CNC Workholding Basics

Do you know how to repeatably produce highly precise and accurate parts on your CNC machine?

CNC workholding refers to any device or apparatus used to keep a workpiece properly positioned and immobile during the machining process. Common examples are chucks, clamps, end stops, soft or hard jaws, locators, vises, fixtures and jigs.

Workholding in a CNC machining process is a potential issue. If workpieces are hard to grasp or grasped improperly, the part's viability, production timeline and per-unit cost may all be negatively impacted.

In this article we will take a closer look at:

What Manufacturers Need to Know About Getting the Most From Their Workholding Solutions

How a workpiece is held in a CNC machine can significantly affect several logistical factors, including viable toolpaths, which workpiece surfaces will be machinable without additional setups and the allowable speed and force of the cutting tools.

Basic workholding components like jaws, vises and even the machine table can limit the ability of cutting tools to access the workpiece, which can lead to more time spent setting up the part, instead of running the spindle.

Ideal workholding devices have easily repeatable setups. While simple workholding solutions are often used, a part may sometimes need a customized CNC workholding set up to secure the piece properly during machining. ***Fixtures and jigs*** are examples of customized workholding devices.

When implemented properly, CNC workholding systems can improve output efficiency by minimizing the time required to set up and change workpieces. Workholding solutions assist in making CNC production processes repeatable and contribute to measurable improvements in speed of production and process reliability, as well as the accuracy, precision and quality of the final parts.

CNC Clamping Solutions

The purpose of a clamp is to exert force and press a workpiece against the locating surfaces and hold it there in opposition to the actions of cutting or other processing forces.

Clamping devices come in different shapes, sizes and strengths. Vises and chucks have movable jaws and are considered standard clamps. Another example is the ***toggle clamp***, which has a pivot pin that acts as a fulcrum for a lever system. One of the more convenient workholding types is a ***power clamping system***. There are two types of power clamping methods: ***hydraulic*** and ***pneumatic***.

Workholding clamps should be placed correctly above the workpiece supports to allow the force of the clamp to pass into the support without deforming the workpiece. Clamps, locators and supports should also be placed to distribute cutting forces as evenly as possible throughout the part to prevent deformation by the cutting tool forces. The setup should allow for easy clamping and not require much change over time.

Common CNC Workholding Challenges

The most common CNC workholding challenges arise when manufacturers attempt to produce parts with unusual geometries or parts that are cumbersome and large.

The workholding solution best suited for a particular part will be determined by a few factors, including production volume, part shape, part dimensions, material, and tolerance requirements, as well as changeover frequency.

Workholding can be accomplished in several different ways and accomplish the same task of successfully gripping a part during a machining operation with the end result being within tolerance. The quality of the workholding may differ greatly as some setups will be more efficient than others. Maximizing the efficiency and effectiveness of CNC workholding setups boosts productivity by saving on changeover time as well as reducing the number of scrapped, out-of-tolerance parts.

Summary

In the end, there is no one-size-fits-all solution to CNC workholding. The goal for manufacturers is to determine the best-fit combination of machining operations and workholding solutions that maximize spindle usage time, reduce the need for changeovers, and improve production throughput.