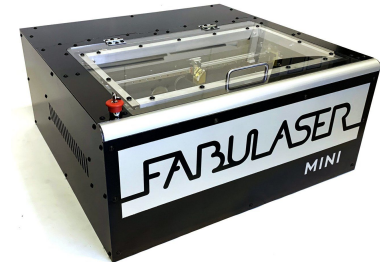


Introduction to Laser Cutting

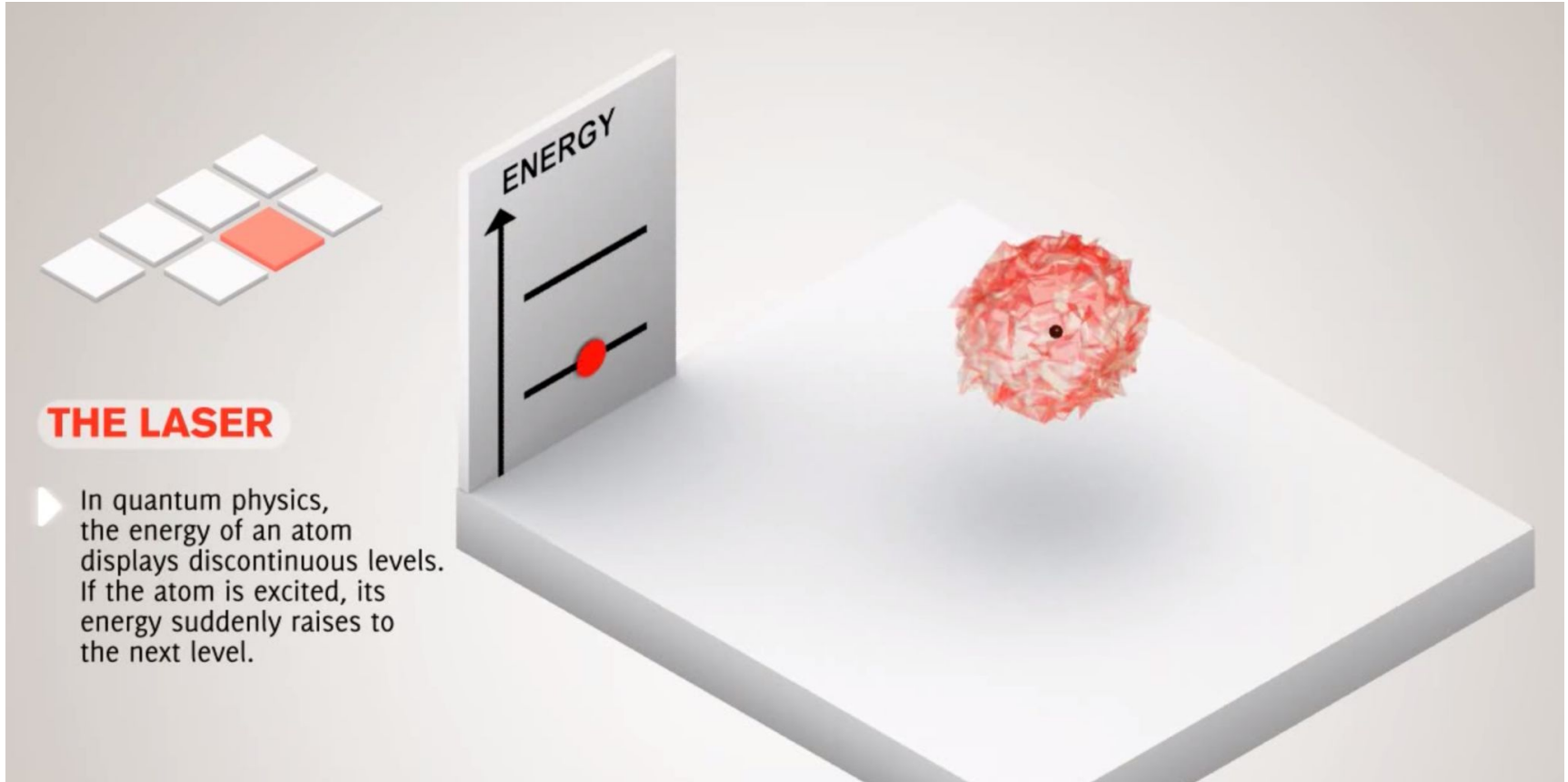
By Daniele Ingrassia

Laser cutting - technology and machines

Laser cutting is a technology that uses a laser to cut materials by directing the output of a high-power laser, most commonly through optics. The focused laser beam is directed at the material, which then either cuts, melts, burns, vaporizes away, or is blown away by a jet of gas, leaving an edge with a high-quality surface finish.

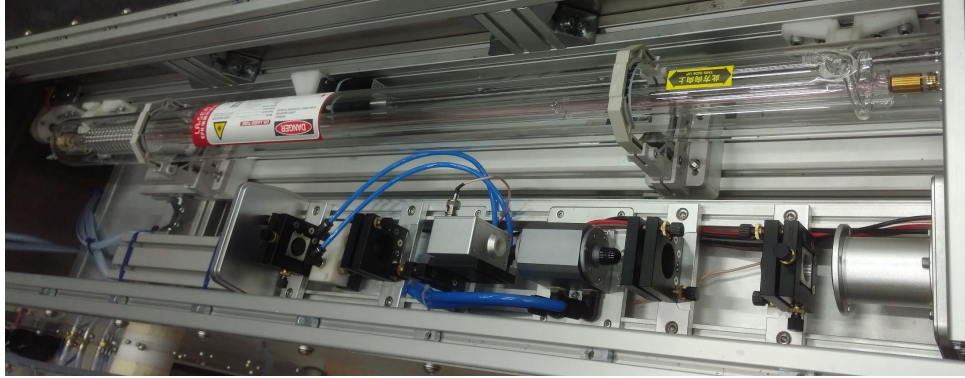


Laser => Light Amplification by Stimulated Emission of Radiation

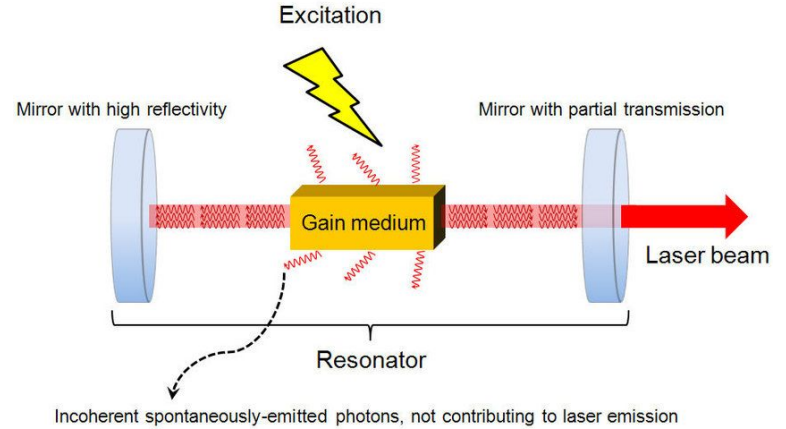


How Laser is generated

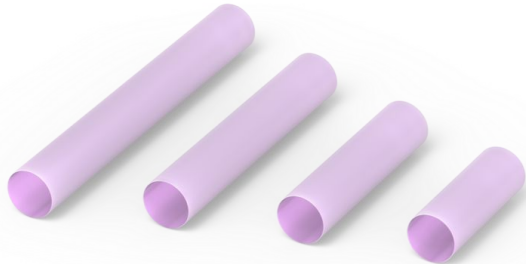
LaserDuo CO2 and Yag sources



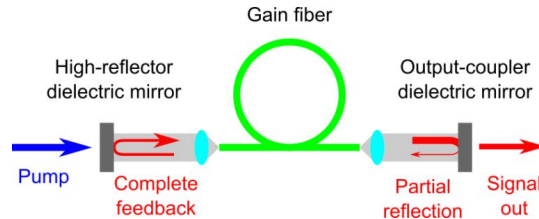
Pumped Laser



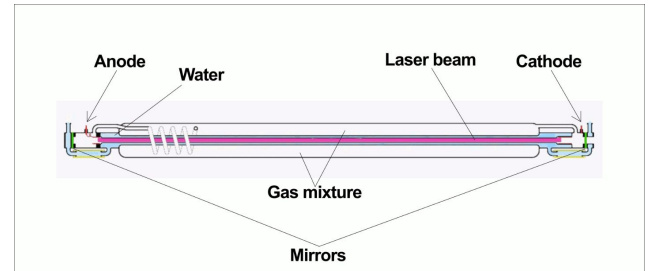
Neodymium-Doped Yttrium Aluminum Garnet



Fiber Laser



CO2 Tube



Common Laser Types

Fiber/Yag - 1,064 nm



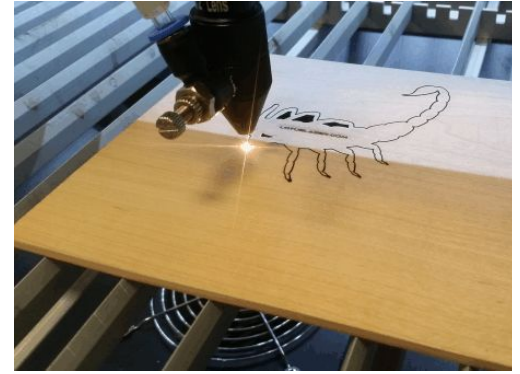
- Materials:
 - Metals
 - Ceramics
 - Silicons

Laser Diodes



- Materials:
 - Depending on wavelength

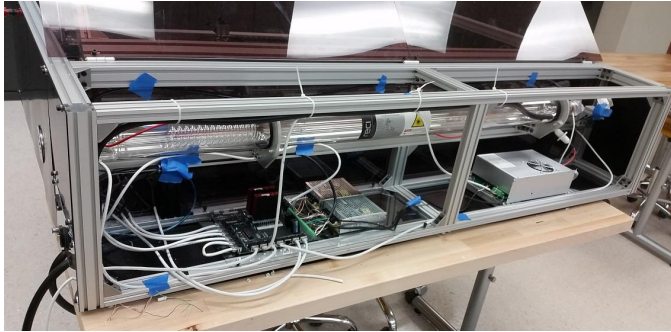
CO2 - 10,600μm



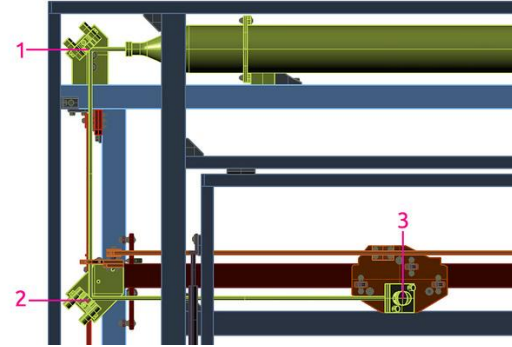
- Materials:
 - Wood
 - Plastics
 - Textiles

Laser cutter anatomy

Laser source



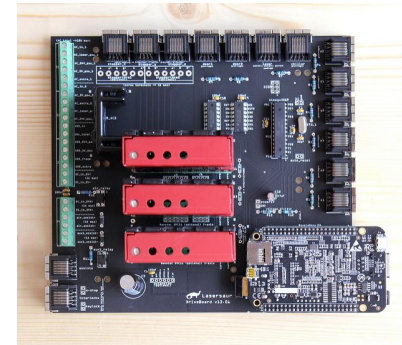
Optics



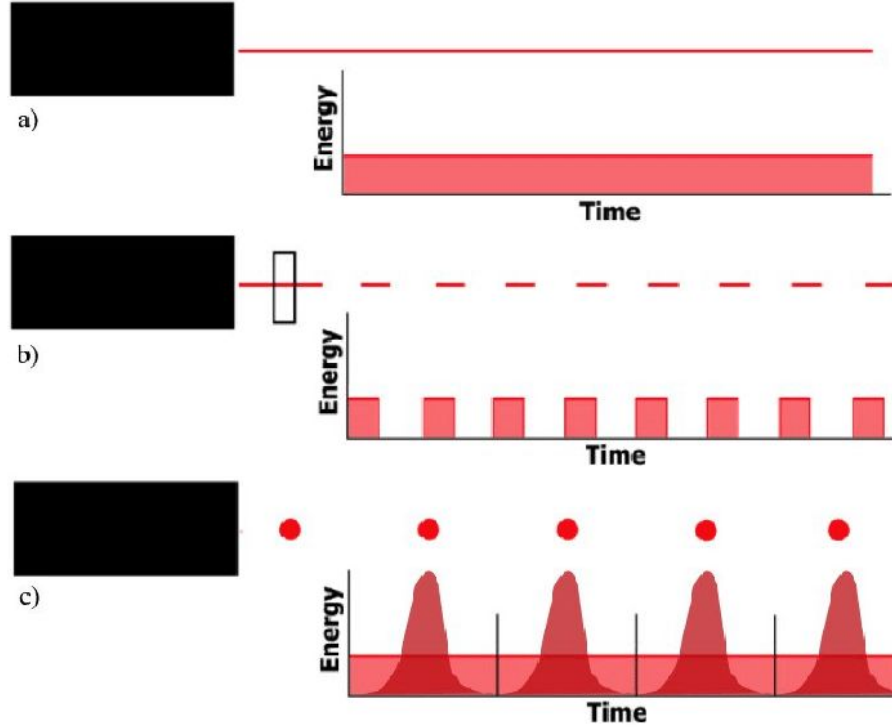
3(+) axis CNC



Controller

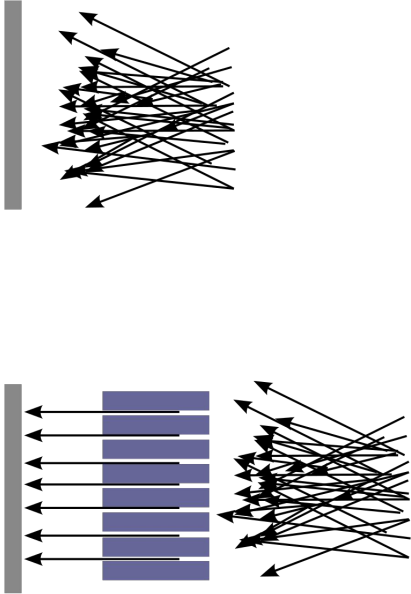


Continuous wave vs pulsed

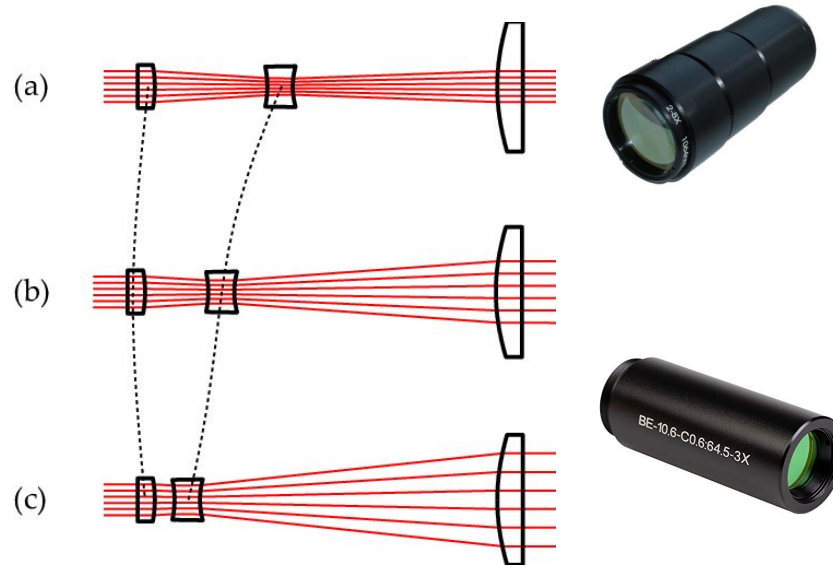


Beam optics

Collimator



Expander/Reducer



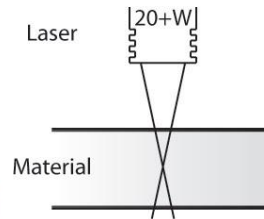
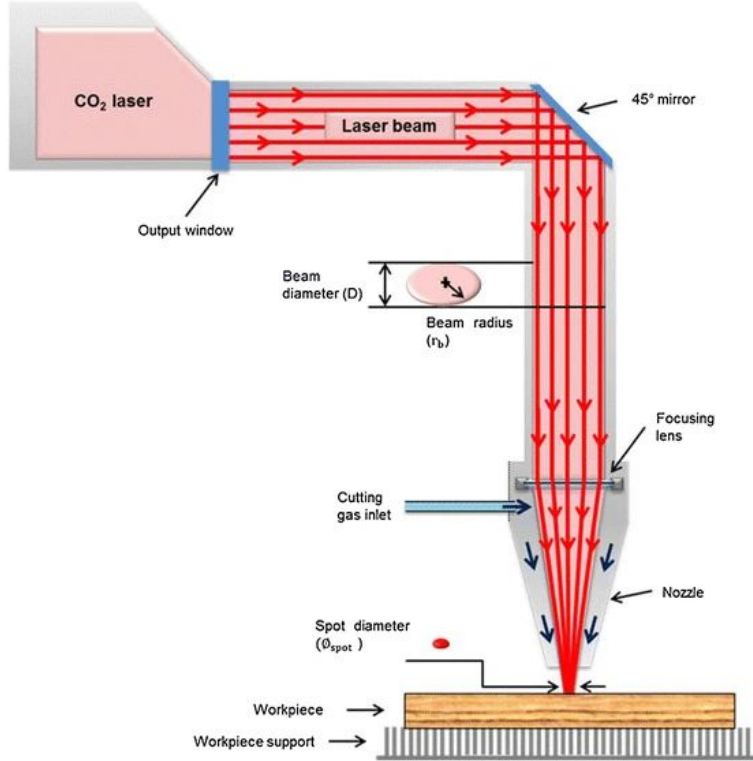
Mirrors



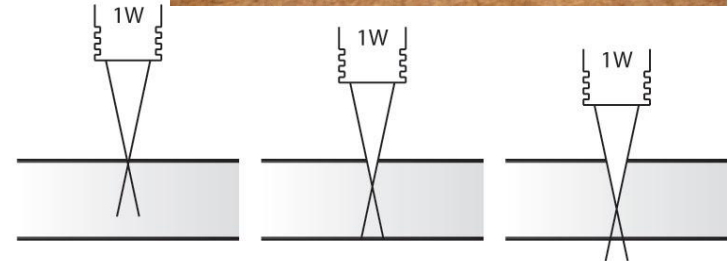
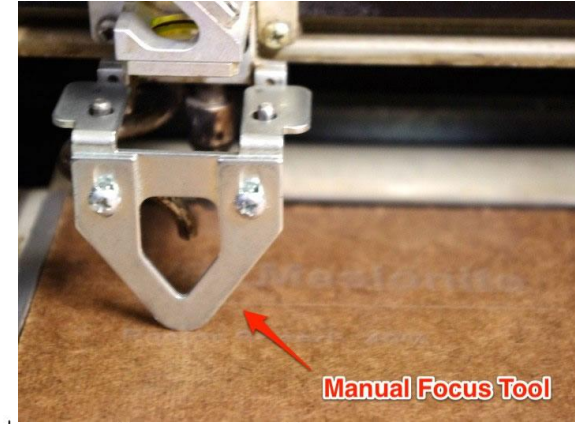
Lenses



Laser focus



Fixed-focus

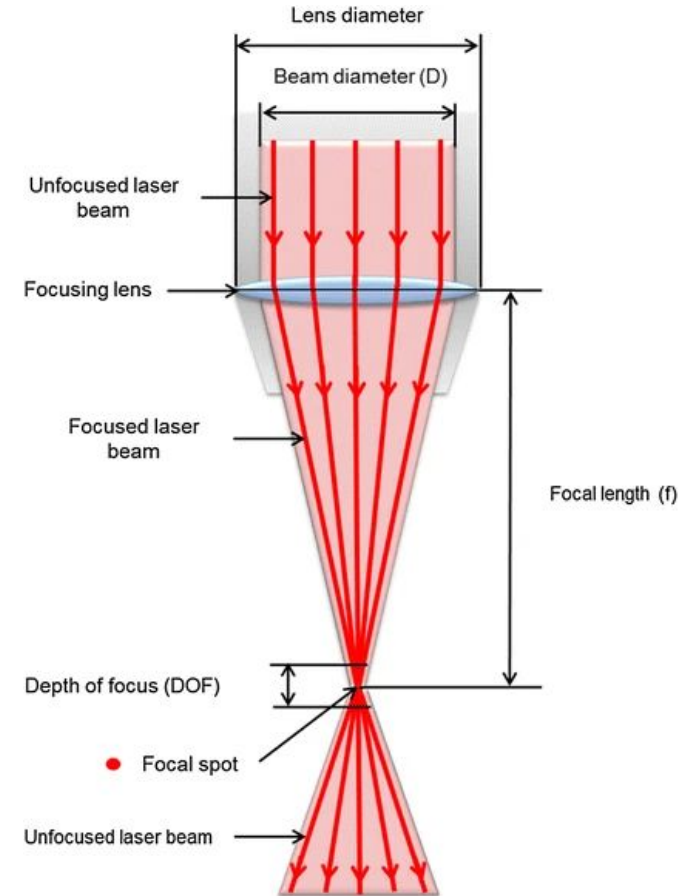
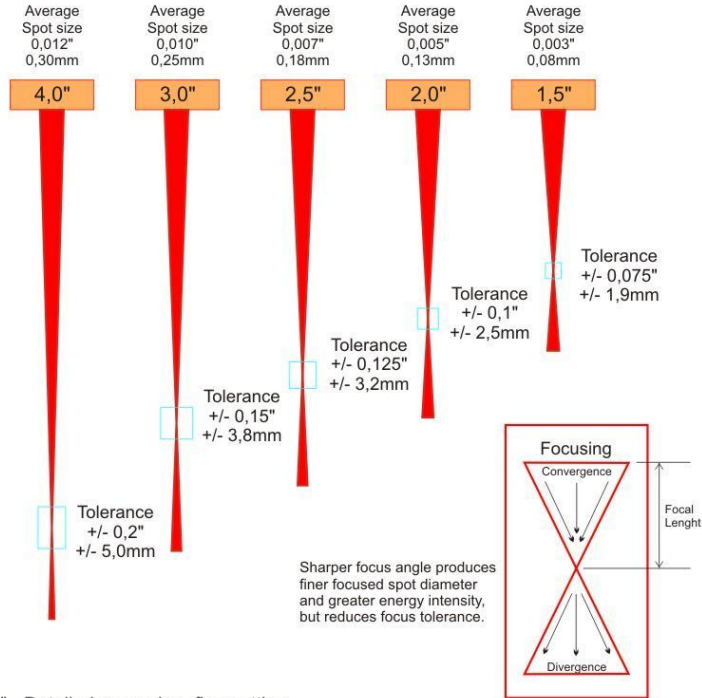


Focus decends for each point along path

Focus lenses



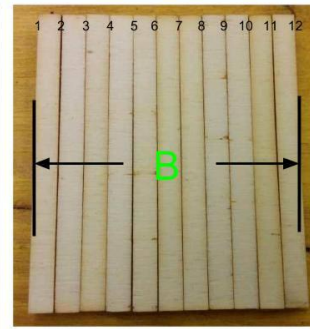
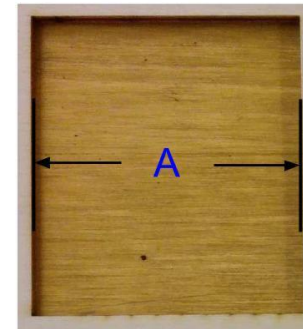
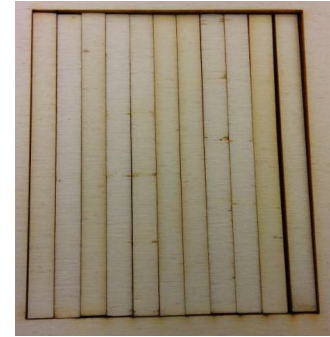
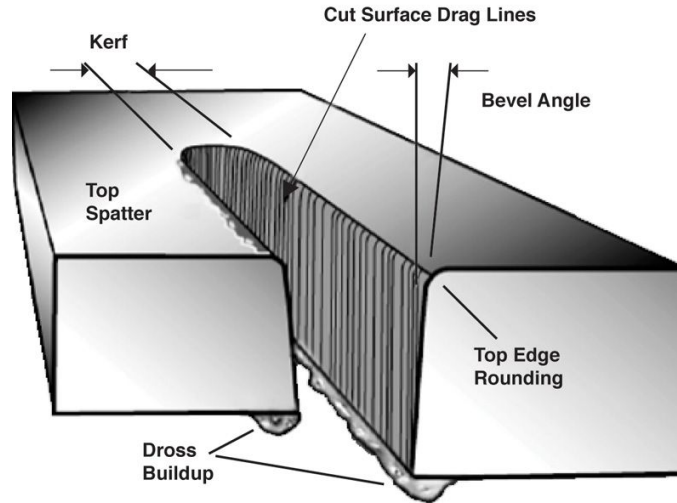
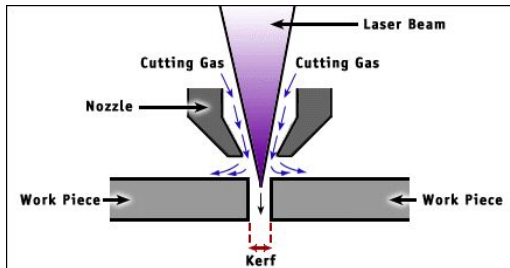
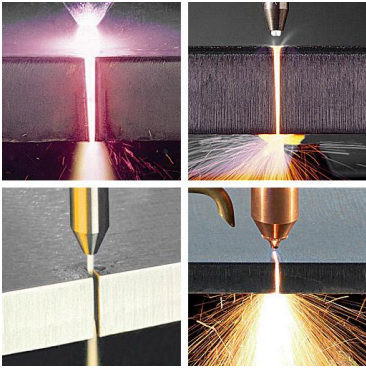
Lense options



- 1.5" - Detailed engraving, fine cutting
- 2.0" - Versatile lens for multi-purpose engraving and cutting, majority of applications
- 2.5" - Excellent cutting lens for thicker materials due to longer focus tolerance
- 3.0" - For cutting thicker materials or when greater working distance is needed
- 4.0" - For greater working clearance or large spot size is needed

Kerf

Kerf is defined as the width of material that is removed by a cutting process. It was originally used to describe how much wood was removed by a saw, because the teeth on a saw are bent to the side, so that they remove more material than the width of the saw blade itself, preventing the blade from getting stuck in the wood.



$$\text{kerf} = (A - B) / 12$$