

Section #3 Fluoroplastics

TABLE IV

RECOMMENDED GEOMETRY FOR
RADIAL CHASERS

Rake angle—0° to 5°

Throat angle—50°

Speeds—Threading ratio, spindle speed to
threading speed—3:1.

Tapping

High speed oversize taps on the order of .002" oversize for small diameters to .005" oversize for larger diameters, are used for TFE fluorocarbon parts. Plating is sometimes used to convert standard taps to oversize for the purpose. However, taps should be purchased to proper size for best results.

A chamfering operation is sometimes necessary after tapping to remove burrs.

When tapping deep holes (over 3:1), tap flute area should be enlarged for greater chip clearance. Four flute taps are generally preferred due to their greater flute area. For closer thread size control, bottom taps are generally recommended.

Reaming

If reaming is necessary, it is advisable to use special reamers with greater clearance angles for accurate holes. When reaming thin-walled bushings, the reamer has a tendency to force the material away from the cutting edge and cause undersize holes. Where hole diameter permits, the use of a single point boring tool or re-drilling is good practice to "finish" hole to close tolerances.

Satisfactory results can be obtained on automatic screw machines with straight flute stub reamers. TFE is resilient and it is necessary to use an oversize reamer to allow for "fall in" since the finished hole will be slightly smaller than the reamer diameter.

Sawing

TFE is saw cut dry; no coolant is required. A skip tooth blade with four to six teeth per inch is the best type band saw blade to use. A rigid machine with good saw blade guides is required for square cuts. Maximum machine speeds can be used.

Centerless Grinding

TFE rod diameters can be readily reduced by centerless grinding. Water base coolants are best suited for grinding. A standard nonmetallic bar grind-

ing fixture is recommended equipment with the work center $\frac{1}{8}$ " below the center line of the wheels. Tubes are used on both the entrance and the exit side of the wheels to reduce whip of the stock as it is rotating at high speeds. These tubes are also used to maintain alignment of the work with the work blade as the stock passes between the wheels. TFE is relatively soft and is easily scratched, and all equipment through which the material must pass must be smooth and burr free.

The regulating wheel setover is approximately $3\frac{1}{2}^\circ$. The entrance angle of the grinding wheel should be between $\frac{1}{2}^\circ$ and 3° . Speeds should vary with the diameter of the rod and the amount of stock to be removed. For smooth finishes and close tolerances, use as much of the grinding wheel width as possible. A soft grade wheel with an open grain, as recommended by various manufacturers, is satisfactory.

Milling

Vertical milling — using face mills, shell mills, end mills and fly cutters — is probably the most common method for TFE. High spindle speeds and fast table travel are possible with adequate holding fixtures.

Because of TFE's flexibility, care must be taken when holding or clamping to prevent deformation in the part being machined. This can cause inaccuracy in the finished part. When milling parts with thin cross section, the part should be confined in its entirety within the holding fixture, leaving only enough opening for the cutter. This will prevent the part from deflecting away from the cutter.

Freshly sharpened cutters with keen edges give best results. Cutters that have been used previously may have apparently sharp cutting edges, but which are not necessarily keen, causing heavy burrs on the edges of the part being milled. When using shell mills it is advisable, whenever possible, to tilt the head slightly into the cut in order to cut with the cutter periphery only. This eliminates cutter drag marks on the material being cut.

Square corners on the cutter are preferred over chamfered corners as fewer burrs are developed at the ends of the cut.

When it is necessary to employ horizontal milling techniques, again only cutters with keen sharp edges should be used. Staggered tooth side mills produce clean accurate slots and grooves with minimum amount of difficulty.