

# CONTROL POINTS OF LASER DRILLING SIZE AND ACCURACY OF LASER CUTTING MACHINE

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The process of laser cutting machine drilling is a complex thermophysical process of laser and material interaction. Therefore, there are many factors that affect the quality of laser drilling. In order to obtain high-quality holes, we should analyze and understand the parameters that affect the quality of laser cutting machine according to the general principles and characteristics of laser drilling. These parameters include: laser pulse energy, pulse width, defocus amount, pulse laser repetition rate, and the properties of the processed material.

However, the size and accuracy of the laser cutting machine is difficult to control when drilling. The following is a brief introduction to share four key points that need to be controlled, as follows:

#### First, aperture size control

The laser cutting machine uses a laser with small divergence angle ( $0.001\sim 0.003\text{rad}$ ), which can obtain a small aperture by shortening the focal length or reducing the output energy. For high melting point. The material with good thermal conductivity can realize the machining of small holes with a diameter of  $0.01\sim 1\text{mm}$ , and the small hole diameter can reach  $0.001\text{ mm}$ .

#### Second, improve the roundness of laser processing holes

The laser mode is processed by using the basic mode, the focus lens is processed by using the spherical aberration objective lens, and the optical axis of the lens coincides with the optical axis of the laser beam, the workpiece is suitable to deviate from the focus, and the appropriate laser energy is selected to improve the processing roundness.

#### Third, reduce the taper of drilling

Generally, the taper of the hole increases with the increase of its aperture ratio. The taper of the hole can be reduced by using appropriate laser output energy or small energy multiple irradiation, short focal length, small lens refractive index and reducing the angle between the incident light and the optical axis.

#### Fourth, hole depth control

Increase the output energy of the laser, use a reasonable pulse width (the better the material and

thermal conductivity, the shorter the pulse width is appropriate), and apply the fundamental mode mode (single mode with Gaussian intensity distribution) to obtain a large hole depth. For deep holes with small aperture, it is advisable to use laser irradiation for many times, and use an objective lens with short focal length (15~30mm) to drill holes.