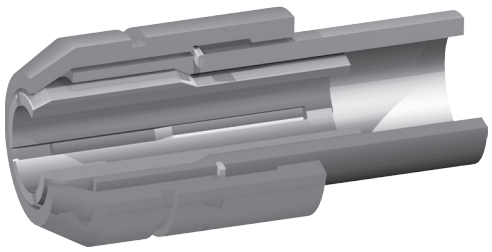
TOOLHOLDER OVERVIEW

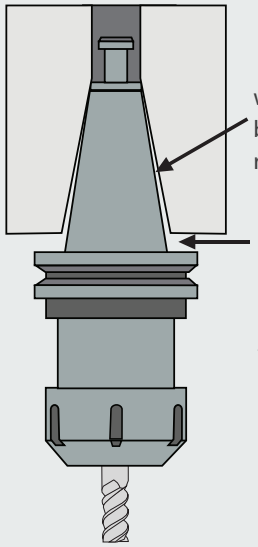
SELECTION, UTILIZATION & MAINTENENCE

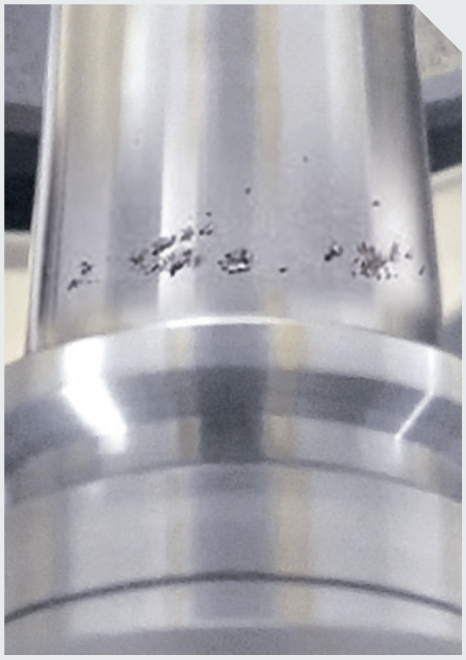
Multiple options exist for securing your cutting tool in your machine. The selection of the right holder is as important as the selection of the right tool. There are advantages and disadvatages to each style of holder and determining the needs of your application will direct you in the selection. All cutting tools, especially high performance end mills, need minimum runout to maximize performance. Approximtely every 0.0001" of total indicated runout degrades the life of the cutting tool by 10% and can be compounded further at high spindle speeds. Excessive runout can contribute to increased machine repair expenses by prematurely wearing the spindle bearings and increases machine time. Simply put, selecting the right tool holder and tooling can result in a 50% greater performance while being the lowest cost component of your operation. Always take a few minutes to properly indicate a new tool in the spindle.

Primarily, there are six types of tool holders for use in cnc machining operations: shrink fit, hydraulic, milling chucks, collet chucks, end mill holders and drill chucks. Regardless of the choice, operators should be taught to recognize wear and when a holder has reached the end of its operational life. Replacing worn toolholders can prevent premature cutting tool failure and extend the life of the spindle. Check the spindle frequently for bellmouthing, a worn spindle will cause runout and a direct increase in tooling cost. Tooling should be incidated on the bench first, securing the tool with a tightening stand and torque wrench, then indicated once again in the spindle. If the runout is componded in the spindle, a service technician will likely need to be called to repair the spindle.

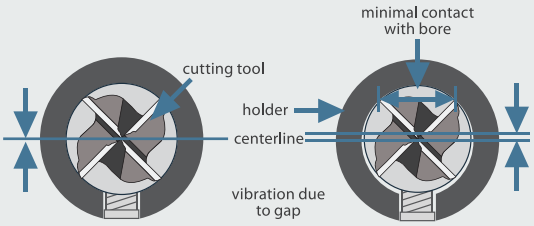
Each toolholder should be examined for wear, as a worn holder will not provide accurate alignment, will prematurely wear out your cutting tools, create a poor finish and potentially cause costly spindle damage. Check the taper for visible signs of wear or damage where it contacts the spindle mouth. Any noticable spotting, fretting or imperfections are likely evidence that the toolholder is no longer usable. This fretting occurs as a result of two steel parts rubbing against each other, creating vibration and heat. A new toolholder that quickly develops fretting on the taper is an indicator of a spindle which needs to be reground.







Collets require more frequent replacement than toolholders as they are manufactured using softer metals and designed to collapse underpressure to tightly grip the tool. When collets wear, they cause the same issues as previously discussed costing countless dollars in increased machine time and machine wear. Any visible damage to the outside or inside of the collet, whether scoring, pitting, rust or abrasions are a general indicator they need to be replaced. Collet nuts must maintain balance when securing the collet and are often designed with internal bearings which tend to fail and need replacement.



Clean all collets, collet nuts, toolholders and the internal diameter of the spindle. Apply rust inhibitor to all metal parts when not in use, clean all dust, dirt, chips, from all surfaces. Minor contaminants can become major problems at high spindle speeds.

End mill holders with set screws are the most common and most economical for milling applications. When selecting an end mill for use in the holder, be sure to use one with a factory ground flat. An irregular flat can cause centerline deflection that is already common with this type of tool holder. Since the set screw pushes the end mill to the opposing side of the holder, if creates an air gap which off centers the tooling. Using ultra precision holders (H5) can reduce the baseline run out from .0015" to .0003", creating a dramatic increase in tool life. These holders are best when used with forgiving end mill materials, such as high speed steels and powdered metals.

Collet chuck holders are common and economical. A single holder is capable of quickly interchanging collets to fit a wide range of cutting tool diameters. Their relatively low rigidity and holding power are detriments to high performing tools. Collets require additional attention as they wear faster than any other type of toolholder. Make sure the collets are clean, examined for cracks, bellmouthing and scoring from slipping or broken tools. Runout is significantly better than tradional endmill holders as the collet concentrically tightens and self centers on the tool.

Likely the least common is the hydraulic toolholder. It ofers an extremely high holding power and rigidity, excellent repeatability and vibration dampening properties with quick and easy tool changes. Hydros are significantly more expensive than other toolholders and mechanically complex. While they offer incredible accuracy, they can be challanging in demanding applications and machines.

High speed or high torque machining requires precision setting of end mills to extend tool life and improve machining performance. With shrink fit toolholders, vibration is reduced and cutting is measurably faster and smoother resulting in high tolerance and finish workpieces. Shrink fit toolholders use the expansion and contraction properties of metal to provide extremely powerful tool holding. The inside diameter of the tool holder is slightly smaller than the outside diameter of the cutting tool shank. When heated, it expands slightly to allow the shank to be inserted. As it cools, the contraction of the metal provides 10,000 pounds of force for unparalleled accuracy and torque. Shrink fit holders have a maximum total indicated runout of 0.0002", permit increased feeds and speeds; increase metal removal rate; reduce tooling cost; increase spindle bearing life; eliminate slippage; provide quick changes; and improve accuracy and reliability. Additionally, the thin profile design of the toolholder allows for extended reach in deeper cavities.