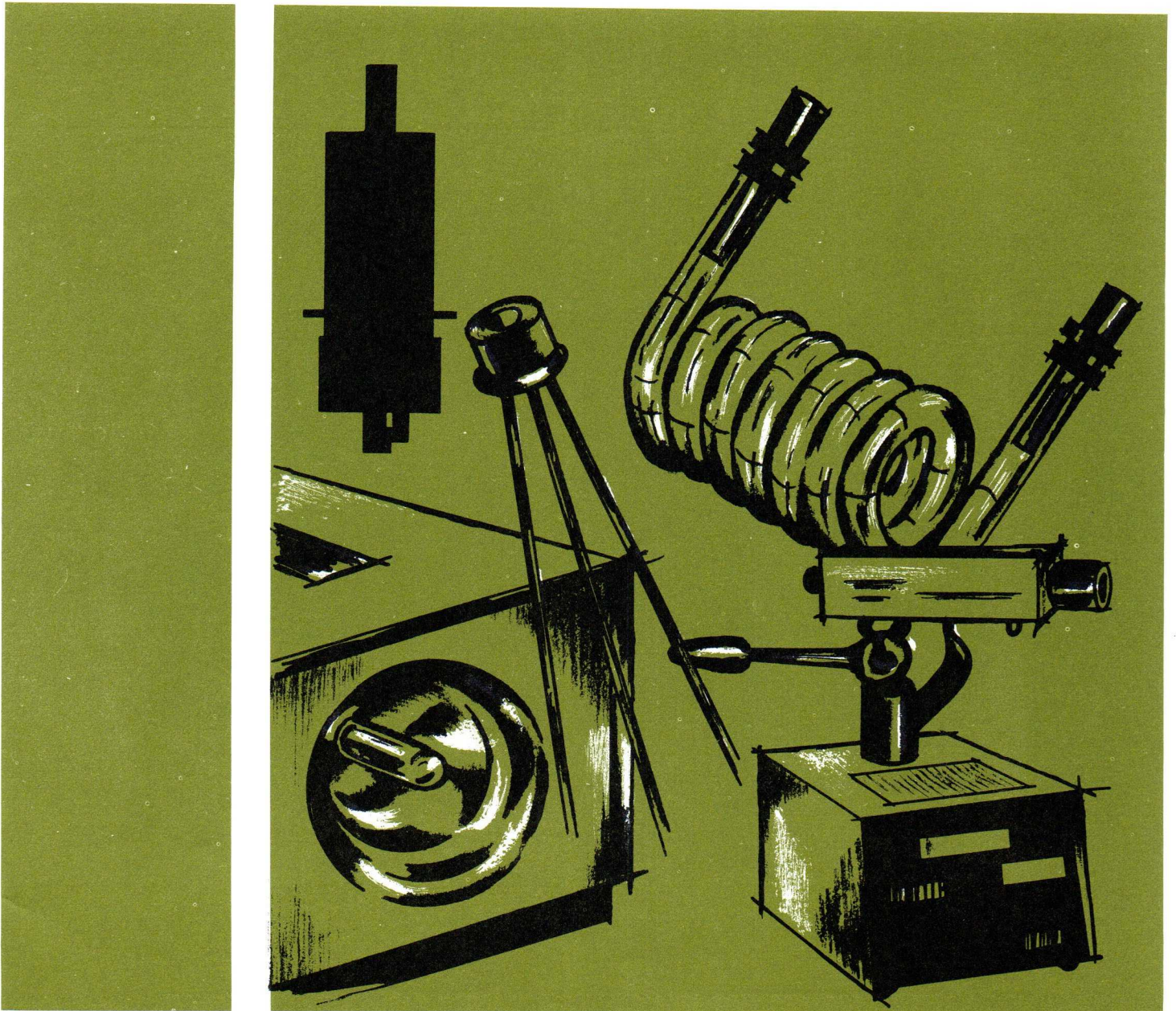
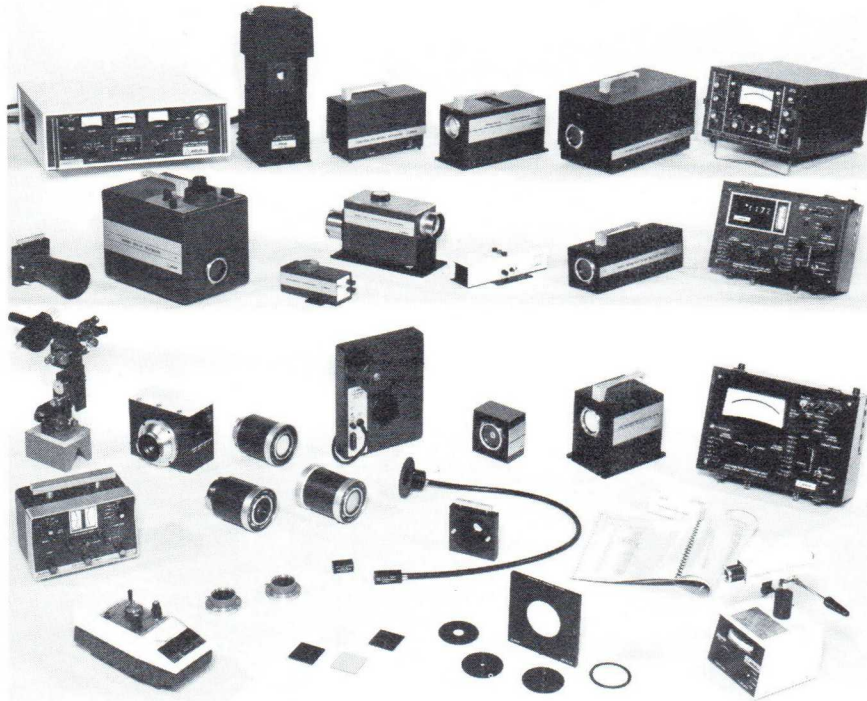




ELECTRO-OPTICS DIVISION



LIGHT INSTRUMENTATION



RADIOMETER The Model 580 Radiometer System permits absolute measurements of CW and pulsed light sources with meter or digital readout. Encompassing a spectral range from 0.2 to 3.2 microns, the 580 can measure over a 12-decade range of incident power and energy levels with a pulse response of under one nanosecond. With provision for scope display, it is an ideal instrument for laser measurements.

SPECTRORADIOMETER The Model 580/585 Spectroradiometer System adds a grating monochromator and additional optics onto the Model 580 Radiometer Detector Head, thereby allowing absolute measurement of the power and energy of chromatic CW and pulsed light sources as a function of wavelength. A truly functional system with provision for recorder output, the 580/585 can cover over a 12-decade range of light levels, e.g. starlight to sunlight.

ACCESSORIES — RADIOMETER & SPECTRORADIOMETER Accessories for the Radiometer & Spectroradiometer Systems include:

Telescope	Microscope
Fibre Optics Probe	IR Detector Head (PbS)
Wavelength Transducer	Chopper
Narrow Beam Adapter/ Laser Attenuator	Synchronous Amplifier
Laser Beam Sampler	Digital Indicator Unit
Tripod	Thermopile

LITE-MIKE® The Model 560B Lite-Mike, which utilizes a calibrated SGD-100A photodiode, permits detection and measurement of CW sources (meter readout) and pulsed light sources (scope readout). All of the fine capabilities of the SGD-100A are obtainable in this inexpensive, compact instrument.

LUMENMETER The Model 565 Lumenmeter allows absolute photometric measurements of pulsed and continuous light sources. Direct meter readout is provided in terms of illuminant power, lumen/ft.² (ft.-candle) and illuminant energy, lumen-sec./ft.². The battery operated system can measure a range from 0.1 to 1000 lumen/ft.² or lumen-sec./ft.².

RADIOMETER/PHOTOMETER The Model 575 Radiometer/Photometer System is a low cost instrument designed for absolute measurements of continuous and pulsed optical radiation. The meter or optional digital display is direct reading in both radiometric (watts, watts/cm², joules, etc.) and photometric (lumens, lumens/ft², lumen-seconds, etc.) terms. The detector heads utilize stable silicon photodiodes of various geometries with optional filter corrections for photometric response, flat broad-band response and tristimulus response.

CALIBRATED LAMP SYSTEM The Model 590 Calibrated Lamp System consists of a power supply and a lamp housing designed for the regulated operation of lamp standards. Primarily used in an optical calibration lab, the 590 provides up to 1000 watts, 1-50 amps with a current regulation of 0.25%. The current is in the form of a 1-2 KHz square wave to eliminate 60 cycle ripple.

CALIBRATED LAMP STANDARDS The Model 595 Tungsten-Halogen Lamp Standard is provided with absolute calibration of spectral irradiance and calculated values of illuminance, luminous intensity, chromaticity coordinates (1931 CIE) and correlated color temperature.

The spectral irradiance data is presented in a computer tabulated format at 191 wavelengths over the spectral range from 0.25 to 2.5 microns. Calibration is directly traceable to the National Bureau of Standards.

The Model 595 operates at an electrical input of 1000 watts. A Model 596 Lamp Standard is also available for operation at 200 watts.

CALIBRATED DIFFUSER Designed specifically as an accessory for the Model 590 Calibrated Lamp System, the Model 590-31 Calibrated Diffuser can be used with any calibrated lamp source to provide a low level source of calibrated light. Consisting of a five inch diameter opal diffuser and four aperture inserts, the Calibrated Diffuser is calibrated in terms of Spectral Radiance, Spectral Radiant Intensity, Luminance and Luminous Intensity. The four, knife-edge apertures permit a rapid change of operating range over three decades.

PHOTODIODES

The **SGD-100A**, **SGD-444**, and **SGD-040** Series of Silicon Photodiodes utilize a planar diffused, guard ring construction. These p-i-n diodes feature a unique combination of high quantum efficiency $>70\%$, wide spectral range (0.35 to 1.13 microns), nanosecond speed of response, low noise, and high linearity. The SGD-444 (active area-1 cm²) is also available in bi-cell and quad-cell configurations.

The **SGD-040** Photodiode blends its excellent characteristics with low cost making it attractive for quantity OEM applications.

The **YAG-100** and **YAG-444** Silicon Photodiodes combine an unusually high sensitivity at 1.06 microns (quantum efficiency $> 50\%$) with fast response and low noise making them ideal detectors in Neodymium Glass and Yag laser systems.

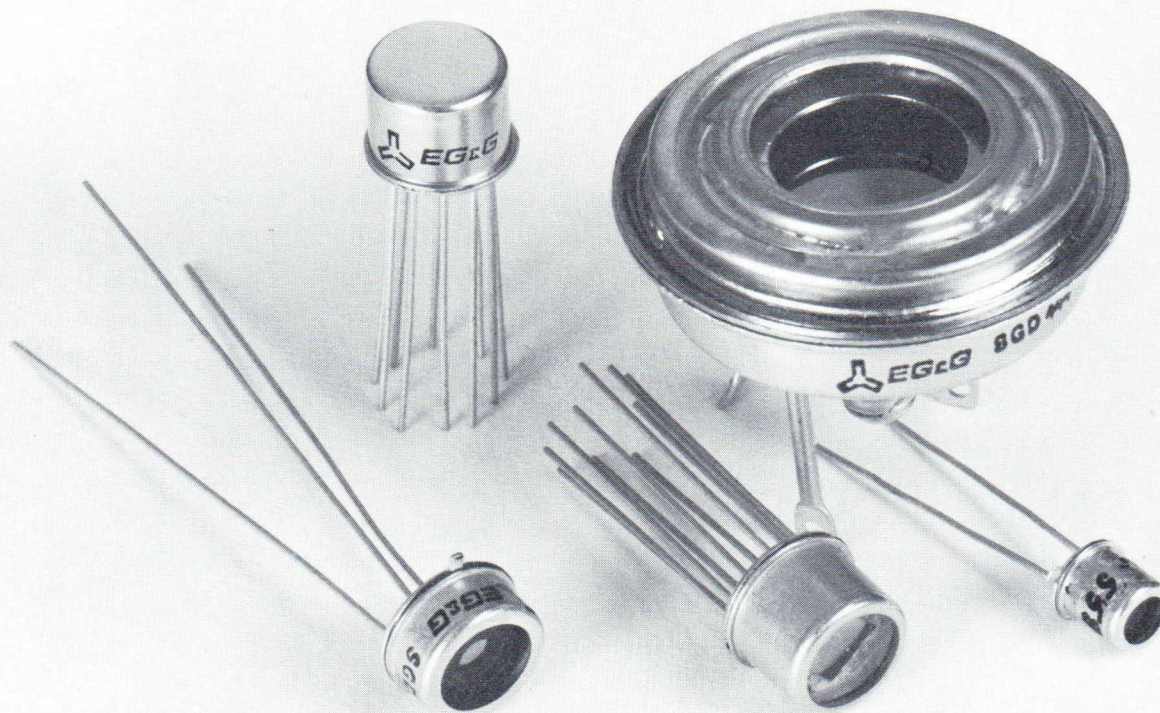
The **HAD-1000** Operational Amplifier/Photodiode incorporates in a TO-5 package an SGD-100A silicon photodiode and a dual FET, differential input operational amplifier. Operating as a linear light-to-voltage converter over a wide

spectral range and featuring inverting and non-inverting inputs, short circuit output protection and offset compensation, the HAD-1000 is ideally suited for system applications requiring performance, versatility and reliability.

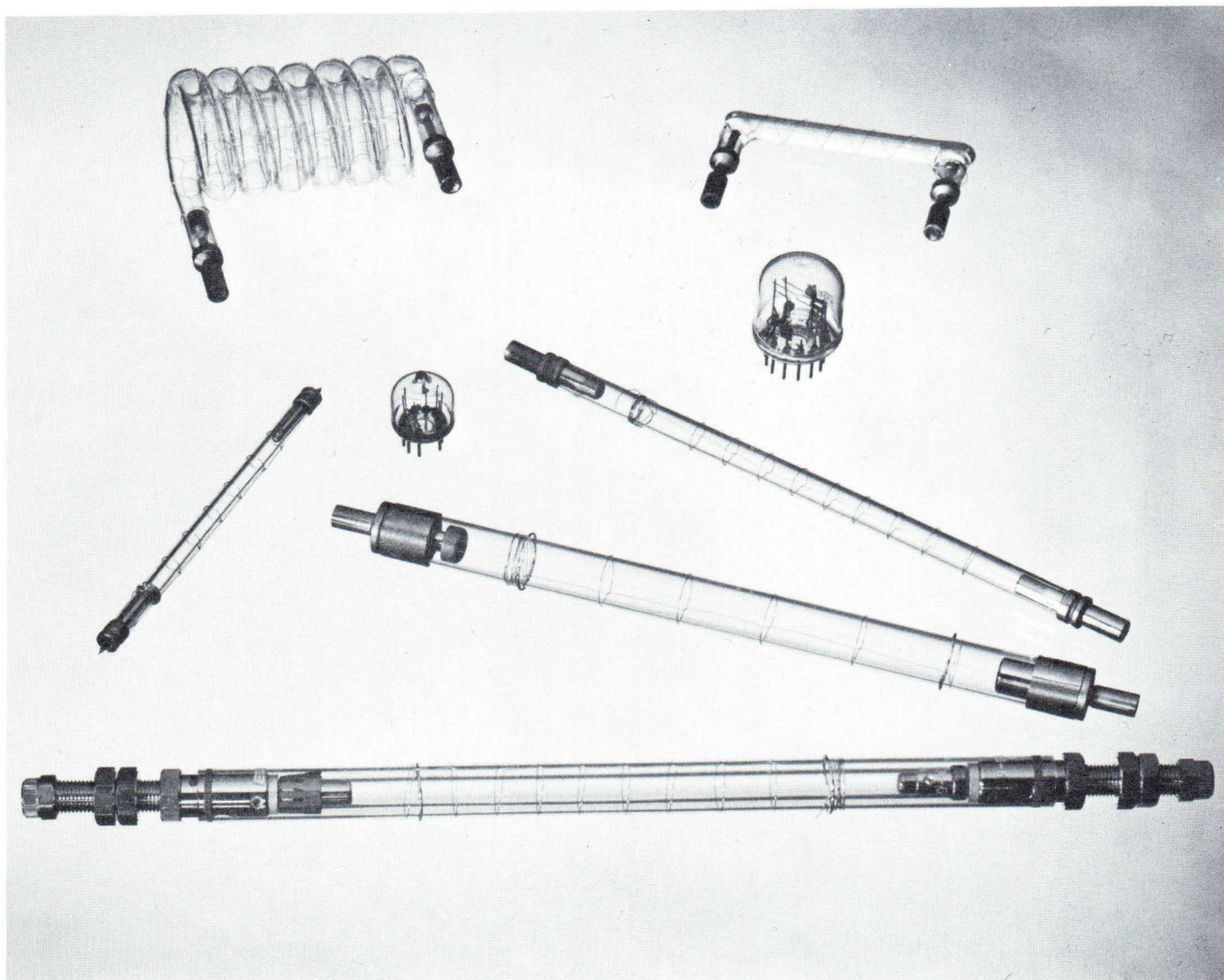
The **UV-444** Photodiode features enhanced ultraviolet response in the spectral range from 0.2 to 0.4 microns while maintaining the other performance characteristics unique to EG&G photodiodes.

Other photosensitive devices available on a standard basis include silicon photovoltaic diodes, thermoelectrically cooled photodiodes, and photodiode arrays.

In addition to the above standard photodiode products, EG&G engineering and production capabilities permit the design and fabrication of custom photodiode devices. Special configurations such as larger and smaller areas, circular and rectangular active areas, arrays, matrices can be manufactured per specific customer requirements.



FLASHTUBES



XENON FLASHTUBES

Flash tubes in linear, air and liquid cooled, helical, "U" shape, and coaxial type designs.

Tubes are available in quartz, germasil, and hard glass in bore sizes from 1 to 19 mm with arc length from 0.125 to 60 inches. Energy inputs range from 0.1 to 25,000 watt-secs. Operating voltages vary from 400 to 3500 volts. Applications include stimulation of solid state and liquid lasers, marine and aircraft beacons, flash photolysis, semiconductor research, night aerial photography, Schlieren studies, and satellite beacons.

DC, continuous arc, liquid cooled tubes are also available in linear designs filled with either Xenon, Krypton, or Argon for laser stimulation of Neodymium Yag doped crystals.

FX-6A and FX-76 family are bulb tube configurations which operate at energies up to 15 watt-secs. and at average powers up to 15 watts. These tubes are capable of operation at repetition rates up to 5 KHz with 10,000,000 shots of typical life. The bulb type family of tubes also include semi-round and flat-top envelopes to facilitate distortion-free optical coupling. Arc lengths can be varied from 0.040 to 0.8 inches with optimum arc-discharge stability. Applications include photo-typesetting, stroboscopy, digital shaft position encoders, oscillograph paper timing markers, and warning beacons.

Flash tubes emit radiant energy over the spectral range from 0.2 to 2.5 microns.

Custom engineered designs are available upon request.

TRANSFORMERS, CHOKES, TRIGGER MODULES

TRIGGER TRANSFORMERS, SERIES INJECTION TRIGGER TRANSFORMERS, CHOKES AND TRIGGER MODULES

These devices are designed for Xenon Flashtube, Krytron and Triggered Spark Gap triggering applications.

For linear, helical, and water-cooled flashtubes, Trigger Transformers are available from input voltages of 100-500 VDC with output voltages of 10 to 40 kv.

Chokes for limiting and pulse shaping current through flashtubes are available from 22 to 850 μ hy at voltages of 2 to 5 KV.

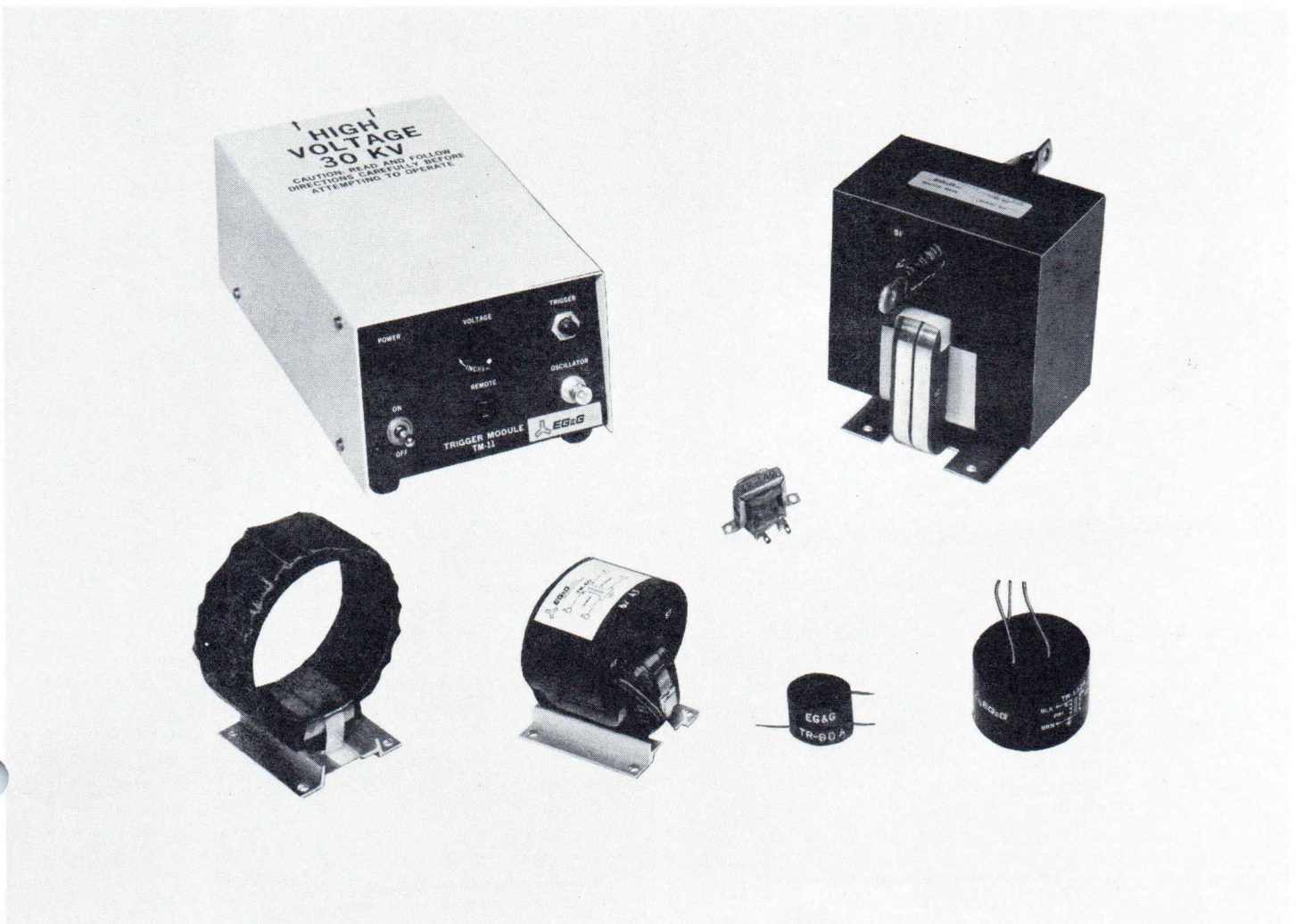
Trigger Modules are available for triggered spark gaps and either external or series injection triggering of Xenon Flashtubes.

Trigger Transformers are also available to trigger Krytrons, with inputs from 7-30 VDC and .35 to 1.4 kv output. Triggered Spark Gap transformers range in input from 100-600V to 10 to 40 kv output.

For internally triggered bulb type Xenon Flashtubes there are pulse transformers with inputs from 10-130 V and outputs from 2.5-6 kv.

Lite-Pacs® which include the Trigger Transformer, circuit components, and mounting socket in a single, potted package are ideal for operating all bulb type flashtubes.

EG&G Trigger Transformers are designed to meet MIL specifications. Custom designs are available upon request.



THYRATRONS, KRYTRONS, SPARK GAPS



CERAMIC-METAL THYRATRONS EG&G offers a complete line of tubes that switch from 8 kv, 100 amps peak to 40 kv, 5000 amps peak with pulse repetition rates up to 50kHz. These tubes are small size, have extended life, and are qualified to MIL specifications. Applications include radar modulators, spark chambers, linear accelerators, and pulsed lasers.

KRYTRONS AND SPRYTRONS Cold cathode, glass envelope, gas filled switch tubes can handle up to 8 kv and 3000 amps peak. Tubes are made in T-3 and T-5½ bulb sizes. Vacuum Sprytrons are designed for radiation environments. These devices are used as a trigger switch for xenon flash-tubes, triggered gaps, bubble chambers, EBW systems, and Kerr cells. Krytrons are also used for generating square wave pulses, pulsing G_aAs lasers and pockel cells, and as crowbar protection devices.

TRIGGERED SPARK GAPS EG&G Triggered Spark Gaps are three element, gas filled switch tubes. Glass-ceramic types are capable of switching 25 joules from 1-3 kv to 8-20 kv at 5000 amps peak. Ceramic-metal types are capable of switching from 200 to 4000 joules from 2-6 kv up to 25-70 kv with peak currents from 15,000 to 100,000 amps. Applications include spark chambers, EBW systems, crowbar protection of TWTs and Klystrons, Kerr cell switches, flash tubes, ion engines, and pulsed lasers.

OVERVOLTAGE GAPS EG&G two element gaps designed specifically for overvoltage protection of solid state circuitry, gas and vacuum tubes, and pulse transformers. These units are available in small configurations utilizing rugged and reliable ceramic to metal construction. Operating voltages range from 500 to 35,000 volts.

FLASH AND STROBE EQUIPMENT

HIGH SPEED STROBE The 501 provides from 60-6000 pulses per second with flash durations as low as $1.2 \mu\text{sec}$. Peak light output for the 501 varies from 7×10^6 to 6×10^7 beam candlepower. Burst durations range from almost continuous at 60 flashes per second down to 0.8 sec. at 6000 flashes per second.

MULTIPLE MICROFLASH The Model 502 can provide a burst of up to 15 one microsecond flashes and an interpulse interval as low as $10 \mu\text{sec}$. Peak light output with the 502 is in the range from 3×10^6 to 4×10^6 beam candlepower.

MICROFLASH® The Model 549 has a flash duration of $0.5 \mu\text{sec}$, and peak light output of 50×10^6 beam candlepower.

MULTIFLASH The Model 553 provides pulse durations of either 25 or $40 \mu\text{sec}$, and a peak light output of from 6×10^6 to 20×10^6 beam candlepower. Random or event synchronized, the 553 permits selection of flash rates from 5-120 flashes per second and burst durations of up to 1.5 secs.

SENSITOMETERS The Mark VI Sensitometer is a highly reliable instrument for analytical sensitometry and film process control. Xenon light source duplicates daylight, eliminates need for color filters. Exposure times of 10^{-2} , 10^{-3} and 10^{-4} sec. are available. Exposure repeatability is within $\pm 3\%$ and light for films is rated ASA 1 and better.



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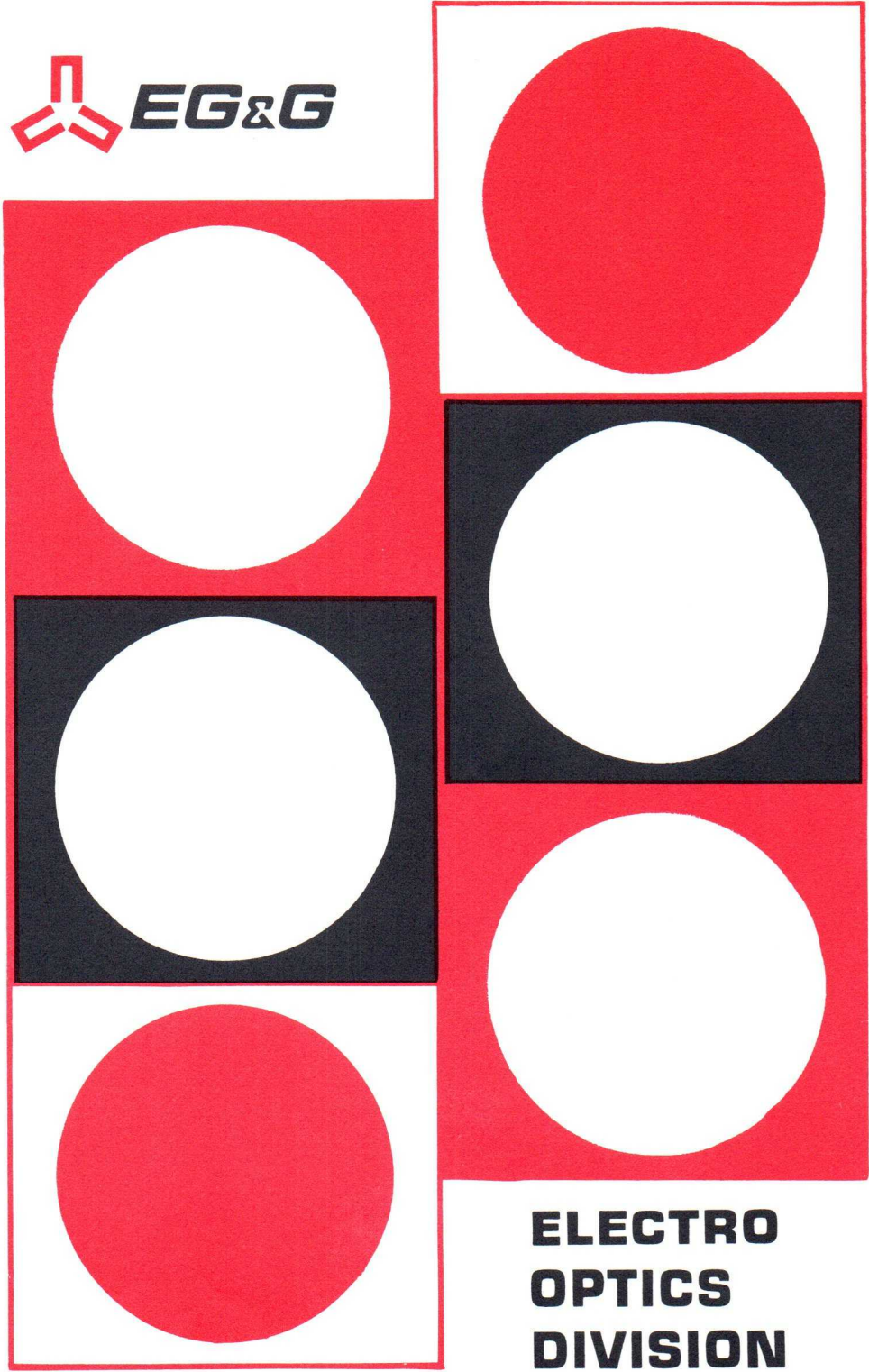
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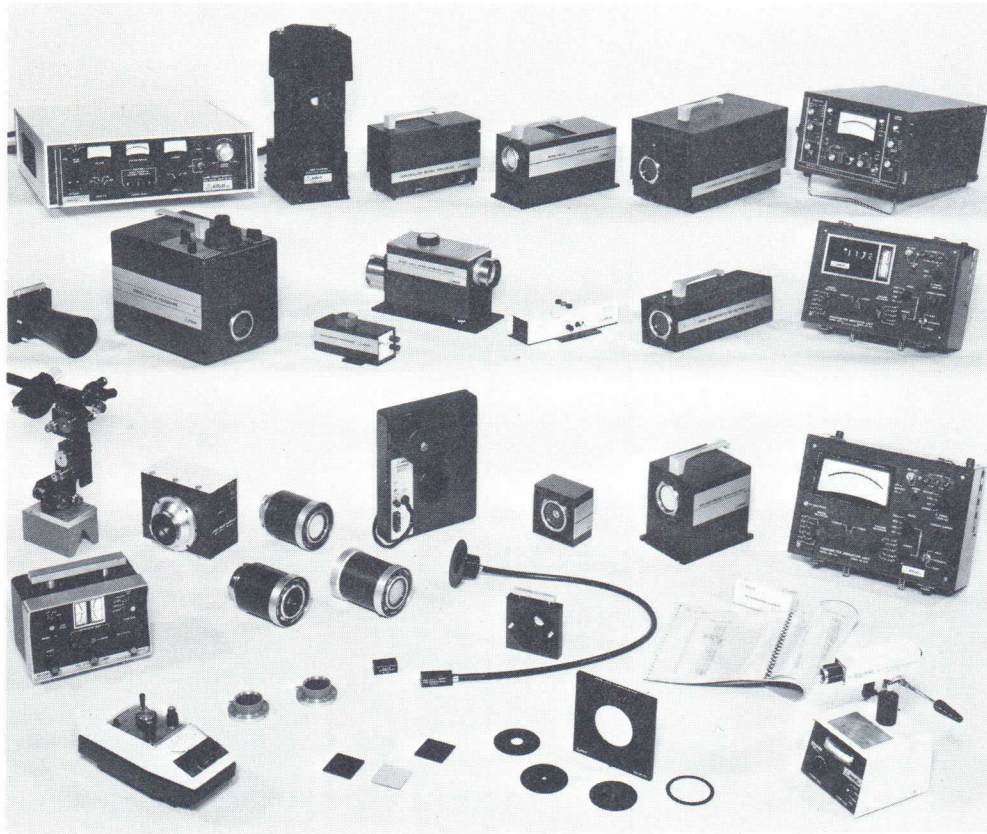
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**ELECTRO
OPTICS
DIVISION**

LIGHT MEASUREMENT INSTRUMENTS



RADIOMETER The Model 580 Radiometer System permits absolute measurements of CW and pulsed light sources with meter or digital readout. Encompassing a spectral range from 0.2 to 3.2 μm , the 580 can measure over a 12-decade range of incident power and energy levels with a pulse response of under one nanosecond. With provision for scope display, it is an ideal instrument for laser measurements.

SPECTRORADIOMETER The Model 580/585 Spectroradiometer System adds a grating monochromator and additional optics onto the Model 580 Radiometer Detector Head, thereby allowing absolute measurement of the power and energy of chromatic CW and pulsed light sources as a function of wavelength. A truly functional system with provision for recorder output, the 580/585 can cover over a 12-decade range of light levels, e.g. starlight to sunlight.

ACCESSORIES — RADIOMETER & SPECTRORADIOMETER Accessories for the Radiometer & Spectroradiometer Systems include:

Telescope	Microscope
Fibre Optics Probe	IR Detector Head (PbS)
Wavelength Transducer	Chopper
Narrow Beam Adapter/ Laser Attenuator	Synchronous Amplifier
Laser Beam Sampler	Digital Indicator Unit
Tripod	Thermopile

RADIOMETER/PHOTOMETER The Model 575 Radiometer/Photometer System is a low cost instrument designed for absolute measurements of continuous and pulsed optical radiation. The digital display is direct reading in both radiometric (watts, watts/cm², joules, etc.) and photometric (lumens, lumens/ft², lumen-seconds, etc.) terms. The detector heads utilize stable silicon photodiodes of various geometries with optional filter corrections for photometric response, flat broad-band response and tristimulus response.

LITE-MIKE® The Model 560B Lite-Mike, which utilizes a calibrated SGD-100A photodiode, permits detection and measurement of CW sources (meter readout) and pulsed light sources (scope readout). All of the fine capabilities of the SGD-100A are obtainable in this inexpensive, compact instrument.

CALIBRATED LAMP SYSTEM The Model 590 Calibrated Lamp System consists of a power supply and a lamp housing designed for the regulated operation of lamp standards. Primarily used in an optical calibration lab, the 590 provides up to 1000 watts, 1-50 amps with a current regulation of 0.25%. The current is in the form of a 1-2 KHZ square wave to eliminate 60 cycle ripple.

CALIBRATED LAMP STANDARDS The Model 595 Tungsten-Halogen Lamp Standard is provided with absolute calibration of spectral irradiance and calculated values of illuminance, luminous intensity, chromaticity coordinates (1931 CIE) and correlated color temperature.

The spectral irradiance data is presented in a computer tabulated format at 191 wavelengths over the spectral range from 0.25 to 2.5 μm . Calibration is directly traceable to the National Bureau of Standards.

The Model 595 operates at an electrical input of 1000 watts. A Model 596 Lamp Standard is also available for operation at 200 watts.

CALIBRATED DIFFUSER Designed specifically as an accessory for the Model 590 Calibrated Lamp System, the Model 590-31 Calibrated Diffuser can be used with any calibrated lamp source to provide a low level source of calibrated light. Consisting of a five inch diameter opal diffuser and four aperture inserts, the Calibrated Diffuser is calibrated in terms of Spectral Radiance, Spectral Radiant Intensity, Luminance and Luminous Intensity. The four, knife-edge apertures permit a rapid change of operating range over three decades.

SILICON PHOTODIODES AND PHOTOVOLTAIC DETECTORS

The **SGD-100A**, **SGD-444**, **SGD-160** and **SGD-040** Series of Silicon Photodiodes utilize a planar diffused, guard ring construction. These p-i-n diodes feature a unique combination of high quantum efficiency $>70\%$, wide spectral range (0.35 to $1.13 \mu\text{m}$), nanosecond speed of response, low noise, and high linearity. The SGD-444 (active area- 1 cm^2) is also available in bi-cell and quad-cell configurations.

The **SGD-040** Photodiode blends its excellent characteristics with low cost making it attractive for quantity OEM applications.

The **YAG-100** and **YAG-444** Silicon Photodiodes combine an unusually high sensitivity at $1.06 \mu\text{m}$ (quantum efficiency $>50\%$) with fast response and low noise making them ideal detectors in Neodymium Glass and Yag laser systems.

The **HAD-1000** Operational Amplifier/Photodiode incorporates in a TO-5 package an SGD-100A silicon photodiode and a dual FET, differential input operational amplifier. Operating as a linear light-to-voltage converter over a wide spectral range and featuring inverting and non-inverting inputs, short circuit output protection and offset compensation, the HAD-1000 is ideally suited for system applications requiring performance, versatility and reliability.

The **SHS-100** Silicon Photodiode operates in the fully depleted mode providing 88% quantum efficiency in the near infrared and elimination of pulse stretching and tailing in nanosecond pulse measurements.

The **SFD-160** Flat Response Silicon Photodiode is similar to the SGD-160 photodiode, but incorporates a special subtractive filter which yields a flat spectral response from 0.45 to $1.0 \mu\text{m}$.

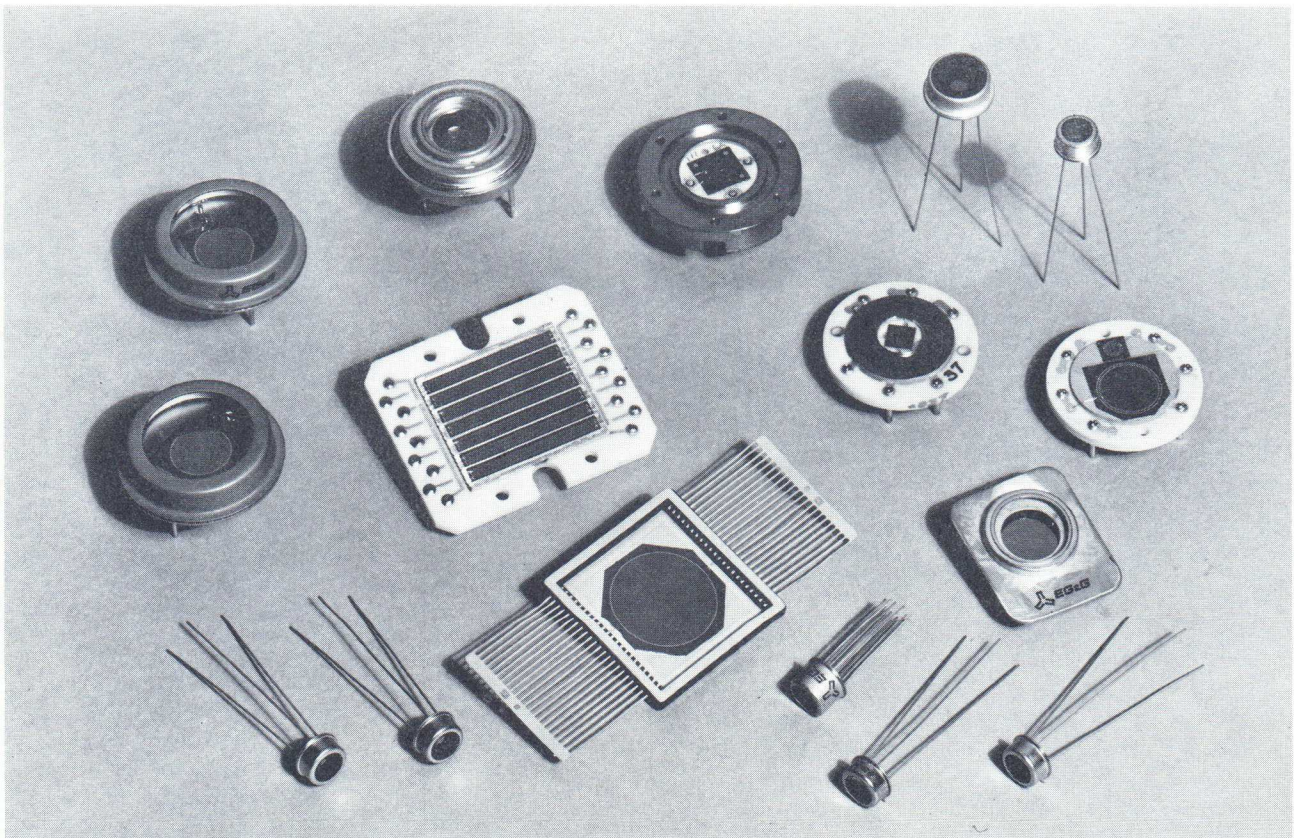
The **PV-100A**, **PV-444A**, and **PV800A** Silicon Photovoltaic Detectors are operated at zero bias and provide the ultimate in low noise, high spectral responsivity, and temperature stability. Designed with high shunt impedance, the detectors can be operated in the "short-circuit mode" with excellent linearity of response.

The **UV-100**, **UV-444A**, and **UV-800A** Silicon Photovoltaic Detectors provide enhanced sensitivity in the ultraviolet spectrum. These detectors are ideal for analytical instrument applications in the UV, visible, and near infrared.

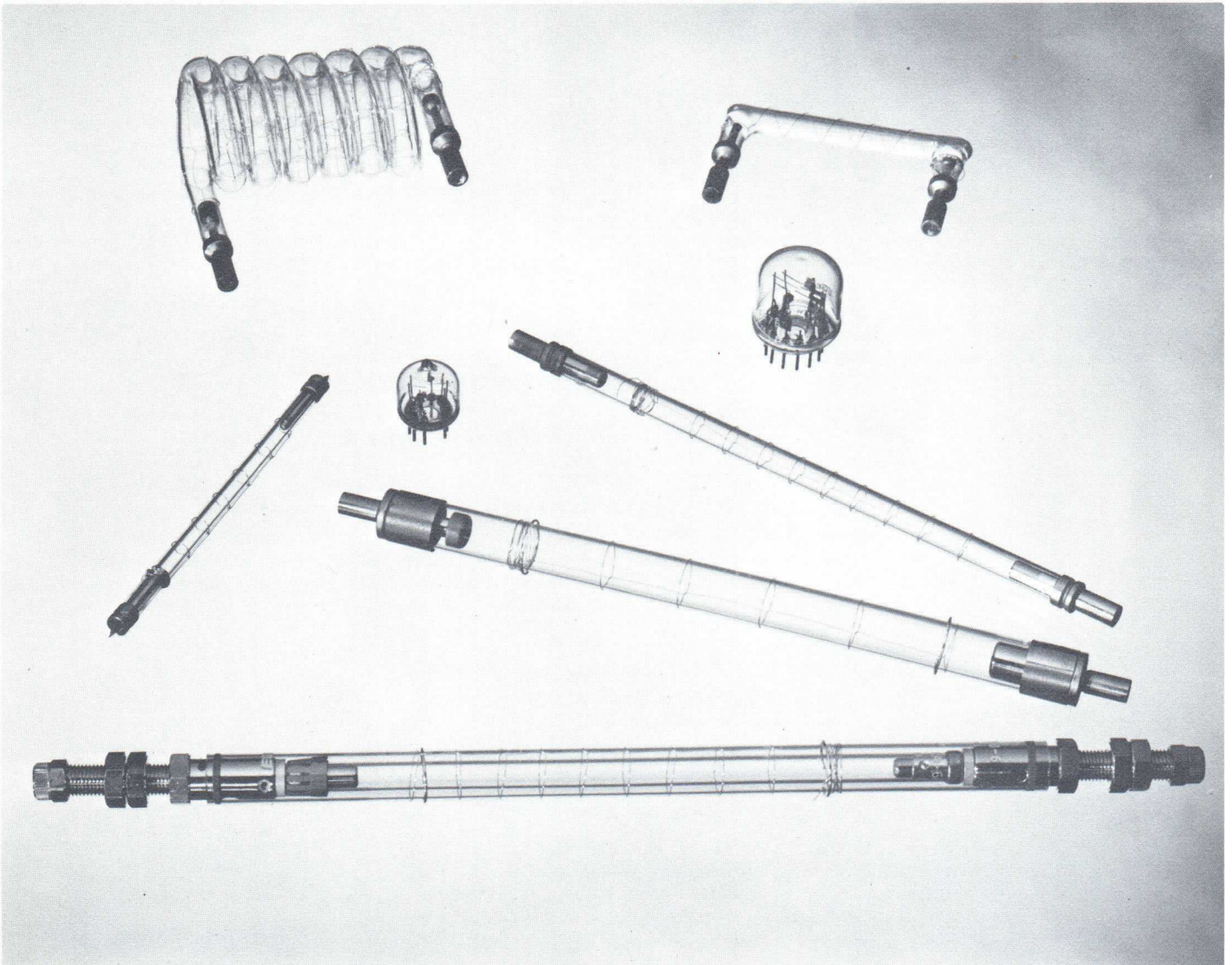
The **HAV-1000**, **HAV-4000**, **HUV-1000**, and **HUV-4000** Detector/Operational Amplifiers incorporate the PV-100A, PV-444A, UV-100, and UV-444A respectively into a small package with a dual FET input, operational amplifier. The resultant combinations surpass the performance capabilities of photomultiplier tubes (PMT's) with additional advantages of small size, low power requirements, lower cost, and long term stability and reliability.

The **DT-25** and **DT-110** Silicon Photodiodes and the **DV-25** and **DV-110** Silicon Photovoltaic Detector are used in OEM applications which can afford slightly reduced specifications in exchange for substantially lower cost.

In addition to the above standard photodiode products, EG&G engineering and production capabilities permit the design and fabrication of custom photodiode devices. Special configurations such as larger and smaller areas, circular and rectangular active areas, arrays, matrices can be manufactured per specific customer requirements.



FLASHTUBES



XENON FLASHTUBES EG&G offers a line of pulsed Xenon Flashtubes in linear, air and liquid cooled, helical, "U" shape, and coaxial type designs.

Tubes are available in quartz, uv inhibiting quartz, and hard glass in bore sizes from 1 to 19 mm with arc length from 0.125 to 60 inches. Energy inputs range from 0.1 to 25,000 watt-secs. Operating voltages vary from 400 to 3500 volts. Applications include stimulation of solid state, doped glass, and dye lasers; photocopy, microfiche, and photoresist exposures; marine, aircraft, and satellite beacons; flash photolysis; semiconductor research; night aerial photography; and Schlieren studies.

DC, continuous arc, liquid cooled tubes are also available in linear designs filled with either Xenon, Krypton, or Argon for laser stimulation of Neodymium Yag doped crystals.

Pulsed Xenon, internally triggered flashtubes such as the FX-6A, FX-76, and FX-132 are bulb tube configurations which operate at energies up to 200 watt-secs. with average powers as high as 100 watts. These tubes are capable of operation at repetition rates up to 5 KHz with 10^9 shots of typical life. The bulb type family of tubes also include semi-round and flat-top envelopes to facilitate distortion-free optical coupling. Arc lengths can be varied from 0.040 to 0.8 inches with optimum arc-discharge stability. Applications include photo-typesetting, stroboscopy, digital shaft position encoders, oscillograph paper timing markers, and warning beacons.

Flashtubes emit radiant energy over the spectral range from 0.2 to 2.5 μm .

Custom engineered designs are available upon request.

TRANSFORMERS, CHOKES, TRIGGER MODULES, FLASHTUBE POWER SUPPLIES

TRIGGER TRANSFORMERS, SERIES INJECTION TRIGGER TRANSFORMERS, CHOKES AND TRIGGER MODULES

These devices are designed for Xenon Flashtube, Krytron and Triggered Spark Gap triggering applications.

For linear, helical, and water-cooled flashtubes, Trigger Transformers are available with input voltages of 100-500 VDC and output voltages of 10 to 40 kv.

Chokes for limiting and pulse shaping current through flashtubes are available from 22 to 850 μ hy at voltages of 2 to 5 KV.

Trigger Modules are available for triggered spark gaps and either external or series injection triggering of Xenon Flashtubes.

Thyratron Grid Drivers are used to operate EG&G's complete family of ceramic thyratrons.

Series Injection Trigger Transformers are available with input voltages of 600 to 1500 VDC with outputs of 15 to 40 kv.

Trigger Transformers are also available to trigger Krytrons, with inputs from 7-30 VDC and .35 to 1.4 kv output. Trig-

gered Spark Gap transformers range in input from 100-600V to 10 to 40 kv output.

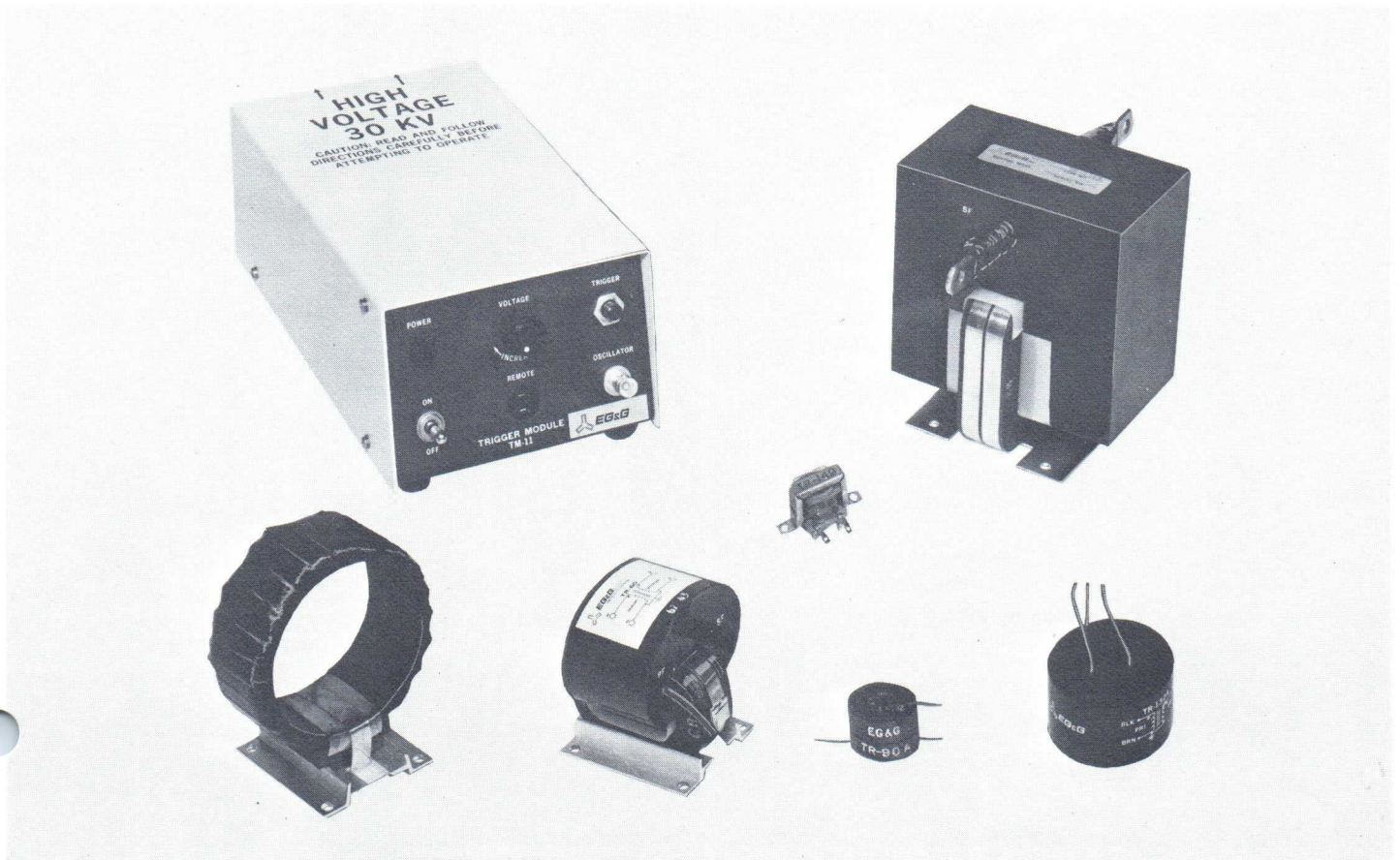
For internally triggered bulb type Xenon Flashtubes there are pulse transformers with inputs from 10-130 V and outputs from 2.5-6 kv.

Lite-Pacs® which include the Trigger Transformer, circuit components, and mounting socket in a single, potted package are ideal for operating all bulb type flashtubes.

EG&G Trigger Transformers are designed to meet MIL specifications. Custom designs are available upon request.

FLASHTUBE POWER SUPPLIES

EG&G designs and manufactures flashtube power supplies. These power supplies are produced primarily for OEM applications and designed per customer specifications. EG&G power supplies are currently being used in photocopy equipment, microfiche duplication, high intensity obstruction lighting, and optical printers.



THYRATRONS, KRYTRONS, SPARK GAPS



CERAMIC-METAL THYRATRONS EG&G offers a complete line of tubes that switch from 8 kv, 100 amps peak to 40 kv, 5000 amps peak with pulse repetition rates up to 50kHz. These tubes are small size, have extended life, and are qualified to MIL specifications. Applications include radar modulators, spark chambers, linear accelerators, and pulsed lasers.

KRYTRONS and **SPRYTRONS** Cold cathode, glass envelope, gas filled switch tubes can handle up to 8 kv and 3000 amps peak. Tubes are made in T-3 and T-5½ bulb sizes. Vacuum Sprytrons are designed for radiation environments. These devices are used as a trigger switch for xenon flash-tubes, triggered gaps, bubble chambers, EBW systems, and Kerr cells. Krytrons are also used for generating square wave pulses, pulsing G_aA_s lasers and pockel cells, and as crowbar protection devices.

TRIGGERED SPARK GAPS EG&G Triggered Spark Gaps are three element, gas filled switch tubes. Glass-ceramic types are capable of switching 25 joules from 1-20 kv at 5000 amps peak. Ceramic-metal types are capable of switching from 200 to 4000 joules at 2-100 kv with peak currents from 15,000 to 100,000 amps. Applications include spark chambers, EBW systems, crowbar protection of TWTs and Klystrons, Kerr cell switches, flash tubes, ion engines, and pulsed lasers.

OVERVOLTAGE GAPS EG&G two element gaps designed specifically for overvoltage protection of solid state circuitry, gas and vacuum tubes, and pulse transformers. These units are available in small configurations utilizing rugged and reliable ceramic to metal construction. Operating voltages range from 500 to 35,000 volts.

FLASH AND STROBE EQUIPMENT

HIGH SPEED STROBE The 501 provides from 60-6000 pulses per second with flash durations as low as $1.2 \mu\text{sec}$. Peak light output for the 501 varies from 7×10^6 to 6×10^7 beam candlepower. Burst durations range from almost continuous at 60 flashes per second down to 0.8 sec. at 6000 flashes per second.

MULTIPLE MICROFLASH The Model 502 can provide a burst of up to 15 one microsecond flashes and an interpulse interval as low as $10 \mu\text{sec}$. Peak light output with the 502 is in the range from 3×10^6 to 4×10^6 beam candlepower.

MICROFLASH® The Model 549 has a flash duration of $0.5 \mu\text{sec}$, and peak light output of 50×10^6 beam candlepower.

SENSITOMETERS The Mark VI Sensitometer is a highly reliable instrument for analytical sensitometry and film process control. Xenon light source duplicates daylight, eliminates need for color filters. Exposure times of 10^{-2} , 10^{-3} and 10^{-4} sec. are available. Exposure repeatability is within $\pm 3\%$ and light for films is rated ASA 1 and better.



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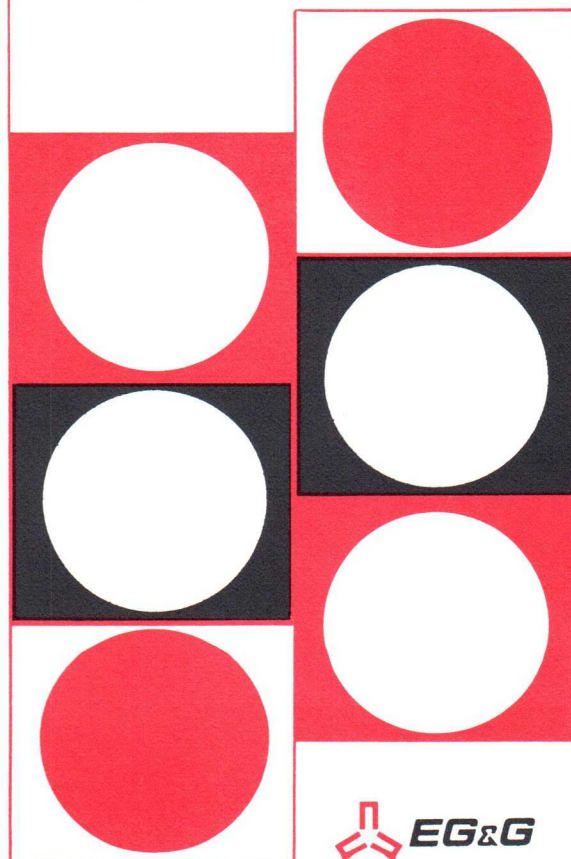
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