FIVE KEY ELEMENTS OF CO2 LASER CUTTING QUALITY

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Laser is the heart of laser equipment and plays a decisive role in the quality of laser cutting. A good laser should have ideal mode, stable power and other elements. There are many types of lasers, which can be defined differently from different angles. Distinguished from the excitation medium, it can be roughly divided into solid-state lasers and gas lasers, which use different solids or gases as media. For example, the earliest lasers used ruby as the medium. At present, the mainstream laser used for laser cutting is carbon dioxide laser, followed by YAG laser. YAG laser has the characteristics of high photoelectric conversion efficiency and small size, but its application is greatly limited due to the fast loss of its energy pump source and high maintenance cost. The use of carbon dioxide lasers is relatively easy to obtain ideal laser modes and higher energy, coupled with stable performance and short downtime, so it is widely used in cutting various materials.

One: Incentive mode. Carbon dioxide lasers use electrodes to excite carbon dioxide gas to generate laser light. According to the installation position of metal electrodes, they can be divided into DC excitation and RF excitation.

Two: laser frequency. The laser output is divided into pulse output and continuous output. The laser used for cutting and welding mainly adopts the pulse output mode. The pulse frequency mainly affects the cutting speed and incision roughness. To obtain high-speed cutting, high frequency is essential. At present, the frequency of carbon dioxide laser produced by most manufacturers is within 5000Hz.

Three: beam divergence angle. Strictly speaking, the beam divergence angle does not belong to the content of the laser part, but because the mode of the laser has a great influence on the far-field divergence angle, we discuss it together here. The influence of the beam divergence angle on the cutting quality is reflected in the width and slope of the cut. The smaller the divergence angle, the narrower the cut width and the smaller the slope, so the higher the quality.

Four: laser mode. It is one of the most important indicators to measure the quality of laser. It can be divided into single-mode, base-mode and multi-mode. The base mode is TEM00 mode, and its index on the X and Y axes are both 0, so it is an ideal dot. The laser with TEM00 mode can obtain the smallest beam diameter, and the smallest kerf and faster cutting speed can be obtained because of the small spot in the cutting process. And multi-mode has a non-zero index in the XY direction, and its beam quality is poor. Generally, it is only used for welding and not for cutting.

Five: Laser power. Including peak power, energy stability and other elements. Different powers can cut through different thicknesses in the cutting of metal plates. Take a 4KW laser as an example, it can cut 20mm thick carbon steel plate, or 15mm stainless steel, 10mm aluminum alloy; while a laser

above 5KW can cut 25mm thick carbon steel , stainless steel up to 20mm. Another indicator of power is power stability, excellent cut quality, must be excellent cuts throughout. Long-term production is also a very important test for lasers. Due to the electrode ablation of the DC excitation laser, the power is attenuated in the long-term working state. In addition, because the vacuum pump and turbo pump of some lasers are lubricated with lubricating oil, the lubricating oil pollutes the laser resonator, which shortens the life of the laser.