

GEP ALUMINIUM MACHINING

Introduction:

Machining and fabrication of aluminium requires certain special techniques to ensure successful outcomes. These guidelines will provide some important considerations to be applied.

1. Aluminium is relatively soft and ductile and the constraints of the various grades when machining need to be well considered. Machining swarf formed tends to be stringy and tenacious. This can turn back on the work and re-weld itself onto the work.
Age-hardened and work-hardened alloys machine well, but still form long stringy swarf. Free machining alloys have been specially developed for automated turning operations. These alloys include elements that break up the swarf into chips.
2. Due to the relatively soft nature of Aluminium, machining should in general take place at faster speeds, higher rake angles, and the work must be cooled. To minimize heat effects rough machining can first be done, then tempering, followed by final machining to design.
3. Handling of aluminium sheets and other shapes in workshops requires much care. The hard oxide surface is susceptible to scratches which lead to stress concentrations and contribute to fatigue. Handling scratches and the use of scribes to mark out work must be avoided.
4. As with all machining of all materials special considerations should be given to jigs, fixtures, tool materials, angles, speeds and feed rates to obtain optimum results. Selected guidelines follow. Consult as well with competent material suppliers and tool suppliers.
5. Tools and tool materials are a specialized field and one can do well to work in close co-operation with specialist tool suppliers. Generally aluminium cutting tools are carbide tipped steel and run at higher speeds than with other materials.
6. For drilling work use twist drill bits with 125 to 140 angles, and apply high speeds.
7. For reaming work use rake of 5 to 10 degrees and helical fluting.
8. For sawing work use blades with alternating long and short teeth. When cutting, heat deformation and loss of tensile properties needs to be avoided
9. Bending – Because the ductility of aluminium is lower than structural steel, bending needs to include a bending radius of about four thicknesses to avoid cracking. There are also tables of minimum bend radii available from prime sources.
Bending temperature should be set at around 250°C, and 400°C at the bend point.
10. Bolt holes should be under-drilled and reamed. Friction bolts should be avoided. Bolts should preferably be 3xx stainless steel or cadmium plated to avoid galvanic corrosion.

All checklists, and other support documents supplied by E4A are supplied as general guidelines only and no warranty or guarantee is intended nor provided. All risks of use reside with the person or organization using these checklists or other documents.