

## Achieving Tight Tolerances

### What is a Tight Tolerance Machine?

A tight tolerance machine isn't necessarily a specific machine type. Rather, it's any machine capable of producing parts with precision tolerances. This means minimal variation in the final dimensions of the part. These cutting-edge tools are meticulously engineered to achieve exceptionally precise measurements within minuscule margins. This is accomplished with CNC, or computer numerical control, a manufacturing method that automates the movement of a machine and optimizes for precision. With technology and advanced techniques, these machines ensure that every component meets exact specifications, guaranteeing unparalleled accuracy in manufacturing processes.

### The Importance of Tight Tolerances

Extremely tight tolerances are crucial in various applications, particularly those demanding high performance and perfect fits. Tight tolerances are crucial for achieving consistency, reliability, and optimal performance in a wide range of industries. Whether you're crafting aerospace components, medical devices, or automotive parts, adhering to tight tolerances ensures seamless functionality and minimizes the risk of errors.

### Tips for Holding Tight Tolerances

- **Invest in High Precision Machining:** Equip your shop with state-of-the-art machinery designed to deliver precision and accuracy at every stage of production.
- **Calibration is Key:** Regularly calibrate your equipment to maintain peak performance and ensure adherence to tight tolerances.
- **Partner with an Experienced Manufacturer:** If purchasing equipment does not make sense for your application, be sure to vet your suppliers. A-Laser possesses the expertise and advanced laser cutting equipment necessary to achieve extremely tight tolerances consistently. Our commitment to precision ensures your parts meet the most demanding specifications.
- **Choose the Right Materials:** Select materials known for their stability and consistency to minimize the risk of dimensional variations during machining processes.
- **Embrace Advanced Tooling Solutions:** Explore innovative tooling options tailored to high precision machining tolerances for superior results.
- **Implement Robust Quality Control Measures:** Integrate rigorous inspection protocols into your workflow to identify deviations early and maintain tight tolerances throughout production.

Mastering tight tolerances is the hallmark of excellence in high precision machining. By leveraging cutting-edge technology, meticulous attention to detail, and a commitment to continuous

improvement, you can elevate your manufacturing capabilities and exceed even the most demanding standards of precision and quality.

### **Benefits of Tight Tolerance for Precision Parts**

When we use a product at home, at work or in purchased services, we gladly go about our day as the use of it has performed to our expectation. If the part malfunctions it can be investigated to who manufactured it, what tolerance was applied during the manufacturing process. Tolerance in precision manufacturing is a measurement of the acceptable variation of the dimensions and overall surface quality of the produced part. There are levels of tolerance to all industries and what is acceptable for one, may not be even close to another. A provider of kitchen range hoods may have a tolerance of +/- 0.5mm. While a part used in a surgical device may have a tolerance of +/- 0.0254mm. Both processes encompass levels of precision vs tolerance and are acceptable for the industry and parts manufactured. There are benefits to consider for using a tight tolerance for precision parts and manufacturing in general.

- **Uniformity:** Parts manufactured under a tight tolerance can be replaced with confidence that the unit or device will continue to function properly. High production assembly is a great benefit of this.
- **Sustained function:** Parts produced with precision tolerance have a longer life cycle and outperform similar parts produced under a lower tolerance threshold. Industries such as medical, food, aerospace, automotive, nuclear science for example, all require tight to extremely tight tolerances for the proper function of the implemented manufactured parts and public safety.
- **Brand loyalty:** Business goals are to create more business and opportunities. Growing this reputation by becoming a reliable provider of goods depends largely on the public view of how your products perform. Demands for tight tolerances increase the quality of the product and integrity of the supplier.

While manufacturing precision parts with tight to extremely tight tolerances are beneficial, there are considerations to keep in mind.

- **The initial cost for development** can lead to an increase in scrap and rework. Holding a tighter tolerance has less room for error in manufacturing.
- **Skilled Labor required:** Tight tolerances require trained and experienced personnel to perform and oversee the manufacturing process. This includes all areas of production including a maintained Quality Management System which must be in place.
- **Industry Certification:** In many cases, for a business to provide precision tolerance manufacturing they will need to go through certifications such as ISO 9001-2015 or ASTM 9100 for example. Many companies will only do business with services providers who are certified.
- **Material considerations:** Manufactured parts held to a tight tolerance can be challenging when there is limitation to the material to be used. Not all grades or types of materials are readily produced to sustain the manufacturing of the intended design. If there is no room for

material selection, there can be an increase in throughput and a reduction to the supply stream.

There are great benefits to manufacturing with precision tolerances that keep parts and devices at a high level of quality and performance. Demands can be stringent and therefore can be costly. This is weighed in balance to the function and safety in private and public sectors.

Please read more at:

[Achieving Tight Tolerances - A-Laser Precision Laser Cutting](#)

[A-Laser Precision Laser Cutting - Laser Ablation, UV and IR Lasers](#)