

# Low Pressure Gas Discharge Lamps for Photoionization Detectors



## Description

PerkinElmer manufactures a complete line of high quality, long life, low pressure gas discharge lamps for use in photoionization detectors and trace gas analyzers. These PID lamps are interchangeable with all similar lamps presently available. Both current and RF excited designs are available with eV ratings ranging from 8.4 to 11.7.

PerkinElmer incorporates a unique high temperature seal design which allows these lamps to be processed at high temperatures. This process results in higher lamp to lamp consistency, enhanced performance and long life. It also allows for elimination of the getter currently utilized in competitive RF designs.

PerkinElmer ensures unsurpassed performance by using only the highest purity metals, window materials and gases. Every lamp must pass a series of stringent tests and measurements prior to shipment to our customers.

## Features

- High sensitivity and stability
- Long life
- Lamp to lamp consistency
- Complete product offering
- Custom design capability

## PID Lamps

### Lamp Operation

In low pressure gas discharge lamps, a glow discharge excites the natural resonance frequency of the fill gas, producing spectral emission lines down to the short wave cut-off of the window material. The gas discharge is confined to a small capillary within the lamp. Precise electrode alignment allows inherently ultra high stability at predetermined wavelengths.

The power supply and components for operation are relatively simple. A power supply and a series resistor power the lamp. Lamp operation occurs as the breakdown threshold of the fill gas is exceeded, usually on the order of -1100 to -1299 volts DC. The series resistor limits the current of the lamp to a reasonable operating level.

### Lamp Life

Lamp life is affected by both current and operating temperature. At ambient temperature and 1 mA input current the lifetime of the 10.0eV lamp is greater than 5000 hours. This is typical for use in portable analyzers where the lamp is not operated at an elevated

temperature. Most laboratory equipment requires the lamp temperature to be elevated to as high as 250°C. The typical lifetime of lamps with magnesium fluoride windows operated at 1mA current and a detector temperature of 250°C is 1500 hours. Operation at higher temperatures and/or currents will shorten the lamps lifetime.

During use it is typical that the outside of the lamp window becomes contaminated which results in lower output and a loss of system sensitivity. PerkinElmer supplies cleaning kits for lamps with magnesium fluoride windows for the removal of any build-up on the window.

Lamps with Lithium Fluoride windows can not be operated at temperatures above 70°C and it is recommended that they be operated at ambient temperature. The Lithium Fluoride material limits the typical lifetime of these lamps to under 200 hours.

### Spectral Output and Relative Intensity

The eV rating of the lamp is determined by the lamp's spectral output. The spectral output of the lamp is determined by the fill gas and the transmission characteristics of the window material. The spectral output of the gases used most frequently are shown in the graphs below. The eV rating and wavelength are associated through Planck's Constant.

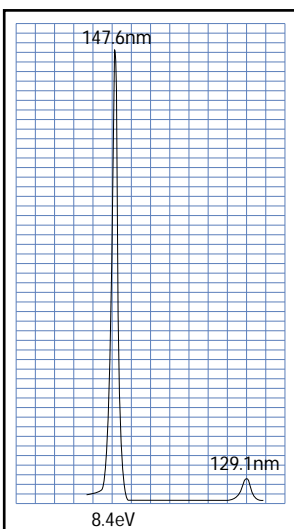
$$l(m) = 1.2395(10^{-6})/eV$$

As seen from the graph showing krypton, both the 123.6nm and 116.5nm lines are present. Because of this the 10.0eV and 10.6 eV lamps are interchangeable.

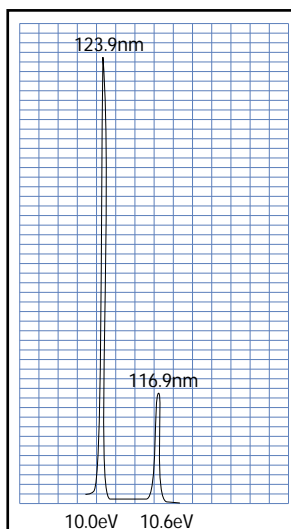
Other fill gases such as hydrogen and oxygen have been used but have found to result in shortened lamp life.

### eV Ratings and Spectral Output

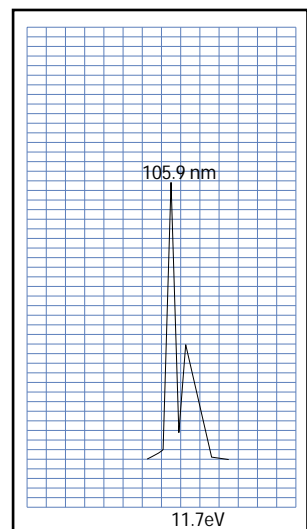
#### XENON



#### KRYPTON



#### ARGON



## Lamp Selection Table

PerkinElmer Part Number	Energy (eV)	Wavelength (nm)	Window Material	Figure
FX-992U	8.4	147.6	Sapphire	1
FX-791U	9.5	130.0	MgF <sub>2</sub>	2
FX-792U	9.6	129.0	MgF <sub>2</sub>	1
FK-600U	10.0	123.9	MgF <sub>2</sub>	1
FK-793U	10.2	121.6	MgF <sub>2</sub>	2
FK-794U	10.6	116.9	MgF <sub>2</sub>	1
FA-798U	11.7	106.0	LiF	2
FA-737U	11.8	105.0	LiF	1
FK-1041U	10.6	116.9	MgF <sub>2</sub>	3
FA-1090U	11.7	106.0	LiF	3

Notes: (1) Wavelength (nm) = 1.2395 (10<sup>6</sup>)/eV.  
 (2) Lamps per Figures 1 & 2 are DC current excited lamps.

## Electrical Specifications

Ignition Voltage	-1100 Vdc min
Ignition Time	1–5 seconds
Operating Current	0.1–1.0 mA
Typical Operating Voltage at max current	-310 Vdc
Typical Operating Voltage at min current	-300 Vdc
Lamp Power Dissipation	0.08–0.77 W
Series Resistor in Circuit	0.77–8.0 Mohm

## Operating Circuit

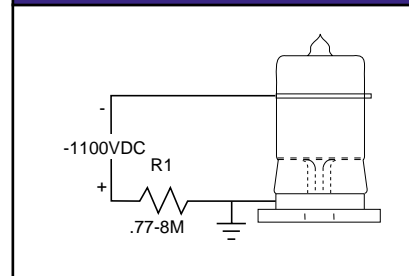


Figure 1

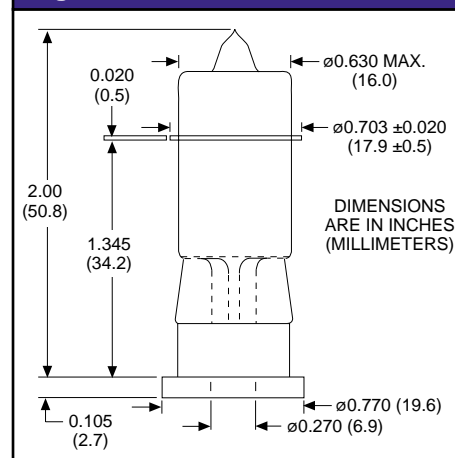


Figure 2

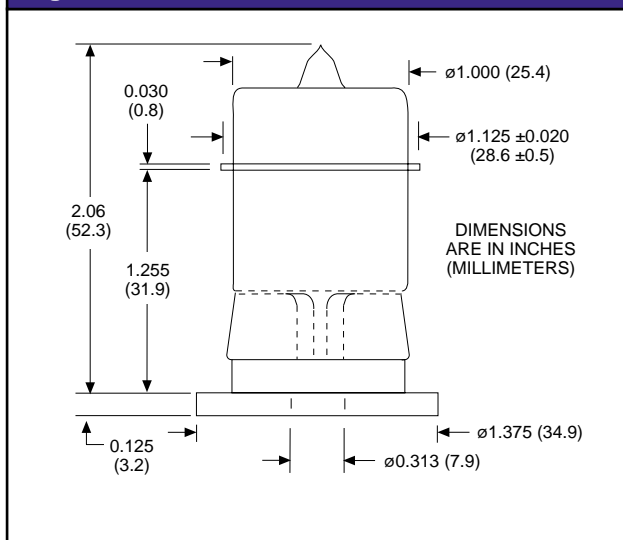
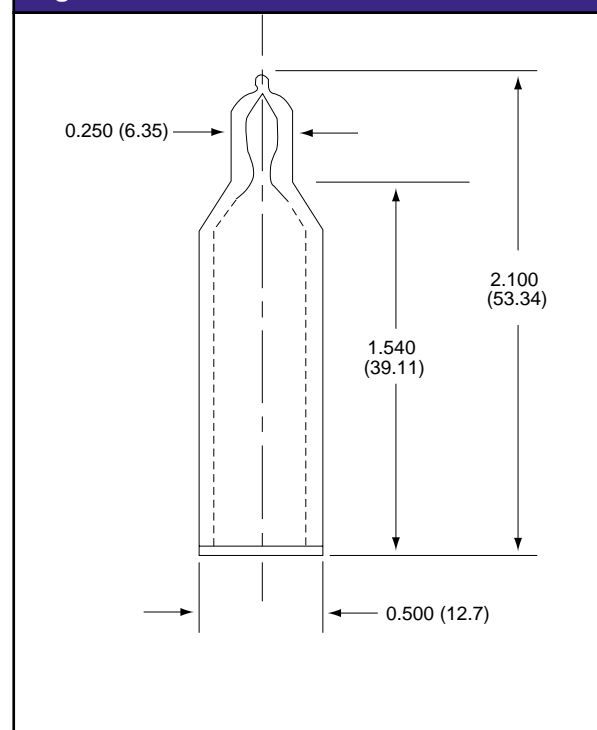


Figure 3



[www.gmp.ch](http://www.gmp.ch)

