

## Laser Applications

### Laser Supply Systems

The purchase of laser cutting or welding systems represents a substantial financial commitment by a metal fabricator. To help maximize the return on investment, special consideration must be given when selecting the resonator gases (He, N<sub>2</sub> and CO<sub>2</sub>), the assist gases (N<sub>2</sub> and O<sub>2</sub>), and the high integrity gas supply system.

Essential factors to be considered include the selection of gas type (gas purity and mixture accuracy – see Section 3), supply mode (flow capacity, delivery pressure requirements, etc.), and design of the gas regulation and distribution equipment (see Section 6 for details).

### Praxair's LaserStar™ Gases and Blends – For Optimum Laser Performance

Praxair's LaserStar™ gases are produced to meet the stringent requirements of the laser processing industry. Available as pure gases or as pre-blended mixtures of helium, nitrogen, carbon dioxide, and occasionally, carbon monoxide, Praxair's LaserStar gases are used to optimize the laser beam quality in a wide variety of CO<sub>2</sub> lasers. Carbon dioxide lasers must be protected from the problems created by contaminants such as moisture, hydrocarbons, and other impurities which can be introduced into the resonator chamber. These impurities can reduce laser power, create unstable operating characteristics, damage expensive optics, and cause costly downtime. When combined with a properly designed gas delivery system, the use of LaserStar gases helps assure optimum laser performance, maximum operating duty cycle, and minimum maintenance costs.

In laser gases, carbon dioxide is the component of the gas blend that is directly involved in producing the laser light.

Nitrogen makes it easier to excite the CO<sub>2</sub> molecule to the higher energy levels necessary to produce laser light. Helium's high thermal conductivity acts to cool the laser by conducting heat away from the electrical discharge area to the walls of the discharge tube; helium also stabilizes this electric discharge and improves laser performance.

### Supply Modes

From resonator gases to assist gases, welding and cutting operations can be optimized when proper care is exercised in the design and selection of the gas supply system.

Praxair offers a variety of supply modes that will meet your specific needs:

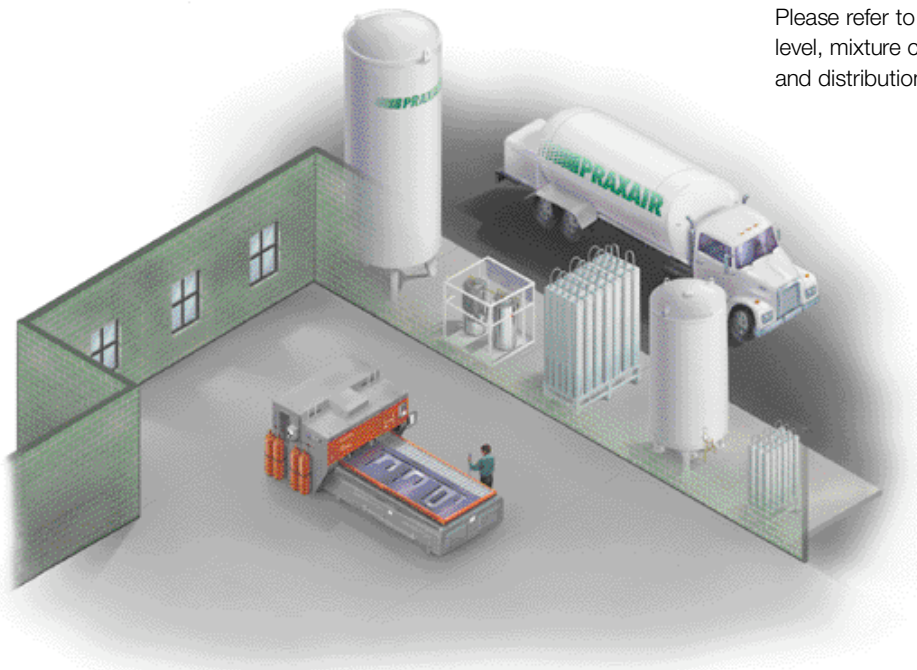
- High Pressure Cylinders (component or pre-mixed gases)
- High Pressure Cylinder Clusters (6, 12 or 18 cylinders)
- Bulk Tanks (nitrogen and oxygen)
- Bulk Tanks with Cryogenic Booster
- On-Site Nitrogen Generation and Air Drying

### Gas Regulation and Distribution System Design

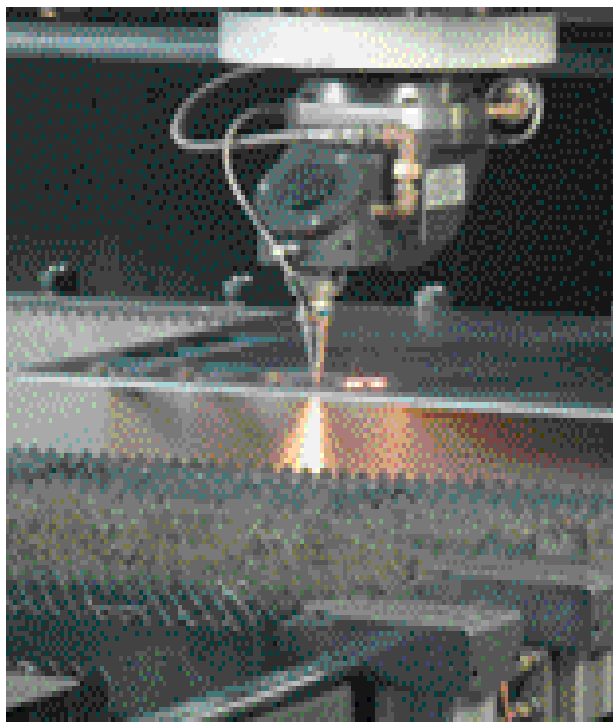
To further enhance laser equipment performance, high quality regulation and distribution equipment systems is recommended. These specially designed systems offer the following advantages:

- Help to maintain gas purity and gas mixture integrity (to the use point)
- Contribute to precise pressure and flow control
- Provide uninterrupted gas supply
- Make the operation safe and easy to use
- Decrease the frequency of periodic laser maintenance
- Lower power levels
- Improved beam quality

Please refer to Sections 2, 3 and 6 for details on gas purity level, mixture composition, supply modes and gas regulation and distribution systems.



### Automated Cutting Solutions



Praxair offers a wide range of automated cutting solutions and support for oxy-fuel, plasma or laser.

#### Oxy Fuel Cutting

- Carbon steel up to thicknesses of 14"
- Multi-torch
- Acetylene
- FG2
- Propylene
- Propane
- Natural gas pressure boosting (G-Tec)
- Tips, torches and safety supplies

#### Plasma Cutting

- Carbon steel, stainless steel and aluminum
- Manual and automated systems
- Plasma gases
- Membrane nitrogen generators
- Air dryers
- Conventional and high definition systems
- Moisture traps
- Extended life consumables
- High speed consumables

#### Laser Cutting

- Extremely accurate
- Excellent edge quality
- Carbon steel up to 1" and stainless steel up to 5/8"
- Less base metal distortion
- Beam purge gases
- High purity resonator gases
- High purity gas handling systems
- Automatic change over systems
- Precision mixers

Praxair can provide optimum solutions and support for virtually every automated cutting application regardless of base metal thickness and composition. Please refer to Sections 2, 3, and 6 for details on gases, mixtures and more automated cutting.

## Dry Ice Blast Cleaning

Blast cleaning with carbon dioxide dry ice is an environmentally safe way to prepare surfaces or remove coatings, saving time and money for an ever-growing list of businesses.

Developed by the aircraft industry to clean everything from electrical components to petroleum waste, blast cleaning uses compressed air to propel dry ice particles that create an impact flushing action. These particles expand on contact and sublime into vapor CO<sub>2</sub>, leaving behind a clean, dry, undamaged surface.

### It's Safe

Dry ice blast cleaning protects surface integrity and avoids grit entrapment, making it an effective alternative to abrasive grit blasting. There's also no residue or secondary waste to clean, so you can use it with food processing equipment.

Eliminating toxic chemicals and harmful emissions makes dry ice blast cleaning environmentally safe, and it reduces employee health risks. It's also:

- Non-flammable
- Non-explosive
- Non-abrasive

### It's Economical

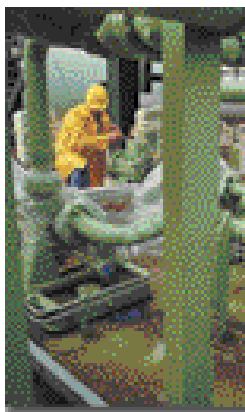
Not only is dry ice readily available, the blast cleaning process:

- Eliminates cleanup costs resulting from toxic chemicals or gritty cleaning
- Reduces the labor costs of manual cleaning
- Slashes or eliminates waste disposal costs
- Lets you bring cleaning equipment on-site, further reducing your costs

### It Improves Productivity

Turning to dry ice blast cleaning instead of using harsh chemicals or gritty abrasives:

- Extends equipment life
- Increases equipment operating availability
- Eliminates equipment disassembly and masking before cleaning
- Reduces cleaning time—which also lowers costs



### Where It's Used

From cleaning sensitive electrical wiring and electronic components to removing adhesives, lubricants, paints and other substances on assembly line equipment, blast cleaning with dry ice is showing its versatility in a wide range of applications, such as:

- Aerospace
- Automotive
- Electronics
- Food Processing
- Foundries
- Mold Restoration
- Packaging
- Plastics
- Tire Manufacturing
- Fire Restoration
- General Maintenance
- Petrochemical
- Printing
- Transportation
- Utilities