

GASGUARD[®]
Bulk Specialty Gas
Systems (BSGS):
The Standard for the
Electronics Industry



proven
economical *and*
safe delivery
systems

Proven, Economical, and Safe Delivery Systems for Higher Volume Users

Air Products is the market leader in manufacturing and supplying Bulk Specialty Gas Systems (BSGS) to the electronics industry. Our GASGUARD® BSGS systems are the benchmark for the safe and continuous delivery of large specialty gas volumes. Offerings include our BSGS Type I (manual), Type II and Type III (automated) gas delivery systems, and Type IV liquid delivery system.

Air Products is in a unique position to provide state-of-the-art BSGS systems, largely the result of continuous developments and patented technology for the supply of high-purity HCl, SiH₄, TCS, halocarbons, and related products. Building on our expertise in bulk atmospheric and gas cabinet delivery systems, Air Products offers the latest advancements in regulators, monitoring, filtration, and component design. This provides superior and reliable specialty gas delivery for large-volume users.

Flexible Offering

Typical equipment for BSGS Type I, Type II and Type III gas delivery systems consists of the product container and High Pressure Control Manifold (HPCM) with monitoring. The bulk supply can be in 500 lb. containers up to large mobile containers like tube trailers or larger tankers in size, or stationary such as a liquid tank. The HPCM contains all the equipment necessary to filter, regulate, purify, and monitor the process feed.

Our latest development—the Type IV liquid system bulk delivery module (BDM)—delivers process gases and is designed as a safe, economical, and self-sufficient delivery option for the supply of TCS and SiCl₄ into fabs. It connects

liquid containers to the customer product delivery header with supply source options from 200-liter (55-gallon) drums to large-volume ISO modules (up to 40,000-pound containers). A liquid valve manifold box (LVMB) distributes the liquid from the main delivery header to several usage points. An auto-refill bubbler delivers the process gases to the tool, or to multiple tools via standard VMB. The bubbler consists of a process piping cabinet (PPC) with electrical control cabinet (ECC), which in tandem can supply multiple tools.

Key options for the BSGS delivery system include Air Products' proven, high-pressure, high-flow HCl purifier and GASGUARD BSGS Y-container heater. Our HCl purifier removes moisture from bulk HCl at ambient temperature to deliver extremely dry and consistently pure product, and at high pressure before it has a chance to do damage to the delivery equipment. The BSGS Y-container heater effectively compensates for heat loss during vapor withdrawal, extending the deliverable flow rate from cylinders of liquefied gases such as Cl₂, HCl, N₂O, SF₆ and NH₃.

With all BSGS systems, connection to the customer house line allows distribution of process gas throughout a facility, which is more economical than multiple lines via gas cabinets. BSGS systems can be installed indoors or outside; the latter may be desirable if gas room floor space is limited. A single house line saves on individual gas cabinet lines, too.

Due to the built-in autodialer capabilities, any problem with the system will alarm and alert those responsible for maintaining the gas supply. In addition, BSGS will automatically switch over from the active to the redundant reserve side to prevent any upset in the process feed. This feature allows time to service a non-functioning component, while the system continues delivering gas to the fab. BSGS systems deliver many specific advantages.



A Type III fully automated BSGS System.

New, advanced design BSGS systems serve a variety of applications. More than 80 have been installed worldwide.



Critical BSGS components are manufactured in Class 10 and Class 100 clean rooms.

Lower Cost

The cost benefits of Air Products' BSGS systems to high-volume specialty gas users include:

- Savings of up to 50 percent on bulk purchases compared to cylinder gas cost.
- Less total capital outlay versus multiple gas cabinets.
- Reduced labor associated with cylinder handling, gas cabinet maintenance, and cylinder change.
- A substantial reduction in scrap costs due to more consistent product and reduced residual gas returned.
- Easy expansion to the tool set by just connecting to a gas drop in the gas distribution piping.

Improved Quality

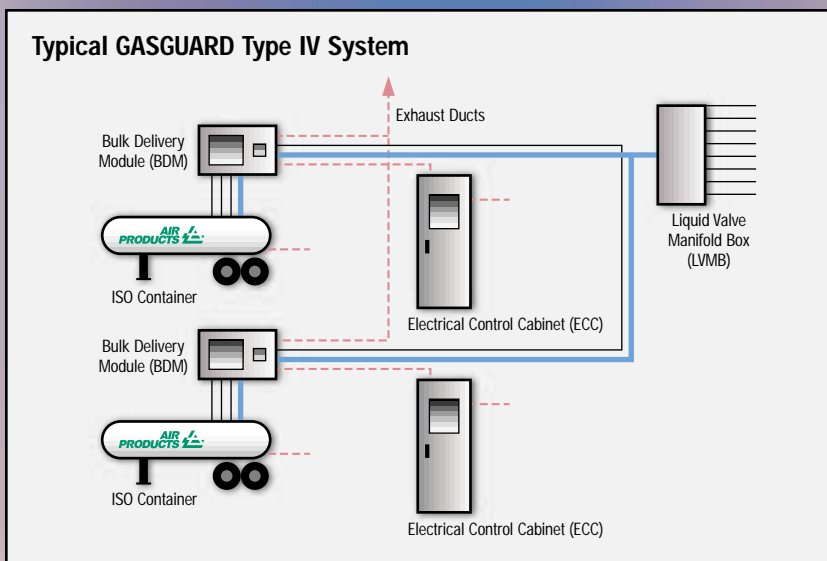
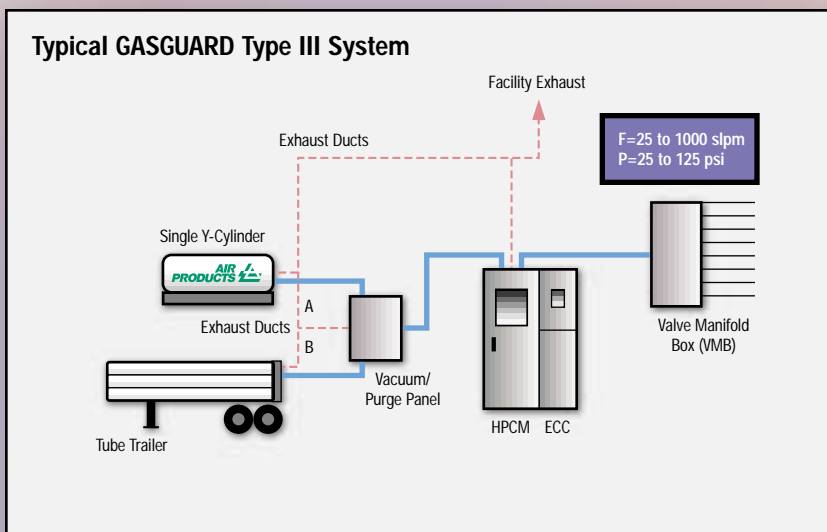
BSGS improves the gas quality in several ways:

- Fewer container changes decrease the possibility of contamination entering through the valve connection.
- Lower surface area per unit volume lessens the effect that the container has on gas quality.
- High-flow BSGS product has less contact time with piping surfaces; the velocity constantly sweeps the gas-wet areas clean.
- The system uses advanced design features and materials to maintain ultra-high purity levels and reduced particulate.

Greater Consistency

Large-volume specialty gas users could consume hundreds of cylinders monthly. Since there are a variety of batches that these cylinders represent, the variability in the fill process produces a slight difference in product consistency. BSGS improves this situation:

- Larger container volume is filled with only one connection to the source, eliminating a variable that could affect purity.
- Product comes from the same source at the same quality.
- A large-volume container inherently provides a more consistent product.
- Gas-tight systems preclude atmospheric byproducts from contaminating the system.



higher reliability

improved quality

Higher Reliability

Some gases, like HCl, are notorious for their corrosive properties, with safety and quality concerns. Silane can contaminate a system with SiO₂ (sand), causing components to self-destruct. Liquefied gas, for example NH₃, can produce two-phase flows, resulting in abuse to the regulators and undesirable fluctuation in house line pressure. Any of these issues could be detrimental to the customer's process. BSGS systems address these issues with various techniques:

- Proper materials of construction prevent the gas from affecting the components.
- Preheating the gas before regulation to counter Joule-Thomson cooling prevents associated two-phase flow impacts on downstream components.
- Optional purifier for removal of selected trace contaminants, such as moisture in HCl.
- Redundancy of components that are historically most susceptible to failure.

Improved Safety

Air Products' greatest concern is safety. Our success is reflected in our Number One ranking in the industrial gas industry. That philosophy permeates everything we do and BSGS systems are no exception. Examples of our commitment to safety include:

- Containment and ventilation for the HPCM, Y-cylinder and trailer pigtails.
- System that can be placed outside with remote monitoring.
- Less frequent container hook-up minimizes personnel exposure and risk of product release.
- Autodialer notification of any problem, with complete alarm matrix.
- Hazop performed on every system, and provided to the customer
- Project manager assigned to assist in the proper installation.

Own and Operate

With the migration to 300-mm fabs and other innovations, process complexity is increasing. As a result, device manufacturers are outsourcing more fab manufacturing operations as they concentrate on their core business.

Air Products, who pioneered the idea of on-site operation of gas systems, offers an own-and-operate BSGS option to further improve your process gas system reliability. There are important added advantages:

- Capitalizing on Air Products' experience in gas systems in working at the customer's site, to better understand needs and satisfy expectations.
- Gas system hands-off approach for the customer so fab personnel can concentrate on production and process technology.
- Air Products assumes the risk of operating and maintaining the system.
- Minimizing the initial capital outlay required for a system.

Many Applications

Newly advanced designed BSGS systems have been installed for a variety of applications ranging from wafer epitaxy to device manufacturing to fiber optics to CVD chamber cleaning. There are more than 80 BSGS units installed worldwide. That's more experience than all our competitors combined globally.

And BSGS systems have evolved to match ever-changing industry demands, like the transition from 200 mm to 300-mm wafers. In full-scale 300 mm factories, where gas volumes and flow rates are two to three times greater, large volume gases such as NF₃, N₂O, NH₃, SiH₄ and HCl are best-supplied using BSGS systems, especially those requiring a dedicated cabinet per tool.

Long-standing customer relationships offer feedback for enhancing BSGS system performance.

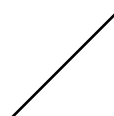
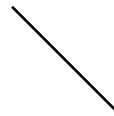
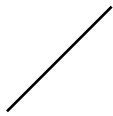


Systems are available for a wide variety of specialty gases

Ammonia	NH ₃
Carbon Dioxide	CO ₂
Carbon Tetrafluoride	CF ₄
Chlorine	Cl ₂
Halocarbon-23	CHF ₃
Halocarbon-116	C ₂ F ₆
Helium	He
Hydrogen Chloride	HCl
Nitrogen Trifluoride	NF ₃
Nitrous Oxide	N ₂ O
Other Fluorocarbons	
Silane	SiH ₄
Silicon Tetrachloride	SiCl ₄
Sulfur Hexafluoride	SF ₆
Trichlorosilane	SiHCl ₃



www.airproducts.com/electronics



Tell me more...

This brochure has provided only a brief glimpse of Air Products' BSGS systems and wide range of electronics industry capabilities. If you would like more information, please contact:

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helping fabs
succeed *worldwide*

Air Products is a proven single source for the semiconductor industry.

Why? Because we advance fab performances worldwide with a complete, cost-effective selection of best-in-class products and services. Meeting all your gas, chemical, water, wastewater, and utility needs.

But mostly because we build lasting value into customer relationships through enthusiasm, integrity, and understanding.

Our expanding global reach is now based on eight major offerings: MEGASYS® Total Gas and Chemical Management, Electronic Specialty Gases, Bulk Gases, Electronic Chemicals, UHP Equipment, TRIMEGA, Analytical Services, and Microelectronics Applications.

Above all, we measure our success by your success. succeed