Laser Tubes

What is a CO_2 Laser?

CO_2 lasers operate when CO_2 gas in a sealed tube is excited by RF energy. The laser emits optical energy in the form of a small, intense beam that may be used for engraving, marking or cutting on variety of materials.

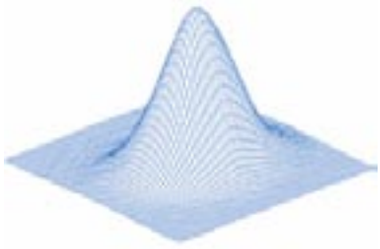
A CO_2 laser emits an invisible infrared beam of a single wavelength that is highly directed (it travels in only one direction) and is focused into a very small spot (~.004 inch). The beam produces very high temperatures when the focused spot comes into contact with other materials.

Do Laser Tubes Differ?

Epilog Laser uses Waveguide laser tube technology from Coherent Inc., which produces the best beam quality in the industry. From a technical point of view, a Waveguide laser's excellent beam quality is the product of a smaller bore, higher CO_2 gas pressure, less stringent mirror alignment requirements, and faster switching rates than other laser designs. These design elements combine to create a laser that not only is longer lasting, but also is the only sealed, air-cooled CO_2 laser design capable of producing 120 watts in a single tube design. Additionally, the super-fast switching rate is one of the reasons that an Epilog laser can engrave so much faster than other laser engravers. This is especially noticeable when engraving grayscale clipart images or photographs at high speeds.

Other companies incorporate a variety of laser technologies that produce beam characteristics that may not be ideally suited for laser engraving systems. These characteristics include oval shaped beams, inconsistent power stability, and slow switching rates, all of which contribute to images that are not as crisp and clean as images produced from an Epilog waveguide laser. A casual evaluation will show that Epilog systems produce the crispest image in the business, while the other system's images may look "fuzzy" in comparison. High speed engraving exaggerates the problems and laser systems that are unable to produce crisp detail at their highest speeds may be limited not only by the laser tube, but by the mechanics of the system too.

This rendering shows a 3D profile of an ideally shaped laser beam. While it's impossible to evaluate the beam directly, without very specialized equipment, a close look at Epilog's engraving quality clearly shows the dramatic benefits that waveguide laser technology provides.



EPILOG LASER

How do I evaluate a laser tube?
The only realistic way to evaluate different laser tube technologies is to evaluate the actual engraving from different laser systems. There are several things that stand out when comparing image quality and it becomes quite noticeable when you compare the same image from different companies side-by-side:

1) Evaluate engraving speed, especially with a grayscale image or a photograph. Turning the laser on and off very frequently when the laser is running at high speeds is a great way to determine if you are getting stable, consistent power with each and every pulse of the laser. If this test is performed on a material like anodized aluminum, a good, fast laser will produce a sharp, crisp image at blazing speed. Less robust lasers will produce faded or "grainy" looking images. Slower systems may be able to produce reasonable images, but it is not unusual for them to take considerably more time than an Epilog laser. High speed engraving and superb image quality are the sign of a robust laser.

2) Evaluate depth and darkness of burn. Use a light colored wood and compare laser tubes that are rated at identical wattage levels. Use any type of image and see which system produces a darker, deeper engraving. Also compare engraving times. A dark, deep engraving in a minimum amount of time is an indication of a stable laser producing a consistently high wattage beam. Make sure that the image is large enough in size so that you can compare the consistency of depth over a large area of wood.

3) Evaluate sharpness of detail. Engrave small text as little as two or three point size. Take a close look at the engraving quality. Is small text legible? Do vertical lines look straight or do they weave? Is the power level consistent from one side of the engraving to the other? These tests can provide a glimpse of how well the laser tube fires when it is supposed to fire, or if fires early sometimes and late other times.

Hopefully this has helped shed some light on the subject of laser tube technology. If you would like more detailed technical information on why Epilog's Waveguide laser technology produces faster rise and fall times, why a Waveguide laser will not produce unwanted multi-mode output, how higher CO_2 gas pressures produce a better quality beam, or why Waveguide lasers are much less susceptible to vibration and thermal stress, just give us a call! We will give you all the technical details along with a laser demonstration showing why Waveguide lasers are the best laser technology in the business.