



**PARAGON**  
Rapid Technologies

# CASE STUDY

## Low volume production: Vacuum cast engine covers

The perfect low volume solution: Twisted sources locally, and saves time and money with vacuum cast engine covers

Paragon Customer:  
**TWISTED**

Type of Company:  
**Niche Automotive, specialising in the customisation of the Land Rover Defender and the Suzuki Jimny**

### ABOUT TWISTED

**TWISTED** is a niche automotive company based in North Yorkshire. With a global audience of Land Rover Defender enthusiasts, their mission is to convert this iconic vehicle to be the best that it can be.

### THE NEED

**Twisted Land Rover Defender** model conversions are, predominantly, commissions. They are built on demand and to the owner's specifications. This means a maximum of 4 - 5 vehicles in production in any one month. The conversion process time is dictated by need; and, as with all high-end customer bases, on-time delivery is key to both success and exemplary customer service.

Engine re-mapping and redesign to deliver increased horse power are the cornerstones of Twisted's reconstruction of the iconic Land Rover Defender. As a result of this increased capacity, the engine covers required remodelling to accommodate additional components.

Twisted sought a heat resistant, chemical resistant, very low volume production solution for the engine covers. On-demand production was essential; as was delivery in a relatively short time-frame. Ideally, the parts would be produced within 30 miles of their Thirsk workshop and showroom.



### VACUUM CASTING

A versatile and efficient manufacturing process that enables the production of high-quality prototypes and low-volume production parts with a wide range of materials and finishes.

## THE SOLUTION

After reviewing requirements, Paragon recommended using the vacuum casting process as a low volume production solution. Using a simple, 2-part silicone mould would be the most cost-effective means to create the part; and the mould would be good for 25 - 30 parts.

Paragon would, ordinarily, make the master pattern for the silicone mould, either through the cost-efficient, pin-point accurate SLA or SLS 3D printing processes; or through CNC machining. However, Twisted already had a master pattern for an alternative process that could be used, thus enabling further savings.

The material for the engine covers needed to be both chemical and heat resistant - engines are greasy, and get hot! Twisted and Paragon explored two vacuum casting materials: PU8263 and VG5285. The highly heat resistant PX234 was not trialled as its use is detrimental to silicone moulds, shortening tool life by as much as 75%. The flame retardant, UL94 V-0 rated PU8263 was, after much consideration, dismissed. A flame retardant material would have been ideal; however, flame retardant materials may not necessarily have good heat resistance; in fact, the PU8263 heat resistance comes in at just 80°C. The VG5285, on the other hand, shares a number of similar attributes but has a heat resistance of 120°C.

Paragon's role was to create the tool, cast the parts and deliver them to Twisted, fettled, finished and ready for painting by Twisted's contracted automotive paint specialists, [Hydro-Graphics](#).



## 3 DAYS TURNAROUND TIME

Once the tool was created, typical turnaround time for the covers, from casting to finishing ready for painting and delivery, was 3 - 4 days



# VG5285

## POLYURETHANE

Heat Deflection: 120°C

Ultimate Tensile Strength: 45 MPa

Impact Resistance: 8.3 kJ/m<sup>2</sup>

Flexural Strength: 55 MPa

## RESULTS

Paragon's ethos is one of collaboration, to ensure a swift and sustainable outcome. Working with Twisted's Chief Engineer and Head of Research and Development, Owen Mortimer, a suitable low volume solution was achieved quickly.

With an existing master pattern, savings in both time and costs were made at the tooling stage. As a low volume solution, silicone tooling is probably the most cost-efficient means of production. The vacuum casting advantage occurs not just from a wide array of suitable, heat resistant polyurethane resins, but also in the time it takes to produce the part.

The engine covers can be cast, fettled, finished for painting, and delivered in as little as 3 days. For new covers, Twisted simply need to drop Paragon a line with order numbers. They'll have them far faster, and at a more beneficial cost than if they'd pursued the Injection Moulding route.

*Images courtesy of Twisted Automotive*

