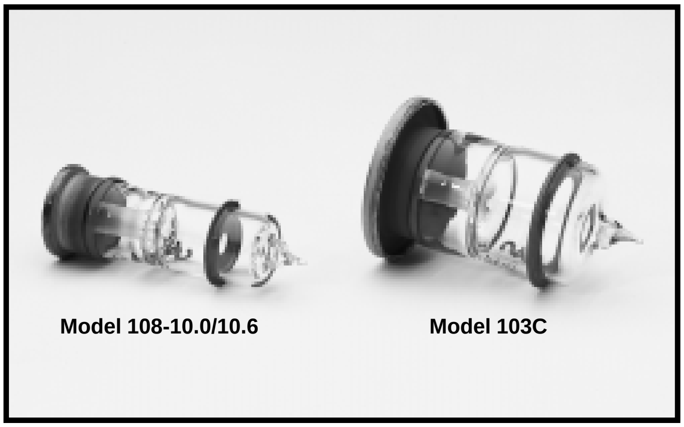
PID Lamps

Product Specification



913-0154

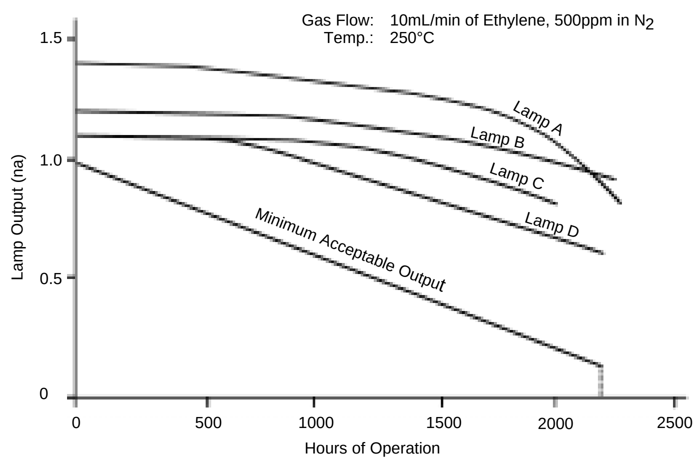
The PID (photoionization detector) lamp was pioneered by Robert V. Gauthier, who, while working with the National Aeronautics and Space Administration (NASA), developed the world's first stable source of high energy emission from a glow discharge lamp for the vacuum ultraviolet. This technology evolved into the production of commercially available PID lamps — a more sensitive and selective alternative to flame ionization as the energy source for the ionizing effluent from gas chromatographic (GC) columns. Now, these PID lamps are found in most GCs, in laboratories around the world.

These lamps emit a very stable, precise photon energy, making it possible to monitor for specific species. Vacuum ultraviolet (VUV) sources for the PID are sealed low-pressure gas discharge lamps in which the natural resonance frequency of the gas in the lamp is excited by the glow discharge, causing the discharge to produce spectral emission lines down to the short-wave cutoff of the window material. Energy is emitted from within the lamp's capillary tube in an axis beam approximately 10° wide at the half-power point. By proper selection of the lamp's gas and the window material, the emitted photon energy may be matched to the ionization potential of the species being monitored, permitting detection in the presence of gases having higher ionization potentials (see Table 1).

Most important to GC users and manufacturers are the sensitivity and stability of PID lamp performance. To ensure the quality of each lamp, each component is tested during the manufacturing process, as well as performance prior to shipment. In addition to these quality tests, "life tests" are continually conducted to ensure the level of performance is maintained in each lamp. These life tests are conducted under conditions simulating normal PID operation, although external window contamination is avoided.

Test lamps are operated continuously at 1mA and 250°C for a period of three months. In these tests, the photoionization current — resulting from passing the VUV beam through 500ppm ethylene in nitrogen at 10mL/min — is measured. Data accumulated over the years indicate that useful life easily exceeds 2160 hours (three months) of continuous use (see Figure A). The most common cause of loss of sensitivity is condensation of the effluent on the lamp window, resulting in a gradual absorption of the VUV. For long life, it is essential that the window be cleaned periodically, The useful life of the lamp can be extended by turning it off when not in use. These lamps have an almost unlimited shelf life.

Figure A. Longevity Test of 4 Model 108-10.0/10.6 PID Lamps



796-0475

Model 103C is the original PID lamp manufactured with an MgF_2 window and filled with krypton. The lamp is used for applications requiring the 10.0, 10.2, and 10.6eV lines and is dimensionally compatible with HNU and SRI detectors.

Model 108 is the most commonly used lamp for applications requiring 10.0 to 10.6eV. Similar to the Model 103C lamp, Model 108 is manufactured with the MgF_2 window and filled with krypton. It is dimensionally compatible with Tracor, OIC Model 4430, and Baseline PIDs.

Note: In 1994, the Model 108-10.6 was renamed "Model 108-10.0/10.6." This change was made to correctly denote the eV potential of this lamp. Early photoionization detectors were not considered sensitive enough to utilize the minor line of krypton at 10.6eV. However, it was proven that they could utilize the 10.6 line. At the same time this was discovered, most PID lamps were already designated as 10.0eV. As a consequence, some instrument manufacturers requested "special" lamps designated as 10.6eV, despite the fact that the only difference was the exterior label. Therefore, whether you require a 10.0 or 10.6 eV potential, Model 108-10.0/10.6 will be suitable for the application.

Table 1. Ionization Potential for Common Compounds

Compound	Ionization Potential (eV)
Acetaldehyde	10.21
Acetone	9.69
Acrolein	10.10
Benzene	9.25
Bromobenzene	8.98
Butane	10.63
Carbon dioxide	13.79
Carbon monoxide	14.01
Chlorine	11.48
Cyclohexane	9.98
Cyclohexene	8.95
Dibromomethane	10.49
m-Dichlorobenzene	9.12
1,2-Dichloroethane	11.12
Dichloromethane	11.35
1,2 Dichloropropane	10.87
Diethyl ether	9.53
Dimethyl ether	10.00
Ethane	11.65
Ethyl acetate	10.11
Ethylene oxide	10.57
Formaldehyde	10.87
Hexane	10.18
Heptane	10.08
Hydrogen	15.43
Isobutane	10.57
Mesityl oxide	9.08
Methane	12.98
Methanol	10.85
Methyl ethyl ketone	9.53
Napthalene	8.12
Nitrogen	15.58
Nitromethane	11.08
Oxygen	12.08
Pentane	10.35
Phenol	8.50
Propane	11.07
Propylene	9.73
Propylene oxide	10.22
Pyridine	9.32
Toluene	8.82
Vinyl acetate	9.19
Vinyl chloride	10.00
Water	12.59

Ordering Information:

Description	Cat. No.
PID Lamp, Model No. 103C	**22631**
PID Lamp, Model No. 108-10.0/10.6	**22626**
PID Lamp Cleaning Kit includes aluminum oxide cleaning compound, swabs, and instructions	**22627**

Contact our Technical Service Department (phone 800-359-3041 or 814-359-3041, FAX 800-359-3044 or 814-359-5468) for expert answers to your questions.