

PEN-RAY LAMPS

Technical Information

Contact UVP with any technical questions or application usage of the Pen-Ray Lamps. Technical support is available to assist you in getting the most output from Pen-Ray Lamp products. The following technical information covers Exposure Data, Terms and Definitions, Temperature Effects on Operation, Lamp Spectra, Lamp Profiles and Polar Intensity Plots.

Exposure Data

Determining Occupational Exposure to Ultraviolet Radiation:

Exposure to excessive amounts of shortwave and midrange ultraviolet radiation can cause injury to the skin and eyes. To measure UV exposure in the workplace, UVP has developed a technique using the UVX Radiometer System. This technique is a two-step process:

1. Using a UVX Radiometer with 254nm Sensor, the operator measures the ultraviolet intensity at the distance exposed skin or eyes will be from the source.
2. The operator converts this measurement to an exposure time limit using a conversion factor. See Permissible Exposure Time equation below.

For further information, refer to UVP's Application Note ANA114, "Determining Occupational Exposure to Ultraviolet Radiation."

254nm Line Emitters

This category includes the low pressure Mercury discharge lamp which is the most used shortwave lamp. The published permissible dose for this type is 6.0 mW-sec/cm². Since the UVX is calibrated to measure this type of source, the PET (Permissible Exposure Time) can be computed from this formula:

$$PET = 6.0/R \text{ seconds}$$

Where R is the UVX reading in mW/cm² and PET is in seconds.

Example: a UVX Radiometer reading at 0.05 mW/cm². Here we would have:

$$PET = 6.0/0.05 = 120 \text{ seconds}$$

Temperature Effects on Operation

While the exact limits of ambient temperature is not known, the lamps can be ignited between 10°C and 200°C. Non-operating temperature limits for some lamp configurations is at least -30°C to 200°C.

Note: UVP's in-house safety policy requires employees to use eye and skin protection in the presence of 200-315nm UV radiation.

Terms and Definitions

Angstrom: Equivalent to 0.1nm.

Fluorescence: Emission of longer wavelengths as a result of the absorption of shorter wavelengths.

Grid Lamp: Low pressure, cold-cathode discharge tube formed into an S-shape.

Inverse Square Law: Irradiance from a point source varies as the inverse square of the distance between the source and receiver.

Irradiance: Power per unit area incident on a surface, usually measured in mW/cm² in UV spectrum.

Joules: Watts times seconds.

Longwave: 315 - 400nm ultraviolet radiation (UVA).

mA: milliAmps - 1/1000 of an amp of current.

mW/cm²: Microwatts/cm². Unit of measurement of ultraviolet energy.

Midrange: 280 - 315nm ultraviolet radiation (UVB).

nm: Nanometers. Unit of length in metric system equal to 10⁻⁹ meter.

Ozone: O₃. Can be produced from O₂ molecules when subjected to energy emissions at 185nm.

Pen-Ray: Registered trademark of UVP, Inc.

Phosphor: A chemical substance that exhibits fluorescence when excited by UV radiation.

Photoreaction: A chemical reaction resulting from radiant energy (185, 254 or 365nm).

Shortwave: 180 - 280nm ultraviolet radiation (UVC).

Solarization: Occurs when optical components are exposed to ultraviolet radiation and undergo changes that reduce their ability to transmit UV radiation.