



elementsix™
DE BEERS GROUP

Friction stir welding (FSW) tool solutions for aluminium

Competitive advantage through innovation

Why Element Six

- **In-house end-to-end manufacturing capability** and a global operational footprint ensure we can effectively service customers worldwide
- **Unrivalled innovation and application knowledge** - a leading team of engineers and scientists enable Element Six (E6) to provide customer-specific friction stir welding (FSW) tool solutions
- **E6 collaborates** with a wide range of leading FSW machine providers and other end-users to ensure that we can offer competitive solutions tailored to customer requirements
- E6 synthetic diamond composite tool solutions for aluminium have proven to be **price competitive** compared to traditional FSW tools



E6 is a world leading supplier of advanced material tooling solutions, including a range for the FSW of aluminium. We offer a complete package of cost-effective products, tailored to a diverse range of customer requirements

Advantages of FSW with E6 synthetic diamond composite tools

- **Exceptional weld quality:** minimal porosity, no filler wire and excellent surface finish
- **High productivity:** reduced tool wear and extended uptime
- **Sustainable process:** no fumes, shielding gases or consumables
- **Superior mechanical properties:** high fatigue strength and corrosion resistance
- **Dissimilar material capability:** proven performance in aluminium-to-steel and aluminium-to-copper joints
- **Tooling designed around your needs:** engineered tools to meet your specific application and machine parameters



E6 FSW synthetic diamond composite tools

Technical specifications

- **Tool material:** synthetic diamond composite
- **Tool life:** our tools have been tested up to 10 km/ 6.2 mi in 6xxx Series aluminium grade with minimal wear
- **Welding speed:** tested up to 5.6 m/min or 18.37 ft/min (speed dependant on alloy and thickness)

Tool geometry options

- Threaded or featureless probes (application dependent)
- Concave or scroll shoulder
- Pin profile options for lap, butt and t-joint weld configurations

Compatible aluminium grades

- **2xxx Series:** high strength, aerospace-grade (2024, 2618)
- **5xxx Series:** excellent corrosion resistance (5083, 5456)
- **6xxx Series:** versatile structural alloys (6061, 6082)
- **7xxx Series:** ultra-high strength (7075, 7475)
- **Cast aluminium** (A356, 319, A390, ADC12)



Element Six is a global leader in the development and production of synthetic diamond and tungsten carbide solutions. For 80 years, our innovation expertise has enabled a wide range of industries, from aerospace and mining, to semiconductors and sensing. Part of the De Beers Group, our primary manufacturing sites are located in the US, UK, Ireland, Germany and South Africa. Our sites in Ireland, Germany and South Africa are ISO 50001 certified. All sites are ISO 14001 certified.

Through the De Beers Group, Element Six is a member of the UN Global Compact (UNGC). The UNGC drives business awareness and action towards the UN Sustainable Development Goals (SDGs), focussing on 10 principles around human rights, labour, environment and anti-corruption. Element Six works within the De Beers Group Building Forever commitment and Science Based Target Initiative (STBi), which is also based on the UNGC principles.

We incorporate and take responsibility for these principles through the Element Six Code of Conduct, Our Values, Responsibilities and Policies.

At Element Six, we have active communities working towards sustainability from a variety of angles, such as environmental impact, inclusion, diversity and community outreach, both internally and externally.

Contact us

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