

## *The single-source gases and chemicals supplier for the fiber optics and opto-electronics industry*

Air Products has dedicated itself to becoming the world's leading single-source provider of best-in-class products and services to the electronics industry. We've done this by supplying all of the consumable products that surround the process tool and by building productive and lasting relationships with customers virtually everywhere in the world.

We pride ourselves on our ability to bring these capabilities to the telecommunications industry and, specifically, optical fiber manufacturers. We seek to develop a long-lasting relationship built on understanding, integrity and passion...to earn your trust by responding with the right solutions at the right time. Reliability and consistency are paramount. Our day-to-day commitment to you, as always, is superior service—from technical assistance to on-time delivery and to develop a cost of ownership.

Ours is a global approach that easily accommodates an expanding customer base. We serve fiber optic customers through our Microelectronics Applications and Technology Group, part of our Electronics Division comprising more than 1700 professionals providing local support to customers.

The Microelectronics group includes a dedicated team of application engineers who develop gas and chemical technologies for the fiber optical industries. Group members are found in all countries in which Air Products has operations, including North America, Latin America, Europe and Asia. They have immediate access to the resources of the entire Electronics Division.

Here's what we offer the fiber optics industry and its OEMs as a committed, front end, single-source material supplier:

### **Supply**

We are the global leader in supplying industrial and specialty gases to the electronics industry. We offer the broadest range of products and methods of supply—from cylinders, to bulk systems to on-site gas generation:

- Liquid and bulk gases (nitrogen, oxygen, argon, helium, hydrogen, CO and blends)
- High-purity and specialty gases (SiCl<sub>4</sub>, GeCl<sub>4</sub>, SF<sub>6</sub>, NF<sub>3</sub>, SiF<sub>4</sub>, Halocarbon 23, Halocarbon 116 and fluorinated gas blends)
- Cryogenic Onsites (nitrogen and oxygen)
- Non-cryogenic Onsites (PRISM® membranes, HPN and PSA systems)
- Industrial cylinder gases (cutting, welding, etc.)

You can count on our proven experience in supplying bulk gases to the electronics industry, including MEGACLASS™ oxygen, nitrogen, argon and hydrogen supplied at ppb purity levels. Our full line of hauled-in liquid gases is stored in tanks at your site and vaporized as needed for your process. We have installed hundreds of air and gas separation,

We offer a full range of cylinder gases.



We welcome the opportunity to work with component, cable and network manufacturers to commercialize leading edge. You'll benefit from our being pioneers in cryogenic air separation.





*"We are positioned perfectly to meet the demanding raw material and facility needs of fiber optic manufacturers throughout the world."*

Valerie Mebert,  
Fiber Optic Market  
Development Engineer

purification and liquefaction plants for customers in addition to building, operating and maintaining hundreds more of our own. We have a substantial distribution fleet of computer-dispatched liquid tankers with our own trained drivers. We can easily adjust shipments to meet your unforeseen or emergency needs.

We manufacture and/or supply more than 80 distinct specialty gases for the electronics and optical fiber industry. Our basic fluorine technology and a proprietary purification process allow us to meet your most stringent needs for dopant gases (SF<sub>6</sub>, SiF<sub>4</sub>, NF<sub>3</sub>), which are unavailable from any other supplier.

We'll work with you to determine the best gas, purity and supply method to meet your needs and to minimize your costs.

## Offerings

Much of our expertise lies in maximizing the advantages of industrial and specialty gases for our electronics and microelectronics customers. We concentrate on manufacturing and delivering products to meet your exacting process requirements. These major offerings can benefit your manufacturing facility:

### MEGASYS® Total Gas and Chemicals

**Management:** A strategic, on-site alliance for reducing customers' costs and increasing productivity. Full-time Air Products' teams of knowledgeable technicians, engineers and managers work on-site, allowing you to concentrate on your core business.

## Home-Grown Product Portfolio

Product		Produce	Purify	Transfill	Available
Ammonia	NH <sub>3</sub>		•	•	•
Argon	Ar	•	•	•	•
Arsine	AsH <sub>3</sub>	•	•	•	•
Boron Trichloride	BCl <sub>3</sub>			•	•
Boron Trifluoride	BF <sub>3</sub>			•	•
Carbon Dioxide	CO <sub>2</sub>	•	•	•	•
Carbon Monoxide	CO				•
Chlorine	Cl <sub>2</sub>		•	•	•
Chlorine Trifluoride	ClF <sub>3</sub>	•	•	•	•
Diborane Mixes	B <sub>2</sub> H <sub>6</sub>	•			•
Dichlorosilane	SiH <sub>2</sub> Cl <sub>2</sub>				•
Fluorine	F <sub>2</sub>	•	•	•	•
Halocarbon 23	CHF <sub>3</sub>				•
Helium	He	•	•	•	•
Hexafluorobutadiene	C <sub>4</sub> F <sub>6</sub>		•	•	•
Hexafluoroethane	C <sub>2</sub> F <sub>6</sub>	•	•	•	•
Hydrogen	H <sub>2</sub>	•	•	•	•
Hydrogen Bromide	HBr		•	•	•
Hydrogen Chloride	HCl		•	•	•
Hydrogen Fluoride	HF			•	•
Hydrogen Selenide	H <sub>2</sub> Se	•	•	•	•
Krypton	Kr	•	•	•	•
Methylsilane	CH <sub>3</sub> SiH <sub>3</sub>	•	•	•	•
Neon	Ne		•	•	•
Nitrogen Trifluoride	NF <sub>3</sub>	•	•	•	•
Nitrous Oxide	N <sub>2</sub> O		•	•	•
Octafluorocyclobutane	C <sub>4</sub> F <sub>8</sub>				•
Octafluorocyclopentene	C <sub>5</sub> F <sub>8</sub>				•
Octafluoropropane	C <sub>3</sub> F <sub>8</sub>				•
Oxygen	O <sub>2</sub>	•	•	•	•
Phosphine	PH <sub>3</sub>	•	•	•	•
Photolithography Mixes	(F <sub>2</sub> /Kr/Ne)	•			•
Silane	SiH <sub>4</sub>			•	•
Silicon Tetrachloride	SiCl <sub>4</sub>			•	•
Silicon Tetrafluoride	SiF <sub>4</sub>	•	•	•	•
Sulfur Hexafluoride	SF <sub>6</sub>	•	•	•	•
Tetrafluoromethane	CF <sub>4</sub>	•	•	•	•
Tetramethylsilane	Si(CH <sub>3</sub> ) <sub>4</sub>		•	•	•
Trichlorosilane	SiHCl <sub>3</sub>			•	•
Trimethylsilane	(CH <sub>3</sub> ) <sub>3</sub> SiH		•	•	•
Tungsten Hexafluoride	WF <sub>6</sub>	•	•	•	•
Xenon	Xe	•	•	•	•

## Matching Our Product Offerings With Your Processes

### Air Products' Advantages

- Complete high-quality product offering: Gases, process chemicals, equipment, delivery systems and technical support and service
- Global contract and supply
- Competitive pricing
- Comprehensive applications development and support
- Customer on-site own and operate services
- Reliable delivery
- Bulk delivery and storage systems
- High-purity gas delivery equipment
- Helium recovery systems
- Diverse research and development capabilities

Raw Materials		Step 1:		Step 2:		Step 3:	Step 4
		Blank Making		Consolidate		Holding Ovens	Fiber Draw
		Flame Hydrolysis	Chemical Vapor	Flame Hydrolysis	Chemical Vapor		
Oxygen	O <sub>2</sub>	•	•	•	•		•
Nitrogen	N	•	•	•	•	•	•
Argon	Ar					•	•
Helium	He	•	•	•		•	•
Hydrogen	H <sub>2</sub>	•			•		•
Methane	CH <sub>4</sub>	•			•		•
Carbon Dioxide	CO <sub>2</sub>						•
Chlorine	Cl <sub>2</sub>		•	•			
Silicon Tetrachloride	SiCl <sub>4</sub>	•	•				
Germanium Tetrachloride	GeCl <sub>4</sub>	•	•				
Phosphorous Oxychloride	POCl <sub>3</sub>	•	•				
Sulfur Hexafluoride	SF <sub>6</sub>	•	•				
Silicon Tetrafluoride	SiF <sub>4</sub>	•	•				
Halocarbons			•				•
Point of use delivery equipment		•	•	•	•	•	•
Bulk delivery equipment		•	•	•	•	•	•



APCI has large and small as well as high and low purity delivery systems to support all materials.

#### **GASGUARD® Ultra-High Purity Equipment:**

Point-of-use gas cabinets, valve manifold boxes and Bulk Specialty Gas Systems (BSGS) and QMAC analytical systems manufactured at our global state-of-the-art Semiconductor Equipment Manufacturing Centers (SEMC).

#### **Air Products Electronic Chemicals (APEC):**

Supplying electronic chemicals, equipment and on-site management. Products include electronic process chemicals through an alliance with Honeywell and CMP slurries through an alliance with DuPont.

**TRiMEGA:** Focusing on the lowest cost of ownership for gas, chemical and water process systems for start-ups and expansions. Complete design and install capabilities. A 50/50 joint venture with US Filter/Kinetics Group.

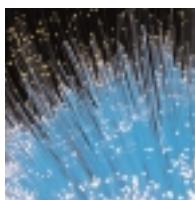
**Solkatronic Business Unit:** Providing dopants and other high-purity specialty gases.

**Analytical Services:** Providing a full line of standard and customized technical troubleshooting services for telecommunications and the entire electronics industry.

### Applications

We'll work closely with you to achieve maximum advantage in the marketplace including:

- **Developing gas and chemicals technology:**
  - ... producing new molecules
- **Developing and implementing commercialization strategy**
- **Providing process technical support:**
  - ... start-up assistance
  - ... cost reduction programs
  - ... problem resolution
  - ... comprehensive gas use audits
  - ... analytical services
  - ... process optimization
- **Evaluating and developing new applications:**
  - ... industry-relevant R&D activities
  - ... joint development activities
  - ... participation in industry consortia
- **Providing technology focus and assessment:**
  - ... cost-of-ownership models
  - ... production trials



## **Helium Recovery System**

Because helium is the second largest consumable in fiber optic fabrication, and because the world's supply of this unique molecule is finite and irreplaceable, Air Products has developed a helium recovery system that also offers significant cost savings. It can collect helium used in the production of fiber optics at the rate of 50 to 80 percent.

As the gas used to transfer heat from the fiber to chiller, helium consumption for this process is great. Our system uses mass flow controllers in conjunction with a vacuum pump to accurately recover helium from the chiller with minimal aspiration of air into the chiller or recovery system.

The helium recovery and recycle system is designed to recover helium gas from the fiber coolers without causing defects in the fiber during the drawing process and minimizing the influx of ambient air into the recovered helium stream. This system can achieve up to 80 percent recovery of helium and recycle it to a purity level of 99.99 percent, with a dewpoint of  $-90^{\circ}\text{F}$  (3.53 ppm water).

We recognize that helium recovery for the optical fiber customers must be a fine balance between recovering the helium gas without causing defects in the fiber during the drawing process and reducing the influx of ambient air into the recovered helium stream.

Air Products is the world's leading producer and supplier of helium, which helps assure security of supply for your facility regardless of where you are in the world.



## **For More Information**

This data sheet provides only a brief overview of our broad range of capabilities for the fiber optics industry. If you would like more information, please contact:

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