Beam Purge Gas System

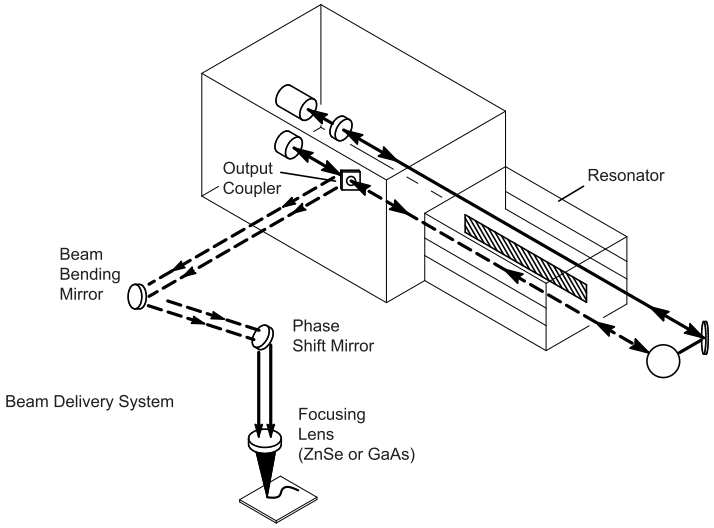
The beam delivery system is comprised of a mechanical bellows that provides a clean, dry atmosphere for the beam after it leaves the resonator output coupler to be transferred by reflective optics to the work piece. The laser beam itself must be protected when being transmitted from one mirror to another. Beam distortion may occur in the presence of airborne particles and vapors in the beam delivery tubes. This can be avoided by purging the tubes using a CONCOA 605 or 603 Series Regulator to deliver moisture and particle-free gas. Depending on the manufacturer and model of laser, the beam purge gas may be supplied by an oil-free compressor, on-site nitrogen supply or membrane system.

Typical Beam Purge Gas Requirements

Beam Purge Gas	Grade	Purity	Pressure	Flow Rate
Nitrogen (N_2)	4.5	99.995%	20 - 80 PSIG	100 - 1200 CFH
Air	Clean/Dry	Dew Point < 40°F	20 - 100 PSIG	100 - 1200 CFH

The use of "house air" can cause contamination of the beam delivery optics since the presence of oil, water, and dirt can be found in most shop-air lines. It is ideal that the laser has its own air supply system. This is important in the event the shop-air system is incapable of meeting the laser's demand and other processes at the same time. The use of filters and traps can be a time-consuming and expensive procedure to maintain the compressor air purity; CONCOA's 5239 Beam Purge Regulator is a good choice to deliver bulk nitrogen as an economical alternative.

Laser manufacturers are currently integrating membrane technology to not only supply clean, dry air but also nitrogen for process applications. Membranes offer several advantages such as modular design allowing future expansion, low maintenance costs (no moving parts), and low energy requirements. Membranes for gas separation are made of polymers in the form of hollow fibers. Gases pass through certain membrane materials at different rates, allowing selective separation. In the case of a beam purge system, a compressor supplies an air supply to the membrane in which dry air permeates through and moisture is evacuated. The effective flow rate out of the system is directly related to the pressure drop across the membrane, the type of polymer fibers, fiber thickness and solubility of the desired gas. A membrane system can be custom-designed to meet the purity requirements, flow capacity and type of gas output for either purging or assist gas applications. In either application, CONCOA's 603 Series Line Regulator meets the demand with a high-flow balanced stem seat. Purity is not sacrificed because the 5239 and 603 both offer a 1 x 10^{-8} scc/sec leak integrity and a stainless steel diaphragm.



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Assist Gas System

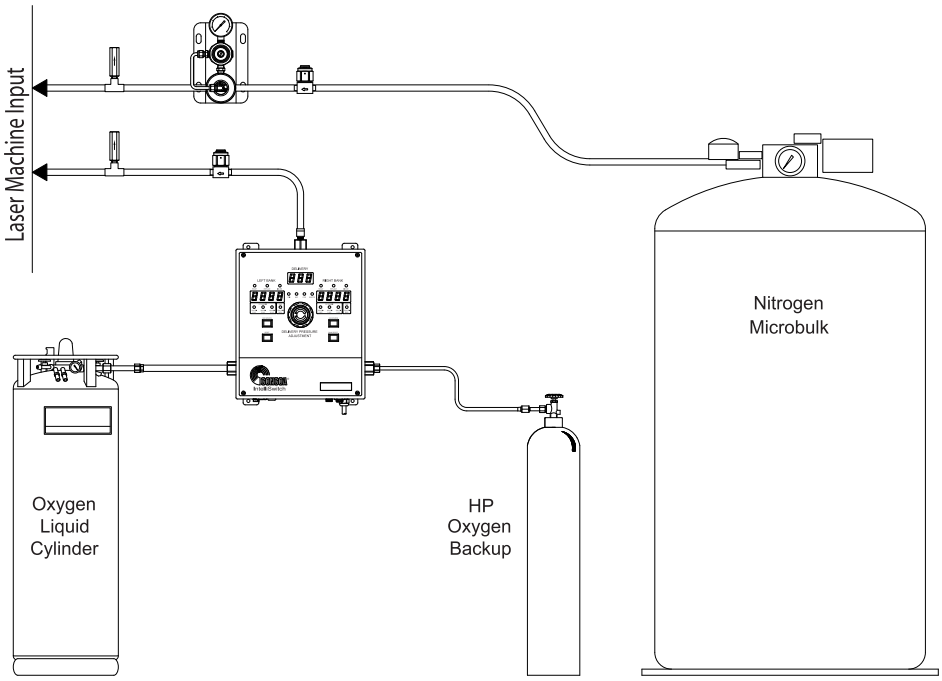
CONCOA process gas systems enhance the performance of lasers used in cutting, welding, cladding, and marking applications. The type of gas will vary according to the process material. To achieve the best performance, the process gas must be delivered instantaneously and precisely at the specified pressures and flows. For bulk installations, CONCOA's 623 is the ideal choice for quick response and balance stem seat that delivers flow rates in excess of 15,000 cfh. CONCOA's next generation 622 unibody dome-loaded regulator is the right choice for liquid cylinders, high-pressure twelve-packs, or as a point-of-use regulator. For continuous operation, an adequate supply of gases must be available at all times.

When cutting mild steel, an oxygen assist gas can be used; the oxygen creates an exothermic chemical reaction with the material that provides up to 30% of the heat input thereby requiring minimal pressures and flows. CONCOA's 600 Series Automatic Switchovers are the ideal choice for high pressure bundles or liquid sources where a continuous supply is necessary to maintain production. Higher powered CO_2 lasers (4-6 kW) may obtain greater cutting speeds with high-pressure nitrogen on thin gauge material. Nitrogen will also produce an oxide-free cut that is advantageous if the material cut is to be painted or powder-coated.

Stainless steel typically is processed with high-pressure nitrogen, but air may be used if moisture and oil levels are minimized. Nitrogen pressure and flow levels are much higher than those of oxygen. Pressures as high as 390 PSIG and flows of 5,300 cubic feet per hour may be required at the nozzle.

Materials such as titanium should not cut with either oxygen or nitrogen. Oxygen will "burn" the cut edge while nitrogen will leave nitrites in the material. The use of either argon or helium is recommended; the proper selections of the assist gas depend on material thickness and the power of the laser. Argon must be free of any oxygen; therefore the supply in cryogenic form is suggested. Helium also must be free of oxygen if used; a certificate of purity levels for either gas should be supplied.

The 603 incorporates a stainless steel diaphragm and boasts a Helium leak rate of 1 x 10^{-8} scc/sec, both of which make it the ideal choice for bulk and microbulk Argon assist applications. The 605 encompasses the same features as the 603, but is designed to work with liquid cylinders or high-pressure twelve-packs.



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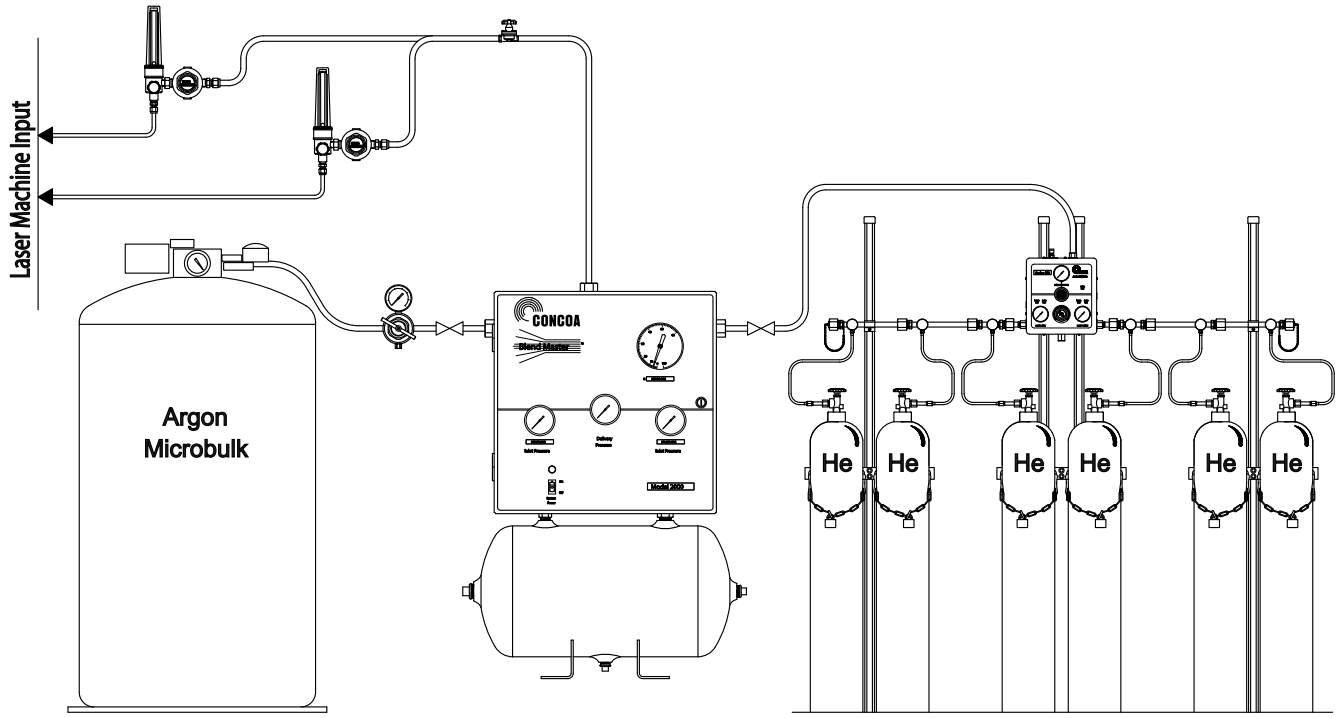
Laser Welding Gas System

CONCOA welding shielding gas systems are designed to deliver sufficient flow to protect the cooling weld and maintain precise blend tolerances, which offer substantial cost savings over traditional Helium shielding applications. Once the plasma is established, the gas begins to distribute the heat radially toward the work piece. Gases with a low thermal conductivity, such as Argon, exhibit a narrow arc with a high inner core temperature that produces a deep funnel penetration profile. Gases with a higher thermal conductivity like Helium transfer more heat peripherally, which produces a wider but shallower penetration profile. CONCOA's BlendMaster 1000 offers infinite adjustment from 0-100%, which enables the operator to fine-tune the heat transfer and penetration characteristics of the shielding gas.

In hybrid welding applications, it may be necessary to supply a plasma suppression gas and a trailing gas. Argon is used for most metals. Argon offers smooth arc starting characteristics due to its low ionization potential. Helium is used in applications requiring better plasma suppression and heat transfer. Helium has a higher ionization potential than argon, therefore increasing the heat input for joining thicker and higher thermally conductive materials. Depending upon joint design and part fit-up, a mixture of Argon and Helium may be used because it offers the benefits of each gas. Series 5237 flowmeter regulators offer Argon flow rates of 0-60 SCFH and 0-200 CFH for Helium, which makes it the right choice for point-of-use pipe-line applications. Series 5270 is designed for local control from liquid cylinders or high-pressure 12-pack sources. The following illustrates a typical laser welding gas supply system for Helium/Argon mixtures.



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