# Optimizing the $CO_2$ laser cutting behavior of polycarbonate

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Polycarbonate is a transparent and colorless plastic with excellent physical and chemical properties and is therefore suitable for a wide range of applications, for example in the automotive, medical and mechanical engineering industries. Various additives allow the use of polycarbonate in different environments, but also for different applications, which continue to increase due to the continuous development of new additives.

$CO_2$ lasers are particularly suitable for cutting a wide variety of plastics due to their wavelength and the corresponding absorption curves. This allows for a high cutting quality with precise material processing. Despite the high absorption, the $CO_2$ laser cutting quality of polycarbonate is low. Although it is easy to cut, the resulting cutting edge shows yellow to brown discolorations. This phenomenon has not yet been fully examined and the aim of this study is to avoid the discoloration and to investigate the causes.

To investigate the behavior of polycarbonate and improve the cutting quality polycarbonate plates, with different additives and thickness have been examined. The material has been cut with a $CO_2$ laser with different wavelength of 9.3 µm and 10.6 µm. Further parameters like type of cutting gas, gas pressure and frequency have been varied. The resulting test series show a trend with a strong dependency on frequency and gas pressure. This parameter study gives an overview on how to choose the right polycarbonate and suitable cutting parameters to achieve the best possible edge quality for industrial applications.