

# **BMW STUB AXLE CONVERSION FOR A LOTUS EUROPA**

## **BACKGROUND**

A problem I've seen on S2 Europas is loosening rear hubs and stub axle breakages. If the retaining nut is not tight enough, the hub works loose. Increased torque on the retaining nut MIGHT work, but this seems to lead to failure of the stub axle.

I had suffered from loosening of the hubs for many years, as well as rapid degradation of the driveshaft universal joints. I was determined to cure both problems and decided to fit CV jointed driveshafts, upper suspension links, and new stub axles. The following details the stub axle conversion for a Europa using the driveshaft as the upper suspension link.

At the time of the original conversion I had an Alfetta GTV 2000, and I notice that the driveshafts were exactly the right length for my design (400mm flange to flange, 420 extended, 380 collapsed). In the past I had seen CV joint conversions on Elans, and these all used cut-and-shut VW shafts, or uniquely machined shafts (very expensive!). I wanted shafts that I could pick-up complete from a wrecker, in case I needed spares. These shafts unfortunately use SPICA CV joints, which are not readily serviceable. Perhaps I should have tried to find something which uses Lobro CV joints (VW or BMW). I purchased an Alfetta rear end, intending to use the Alfetta stub axles as well, but these proved to be too short.

My next choice of stub axle was BMW. I had previously owned a 2002, and thought they should be OK. In retrospect, I probably should have fitted BMW drive shafts as well. I visited my local BMW specialist in Melbourne, and found they had bucket loads of stub axles and hubs. I selected a pair of stub axles with a 30mm shaft diameter. This shaft diameter would press straight into the existing outer bearing in the Europa. The inner bearing on the Europa is a bastardized 6006 bearing machined out to suit a 31mm shaft. New 6006 bearing with a standard 30mm diameter are really cheap, and can be supplied fully greased and sealed.

The flanged end of the stub axle (that attaches to the driveshaft) is basically flat.

I think the original stub axles I used came from 2002Tii or 2000. The second set came from a 320 or something similar. Anyway, take the attached sketch along to ensure you get the right parts.

## **WHAT YOU NEED**

This conversion requires

- a pair of BMW stub axles with 30mm shafts, matching hubs and nuts. Overall shaft length approx 223mm
- two new driveshafts (20mm shorter than original)
- two new U/J flanges for the ends of the drive shafts (to mate to the BMW stub axles)
- two new standard 6006 inner wheel bearings
- two new 6206 outer wheel bearings (only if required)
- 4 tubular spacers, 30mm ID
- 2 spacer rings to centralize the brake drum on the BMW hubs
- 8 x 5/16" bolts and Nyloc nuts to attach the new flanges on the driveshaft to the BMW stub axles
- adjustable lower links to fine-tune the rear camber. I assume all Europa owners have already done this!

## **STUB AXLES**

**Please refer to the two sketches. One is coloured in the help identify the different parts. The other details the dimensions of the last BMW stub axle I used**

The stub axles will need two (maybe 3) modifications

- 1 - the flange of the stub axle needs to be machined to accept the new U/J flange on the driveshafts
- 2 - drill the stub axle flange to match the bolt pattern of the new U/J flange

In the last few cars that were modified the following had to be performed

- 3 - the surface where the outer wheel bearing mounts needs to be built up and ground to 30mm diameter. This can be done by hard chroming.

## HUBS

The BMW drive hubs need three modifications

- 1 - knock out the old BMW wheel studs (approx 100mm PCD). Drill 4 new wheel stud holes on 3.75" PCD. From memory these holes need to be 1/2", and you will need to countersink the holes to ensure the studs are long enough.
- 2 - machine down the outside diameter of the hub so that it fits inside the brakes. The hub will hit the brake shoes and wheel cylinder if it is not machined down, and it will also be too big to fit against the mounting face inside the brake drum.
- 3 - a spacer ring is required on the hub, to locate and centralize the brake drum. I fitted a spacer onto the hub (with Loctite) and then machined the spacer down so that the drum was a nice snug fit.

P.S. during my recent restoration, I modified these spacers. Now they are also used to act as a pilot for centralizing my Cosmic mags

The BMW hubs are quite hard to machine and drill.

## DRIVESHAFTS

These need to be 20mm shorter than the original shafts. I highly recommend you get new shafts made. The tubing used on the Europa drive shafts is quite small in diameter, and very thin. This makes it very light, but eventually it may twist if you have a half decent cross flow engine with twin Webers.

## SPACERS

You will need 4 tubular spacers (similar to the ones used in the original Europa set-up). Two will be used between the wheel bearings (approx 65mm long), and two will be used between the outer wheel bearing and the BMW hub (approx 24mm long).

These spacers should be just over 30mm ID so that they easily fit over the 30mm stub axle. Make sure you use something with a wall thickness of at least 5mm.

You can vary the length of the longer spacer to adjust where the flange of the stub axle will sit. If your not sure, start with a longer spacer and do a dummy build. You can always remove a millimeter or two. Use the original long spacer as a guide. If the original spacer is OK – use that! Mark all spacers, stub axles and hubs "left" and "right", so the same parts always go back together in the same order.

You can vary the length of the shorter spacer to adjust where the hub and drum sit relative to the brake shoes. Start with a long spacer and do a dummy build.

## OTHER MODS

On my car with Alfetta CV joints, the O.D. of stub axle flange was approx 100mm. This required moving the spring/shock assembly rearward slightly on its lower mounting bolt. I think I used 2 or 3 washers, each one approx. 1.6mm thick.

If you don't have adjustable lower links, then the rear camber can be adjusted (more negative) by shortening the longer spacer between the wheel bearings. This would require building up the rear end, taking the car for drive to settle the suspension, then measuring the camber. You then have to strip out the stub axles and machine down the spacers and repeat the measurement process – a very slow and tedious task.

Don't forget to do a rear wheel alignment and set the toe-in.

If you need some advice or clarification, please feel free to contact me [richard.mann047@gmail.com](mailto:richard.mann047@gmail.com).

Richard Mann  
7004100119Q  
RH drive S2

Melbourne Australia.