

MSA Chemgard® Gas Detection System

For Monitoring NF3 in Semiconductor Fabrication Lines

APPLICATION:

Monitoring ambient nitrogen trifluoride (NF3) leaks within a semiconductor fabrication line and in associated areas.

THE PROBLEM:

Traditionally, a pyrolyzer and hydrogen (HF) electrochemical sensor combination has been used to monitor NF3 in these applications. However, there are several significant drawbacks to this method:

✓ *False Alarms*

The cleaning solvents commonly-used in these areas are often falsely registered as NF3 leaks by the pyrolyzer/HF technology, which cannot distinguish between the compounds.

✓ *Sensor Life & Durability*

The release of large amounts of NF3, sustained sensor exposure to cleaning solvents, or exposure to entrained liquids all result in a dramatic reduction of the life of the HF sensor as the electrolyte is depleted or rendered inoperable. Dependant upon sensor location and ppm-hours exposure, the resultant lifespan can range from months to less than two years.

✓ *Humidity Effects*

The pyrolyzer/HF sensor combination has shown reduced accuracy due to changes in humidity.

THE SOLUTION:

The selective, stable, and sensitive MSA Chemgard Gas Detector with pump and photoacoustic infrared (PIR) analyzer possesses significant advantages over the pyrolyzer/HF sensor in these applications. The Chemgard Monitor resolves the above issues as follows.

✓ *False Alarms*

Depending on the cleaning solvent, the Chemgard's PIR technology can minimize or eliminate cross-interference effects. In the event that a cleaning solvent is known to adsorb IR energy in the measuring wavelength band of NF3, MSA can assist in quantifying this effect to compensate.

✓ *Sensor Life & Durability*

PIR technology is non-intrusive and does not contain a consumable or depletable electrolyte solution. Protection of the analyzer system from moisture can be attained by using water-barrier filters.

✓ *Humidity Effects*

The Chemgard Monitor contains a built-in humidity sensor that continuously compensates the output for changes in humidity.



NITROGEN TRIFLUORIDE – OTHER USES:

Nitrogen trifluoride is used in the plasma and thermal cleaning of chemical vapor deposition (CVD) reactors. It is also used as a source of fluorine radicals for plasma etching of polysilicon, silicon nitride, tungsten silicide, and tungsten. In this application it can replace perfluorocarbons (such as hexafluoroethane) and sulfur hexafluoride, resulting in both ecological advantages and higher process efficiency. It is a potent oxidizer, used to oxidize some high-energy fuels, in the preparation of tetrafluorohydrazine, and to fluorinate fluorocarbon olefins. Nitrogen trifluoride is also used as a fuel for both hydrogen fluoride and deuterium fluoride chemical lasers.

Note: ACGIH TLV-TWA for NF3 is 10 ppm; OSHA PEL is 10 ppm; and the NIOSH IDLH (never to exceed) is 1,000 ppm. The Chemgard Monitor delivers 0.4 ppm performance sensitivity for NF3.

For more information on the Chemgard Gas Monitor see data sheet #07-2033.