

<p>Sawing & cutting</p>	<p>1. Use light, evenly applied pressure, heavy pressure may result with the blade being clogged up with dust particles. 2. It is essential that adequate support is provided to prevent the material from moving whilst cutting. Failure to do so may result in chipping or uneven cuts. Clamps are one method used to fasten the material. 3. For volume production or very thick pultrusions, it is advisable to use water-cooling tools. The use of water-cooled blades will help to eliminate any dust created, increase cutting speeds and create a neater cut. 4. Always use diamond or carbide tipped edge blades to avoid excessive blade replacement. 5. There are many different types of saws that can be used depending on the type of profile and the volume of cuts.</p> <p><i>The decision between a hand or a power saw depends on the volume being cut. A circular power saw is suitable for straight line sawing. The hand model is ideal for on site fabrication and the table saw is recommended for volume cutting and is more accurate. A radial arm saw is suitable for large or thick sections. A radial arm saw with a swivel head can be used for mitering. A sabre / band saw is suitable for small quantities, curved and irregular shapes. A hand router is used for large quantities of curved cuts. It is important to remember that the cut produced by the router may be larger than required and the bit has to be well designed. A hack saw is suitable for cutting rods and bars - a power saw is recommended for large volume production.</i></p> <p>Sawing & cutting guidelines:</p> <ul style="list-style-type: none"> - Speed is very important, too fast a cut will result in uneven cuts. - If the edges start to fray, slow the speed down. - The thicker the part, the slower the speed of the cut.
<p>Drilling</p>	<p>Pultrusions can easily be drilled. Any standard high-speed drill bit will be suitable for low volume production. For large quantities either cobalt bits or carbide tipped drills are recommended. Holes drilled in pultrusions are generally undersized by 0.05 mm to 0.15 mm. A 3 mm drill bit will not be suitable to admit a 3 mm expanding rivet and a 3.25 mm drill bit is required. It is always advisable to oversize the drill bit to compensate for any shrinkage or for variation in fastener dimensions. For large holes a back up plate of wood will prevent splitting on the reverse side of the material.</p>
<p>Grinding</p>	<p>Exel Composites does not recommend that pultrusions should be ground. During the typical grinding operation the dust generated will load the stone and stop the grinding action. In certain circumstances it may be necessary to grind - for example notching, tidying up inaccuracies in primary cuts, touching up edges and recessing an internal wall.</p> <p>When grinding:</p> <ul style="list-style-type: none"> - Use any standard gringer with a carbide grinding wheel and water as a coolant. - Pay constant attention to the wheel surface. - Centerless grinding is very accurate for rods and tubes.
<p>Routing</p>	<p>By using a router, square holes, straight lines and angles can all be made. Both hand held and table top type routers are suitable. Carbide or diamond tipped bits are essential for volume production. Light pressure should be applied when making a cut, excessive pressure may cause the pultrusion to heat up and soften. Special bit routers are ideal for cutting radii, keyways and other milling operations.</p>
<p>Threading and turning</p>	<p>Standard metalworking equipment is suitable for "turning" pultrusions. Tool steel cutters are suitable for short production runs. For large production quantities carbide tool bits are essential.</p> <p>Turning guidelines:</p> <ul style="list-style-type: none"> - In general, dimensional tolerances should match cold rolled steel tolerances. - Round nose lathe tools will give a good finish however, the tool should have very little clearance; a single point may tear the material and result in round corners instead of sharp ones; the material should be fed continuously and steadily - stopping and starting will result in jagged cuts; and speed has to be geared to the hardness of the material. - Threaded connections are satisfactory only when strength is not an important consideration. - The use of a polyester or epoxy adhesive to bond the thread will improve the strength of the connection. - Standard taps and dies can be used for threading pultrusions, water is suitable as the cutting lubricant. - When tapping a blind hole, adequate clearance should be left at the bottom of the hole to prevent the top from bottoming and damaging the threads.
<p>Shearing</p>	<p>Effective shearing can be achieved by using a specially shaped blade that allows only a small portion of the cutting edge to cut the pultrusion at any one time. Shearing is useful for large production applications particularly for thinner profiles. All shearing should be done perpendicular to any continuous fibres in the pultrusion. Do not shear pultrusions thicker than 4.5 mm. The rules and guidelines for punching are also valid for shearing.</p>
<p>Sanding</p>	<p>Always use a light pressure - heavy pressure may result in the pultrusion heating up and softening. Open grit sandpaper on a high speed sanding wheel gives the best results. Wet fine grit sandpaper applied by hand or with an orbital sander will produce a high gloss finish.</p>