

## Stainless steel vs Titanium and Aluminium

This section is not intended to be a beginners course in metallurgy, far from it ! Its purpose is to try to help to "demystify" the product with regard to its application on motorcycles and also to give the answers to frequently asked questions concerning the product Inox fasteners sell.

Please also bear in mind that stainless steel is a multi faceted subject. These pages deal with stainless fastener grades and their likely application on Japanese motorcycles - nothing else. These information pages contain the absolute minimum in terms of jargon and flowery language.

Any weird sounding terms are explained (hopefully) as they are written. If you are a Metallurgist you'll probably find it a bit beneath you!

Firstly, stainless steel is essentially a British invention and has been around for the last eighty years or so. Discovered by accidentally by Harry Brearley in Sheffield in 1913 whilst he was experimenting with new alloys for weapons materials. That said it was the German company Krupp who produced the first austenitic (non magnetic) grades a few years later. It is an amazing product its surface is protected by a passive film that repairs itself if it is broken or scratched. It can be left in it's raw state or polished and of course never needs additional plating or protection. In short, its potential service life is unlimited, it is the ultimate fit and forget material.

Many people perceive stainless to have two main features, its ability not to corrode and an extremely high price tag. The ability not to corrode is not in doubt, but the high price tag? You would expect the superior metal to be more expensive, compare the cost of the allen screws in Inox Fasteners crankcase screw sets in electropolished finish to the cost of original manufacturers equipment in zinc plated tensile steel and then decide! If at that point you are not convinced, remind yourself of the comparative service life! If that doesn't work, buy the mild steel, wait a year or so, then ask your self again.

Apart from mild steel the only other fastener material options are Aluminium and Titanium. We are sometimes asked about these materials. Briefly...

### TITANIUM

Excellent material for motorcycle fasteners. Can be polished, anodised in certain colours (usually blue) but works just as well in mill finish state. Ti is as strong as stainless but density about the same as Aluminium. Downside is expensive to machine and cheaper grades can become brittle. There is a weight saving over stainless of course but go to the pub and have one pint, get back on your bike and the weight saving has gone! Incidentally you cannot buy a titanium screw for the price of a pint - check out our scooped head screws!

### ALUMINIUM

Manufacturers of Aluminium fasteners have a difficulty.....

Aluminium Alloy is an inherently low tensile material when compared to any form of steel. It needs protecting or it will corrode, hence the pretty anodic finishes. The most suitable grades for anodising tend to be very weak and completely unsuitable to make fasteners. The 'stronger' grades will accept the anodised finish for a while then fade. "Strong" grades of Aluminium tend to corrode more quickly than softer grades.

Most manufacturers use the 2014T6 or HE15 grades of aluminium, with which to manufacture Ali bolts because it is effectively the 'strongest' aluminium rod available. However, 2014 is an aluminium/copper alloy and does not stay decoratively intact for very long. I know people that have experienced failure with such material after four to five months. Another alloy used by some aluminium fastener manufacturers is type 7075, an Aluminium/Zinc alloy. Performance characteristics are similar to 2014.

The end user of aluminium fasteners MUST be extremely careful in the choice of precise application because of the weakness referred to earlier. Aluminium fasteners are often sold as "high tensile aircraft aluminium" - a rather ambiguous statement! There is no such thing as high tensile aluminium. Similarly, there is no such thing as "high tensile stainless"

Another seemingly curious fact concerning Ali fasteners is that the distributors often provide a mild steel hex key to fit the fasteners. As soon as the key is used it will scratch through the anodic layer, leaving a layer of mild steel behind, to start a corrosion convention. When a mild steel tool is used to fit stainless screws the passive film repairs instantly and the steel residue will have nil effect.

Aluminium fasteners have become more popular over the last few years. Their main attraction is the anodised finish, they are often available in up to 6 colours but at a price way in excess of Inox Stainless prices. Not only are they very expensive, but their life expectancy tends to be very short, the anodised layer on anodised screws is way below the minimum thickness defined by ISO standards as suitable for exposure to weather. To qualify that statement scientifically, BS/ISO standard for the thickness of the anodised layer is 25microns. On 7075 and 2014 grades you will be lucky to achieve between five and ten microns. The anodiser often cannot achieve a sufficiently thick layer to make the product surface appear consistent that's why aluminium screws of the same colour often have different shades.

Authors note: You wouldn't expect any other type of statement from somebody selling stainless screws! I spent ten years working in the stainless and aluminium alloy industry and a spell with an anodising company.