



*Engineered Plastic Solutions™*

Engineering | Custom Fabrication | Manufacturing

## **RULON<sup>®</sup> and PTFE Machining Information**

TriStar Plastics maintains a very complete machine shop. We offer many manufacturing processes, such as centerline grinding, cutting, stamping, CNC turning, drilling, boring and milling, screw machining, as well as close tolerance molding of RULON and PTFE.

We realize that there exists a real need for specific information on the machining of RULON and PTFE so that a customer working with these materials for the first time may save the hours usually spent experimenting with any new material.

This paper is directed to the many companies who prefer to buy materials in molded or extruded form and do their own machining. RULON and PTFE will be treated together. Where techniques differ, each will be given its own recommendations.

### **Availability**

Both RULON and PTFE are available in any desired length of rod or tubing of 2 inch diameter or under. Standard screw machine practice usually limits bar length to 12 feet. Rods and tubes from 2 inch to 12 inch diameter can be ordered in any length up to 12 inches maximum.

### **Cutting**

Either material in diameters up to 1/2 inch and sheet thicknesses up to 1/4 inch can be cut with a steel knife blade mounted in a kick-press. Care must be taken to see that the material is firmly held under the blade and that the blade itself is rigidly mounted with a strong frame. Without such a frame, blade deflection will cause an angular cut-off.

### **Sawing**

Sawing is easily accomplished with these materials in any thickness. For hand saws, use a coarse-bladed hacksaw, since the fine-tooth blades tend to gum with material. Power sawing with a skip-tooth blade band saw is preferred, as the length of the blade will tend to dissipate heat.

---

Warranty Information: All information contained herein is believed to be correct but is presented without any guaranty, warranty or representation of any kind, express or implied. Technical data set forth herein is based on tests and measurements conducted in our laboratory under controlled conditions. Suggestions concerning possible applications of our products are made without representation or warranty that such use is free from patent infringement and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated, or that other such measures may not be required.

## Centerless Grinding

RULON and PTFE are both centerless ground without difficulty. Tolerances of +/- .001 inch are easily held, and a total of .001 inch can be held by a careful operator. The work cutter should be slightly above the center line to round up the material and on the center or slightly below for the finish cut. A set-over angle of 4° pitch is advised with 2° to 9° entrance angle on the grinding wheel. Generally, a medium all-purpose wheel is satisfactory. For rough passes, up to .012 inch can be removed, but a final pass at .004 inch will result in a superior finish. Cleanliness of wheels and coolant are important. Any metal dust will become embedded in these materials during grinding. A steel or wooden tube or "U" channel is helpful in grinding to prevent whipping in small diameters as the material is fed into the wheels. Keeping on the low side of a grinding tolerance is advisable.

## Drilling

A high speed on PTFE and a slow speed on RULON is recommended. Drilled holes tend to become undersized after drilling or reaming and should be checked after 24 hours at room temperature (70°F). Water emulsion type coolants are helpful in maintaining dimensions.

## Tapping and Threading

Regular high speed plastic type taps and dies can be used. Four flute taps have less surface friction and, therefore, cause less heat distortion. A slightly oversized tap will maintain the required size. Entrance points should be chamfered to reduce thread tearing.

## Reaming

Reaming is not particularly effective with PTFE and RULON materials. Soft and springy, the work deflects under pressure. When reaming is tried at least .005" must be removed. Coring to size is recommended.

## Turning and Machining

For lathe work a high speed is best for PTFE, but RULON must be run slower in order to prolong tool life, if using ordinary steel. For RULON, we always use Carboly Type 883 tool tips. It is imperative to keep tools very sharp. A feed rate of .015 inch per revolution gives the best results. The final cut should be at least .004 inch. Use a 15 inch tool clearance, and move shavings away rapidly to avoid tangling. Coolants are not necessary but will help maintain dimensions by dissipating heat.

## Screw Machining

We use Carboly Type 883 tips for all tools on RULON, and H.S.S. for PTFE and water-soluble oil for cooling. Once again, cleanliness is imperative. In our own shop we never alternate between metals and plastics on the same machine. This will, of course, be impossible for most shops, but a thorough cleaning is a must. Feed tubes are usually neglected. An iron pipe tube can cause considerable scratching to these materials. We now use a fiberboard insert in the tube and are careful to change it frequently.

## Recommendations

SURFACE SPEED (F.P.M.): Maximum speed of machine for PTFE; 400 for RULON

	SIDE	FRONT	BACK (CUTOFF)
CLEARANCE ANGLE	10°	15° to 25°	-----
RAKE ANGLE	5° to 12°	0° to 5°	3° to 7°

A feed rate of .004 to .006 inches per revolution is excellent in working with stock of .125 inch diameter or smaller; the bar will have to be supported during forming either through a center hole or on the side opposite the tool. Some very small diameter pieces have been handled successfully only by using a much larger diameter ground rod and forming the required diameter just prior to cut-off.

We're ready to put our engineering expertise to work for you from prototype to production.

Engineering | Custom Fabrication | Manufacturing



## CJ Composite

- Self-Lubricating
- Low weight | High Strength
- Chemical Resistance
- Direct replacement for Bronze



## Ultracomp<sup>®</sup>

- Self-Lubricating
- High Load | Low Speed
- 54,400 PSI Compressive Strength
- Exceptional Resistance to Vibration and Impact



## TriSteel<sup>™</sup>

- Self-Lubricating
- High Load | High Speed
- Metal Backed Bearing System
- 100% Lead Free



## Rulon<sup>®</sup> Fluoropolymers

- Self-Lubricating
- Low weight | High Strength
- Low Coefficient of Friction
- Chemically Resistant



## Enhanced Materials Division

- Plasma Surface Treatment
- Asymmetric & Symmetric Filtration Membranes
- Specialized Primers & Coatings
- Material ID & Selection



TriStar



Engineered Plastic Solutions<sup>™</sup>

[tstar.com](http://tstar.com)



1.800.874.7827