CNC MACHINING WHITEBOOK

YOUR CNC MACHININED PARTS SOLUTION

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What is CNC Machining?

CNC machining is a computer-controlled method of cutting metal or plastic parts. This process is also known as computer numeric control (CNC). The first CNC machines were developed in the 1940s and were used to manufacture aircraft parts. The technology has advanced greatly since then, and today, it's widely used to create many different types of parts for a wide range of industries.

CNC uses automated, high-speed cutting machines to form shapes from metal stock. 3-axis, 4-axis, and 5-axis mills, lathes, and routers are standard CNC machines. The workpiece may stay in place while the tool moves, the tool may stay in place while the workpiece is rotated and moved, or both may move together.

Skilled machinists programme CNC machine tool paths depending on part geometry. CAD models give part geometry information. CNC machines can cut almost any metal alloy with great precision and repeatability, making custom manufactured parts appropriate for industrial, electronics, medical, robotics, and aerospace use. DS offers custom CNC quotes on over 40 materials, from aluminium to titanium.

A CNC machine can be used for various types of jobs, including drilling holes, milling, routing and cutting. The machine operator enters instructions into the control system using a keyboard or touch screen. The CNC software controls all aspects of the manufacturing process, from material selection and setup to machining and finishing.

The different types of CNC machines include milling machines, lathes and grinders. These machines are controlled with different types of controllers that are designed for each specific machine type.

How does CNC machining work?

CNC machining enables the production of components and parts that would be impossible to produce manually. A single set of instructions given into a computer can produce complex 3D products. Through drilling, milling, turning, and other operations, the CNC machine removes material from the base stock piece to create shapes, angles, and the final output.

CNC machining is adaptable and may be utilised with a variety of materials, including metals, plastics, wood, glass, foam, and composites. This versatility has contributed to the widespread adoption of CNC machining across industries, allowing designers and engineers to create things efficiently and precisely.

CNC Machining Processes

There are several different types of processes that fall under the umbrella of CNC machining:

CNC Milling: The most common type of CNC milling machine used in the manufacturing industry is the vertical milling machine. The vertical milling machine has a rotating spindle, which moves up and down along the Z-axis. An X-Y table moves along the X and Y axes of the machine's work surface. The X-Y table has clamps that hold workpieces in place as they are being machined by the spindle.

There are three main types of tool heads:

Spindle-type tool heads (like those used on vertical mills): These tools have an endmill attached to their shank at the end closest to the spindle shaft. They can be mounted on either side of the spindle shaft or on both sides (by using two tool holders).

Rotary indexer tool heads: These tools have multiple cutting edges arranged around their circumference, like a drill bit. They can be set at any angle relative to the workpiece by rotating them on their shafts while they're still mounted in their bearings inside the spindle housing. This gives them an infinite number of positions relative to each other.

CNC Turning: Turning involves removing material using a rotating cutting tool held by a rotating spindle. The cutting tool may move along an axis parallel to the axis of rotation (like lathe turning), or perpendicular to it (like boring).

CNC turning is the process of cutting parts on a lathe using a computer. The computer takes information from a CAD/CAM program, and uses it to control the speed and movement of the tool to create your part.

CNC turning is one of the most common manufacturing processes because it's relatively easy to learn and can be used to cut a variety of materials. Lathes are used to create parts with circular cross-sections, such as bowls, plates and jewelry.

Lathes have two main components: a headstock and a tailstock. The headstock houses the chuck that holds the workpiece (the piece you're cutting). It also contains gears that rotate at different speeds based on commands from the controller. The tailstock supports the other end of your part while it's being worked on by the chuck and tool bit (the cutting tool). This ensures that both sides of your part get cut evenly, so they don't become lopsided when you turn them into something else (like making a bowl from metal rods).

In order for this process to work properly, there needs to be enough space between these two parts for each individual operation without hitting each other or getting too close together during their movement around each other.

Why Should I Use It?

CNC machining is one of the most efficient and cost-effective manufacturing processes in the world today. By using computers to control machine tools, CNC machining can produce parts with high precision and accuracy, as well as produce components in large quantities at a low cost.

CNC machining can be used for just about any metal part that needs to be made. The process works by taking a computer file that contains the specifications of what you want to make, then cutting it into a computer controlled

machine tool. The computer will then direct the machine tool to make cuts and shape the piece until it matches your specifications.

There are many advantages to using CNC machining over other manufacturing methods:

High precision – When compared to hand-operated machines or manual labor, CNC machines have much more precise control over their movements. This results in parts that are more consistent in size and shape than those produced by other methods.

Low cost – Not only do these machines allow for greater precision, they also allow you to produce multiple copies of an item quickly and efficiently without having to pay workers overtime or hiring additional employees. This reduces costs significantly when compared to other methods of manufacturing.

Flexibility - With CNC machining, engineers can manufacture parts that are impossible or impractical to make by hand or with traditional methods like casting or forging. This allows them to create custom components that would be impossible to mass produce otherwise.

Complexity - CNC machining can produce complex shapes that cannot be easily manufactured by other methods, such as welding, casting or forging.

How does a 5-axis CNC work?

The five axes of motion are called X, Y, Z (the traditional axes), U (rotation around the Z axis) and V (rotation around the U axis).

The 5-axis CNC machining is a very useful technique to produce components with complex geometries and large dimensions. This way you can reduce time and costs needed to manufacture them in comparison with traditional ways.

A 5-axis CNC machine can move in the x, y and z axes as well as rotate on the y axis. It can also move in the x and z axes at the same time (called dual spindle). The y axis is usually referred to as a third spindle.

The advantage of 5-axis machining is that it allows you to machine complex shapes without having to make multiple parts or use expensive EDM processes. You can also hold tighter tolerances with less machine cleanup required.

The disadvantage of 5-axis machining is that it requires more setup time and tool changes than traditional machining processes like milling or turning. This means it's not possible for every kind of part to be made this way (for example, if you want to cut threads).

What kind of material do I need?

Material selection is very important when machining metal parts. We suggest using one of these materials:

Material	Available Varieties
Aluminum	Aluminum 5052, Aluminum 6082-T6, Aluminum 7075-T6, Aluminum 6063-T5, Aluminum 6061-T6, Aluminum 2024-T3
Brass/Bronze	Brass C360,

	Brass 260, C932 M07 Bearing Bronze
Copper	EPT Copper C110, Copper 101
Steel	Alloy Steel 4130, Alloy Steel 4140, ASTM A36, Stainless Steel 15-5, Stainless Steel 17-4, Stainless Steel 18-8, Stainless Steel 303, Stainless Steel 304, Stainless Steel 316/316L/316F Stainless Steel 416, Stainless Steel 420, Steel 1008, Steel 1018,

	Steel 1020, Steel 1045, Steel A36
Nickel	Nitronic 60 Nickel alloy
Kovar	Kovar alloy
Titanium	Titanium alloy

CNC machining tolerance

CNC machining tolerance is the difference between the maximum and minimum dimensions that a part can be manufactured to. The CNC machining tolerance is specified by subtracting the maximum allowable deviation from the minimum allowable deviation.

CNC machining tolerance is the accuracy of a part or product. The precision of a CNC machined part is determined by the tolerance of the process and materials used to manufacture it.

CNC machining tolerance is one of the most important factors to consider when purchasing CNC parts or products from a supplier. This is because it determines whether or not you will be able to use the product you have purchased in your application with ease.

CNC machining general tolerance is +/-0.01MM.

For reference, the thickness of a human hair is 0.05 mm (0.002”).

If you are looking for high-quality CNC parts, we recommend that you take a look at our website, www.dsindu.com/cnc-machining-tolerance. There, you will find all the information on how to choose the right tolerances and materials for your project.

How Do I Get Started?

If you have a 3D model of your part, you can upload it to our website www.dsindu.com and we will give you a quote. If you don't have a 3D model, we can create one for you. We also offer free assistance via email if you are having trouble with the process. Contact Us Now, to start your projects.