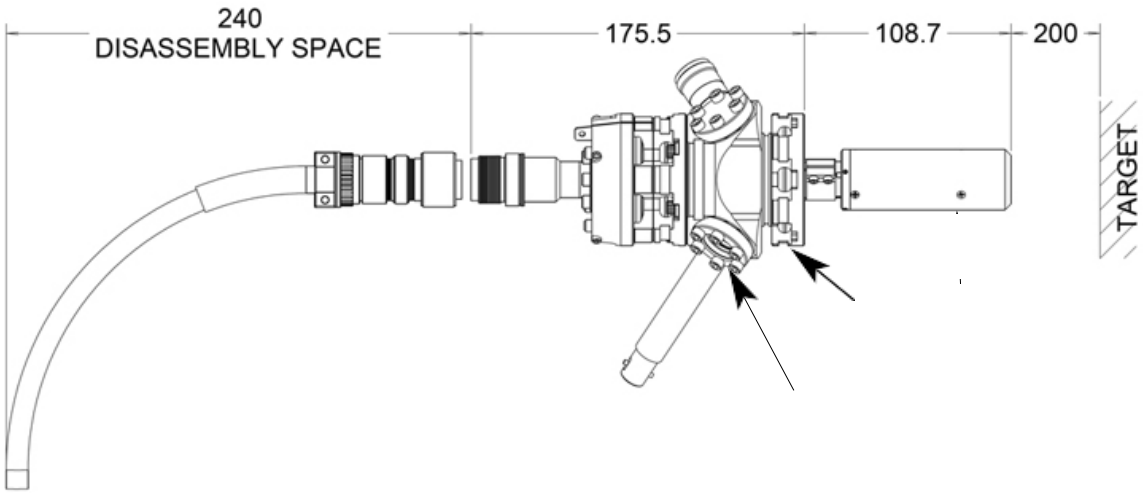

EGG-3101 ELECTRON GUN, without Blanker (Dimensions in mm)

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 04/15/2025

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