

WHAT IS THE DIFFERENCE BETWEEN PICOSECOND, FEMTOSECOND AND NANOSECOND LASER CUTTING APPLICATIONS?

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Nanoseconds, picoseconds, and femtoseconds are time units. 1 second = 10³ milliseconds = 10⁶ microseconds = 10⁹ nanoseconds = 10¹² picoseconds = 10¹⁵ femtoseconds. Picosecond laser cutting machines and nanosecond laser cutting machines refer to picosecond lasers. The single pulse time refers to the pulse width of the laser. The laser processing method is to use a high-energy laser beam to focus on the surface of the material to produce a physical or chemical reaction to form a cut. It is essentially a heat treatment method, but due to the short working time and small heat-affected area, the treatment effect and speed can be guaranteed.

In today's mainstream market, our common laser processing tool is a nanosecond laser. With the requirements of industrial technology, the range of thermal influence has expanded. Since the market does not accept derivative effects, new laser processing tools can meet market demand. A technological breakthrough in the laser industry, we call it a micro-precision ultra-fast laser processing system, usually called a femtosecond laser cutting machine or a picosecond laser cutting machine.

The pulse time of the picosecond [laser cutting machine](#) is ultra-short, and the single pulse time is only a few picoseconds, and its thermal influence is very small, even negligible. Compared with the processing of nanosecond laser cutting machine, there is no recasting material in the whole processing process, the processing process is clean, and the absorption of laser energy is less dependent on the material or wavelength. Therefore, in the field of micro-precision laser processing, picosecond laser cutting machines and femtosecond laser cutting machines provide a broad space to play, and their processing characteristics are destined to play an important role in the future.

What is the difference between picosecond, femtosecond and nanosecond laser cutting applications?

Picosecond laser cutting machine has better processing effect and processing speed than nanosecond laser. In the field of market application, picosecond laser also has a wider space, such as solar cell laser etching (narrow line width), OLED laser cutting (small edge), brittle material laser punching (faster), etc., mainly in the heat-affected area. Influence. From below we can intuitively see the difference between ultrafast picosecond lasers and nanosecond lasers. In the figure, we found the heat-affected area of the material and the heat influence in nanoseconds, while the ultra-fast picosecond laser cutting machine can almost ignore the heat influence, so the processing effect is more ideal. At the same time, the working time is short, the precision is high, and the processing speed is fast.

The pulse time of the picosecond laser cutting machine is short, and the action time of a single pulse is only a few picoseconds, so its thermal effect is very small, or even negligible. Compared with nanosecond laser cutting machines, the entire processing process does not require recasting materials and cleaning processes, and the absorption of laser energy is less dependent on materials or wavelengths. Therefore, in the field of micro-precision laser processing, picosecond laser cutting machines and femtosecond laser cutting machines provide a broad game space, and their processing characteristics are destined to play an important role in the future.

Compared with nanosecond laser, picosecond laser not only has good processing effect and processing speed, but also has solar cell laser etching (narrow line), OLED laser cutting (small), brittle material laser Punching (fast and other large space diagrams, we found that the thermal effect of the material in the heat-affected zone and thermal effect, ultra-fast picosecond laser cutting thermal effect is almost negligible, and the processing effect is more ideal. At the same time, the working time is short, the precision is high, and the processing speed is fast.

Although nanosecond laser cutting machines are still the main cutting machines in the market, with the rapid development of precision cutting technology, the requirements for laser cutting equipment are getting higher and higher, and micro-precision laser processing equipment will penetrate into all walks of life.

Due to the ultra-fast picosecond laser cutting machine has the characteristics of low heat, cold melting, and high precision, it has extraordinary performance in stainless steel, aluminum, titanium alloy, sapphire, ceramics, glass and other materials, and is widely used in scientific research, biological instruments, solar photovoltaics , Electronic product manufacturing, semiconductor manufacturing and other fields.

Of course, the current mainstream laser processing market in the market is still dominated by nanosecond lasers. Due to the high cost of picosecond ultra-fast laser cutting machines, the future trend will inevitably develop into the field of picoseconds and femtoseconds, and we can look forward to it in the future.