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CO2 Lasers vs. Nd:YAG Lasers

Two of the most widely used industrial lasers are Carbon Dioxide lasers (CO₂) and Nd:YAG lasers. Both lasers generate a concentrated beam of light however there are major differences between the two lasers. Depending on your purpose for the laser will determine the best fit.

What Is a CO2 Laser?

A CO₂ laser is a gas laser, which means it uses Carbon Dioxide, CO₂, as a medium to produce the infrared light.¹ CO₂ lasers emit a wavelength of 10.64 microns, which produces an intense infrared light.² CO₂ lasers are easily absorbed by organic materials, for example plastics, glass, fabrics and acrylics.

What Is an Nd:YAG Laser?

An Nd:YAG laser is a solid state laser, it uses Neodymium (Nd) diffused in a crystal that is composed of yttrium aluminum garnet (YAG) to produce a light beam.³ Nd:YAG lasers emit a wavelength of 1.64 microns, which is near infrared.² Nd:YAG lasers are exactly ten times smaller than CO₂ lasers. Due to the small wavelength, Nd:YAG lasers are primarily used on metals and cannot be absorbed by organic materials like glass and plastics.

When Would You Use an Nd:YAG vs. CO2 Laser for Welding?

Depending on the type of material you are looking to weld will determine which laser will work best. Nd:YAG lasers work very well when engraving, welding, cutting and drilling metals and are faster than CO₂ lasers. However, CO₂ lasers work very well with many organic materials. The difference between the two lasers comes down to the size of wavelength each laser emits. Metals are highly reflective and CO₂ lasers cannot easily penetrate the metal. The less reflective the metal is the easier it is for CO₂ lasers to weld. Nd:YAG lasers have a small wavelength therefore making it impossible to penetrate organic materials; the light simply passes through glass for example.

What Are Typical Applications for Nd:YAG Lasers?

Nd:YAG lasers are one of the most common types of lasers and can be used for many applications because of their ability to engrave, mark, cut, drill and weld. There are three main industries that utilize the Nd:YAG lasers; aerospace, medical and industrial. Nd:YAG lasers are used in the aerospace industry to hermetically seal electronic packages. Medical uses include laser welding and sealing of cannulas, pacemakers and ventricular pumps. The industrial industry has unlimited uses due to the variety of materials Nd:YAG lasers are able to work on including Titanium, Stainless Steel, Aluminum, and more depending on your requirements.

¹ Information sourced from http://en.wikipedia.org/wiki/CO2_laser

² Information sourced from <http://en.wikipedia.org/wiki/Laser>

³ Information sourced from http://en.wikipedia.org/wiki/Nd:YAG_laser