

## How much does it cost to laser cut polyimide?

Often the first question that laser services providers receive is how much will this cost? It would be easy to promote a formula that results in an overall cost average, but everyone likes a challenge, right? Since laser cost is a cumulation of numerous factors, we will focus on a material such as Kapton or generically called polyimide and how cost is determined. For clarification, Kapton is a brand manufactured by Dupont and made into sheets and films to specific standards and formulations. Polyimide film and sheets are made by manufacturers but do not have the exact formulations as Kapton, but in the end, result with very similar characteristics and used in many of the same industries. Calculation of laser cutting Kapton, or polyimide is done by considering the following:

- The thickness of the material: Like many raw materials produced, polyimides, are made in numerous thickness grades. For laser technology, generally the thicker the material, the longer it will be to cut through.
- The linear distance amount: Laser systems cut from a CAD file. This digital data is the cut path that the laser will undergo. Completion of the path results in the intended design of the polyimide part. A linear distance of 50mm will cut faster than 300mm, assuming the thickness is the same for each. 50mm however can cut slower than 300mm if the material thickness is 1mm thick, while the 300mm thickness is .127mm.
- Laser speed: Laser speed is the factor that the laser beam is moving to cut material. It can vary greatly depending on the thickness and geometry. Critical features of smaller details and intricate designs will need to cut slower, while longer and larger features can cut at a faster speed. These settings are input as millimeters per second. Adjustments of the Kapton cutting speed will be made to result in the best quality and efficiency.
- Tolerance required: Using laser technology polyimide cutting of film or a Kapton sheet, is going to result in a component with high accuracy and precision. For many projects a +/- .002" or 0.0508mm is going to be acceptable. However, many projects using polyimide material require a tolerance of +/- .0005" to .001" or 0.0127mm to 0.0254mm. This tighter tolerance requirement will incur additional quality measurements which can add cost.

The factors for each job requiring a Kapton sheet or polyimide film to be cut will be unique. The following demonstrates in general these factors affecting the cost.

- Kapton film or Sheet at 5mil thick (0.127mm) x 50mm linear distance will cost \$0.50 cents.
- Polyimide film or sheet at 10mil thick (0.254mm) x 400mm linear distance will cost \$6.50.
- Kapton sheet at 10mil thick (0.254mm) x 50mm linear distance will cost \$0.90 cents.
- Polyimide film or sheet at 5mil thick (0.127mm) x 400mm linear distance will cost \$3.40.

Whether your project requires Kapton cutting or polyimide cutting or some other material, the process is the same in determining the cost per unit. A good thing to remember is that laser technology is highly repeatable. What you have processed today can be cut again two months or two years later without drastic changes to your cost. There is no tooling to be made and the CAD file remains intact for these future project requests.

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