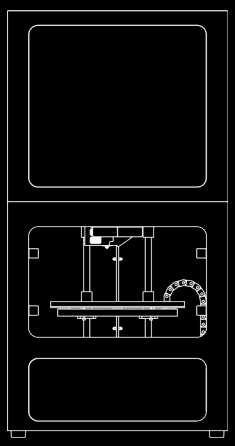
Bremar



Industry	Automotive
Application	IndexLok - Serrated Washer Alignment Set
Technology	Metal X
Materials	17-4PH Stainless Steel

Markforged

The Challenge

Bremar Automotion is a Melbourne-based engineering design company that uses advanced software and in-house 3D printing to create lighter, stronger, and more efficient products for its clients.

For race cars, making fine-tuning adjustments in tight spaces has always been a problem. Mechanics often rely on “camber bolts” or “slot bolts,” which are clumsy to use and depend on friction to stay tight, creating a risk of slipping under the extreme forces of racing.

Traditional manufacturing methods presented their own problems:

- **Size Limitations:** Parts had to be large for grooves and teeth to be machined accurately.
- **Limited Performance:** The final product only allowed for a few millimeters of adjustment.
- **High Costs & Delays:** Minimum Order Quantities (MOQs) made it expensive and slow to get a single custom part.

The Solution

Bremar designed a smarter, two-piece solution:

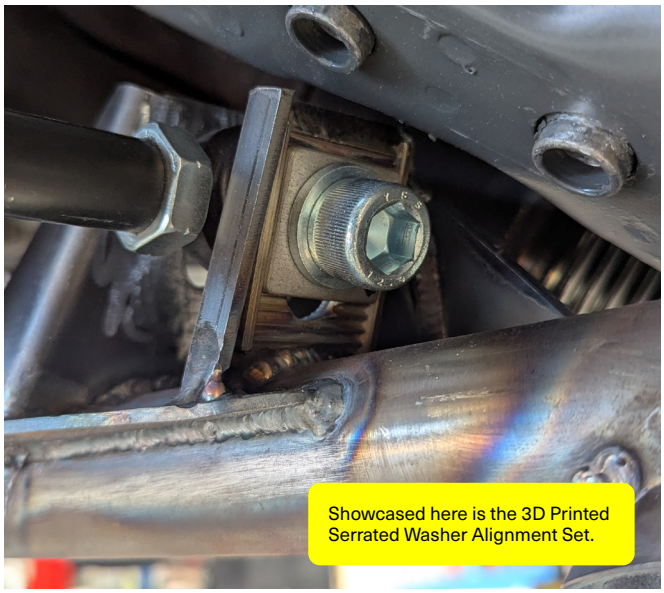
1. A **slotted washer** designed to be welded onto the car’s frame.
2. A **holed washer** that mates with the first using precise, interlocking serrations (teeth).

When bolted together, these serrations lock the assembly into place, reducing the need for friction and preventing any slippage. The team used their Markforged Metal X printer to create the washer set from durable stainless steel.

> “3D printing offers greater accuracy in the production of small, intricate parts than would be possible using traditional methods, so we have achieved a better outcome in a smaller space with a hardened steel part that can be welded in place.”

— Tim Woods
Engineering Manager, Bremar





Showcased here is the 3D Printed Serrated Washer Alignment Set.

The Solution (cont.)

A major advantage of this approach is the ability to create fully custom parts on demand.

The new design is a significant improvement over the old method, offering advantages that traditional manufacturing simply couldn't match.

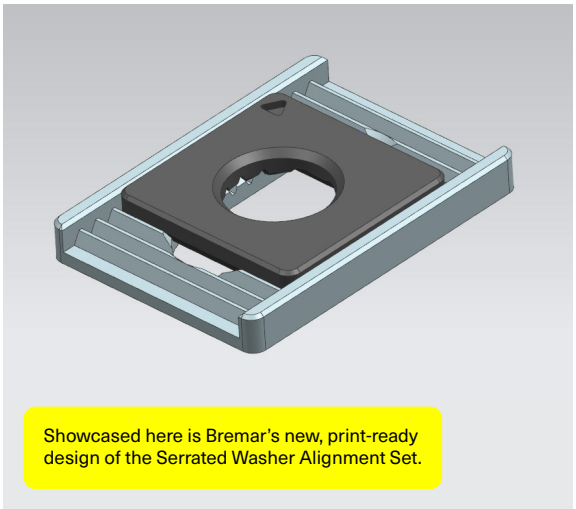
> "A massive bonus is that we have a design that is totally customizable. We just enter the customer's key parameters—like hole size and travel distance—and the model builds itself. We can have it on the printer in five minutes!"

— Tim Woods
Engineering Manager, Bremar

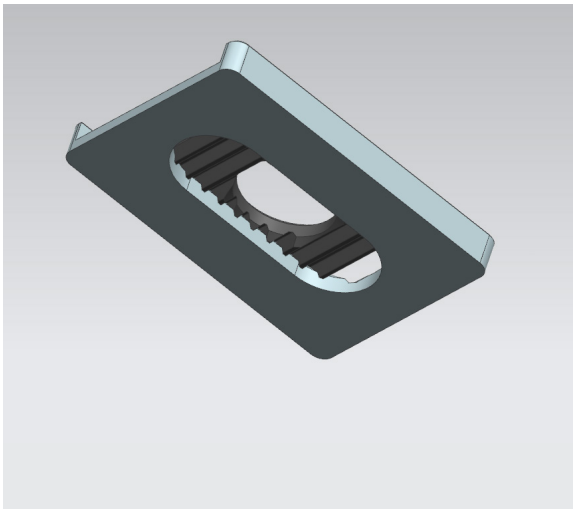
- **Superior Performance:** The new washer provides almost limitless range of movement—a huge increase when compared to the few millimeters offered by old camber bolts—all within a smaller footprint.
- **Increased Safety:** By using interlocking teeth instead of friction, the part is far more secure and reliable under load.
- **Total Customization:** Parts can be tailored to a customer's exact specifications and printed in minutes, without the long lead times of traditional machining.
- **No Minimum Orders:** It is just as easy and cost-effective to produce a single, unique part as it is to produce a large batch.

> "In this situation, Additive Manufacturing can achieve things that are simply not possible using traditional methods."

— Tim Woods
Engineering Manager, Bremar



Showcased here is Bremar's new, print-ready design of the Serrated Washer Alignment Set.



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