

Technology

Before a continuous kerf can be produced, the laser beam must penetrate the material. The sheet must be melted at a point in a particular area or oxidized. The melted material must then be blown away. The puncturing process can be carried out quickly, i.e. with full laser power, or slowly with the help of a so-called "ramp".

When piercing slowly with a ramp, the laser power gradually increases and is then held constant for a certain period of time until the piercing hole has been formed. Piercing as well as laser cutting are supported by adding a gas. Oxygen, nitrogen, argon or simply air is used as a cutting gas. The gas finally selected depends on the materials to be cut and the quality demands placed on the workpiece.

Cutting with oxygen: flame cutting

When cutting with oxygen, a maximum gas pressure of 6 bar is normally used. The material is melted at the point where the laser beam strikes the sheet and is in large part oxidized. The melted material created together with the iron oxides are then blown off.

During the oxidation process (exothermal reaction), energy is also released which promotes the cutting process. Using oxygen as a cutting gas, it is possible on the one hand to attain considerably higher cutting speeds. On the other hand, it is possible to cut thicker materials than would be possible when nitrogen is used.

The cutting speeds below are provided as a comparison:

- high-grade steel,
 - s = 1 mm, 1500 watt laser power
 - cutting gas N₂: cutting speed 7 m/min
 - cutting gas O₂: cutting speed 9.5 m/min, factor 1.38

The cutting gas is delivered in the cutting head.

- high-grade steel,
 - s = 3 mm, 2600 watt laser power
 - cutting gas N₂: cutting speed 3.5 m/min
 - cutting gas O₂: cutting speed 7.7 m/min, factor 2.2

It should be noted that when cutting mild steel or stainless steel with oxygen, this produces an oxide layer. This layer negates the corrosion protection of workpieces made of high-grade steel and makes it difficult to weld parts together flawlessly. In such cases it will be necessary to prep the pieces.

Cutting with nitrogen: fusion cutting

Fusion cutting involves using inert gases such as nitrogen or argon. The material is melted at the point where the laser beam strikes the sheet. In practice, the cutting gas – in most cases, nitrogen – is delivered at a pressure of 8 to 20 bar. The high gas pressure causes the melted material to be blown out of the kerf very quickly. This almost eliminates the



Processing example: high-grade steel

