

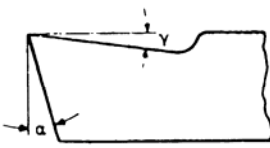
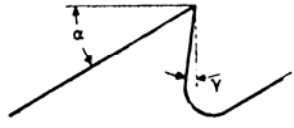

Machining Röchling Polystone UHMW Materials

Semifinished parts can be easily sawed, turned, planed, milled, drilled, threaded or punched on equipment generally used for fabricating wood and metals. Sharp tools with wide tooth spacing are necessary for adequate chip clearance and heat removal. Normal tool steel is usually satisfactory, however, high speed steel and carbide tipped cutting tools may be more economical for the long term.

Optimum cutting speed is 800-3300 ft./min. Lower speeds do not require cooling. Higher speeds result in better quality surface finish and a cleaner cut, if frictional heat buildup is removed. Otherwise material accumulation on the cutting surface and part deformation may result. Air, water and dilute soluble cutting oil are used as coolants.

When dimensional stability is important, the part should be annealed at 210° - 370°F. Stresses from molding and machining operations will be essentially relieved, depending upon part service conditions.

Recommendations and Tool Geometry for Machining Röchling's Polystone UHMW

MACHINING METHOD	CUTTING SPEED, ft/min	FEED RATE, in/rev	RAKE ANGLE a, °	CLEARANCE ANGLE b, °	GEOMETRY
PLANING	8,000-12,000	0.012-0.030	20	15-20	
TURNING	600-1,300	0.004-0.020	0-25	5-30	
MILLING	600-12,000	0.010-0.030	10-15	10-20	
SAWING BAND CIRCULAR	3,000-6,000	0.0008-0.0040 ⁽¹⁾	5-8	15	
	3,000-13,000	0.0008-0.0040 ⁽¹⁾	0-15	10-15	
DRILLING ⁽²⁾					 <p>^{*)} Helix angle γ_2 at the chisel edges</p> <p>^{**)} Clearance angle measured at the chisel edges</p>
HOLE DIAM, in.					
<0.8	150-500	0.004-0.012	60 ⁽³⁾	10-20	
0.8-1.6	150-500	0.004-0.012	120 ⁽³⁾	10-15	
>1.6	150-500	0.004-0.015	140 ⁽³⁾	10-15	

NOTE: (1) in./tooth

(2) Helix Angle (c), 10-30°

(3) Angle of Point (d), °

Planing

Röchling's Polystone UHMW can be successfully planed with standard wood planers or metal shapers, operating at high cutting speeds. Using sharp stellite or carbide tipped blades, feed rates of up to 0.030 in./rev. can be achieved.

Turning

Röchling's Polystone UHMW may be easily machined on conventional wood or metal working lathes, producing a quality finish. Cooling is not usually necessary, but care is required to remove all swarf. When cut depth is large compressed air or cutting oils are required. Cutting speeds up to 1300 ft./min. may be used with feed rates of 0.004 -0.020 in./rev.

Milling

Standard and high speed machines are suitable for machining Röchling's Polystone UHMW. Special machines with horizontal, vertical, angle, and arc milling attachments permit economic large scale production of parts. Tools with coarse pitch are recommended to assure the most efficient swarf removal. Cutting speeds up to 12,000 ft./min. can be used with feed rates of 0.01-0.03in./rev.

Sawing

Röchling's Polystone UHMW can be cut with standard band and circular saws used for wood or manually with sharp wood or metal hand saws. A wide tooth spacing of 1/8" to 3/16" is recommended to facilitate chip removal during cutting. Band saws are preferable for large cross-sections since heat is conducted away allowing for high cutting speeds. Recommended tooth pitch is 0.12 - 0.40 inch. Teeth should have a slight amount of set to prevent wedging. Circular saw speeds may be lower than band saws. When circular saws are used, tungsten carbide blades are preferred.

In general, higher cutting speeds produce a cleaner cut surface, but speed is limited by frictional heat buildup. Cutting speeds up to 13,000 ft./min. may be used.

Drilling

Drilling can be performed with a drill press, lathe, or milling machine. Twist drills are generally used for large diameters, circular cutters are also acceptable. Local overheating can be normally be avoided with good chip removal. This can be accomplished by frequently removing the drill for the hole to clean out chips. If excessive heating occurs, cooling may be achieved with compressed air, water or dilute soluble cutting oil. Cutting speeds should be limited to 500 ft./min.

Thread Cutting

Conventional threading equipment can be used for Röchling's UHMW. Round threads are preferable, but vee threads still possess adequate strength properties because of the high notched impact strength of the Polystone UHMW material. Band Screw diameter spindle speeds range from 1,000 to 5,000 rpm for screw diameters of >1" to <0.124", respectively. Cutting feeds of 0.007 to 0.015 in./rev. for cutoff and 0.002 to 0.003 in./rev. for shaping should be used.

Punching

Röchling's Polystone UHMW can be punched without breaking or cracking. A progressive step punch is recommended with final wiping stage before the stripper plate