

LUMI-TEC™

Luminescence Detector

The Lumi-Tec is a highly sensitive, compact photometer designed specifically for the measurement of bioluminescence and chemiluminescence. Photomultiplier detection and multi-mode data processing combine to provide ease of operation, flexibility, and reliability, all at an unmatched level of economy. Models are available for either discrete samples (test tubes) or flow applications such as HPLC detection or flow injection analysis.

The Lumi-Tec was developed to address the growing variety of luminescence-based analytical procedures. These procedures include analyses of organic and inorganic chemicals, complex biochemicals, and even living cells. In luminometry, the light emitted by the sample is the result of a highly specific and uncommon sequence of reactions. The light emitted is measured against a background of total darkness. The resulting analyses are both highly specific and extremely sensitive.

APPLICATIONS

Bioluminescence:

Chemiluminescence catalyzed by enzymes is frequently called bioluminescence. Terrestrial organisms such as fireflies, glow worms, and fungi are the most well known generators of bioluminescence, however, aquatic bioluminescent organisms are by far the more widely distributed throughout the world. Fish, sea anemones, bacteria, worms, and crustaceans all have bioluminescent species.

Two reagent systems are used for the majority of bioluminescence assays: firefly luciferin/luciferase/ATP, and bacterial luciferase with oxidoreductase. A third reagent, aequorin, is used for the determination of calcium. The firefly luciferin/luciferase/ATP system is highly specific for ATP, and is widely useful where ATP is of interest, or where reactions can be coupled to generate ATP. The assay is linear over an extremely wide concentration range. Applications include:

- ATP-Specific Enzymes
- ATP-Coupled Enzyme Systems
- Cell Quantity and Cell Viability
- Cyclic AMP, cGMP, ADP, & AMP

Bacterial luciferase in conjunction with bacterial oxidoreductase can be coupled to reactions producing NADH or NADPH. Enzyme immunoassays using dehydrogenases can be coupled with bacterial luminescence to provide very high sensitivity and added specificity. Applications of bacterial luciferase include the determination of ADH, hexokinase, LDH, glucose, ethanol, oxygen, and pyruvate.

Chemiluminescence:

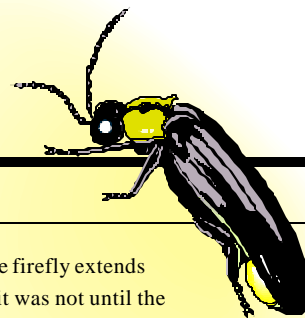
Frequently used reagents for chemiluminescence include the peroxyoxylate system (incl. the 1-2 dioxetanes and dioxetanones), luminol, lucigenin, and related acridinium esters. These reagents have been adapted to discrete sample assays, HPLC detection and flow injection analysis systems.

The peroxyoxylate system involves the oxidation of an aryl oxylate by alkaline peroxide to yield a high energy intermediate. This intermediate forms a charge transfer complex with a separate fluorophore which, in turn, dissociates to yield an excited-state molecule which decays to produce the luminescence. Analytical procedures are coupled to this sequence via the fluorophore or via the peroxide. A related approach involves the use of a stable dioxetane phosphate or galactoside which is cleaved by alkaline phosphatase or beta-galactosidase to form a chemiluminescent decomposition product. These approaches can be used to develop highly sensitive assays for complex biochemicals, including gene detection and antibody detection via enzyme immunoassay.

Luminol is one of the oldest and most commonly used reagents. Alkaline oxidation of luminol forms the chemiluminescent product 3-aminophthalate. Peroxide oxidation of luminol requires a catalyst such as a transition metal ion. By taking advantage of the catalytic activity of metal ions, very sensitive metal ion assays have been developed. Conversely, systems which generate peroxide such as horseradish peroxidase systems, can be coupled to the luminol reaction. Lucigenin and other acridinium-based luminescent compounds can be linked to enzyme reactions in much the same way.

LUMI-TEC™

Versatile & Sensitive



FEATURES

The Lumi-Tec is a very compact bench-top photometer designed for versatility, sensitivity, and ease of use. Three models are available: a test tube model for discrete samples, a flow cell model, and a flow cell model with an integral mixing tee for the addition of a reagent. The test tube instrument uses either 6 x 50mm disposable glass cuvettes or 12 x 50mm polystyrene cuvettes. The cuvette is placed into the light measurement chamber by way of a sliding drawer with a built-in shutter. This provides easy access to the disposable cuvette while preventing stray light from entering the photodetection system. Reagent addition and mixing is accomplished by syringe injection through a light-tight septum injection port.

Flow instruments have 70ul, 1 meter coil flow cells placed directly in front of the photomultiplier detector. Other cell volumes and lengths are available on request. Flow cells can be furnished with or without an integral mixing tee for reagent addition. The mixing junction is exposed directly to the photodetector, an important consideration when using fast light-emitting reactions.

Data is displayed on a 3 1/2 digit digital panel meter with easy-to-read LED readouts. Two separate analog outputs are provided for data processors and oscilloscopes. A wide range blank subtraction system with three switch-selectable ranges and a ten-turn vernier fine adjustment provides precise blank compensation at all sensitivity levels.

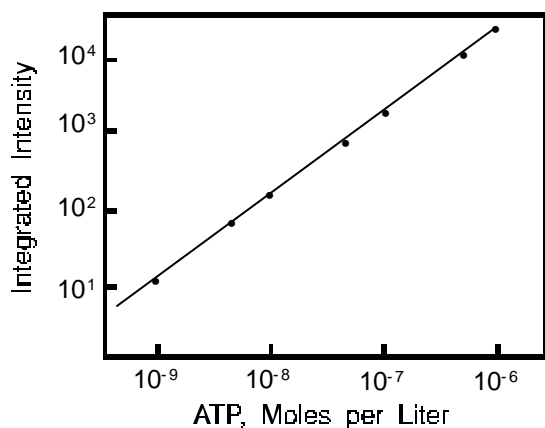
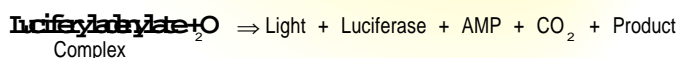
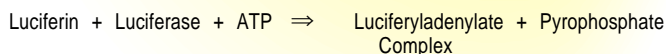


Figure 1. Analytical Curve of ATP concentration vs. relative integrated intensity (firefly luciferin-luciferase system).

The documented history of the firefly extends back to the 5th century B.C., but it was not until the late 1950's that the luciferin enzyme was purified, the structure of luciferin was determined, and the reaction mechanism firmly established. Now this childhood favorite bug contributes a valuable tool to the biochemistry laboratory.



High Sensitivity:

Four precision decades of selectable amplification coupled with five steps of photomultiplier voltage adjustment provide both high sensitivity and extremely wide dynamic range. Figure 1 below illustrates the exceptional sensitivity, dynamic range, and linearity available with the Lumi-Tec.

Multi-Mode Data Processing:

Three types of data processing are provided with the Lumi-Tec: Analog (rate) for external data processing or recording, Peak Height for measurement of peak flash intensity of fast reactions, and Delayed Integral for the ultimate in sensitivity and precision. The delayed integral setting features a three second delay followed by switch selectable integration times of 10, 20, or 30 seconds. The three second delay provides time for mixing disturbances to subside before data acquisition starts. This feature improves sample to sample precision.

Auto-Zero and Reset:

Automatic meter zeroing occurs immediately before starting the integration interval. A separate Reset function is provided for zeroing the peak height function.

Specifications:

- **Compact Size:** 4 1/4" W x 11 1/2" L x 8" H
- **Portable:** 8 pounds; 12 pounds shipping weight
- **Low Power:** 25 watts, 115/230 VAC, 50/60 Hz
- **Wavelength Range:** 300 to 650 nm, other wavelength ranges are available as optional extras.

GENERAL SPECIFICATIONS:

Detector	9 stage 931B photomultiplier tube with S-4 response (300 to 650nm), other wavelength ranges optional. High voltage supply to the Photomultiplier Tube has five fixed steps of adjustment: 300, 450, 600, 750, and 900 volts.
Recorder Outputs	Adjustable 0-250 millivolts and fixed 1 volt output.
Sensitivity	1.4 x 10 ⁻¹⁴ mole of ATP using the firefly luciferin/luciferase system. Four ranges of amplification.
Detection Modes	Peak Height, Integration, and Analog (Rate).
Blank Subtract	Three levels of Blank Subtract with 10 turn dial for fine adjustment.
Digital Panel Meter	Indicates intensity of light detected by PM tube. Easy-to-read 3 1/2 digit LED display.
Power requirements	105-130, or 200-260 volts, 50 / 60 Hz, 25 watts.
Dimensions	4 1/4 inches (10.8cm) wide x 11 1/2 inches (29.2cm) long x 8 inches (20.3cm) high.
Weight	8 lbs. (3.64 kg), 12 lbs. shipping weight.

MODEL SPECIFICATIONS/CATALOG NUMBERS:

A5-2021A LUMI-TEC™	(Test tubes) 10 x 75mm or 6 x 50 cuvettes in easily-changed adapter.
A5-2023A LUMI-TEC™	(Flow cell) 70ul, 1 meter flow cell with industry standard 1/16" cone ferrule stainless steel HPLC fittings inlet and outlet. Used with external mixers and reactors.
A5-2025A LUMI-TEC™	(Flow cell with mixing tee) 70ul, 1 meter flow cell with an integral mixing tee. The mixing tee is exposed directly to the photodetector. Used with very fast reactions where delay between mixing and light detection is undesirable.

ACCESSORIES (See price list for complete listing):

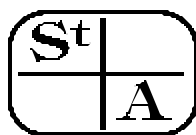
800-600 Repeating Dispenser Assembly	800-602 Flow Cell Reaction Chamber
800-610 Septa, Injection Port, Package of 12	800-611 6 x 50mm round Cuvettes, pkg of 100
800-613 PM Tube, 1P21 (Selected)	800-615 Adapter, 12 x 50mm to 6 x 50mm tube
800-616 Switch Lamp	800-620 Fuse (Box of 5)
801-103 12 x 50mm Cuvettes, package of 100	801-109 PM Tube, 931B (Selected)

WARRANTY: One year from date of shipment against defects in material or workmanship excluding photomultiplier tubes. All warranty service at factory.

SERVICE: For prompt service, call St. John Associates, Inc. Home Office or your local representative.

ORDERING

INFORMATION: SPECIFY: LUMI-TEC™ Luminescence Detector, model A5-2021A, A5-2023A, or A5-2025A.
TERMS: Net 30 Days, FOB Beltsville MD 20705
TOLL FREE SALES NUMBER: 1-800-837-2023



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