

### 100 eV to 10 keV

### Small Spot Collimated Beam, Alignment during Operation

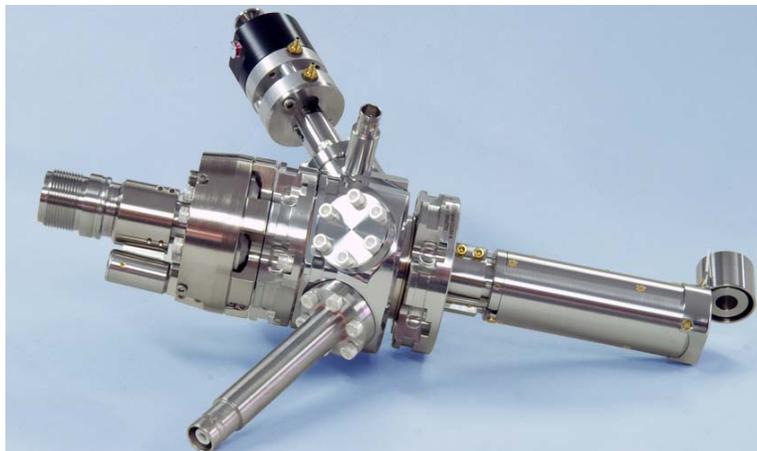
### Higher Current Option up to 1 mA

#### FOR USE IN:

- ▶ General vacuum physics experiments
- ▶ Space physics studies
- ▶ 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  $\mu\text{m}$
- ▶ Higher current option up to 1 mA
- ▶ Electrostatic focusing & deflection
- ▶ Blanking, pulsing, rastering
- ▶ Rotatable 2 3/4 inch CFF mounting
- ▶ UHV compatible / bakeable
- ▶ Computer / Remote control
- ▶ Flange multiplexer flexibility
- ▶ User-replaceable firing units



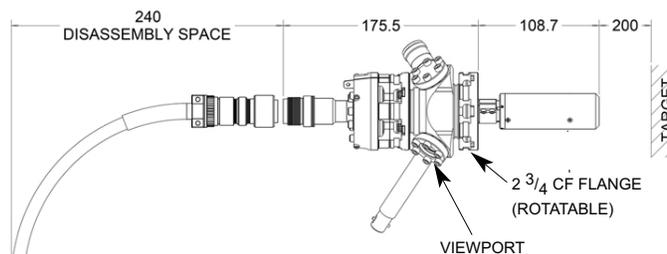
EGG-3101 Electron Gun with optional Faraday Cup, mounted on 2 3/4 inch Flange Multiplexer

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  $\mu\text{m}$ . 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 perveance.



EGG-3101 ELECTRON GUN, WITHOUT BLANKER (Dimensions in mm)

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.

Many 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), barium oxide discs ( $\text{BaO}$ , low light, low energy spread, min. vacuum  $1 \times 10^{-7}$  torr) and yttria-coated iridium discs ( $\text{Y}_2\text{O}_3$  - Ir, rugged, vacuum up to  $10^{-4}$  torr). With the exception of  $\text{BaO}$ , 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.

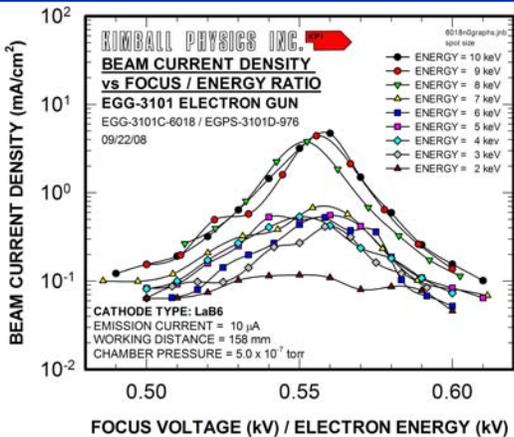
The FlexPanel provides a digital display screen, keypad and up/down arrows for programming control on the front panel. Rear panel connectors allow remote /computer control and metering of all gun power supplies. An RS-232 serial port and an analog input/output connector are included on standard power 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 types: Using National Instrument DAQ boards and SCSI connectors on the EGPS-3101, 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.

EGG-3101 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	100 eV to 10 keV (Independently adjustable)
BEAM CURRENT	Standard: 1 nA to 100 $\mu$ A (Independently adjustable) Small Spot option: 1 nA to 10 $\mu$ A High Current option: 1 $\mu$ A to 1 mA
ENERGY SPREAD	Approx. cathode thermal spread, calculated Ta - 0.5eV      Y <sub>2</sub> O <sub>3</sub> - 0.4eV BaO - 0.3eV      LaB <sub>6</sub> - 0.4eV
BEAM DIVERGENCE	Collimated beam, optimized for parallel, 1mm diameter, 1 nA to 100 $\mu$ A beam
SPOT SIZE	Standard: 500 $\mu$ m to 25 mm Small Spot option: 60 $\mu$ m 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: $\pm 6.0^\circ$ at 10 keV; scales larger at lower energies
PULSE CAPABILITY (using appropriate pulse generator, not included)	Optional Dual Grid Power Supply: Pulse width 2 $\mu$ s to DC, rise/ fall 500 ns, rep rates to 5 kHz (TTL required)
BEAM BLANKING	Optional: Pulse width 2 $\mu$ s to DC, rep rates to 5 kHz (TTL required) Optional Capacitive Pulse Box: Pulse width 20 ns to 100 $\mu$ s 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 TYPES	Standard: Tantalum disc Optional: Barium oxide (BaO), Lanthanum hexaboride (LaB <sub>6</sub> ), Yttrium oxide (Y <sub>2</sub> O <sub>3</sub> ). With the exception of barium oxide, 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
FARADAY CUP	Mounted on gun or stand-alone designs available
MOUNTING	Flange Multiplexer with a 2 $\frac{1}{4}$ inch CFF, including both tapped and clear mounting holes
INSERTION LENGTH	Standard: 109 mm, 163 mm with optional beam blanker
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 (Faraday cup: removable pneumatic actuator 65°C max)

EGPS-3101 ELECTRON GUN POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EGG-3101 Electron Gun
ENERGY STABILITY	$\pm 0.01\%$ per hour; $\pm 0.02\%$ per 8 hours at full output
BEAM STABILITY	$\pm 0.1\%$ per hour with Emission Current Control or $\pm 10\%$ 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 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 computer DAQ boards NI PCI-6733 and PCIe-6341. SCSI interface
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 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)	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 RS-232, RS-422, RS-485, analog input, or computer control with LabVIEW™ software option.



Typical performance; data for guidance only.

