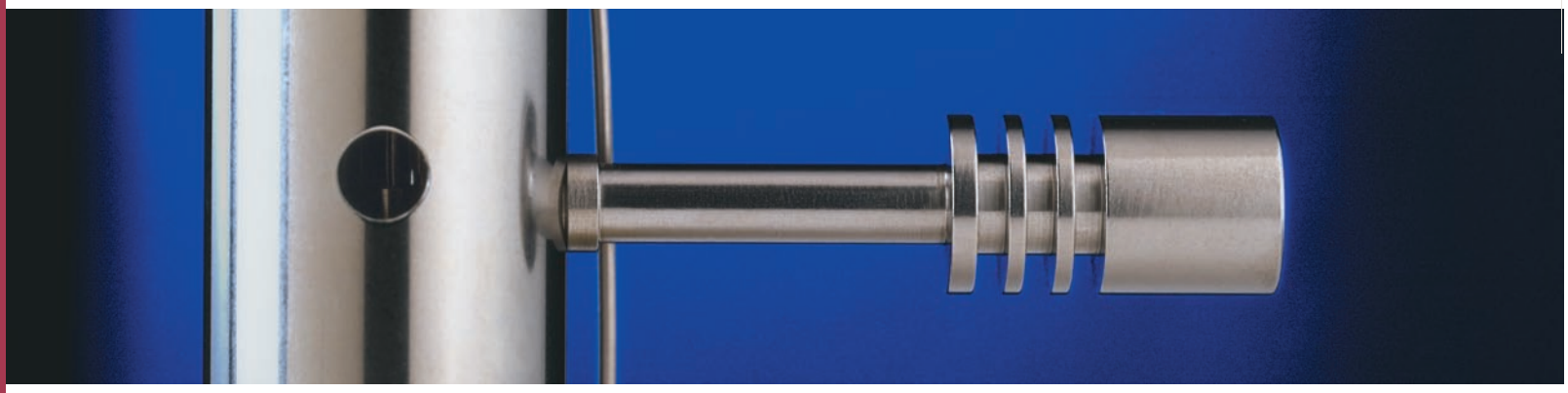


Instrumentation

Most of the components we supply to the instrumentation industry are from our valve and fitting lines. The rest, from our R&D 100 Award-winning pulsed discharge detectors to our application-dedicated trace gas analyzers, are primarily for gas detection and purification.

Pulsed Discharge Detectors

Non-Radioactive, Multiple Mode Electron Capture / Helium Photoionization

VICI PDDs (pulsed discharge detectors) utilize a stable, low powered, pulsed DC discharge in helium as an ionization source. Eluants from the column, flowing counter to the flow of helium from the discharge zone, are ionized by photons from the helium discharge. The bias electrode(s) focus the resulting electrons toward the collector electrode, where they cause changes in the standing current which are quantified as the detector output. Performance is equal to or better than detectors with conventional radioactive sources.

In the electron capture mode, the PDD is a selective detector for monitoring high electron affinity compounds such as freons, chlorinated pesticides, and other halogen compounds. For this type of compound, the minimum detectable quantity (MDQ) is at the femtogram (10^{-15}) or picogram (10^{-12}) level.

In the helium photoionization mode, the PDD is a universal, non-destructive, high sensitivity detector. The response to both inorganic and organic compounds is linear over a wide range. Response to fixed gases is positive (increase in standing current), with an MDQ in the low ppb range.

The PDD in helium photoionization mode is an ideal replacement for FIDs in petrochemical or refinery environments, where the hydrogen and flame can be problematic. In addition, when the discharge gas is doped with argon, krypton, or xenon (depending on the desired cutoff point), the PDD functions as a specific photoionization detector for selective determination of aliphatics, aromatics, amines, and other species.

R&D 100 AWARD WINNER

MORE INFORMATION

Pulsed discharge detectors
- Model D-2 .... page 221
- Model D-3 222
- Model D-4 223
- Model D-5 222

Plug-and-play detectors
- for Agilent 6890 222
- for Agilent 7890 222
- for other GCs 223

Model D-2

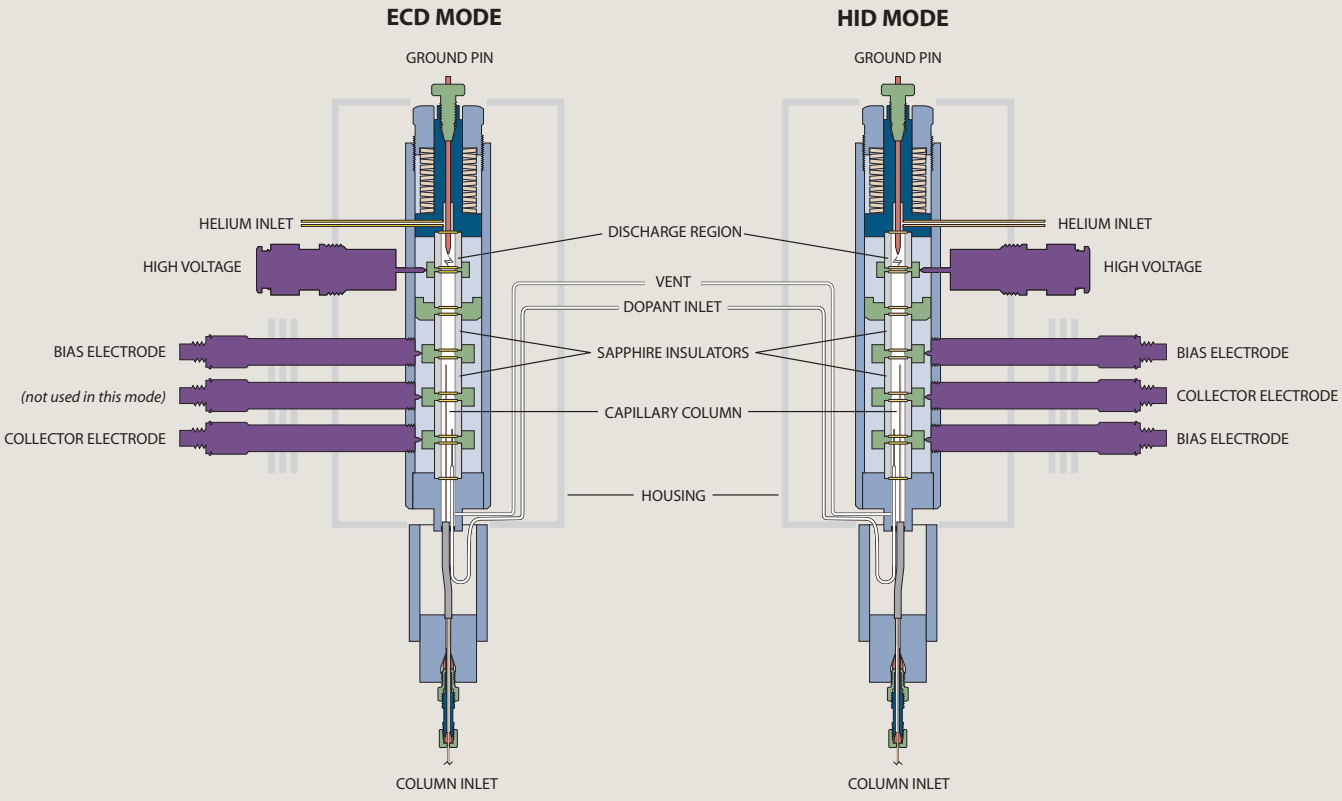
The D-2 is a dual mode, universal detector system which can be retro-fitted to your older GC. The D-2-I is optimized for trace level work in the helium photoionization mode. The stand-alone systems include detector, controller, electrometer, helium purifier, and power supply.

PDD Model D-2 *Stand-alone system*

Detector system includes detector cell, pulser, controller, electrometer, and helium purifier.

Description	**110 VAC** *Prod No*	**230 VAC** *Prod No*
Mode-selectable universal electron capture / photoionization detector system	D-2	D-2-220
Detectors optimized for trace level work in helium photoionization mode		
Optimized for packed column use	D-2-I	D-2-I-220

Model D-2



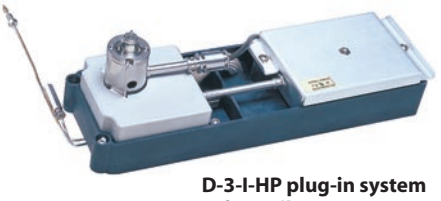
Pulsed Discharge Detectors

Plug-and-play detectors for Agilent 6890 and 7890

Model D-3 is designed for plug-and-play installation on the popular Agilent 6890 and 7890, and is optimized for trace level work in the helium photoionization mode

Model D-5 is a plug-and-play electron capture detector for the 6890.

All versions utilize the electonics and power supply of the host GC.



D-3-I-HP plug-in system for Agilent 6890 GC

PDD Model D-3 *Helium photoionization*

Detector optimized for trace level work in helium photoionization mode

	110 VAC	230 VAC
Description	*Prod No*	*Prod No*
Plug-in system for Agilent 6890	D-3-I-HP	D-3-I-HP-220
Plug-in system for Agilent 7890	D-3-I-7890	D-3-I-7890-220

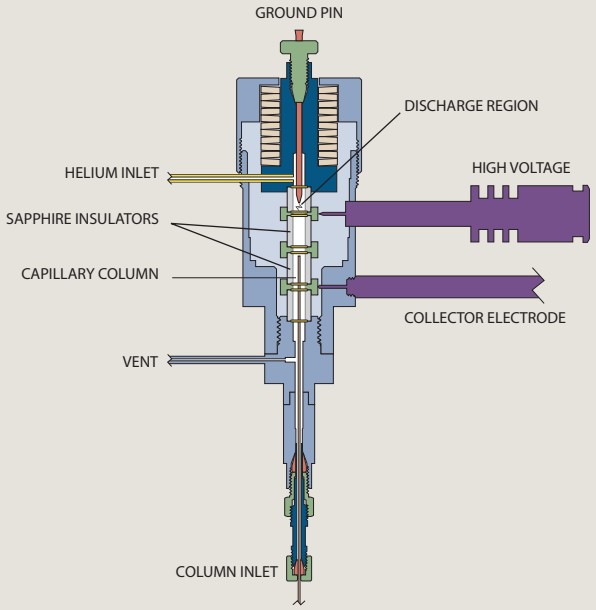
PDD Model D-5 *Electron capture*

Detector optimized for electron capture detection

	110 VAC		230 VAC
Description	*Prod No*	*Price*	*Prod No*
Plug-in system for Agilent 6890	D-5-6890		D-5-6890-220

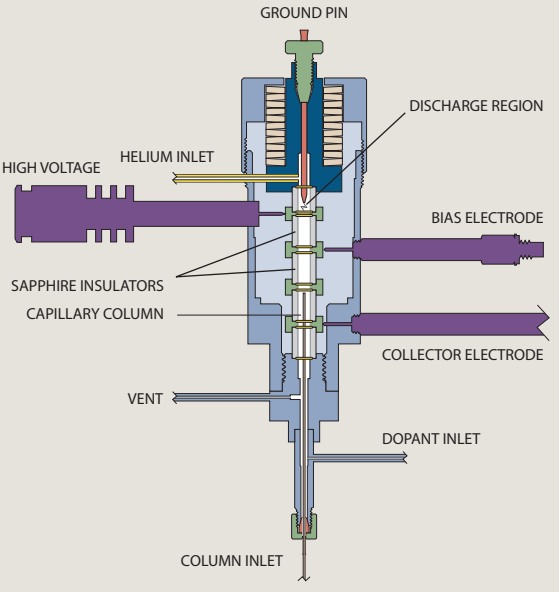
Model D-3 schematic

HELIUM PHOTOIONIZATION



Model D-5 schematic

ELECTRON CAPTURE



Plug-and-play detectors for other GCs

Pulsed Discharge Detector Model D-4 is available in versions for easy installation on most of the GCs in current use, including the Varian 3800, Shimadzu 14 and 17, ThermoFinnigan Trace, Mega, and Top, and Hewlett Packard 5890. The D-4 is single mode, optimized for trace level work in the helium photoionization mode.

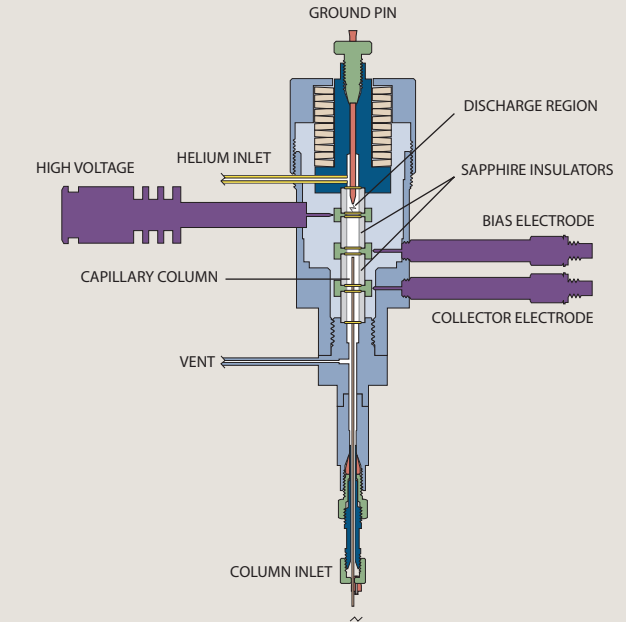
PDD Model D-4 *Helium photoionization*

Detectors optimized for trace level work in helium photoionization mode

	110 VAC	230 VAC
Description	*Prod No*	*Prod No*
Specialized detector for		
HP 5890	D-4-I-HP58	D-4-I-HP58-220
Shimadzu GC 14 *	D-4-I-SH14-R	D-4-I-SH14-R-220
Shimadzu GC 17 *	D-4-I-SH17-R	D-4-I-SH17-R-220
Thermo Trace GC *	D-4-I-TQ-R	D-4-I-TQ-R-220
Varian 3800 *	D-4-I-VA38-R	D-4-I-VA38-R-220
* Uses existing GC FID electrometer.		
For all other GCs	D-4-I	D-4-I-220

Model D-4 schematic

HELIUM PHOTOIONIZATION

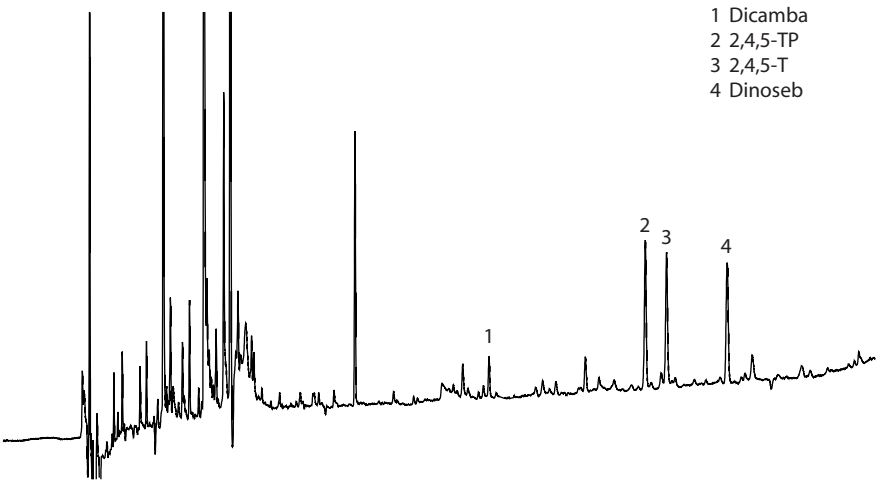


Pulsed Discharge Detector Applications

Model D-2

HERBICIDES IN SOIL SAMPLES USING EPA METHOD 8151

Detector:	PDD Model D-2
Mode:	Electron capture
Sample:	Environmental soil (1 g)
Detector temp:	320°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x 0.25 µm
Column temp:	60°C (2 min), 20°C/min to 180°C, 4°C/min to 220°C, 40°C/min to 300°C (5 min)
Injector temp:	200°C
Sample volume:	2 µL (solvent microextraction), 1:15 split
Discharge gas:	Helium
Dopant gas:	Helium/argon
Attenuation:	1

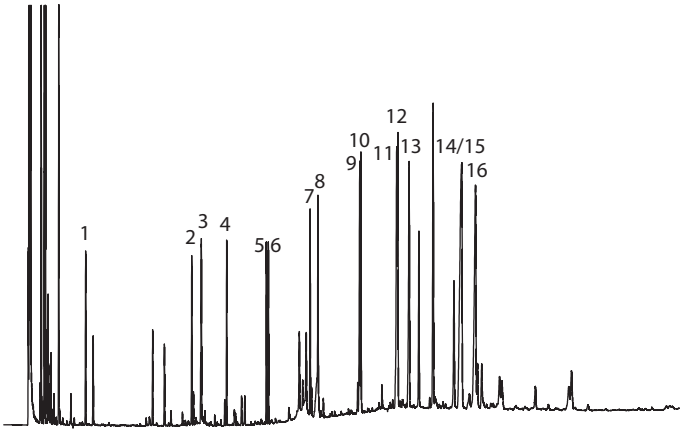


1 Dicamba
2 2,4,5-TP
3 2,4,5-T
4 Dinoseb

PDD Model D-2

PAH RESIDUES IN AN ENVIRONMENTAL SOIL SAMPLE SPIKE

Detector:	PDD Model D-2
Mode:	Helium photoionization
Sample:	Environmental soil (1 g)
Detector temp:	300°C
Column:	ValcoBond VB-35 30 m x 0.25 mm x 0.25 µm
Column temp:	120°C for 3 min, 15°C/min to 310°C for 15 min
Injector temp:	275°C
Sample volume:	2 µL (solvent microextraction), 1:15 split
Discharge gas:	Helium
Dopant gas:	none
Attenuation:	1

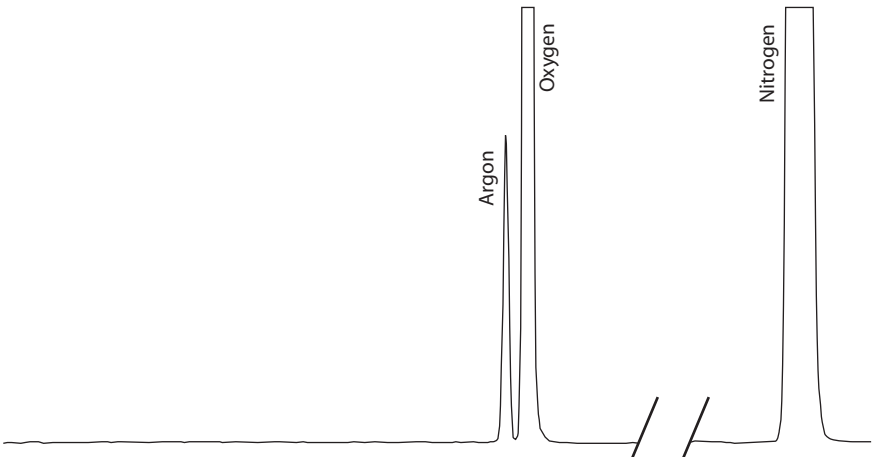


1 Naphthalene
2 Acenaphthalene
3 Acenaphthene
4 Fluorene
5 Phenanthrene
6 Anthracene
7 Fluoranthene
8 Pyrene
9 1,2 Benzanthracene
10 Chrysene
11 Benzo(b)fluoranthene
12 Benzo(k)fluoranthene
13 Benzo(a)pyrene
14 Indeno (1,2,3-C.d)pyrene
15 1,2:5,6-Dibenzanthracene
16 1,12-Benzoperylene

PDD Model D-3

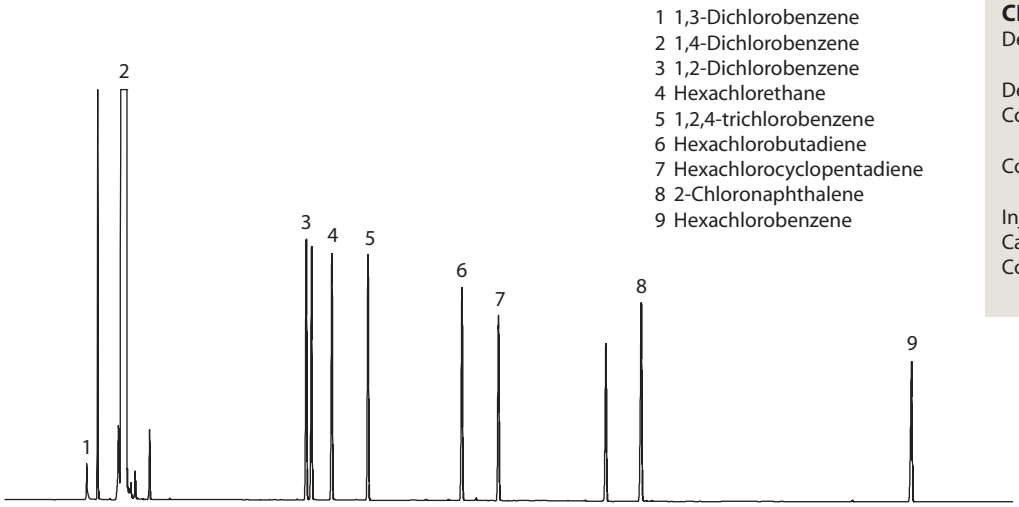
AIR

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	300°C
Column:	ValcoPLOT VP-Molesieve 30 m x 0.53 mm x 0.50 µm
Column temp:	Ambient
Injector temp:	250°C
Discharge gas:	Helium
Carrier gas:	Helium



Pulsed Discharge Detector Applications

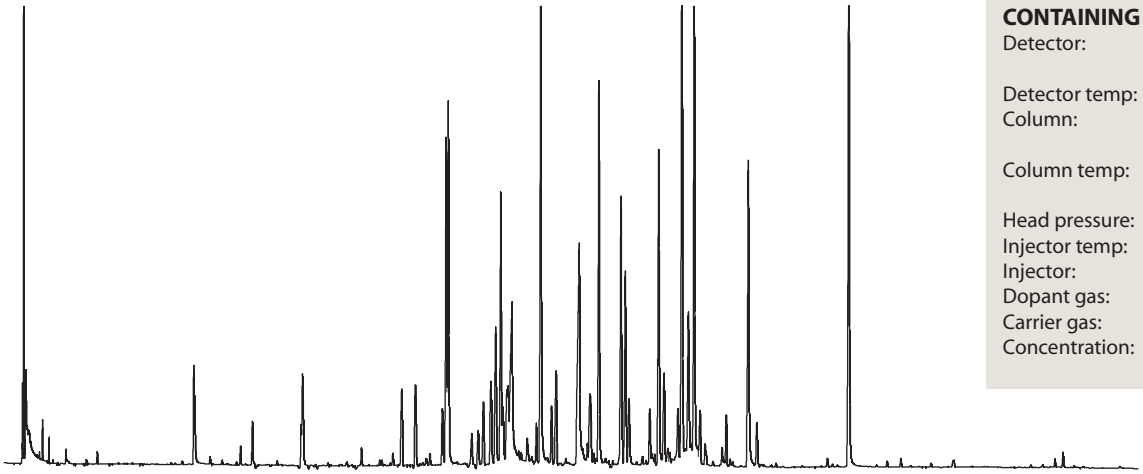
PDD Model D-3



CHLORINATED HYDROCARBONS

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Injector temp:	280°C
Carrier gas:	Helium
Concentration:	5 mg/ml

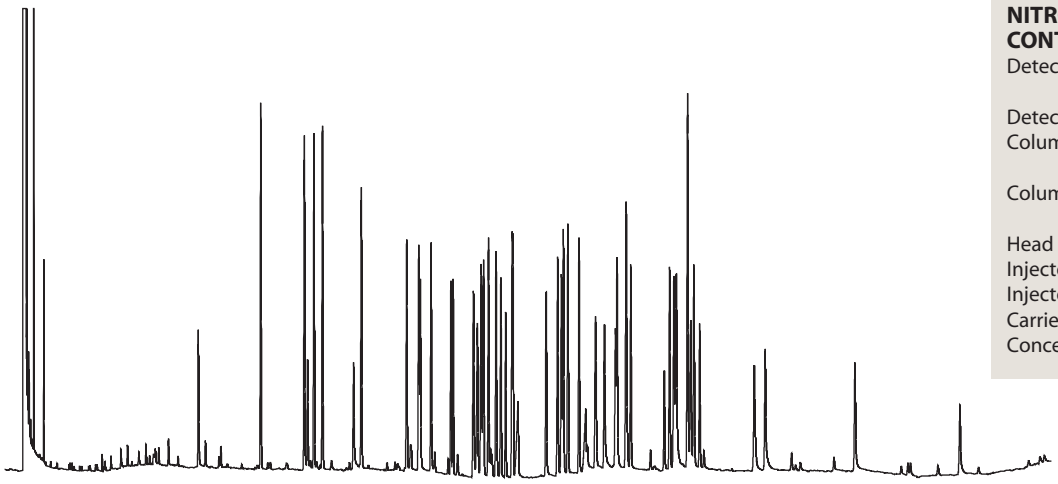
PDD Model D-5



NITROGEN- AND PHOSPHOROUS-CONTAINING PESTICIDES

Detector:	PDD Model D-5 Electron capture
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Head pressure:	15 psi
Injector temp:	280°C
Injector:	Split 1:10
Dopant gas:	3% Xenon in helium
Carrier gas:	Helium
Concentration:	0.8 mg/ml

PDD Model D-3



NITROGEN- AND PHOSPHOROUS-CONTAINING PESTICIDES

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Head pressure:	15 psi
Injector temp:	280°C
Injector:	Split 1:10
Carrier gas:	Helium
Concentration:	2.5 mg/ml

Helium and Nitrogen Purifiers

Carrier gas purity is essential in any application requiring extreme sensitivity. Impurities limit detector sensitivity and can even destroy capillary columns. The Valco HP2 provides "point-of-use" purification of helium or other noble gases, such as Ar, Ne, Kr, and Xe, to sub-ppm levels of reactive gaseous impurities. The NP2 is similar, purifying nitrogen to sub-ppm levels of gaseous impurities.

The purification substrate in Valco gas purifiers is a non-evaporable gettering alloy. This stable alloy is contained in a welded assembly, so the purifiers can be used safely in industrial applications with minimal precautions. The getter is activated by heating, which eliminates the oxide film on the particle surface and allows helium to diffuse into the bulk of the getter particles. The HP2 and NP2 feature a self-regulating design which eliminates the possibility of thermal runaway and maintains the getter material at the optimum temperature.

Standard helium and nitrogen purifiers

Includes universal power supply.

	Helium purifier	Nitrogen purifier
Description	*Prod No*	*Prod No*
110 VAC	HP2	NP2
230 VAC	HP2-220	NP2-220

Replacement getter assembly

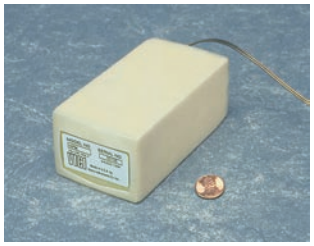
Helium	I-23572HP2
Nitrogen	I-23572NP2

HELIUM PURIFIER

- CE certified
- Gases purified: He, Ne, Ar, Kr, Xe, Rn
- Maximum operating pressure: 1000 psig
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, N_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn

NITROGEN PURIFIER

- CE certified
- Gases purified: N_2 only
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn, N_2



Miniature Gas Purifiers

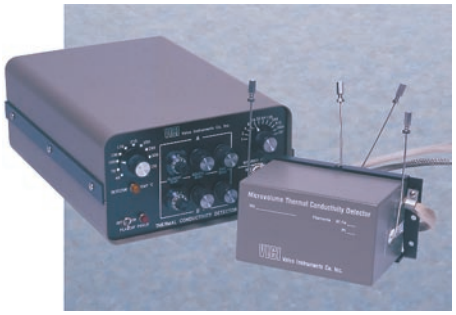
The Valco Miniature Helium Purifier (HPM) and Miniature Nitrogen Purifier (NPM) are designed to be installed in a gas chromatograph's flow path immediately upstream of the injector.

The HPM/NPM will remove any contaminants introduced by flow controllers, elastomeric tube seals, pressure regulators, crude traps, or other system components that are not completely clean and leak-tight.

Mini helium and nitrogen purifiers

Includes universal power supply.

Description	**Helium purifier** *Prod No*	**Nitrogen purifier** *Prod No*
110 VAC	HPM	NPM
230 VAC	HPM-220	NPM-220



Microvolume Thermal Conductivity Detector

Our dual filament TCD is a stand-alone unit consisting of the detector housing and a controller with electrometer and temperature controls. The detector cell includes two separate nickel/iron filaments, capable of independent or referenced (differential) operation. Cell volume and geometry are optimized for capillary chromatography and enhanced sensitivity at low flow rates. (Recommended total flow rate: 2-10 mL/min.) Thermal stability is maintained to ±0.02°C, resulting in a stable, noise-free signal. A single 0-1 millivolt attenuated output for a strip chart recorder is provided through the signal cable at the rear of the controller, with 0-1 volt and 0-10 volt unattenuated signals available through the remote signal cable.

TCD Thermal conductivity detectors

Description		**110 VAC** *Prod No*	**230 VAC** *Prod No*
Entire unit (cell and electronics)		TCD2-NIFE	TCD2-NIFE-220
Cell/oven assembly only	Dual filament	TCD2-NIFED	TCD2-NIFED-220
TCD controller only		TCD2-C	TCD2-C-220