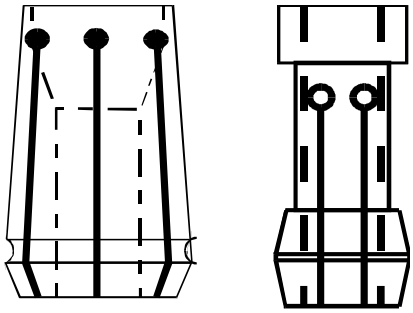
COLLETING AND MAINTENANCE

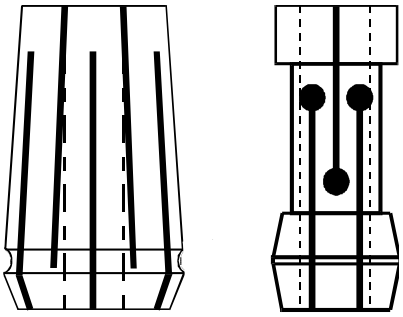
Many users select tools without regard to the importance of adequately holding them in the colleting system of the router. This is often the case in routers ranging from simple air routers to the most complex CNC machines. All collets are of two basic types; half grip or full grip. The attributes and peculiarities are important because of the way in which they secure the tool. We like to think of the spindle/collet system as a chain. Just as a chain is only as strong as its weakest link, so is the collet in relation to the tool. A high performance tool can only perform when the collet is properly maintained every time that the tool is changed.

TYPES OF COLLETS

There are two basic types of collets, namely half grip and full grip. Both types are not always available with every spindle.



HALF GRIP COLLET



FULL GRIP COLLET

HALF GRIP COLLETS

Half grip collets are identified by slits running from the bottom or mouth of the collet toward the top for about 80% of the collet length. This allows them to squeeze the tool with a force primarily directed at the mouth or bottom of the collet. These collets are often counterbored at the top and the shank of the tool is not allowed to contact the entire length of the collet. This type of collet is the simpler of the two types and is ideal where tools do not have a long enough shank to fill the entire collet.

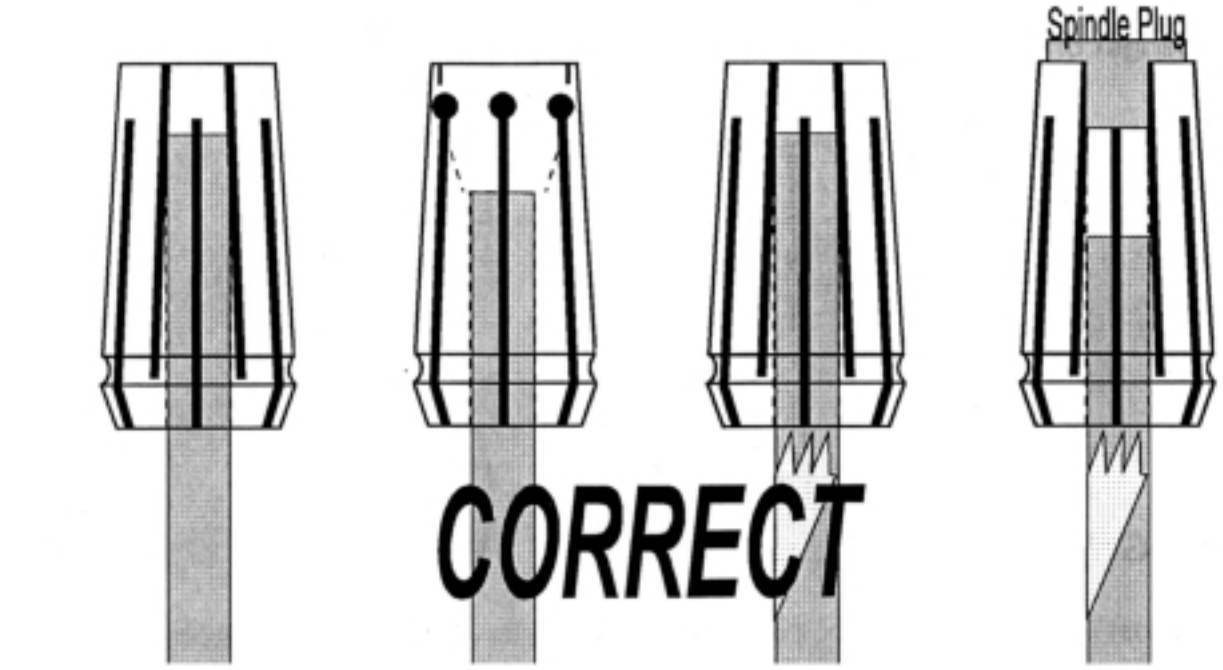
FULL GRIP COLLETS

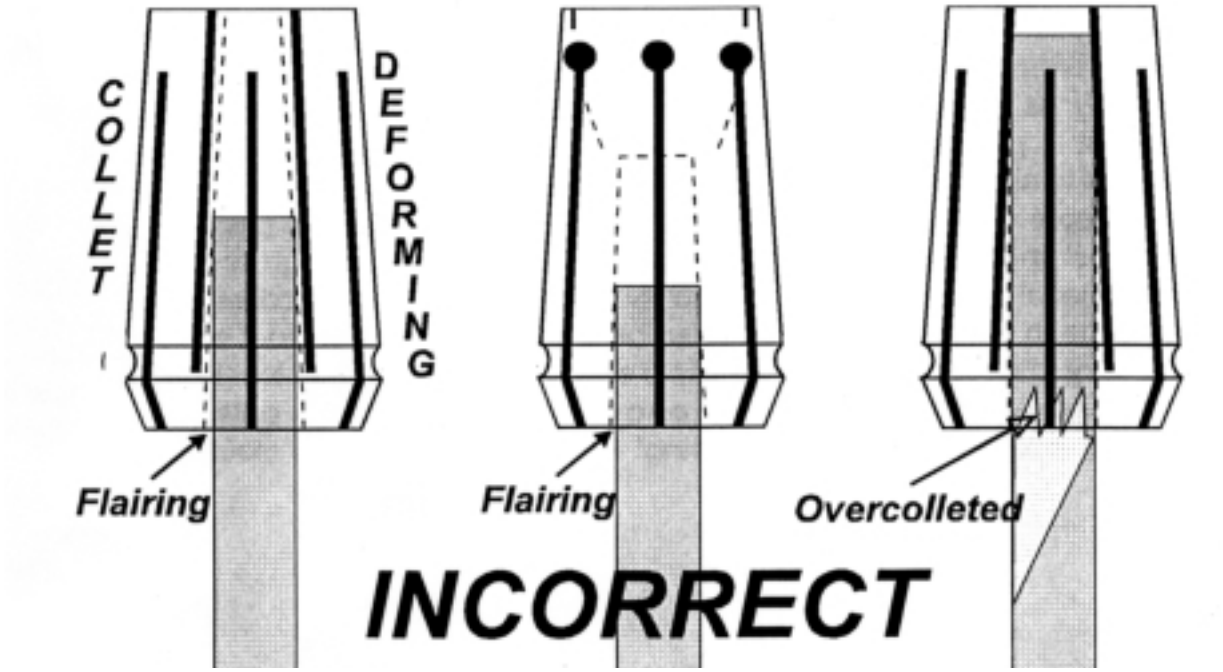
Full grip collets are identified by slits running from both ends, which create specific collet sections. This full grip type allows squeezing over the entire length of the collet. Proper utilization requires the tool to fill a minimum of 80% of the depth of the collet. This type of collet tends to have more flexibility and *often* comes in what is termed as "Range Collets". These allow gripping a range of shank sizes. Example: 12-13 mm is used for 1/2" shank tools. This increase in gripping range can have a price in longevity of the collets. They are required to collapse more each time onto the tool thereby making the memory of the collet very important. Often times the memory goes away much faster than an inch size collet. Another more annoying habit of range collets is their inability to snugly hold onto the tool while it is not yet tightened down. Often when these collets are used they will drop the tools onto the table causing potential damage. Consequently, specific size collets are recommended for relative size shanks. (Even metric collets should be specific).

The most important portion of the collet is the mouth, which is located on the bottom end from where the tool extends. This area is important because all the lateral pressure taken by the tool must be evenly distributed on all sections of the collet for it to cut true or concentric. It is very critical that the 80% rule (at least 80% of the collet filled with tool shank) be followed when using a full grip collet due to the ability of the collet to flare at the top. Not colleting at the 80% level will allow tool movement in very minute amounts resulting in tool breakage. There are times that the 80% rule is not possible because of inadequate shank lengths. It then becomes necessary to fill this void in the top of the collet with a filler or collet life plug the same size as the shank. This is a practical way to solve the problems of short shanks and collapsing of the collet which may occur by not following the 80% rule.

Equally as important is overcolleting. This occurs when the "flute fadeout" portion of the tool is allowed to extend inside the collet. This does not allow a firm equal grip by all sections of the collet at the mouth. This uneven support at the most critical area actually scars the inside of the collet. This causes permanent damage and is a common cause for tool breakage. It is necessary to visually inspect the collets for wear each time a tool is changed. Proper action will aid in avoiding tool breakage, which often results in permanent damage to the collet due to intense pressures exerted from either "burring" or "mushrooming" the mouth of the collet.

PROPER TOOL COLLETING





TYPES OF COLLET NUTS

There are two spindle or collet nut styles prevalent in the industry. They include the solid nut and the bearing style nut. Both types are not always available depending on the spindle.

Bearing type nuts contain a thrust bearing allowing the collet to be tightened without the friction that normally is present when the spindle nut is tightened directly onto the collet.

Solid nuts are tightened directly onto the spindle and often require greater tightening pressure than bearing type. The force required to tighten them can sometimes be reduced with use of dry graphite film. But petroleum based lubricants should be avoided due to their ability to act as a magnet for any dirt or dust.

A new style or process is the coated solid nut with special heat treating and coating properties which provide up to 100% more clamping pressure. The coating negates the need for a thrust bearing.

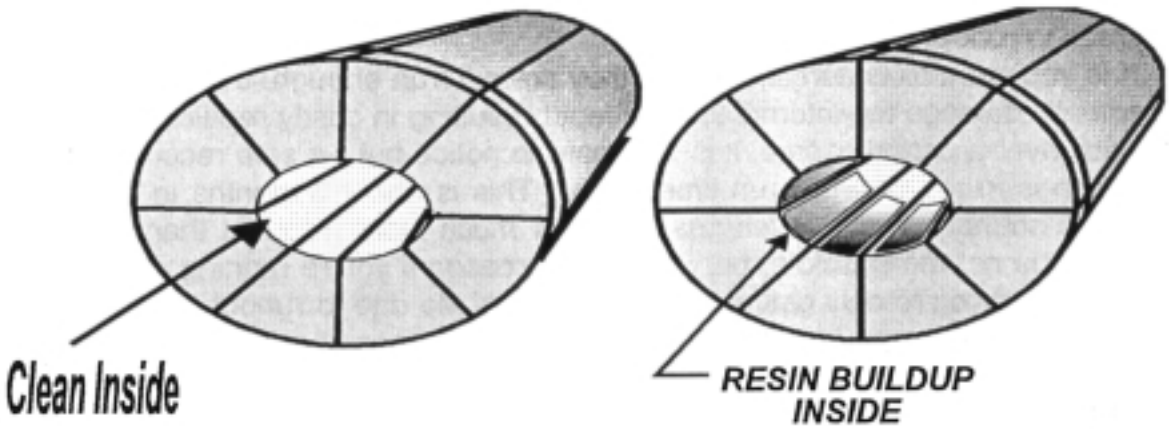
COLLET MAINTENANCE

Heat is the biggest enemy of the tool and the initial transfer of heat is from the tool to the collet. Collets are manufactured from spring steel and over a period of time, heat and usage causes them to lose elasticity. This hardening process makes tightening of the collet more difficult thus causing uneven gripping and ultimately tool runout.

It is important to understand when hardened collets are not replaced; over tightening will eventually damage the internal spindle taper resulting in costly repairs. This process occurs gradually over a period of time and is difficult to diagnose. A practical recommendation for collet life is in the 400-600 run time hours. This is about 3 months in a normal two-shift operation. If collets are not changed, they will eventually become brittle enough to crack or break and permanently damage the spindle. Preventative maintenance is much cheaper than this costly alternative. Timely collet replacement is important, but cleaning the collet, along with the collet nut, toolholder taper, and inside spindle taper each time the tools are changed is equally important. Collets are in a dirty environment and are expected to perform a very accurate task while subjected to extreme heat. As material is routed, whether it be wood, plastic, aluminum, or man-made board, the chips carry many resins migrating up the slits in the collet and depositing onto the inside of the collet ears (usually nearest the mouth of the collet). The resin acts as pressure points gripping the tool tighter at the mouth of the collet. These pressure points often distort the grip on the tool creating runout. This resin heats up as the tool does and actually transfers onto the shank of the tool almost adhering the tool into the collet. Many times the tell tale sign of this transfer is brown marks at the mouth of the collet contact on the shank. These marks are a strong signal of collet neglect and the necessity to institute a collet maintenance procedure.

To prevent this problem, the resin must be removed form all surfaces using a non-abrasive brass tube brush to clean inside of the collet in combination with a cleaner such as Rust-Free. This nonflammable, biodegradable cleaner allows it to be safely used on the shop floor. This cleaner will also do an excellent job of removing the “fretting” resin build up that occurs at the base of the ISO 30 toolholder taper along with a light scrubbing with the brass brush. Make sure that all surfaces including outside and inside collet and inside spindle taper are thoroughly clean and dry before reassembling. IF ISO 30 quick-change toolholders are used, make sure to clean all matching and mating surfaces as well. Also, the collet nut should be cleaned of resin and chip buildup and regularly replaced to insure the integrity of the whole collet system. Do not allow Rust-Free to soak on any surface for longer than 5 minutes. It is important to point out that simply blowing out the collets or soaking them overnight in a thinner does not rid collets of resin buildup. In fact, the later procedure can prove to be hazardous. Do not use a petroleum-based lubricant for cleaning, as it will only act as a magnet for all of the dirt and dust by the residue it leaves behind. The Onsrud Cutter catalog provides availability of brass collet brushes, spindle taper wipes, Rust-Free, and a waterproof lubricant called Boeshield T-9 for protecting parts from rust and corrosion.

COLLET EXAMPLES



SPINDLE TYPES