

Introduction:

Nuferm NuQ fiber lasers are used by our customers in all sorts of marking and engraving applications where permanent marks are needed. Such marks can be made on many different materials. In some cases, end-users will mark highly reflective materials. For example, marking or engraving of gold or silver in jewelry applications, or marking of copper used in microelectronics manufacturing. The purpose of this application note is to make end-users and customers aware of some of the techniques that can be employed to successfully mark these highly reflective materials, while also minimizing the potential impact of high levels of back-reflected light.

What is the impact of high levels of back-reflected light?

Lasers by definition are amplifiers of light. When unwanted light is allowed into a laser this can be disruptive to the laser's stability, or can even cause damage to the laser. For this reason, each NuQ laser is equipped with an optical isolator. This is a device which minimizes the level of any back-reflections coming back into the laser. For most applications, this provides ample protection of the laser. It should be noted, though, that isolator performance is a function of temperature. As the temperature goes up, the amount of protection—or isolation—goes down. For this reason, NuQ lasers are specified to operate in ambient temperatures of 0 to 42C (see NuQ Operators Manual for details). In addition, when highly reflective materials such as copper are marked, the risk of back-reflected light causing disruption or damage to a laser increases.

“What can I do if I will be marking highly reflective materials?”

There are several approaches that can be used when marking highly reflective materials with your marking system. Both involve arranging the object being marked to reduce the likelihood that reflected light will travel back through the optical train of the system and re-enter the laser. First, try inclining or tilting the work piece.

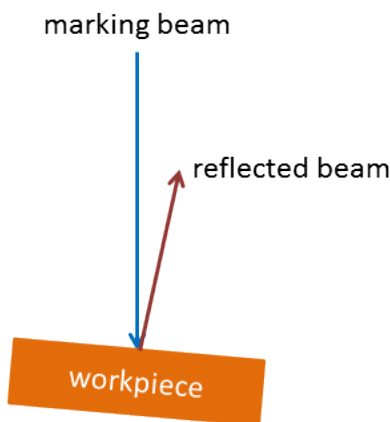


Figure 1 Reflection from a Tilted Workpiece

If this is not feasible given the nature of the application or the object, the second thing that can be done is to move the object out of the center of the field of view of the marking system. Avoid placing the object anywhere within a cone which represents ~20% of the field of view (FOV).

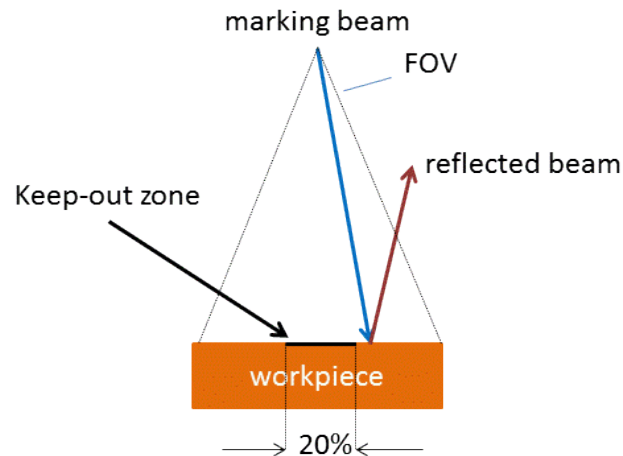


Figure 2 Marking Outside the Center of the FOV

Summary:

For those customers and applications where marking of highly reflective materials will be a common occurrence, Nufern offers a product variant that is designed to protect the laser from high levels of back-reflection. If this is of interest, speak with your Nufern sales contact about ordering the appropriate part numbers. These products come standard with onboard optical monitors, which allow the laser to protect itself if high levels of back-reflection or a disturbance to the laser cavity are detected. Should this occur briefly, then the laser will provide a transient alarm signal to the alarm status pins on the laser. If such a back-reflection disturbance is detected for an extended period of time (>~900 msec), then a latching fault will be triggered, and the lasers will shut off. At this point, the user will need to make some adjustments in the application, and then can re-start the laser to clear the latching fault and resume processing.

Nufern offers a wide range of fiber laser platforms for industrial, medical, military, aerospace and scientific applications.

Our ongoing commitment to research and investigation with our customers promises a bright future with optical fiber technology.

We look forward to hearing from you.



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