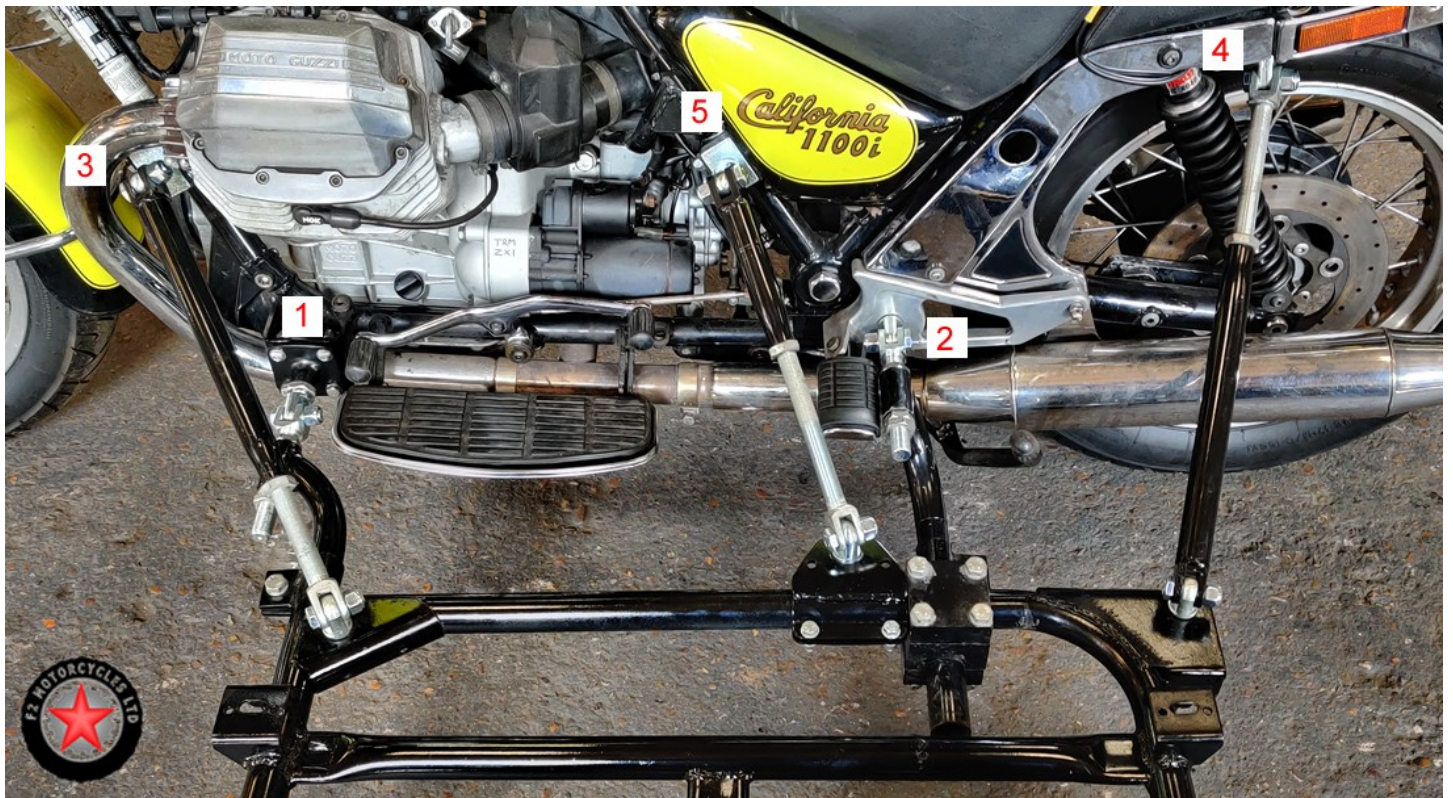


Velorex Sidecar Fitting Example

Written by David Angel of F2 Motorcycles Ltd and Simply Sidecars. This is not designed to be an instruction manual but should give an idea of what to expect when fitting a Velorex sidecar at home. The Moto Guzzi was chosen as it demonstrates some of the problems and solutions the average fitter may encounter fitting to a typical tubular steel frame. It is neither completely straight forward using only parts from the universal kit without alteration, nor is it extremely complicated requiring complex fabrication of additional subframes. It uses a five-point fitting system using parts available from F2 Motorcycles Ltd, although some of these parts require modification. Any part numbers given that start SCV are from F2 Motorcycles Ltd using the parts on its sidecar site, Simply Sidecars (www.simplysidecars.co.uk).

The Five Fittings

1. Lower Front
2. Lower Rear
3. Upper Front
4. Upper Rear
5. The Fifth Fitting



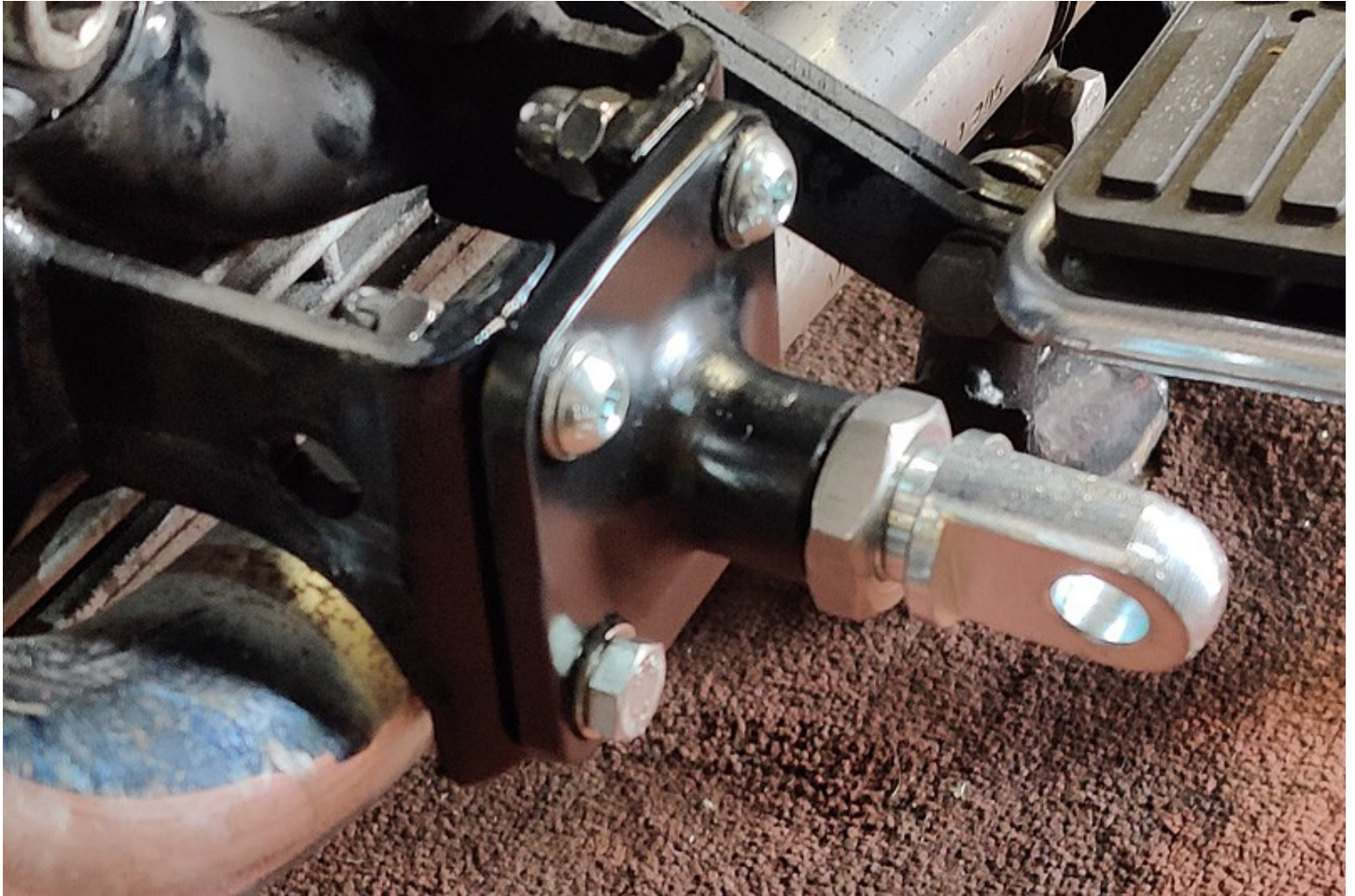
The two lower fittings (marked 1 and 2) form the main strength of the attachment, they tend to carry the most load when riding in a straight line. They are the main adjustment for toe-in.

The two upper fittings (marked 3 and 4) carry a lot of load when riding through twisty roads, they are the main adjustment for lean-out.

The fifth fitting serves to re-enforce and triangulate the other fittings. It is surprising how much extra rigidity this extra fitting adds. It also serves to spread the load across more points on both the sidecar chassis and the motorcycle frame.

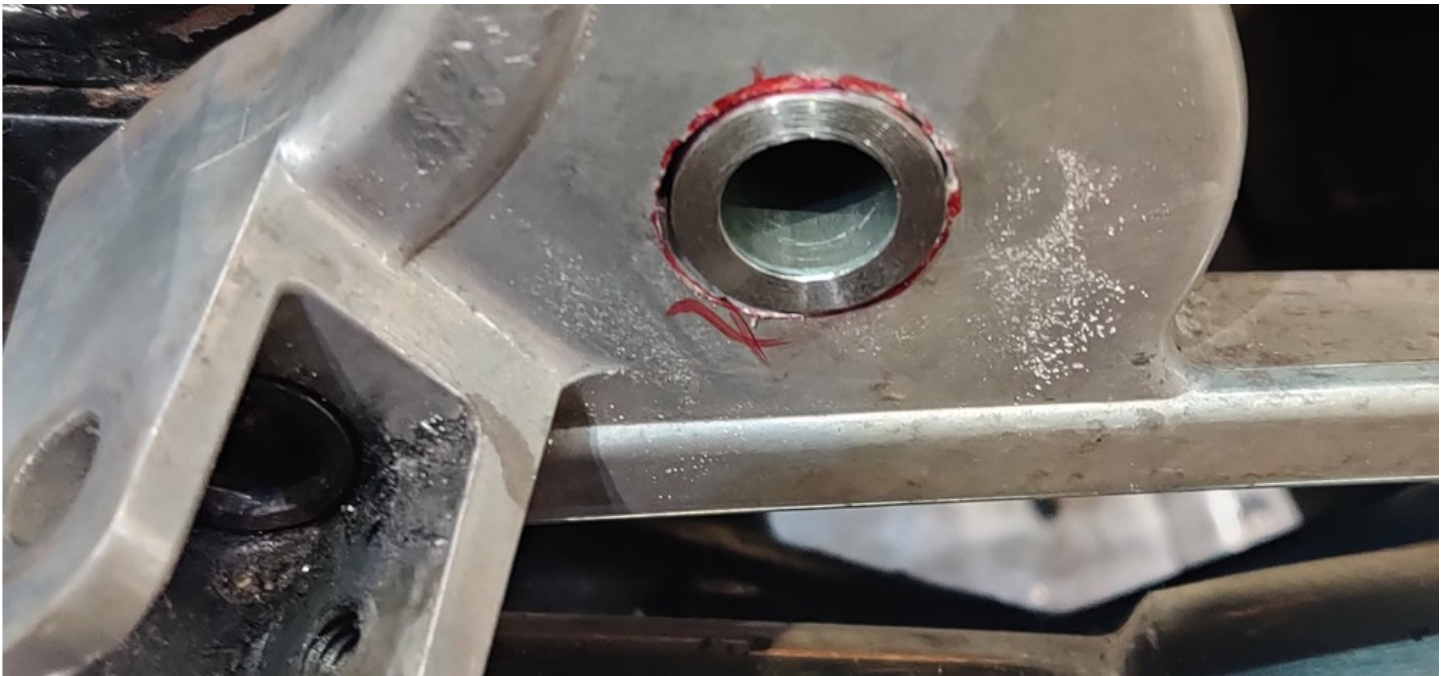
1. Lower Front

The original motorcycle had a very substantial side-stand mounting point made from 5mm steel plate and seam-welded to the frame by the factory. Normally a side-stand mount consisting of a little tab sticking out of the frame would not be considered strong enough as a mounting point, but this one certainly is. A one-off fitting was made using a threaded tube welded to a 6mm thick steel plate. This was then bolted to the original side-stand mount and a short M18 eyebolt screwed into the new mount. Part used is SCV/14 plus a 6mm steel plate and some high tensile (8.8 or above) fasteners.



2. Lower Rear

Towards the back of the motorcycle is what appeared to be a substantial alloy casting carrying both the rear footrest and the exhaust mount. Never be tempted, these alloy castings will never be strong enough however good it looks, it is simply a firm NO. But once it was removed the discovery that one of the M12 mounting bolts went through nearly 10mm of steel made things a little easier. The 12mm hole in the thick steel plate was drilled to 14mm so an M14 eyebolt could pass through it (using an M12 eyebolt was briefly considered, but M14 should generally be considered the smallest diameter for any mount on a bike of this weight and power). A steel spacer was made with a 14mm internal diameter and a 22mm external diameter. The original alloy casting was then drilled to 22mm so the new steel spacer just pushed through it and came up hard against the thick steel of the original mount. An M14 x 50mm eyebolt was fitted along with a castle nut and split pin. The castle nut was only used as there was not enough room behind the thick steel of the frame to use a nylon insert locking nut. The solution worked well, and retained the original rear footrest and exhaust mounts. Parts used SCV/2 plus M14 castle nut, split pin and a one-off steel spacer.



3. Upper Front

The upper front mount was as easy as it gets. Simply the standard Velorex universal clamp fitted to the frame. In a perfect world this clamp would have been higher up on the frame, above the exhaust pipe but on this model year there is a brace welding between the two front frame tubes right where the clamp would go. On other model years of the same bike this brace has been higher and the clamp fits above the exhaust. The world is not perfect so the clamp was fitted lower down. I often see people commenting that a clamp should never be fitted to one down-tube of a twin down-tube frame as it will break the frame. I think you need to use your common sense on this one. This bike has a frame made from 30mm tubing, it is braced side to side in two places before it gets to the headstock and the engine mounting bolt passes through both sides of the frame forming an additional brace. The clamp was placed at an equal distance between one of the frame braces and the engine mounting plate. To break the frame, both the engine mount and the original factory frame brace would need to fail. This is not going to happen. I haven't shown a picture as it is similar to the upper rear. Parts used SCV/3.

4. Upper Rear



Removing the chrome trim plates revealed a substantial and well braced 30mm diameter section of frame. Much like the upper front, the standard Velorex clamp is perfect for this fitting. The mounting point is nice and high as well as being well towards the back of the bike. The really good news is that all the chrome covers fitted back after the clamp was fitted. Parts used on this build SCV/3.

Say no to top shock mounts!

A little note here about top shock absorber mounting points. I have seen countless M10 and M12 shock absorber top bolts replaced with eyebolts for sidecar mounting. I have also seen many shear and fracture – one after only 120 miles of use. The shock absorber usually has a bush and the bush has a thin-walled steel insert. The bolt passes through this and bolts up tight. Over time this thin-walled bush deforms from the extra load of the eyebolt allowing the eyebolt to flex over and over until it suffers fatigue failure and snaps off. Please consider using a proper clamp or separate eyebolt secured to the frame rather than the temptingly easy eyebolt through the top shock mount method.

The Fifth Fitting



Removing the side panel revealed a ton of wiring and pipe work, but also more well braced frame tubing. Annoyingly the cable operated seat lock had to be removed and refitted to wrap the clamp around the frame and a section of the plastic side panel had to be cut away. (Had the bike been extremely rare and original a used side panel would have been found for cutting up and the original safely stored just in case the bike needed to be returned to standard in the future). Parts used SCV/3.

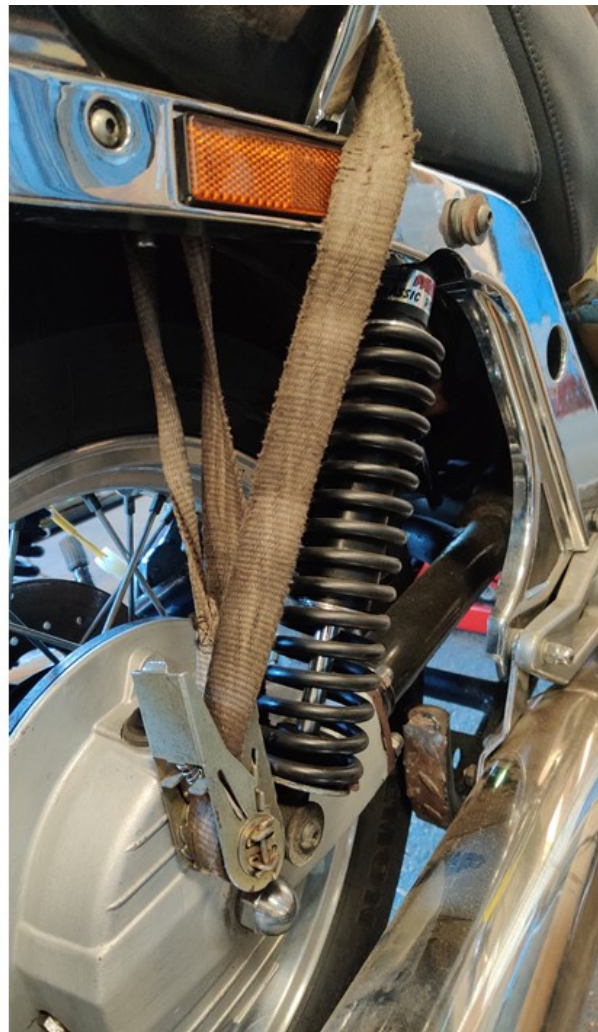
The additional strength of the fifth fitting should not be underestimated. It is at roughly the midpoint between the upper front and rear mounting points, not the same height on the bike frame as either, so it acts as a brace for both. It is true that many sidecar outfits are built with only 4 mounting points and most of them get away with it. However, I hear many tales of sidecars that go out of alignment, need constant setting up, or worse still have fittings fail out on the road. I strongly recommend a minimum of 5 fittings and on some of my builds I have used 6.

Equipment needed for fitting and set up

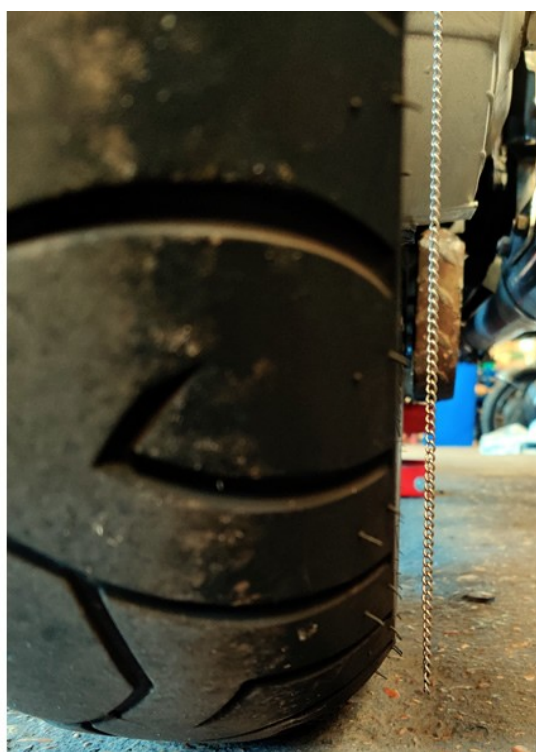
You are definitely going to need two straight things slightly longer than the motorcycle, some supports to raise them off the ground, a plumb-line and a tape measure. It is also handy to have spirit levels, adjustable stands, some way to measure very accurately, some ratchet straps, an adjustable bike stand and a few bits of thin metal to act as wedges. I do this professionally for a living, so I have some quite nice stuff, but 20 odd years ago I was using heavy angle iron, bricks and bits of wood. It works just the same, it just takes a little longer. As you can see from this picture the straight edges go each side and as close as possible to the motorcycle or sidecar. The front wheel of the motorcycle should be perfectly straight ahead.



Setting the ride height and lean of the motorcycle

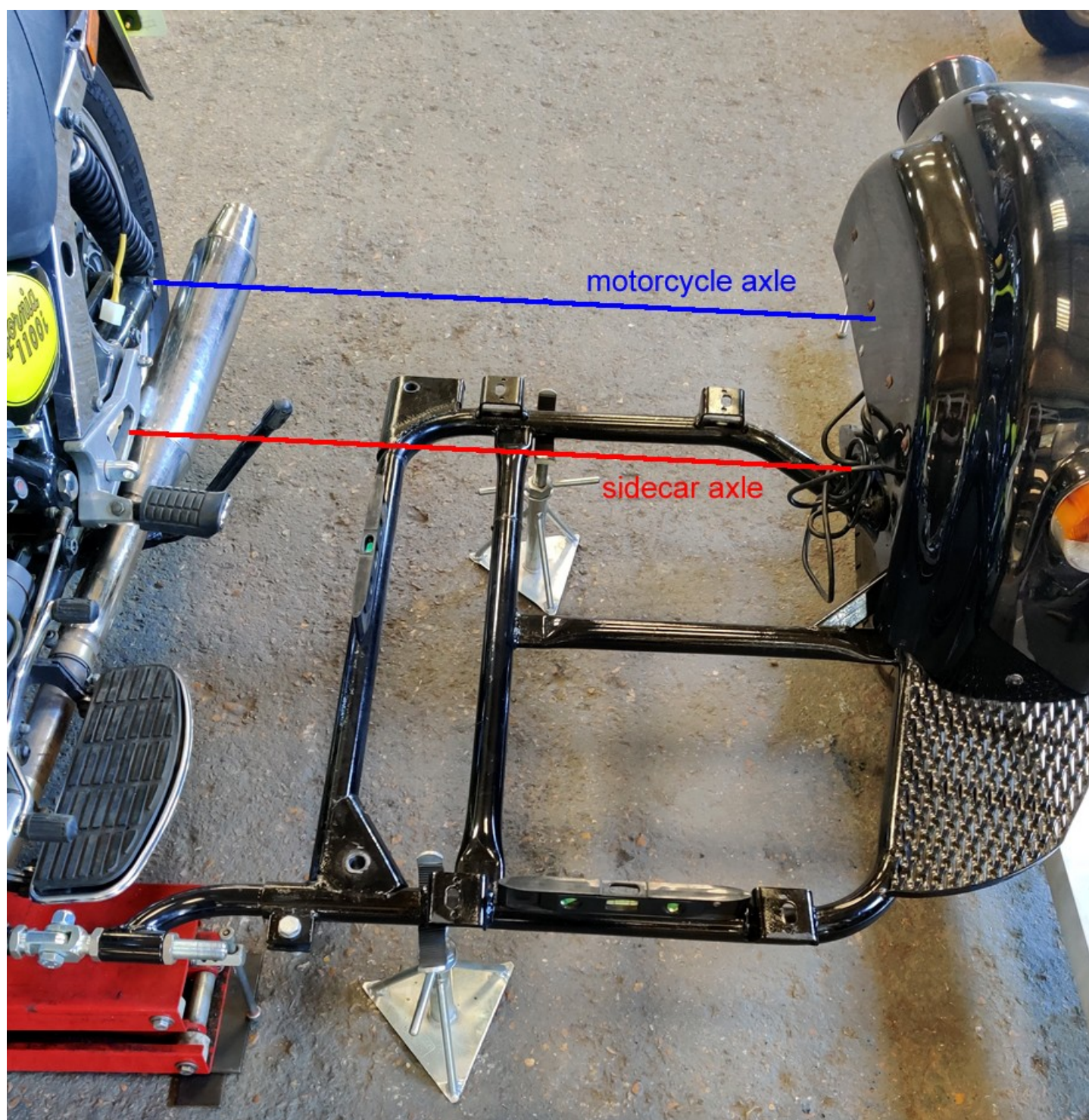


Sit on the motorcycle and take a look at how far the suspension sags. Use ratchet straps to slightly compress the suspension so the motorcycle remains at this level when you get off. Support the motorcycle securely and almost upright, but just leaning a little away from the sidcar. Somewhere between 5mm and 10mm measured using a chain or plumb-line over the rear wheel.



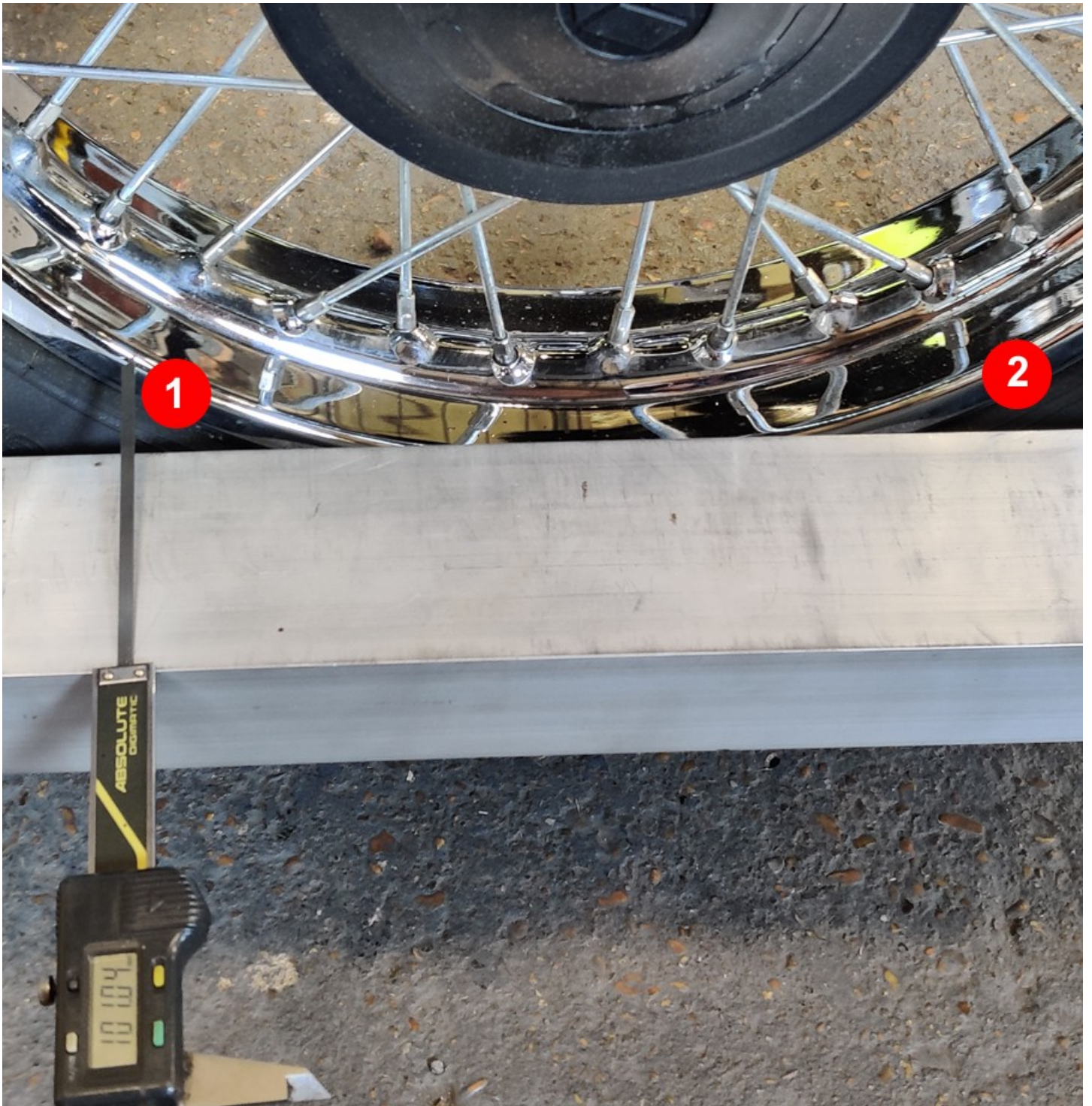
Positioning the sidecar and axle lead

As there is no weight on the chassis the sidecar will be sitting slightly high, drop the sidecar tyre pressure to about 10 psi (0.7 bar) to compensate for the lack of weight. Support the sidecar chassis so that it is level and alongside the motorcycle. At this point the axle lead should be set. This is the distance from the centre of the motorcycle axle forward to the centre of the sidecar axle. This needs to be between 200mm and 300mm, less axle lead (200mm) will produce a sidecar outfit which turns quickly but is less stable at speed. It will also require slightly more toe in. More axle lead will produce a sidecar outfit that is slightly heavier to turn but it will be more stable at speed. It will also require less toe-in. In this case it was set at 290mm. The front swan necks (SCV/1) can be supplied with various offsets from 60mm to 160mm. In this case SCV/1S was used at 60mm offset. Using more offset would move the sidecar chassis backwards and decrease the axle lead. If you cannot get exactly where you want to be, sometimes you just have to make a compromise.



Setting the toe-in

Place a straight edge along each side. One as close as possible to the motorcycle wheels and the other as close as possible to the sidecar wheel. Measure as accurately as possible at two places on the sidecar wheel and two places on the motorcycle rear wheel to be certain the straight edges are exactly in line with the wheels. I would like to make a little comment about wheel alignment on motorcycles here. I have fitted many sidecars to many motorcycles from many manufacturers. It is very rare to find one with the front and rear wheels in line. In the case of shaft drive bikes there is no adjustment. In the case of chain drive bikes there is. But never believe any markings on the swingarm when setting wheel alignment on the solo motorcycle. Do it using straight edges or string and then remark the swingarm if needed. This is worth checking and adjusting before fitting the sidecar. In any event, all sidecar alignment is made using the rear wheel and the sidecar wheel. The front wheel should just be set straight ahead by eye.



Once you have the sidecar attached by only the front lower mount and the straight edges are perfectly placed a toe-in measurement can be taken. Take a measurement of the distance between the two straight edges just behind the rear wheel of the motorcycle (A) and another just in front of the front wheel (B). The measurement at B should be less than at A. As the sidecar is only attached at one point at the front, it is fairly easy to adjust it. Each time you move the chassis you must move the straight edges and check the measurements to the wheels again to be perfectly accurate. The toe-in should be between 15mm and 25mm. So the measurement taken at B will be between 15mm and 25mm less than the measurement at A. The greater the axle lead the less the toe-in. As this bike has 290mm of axle lead the toe-in was set at 16mm.



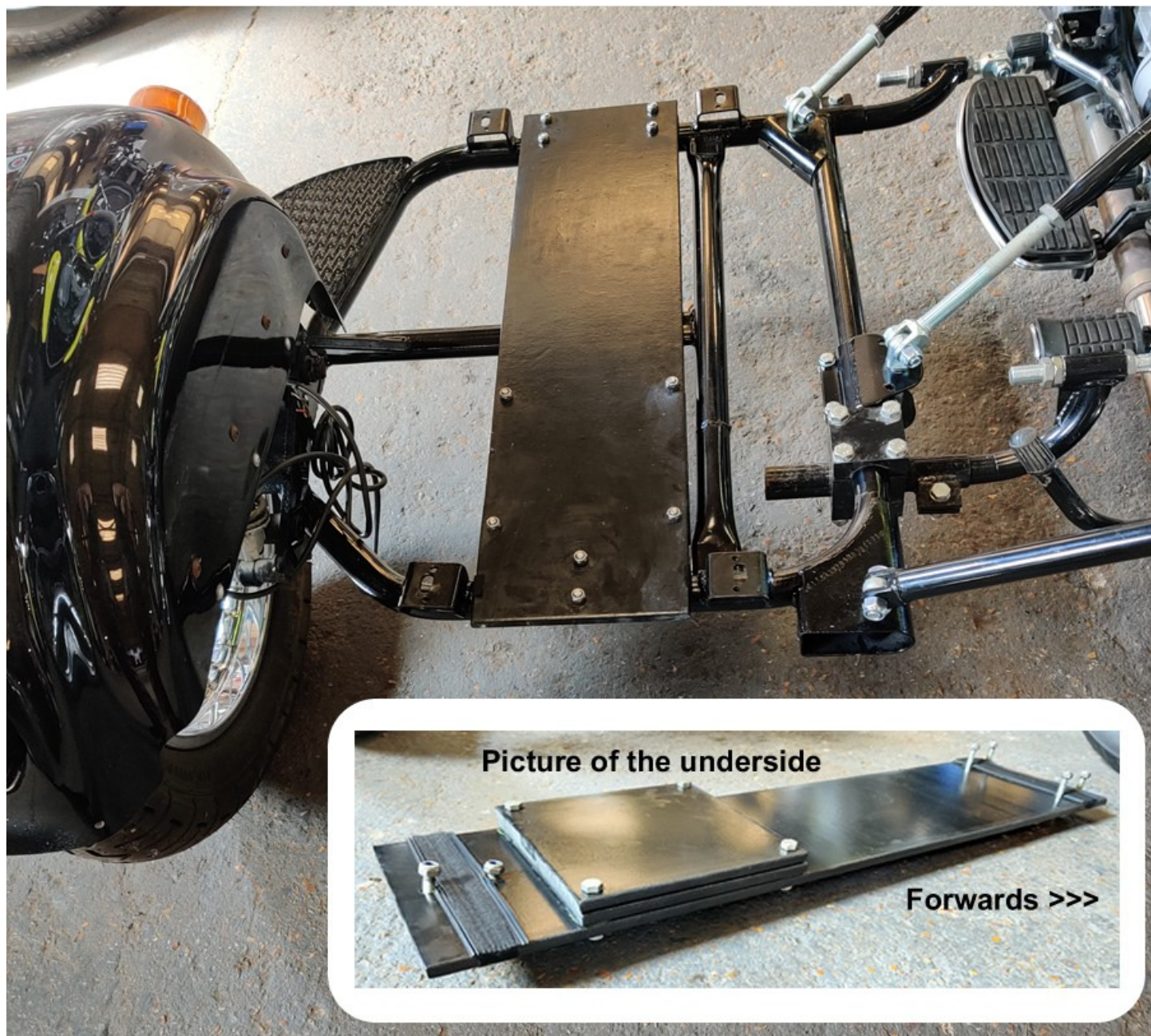
Once the lean-out, axle lead and toe-in are all set, it is time to attach all the other fittings. I tend to attach the lower rear (SCV/9HD and SCV/1) so I have both the lower mounts on and fairly tight. Then I recheck the toe-in once more as accurately as possible. At this point tiny adjustments, as small as 1mm can be made using the threaded adjusters on the fittings. Each time recheck the straight edges to wheel distance. Then attach the upper front and rear props (SCV/8, SCV/5, 5A 6A.), have a final check of the lean-out and toe-in before fitting the final fifth fitting (SCV/9LW, SCV/6, 5A). If anything feels like it has moved as you are fitting the props, stop, check all the measurements, and then continue. The ratchet straps and supports can now be removed and the tyre pressure in the sidecar set to 25 psi (1.75 bar).

Wiring

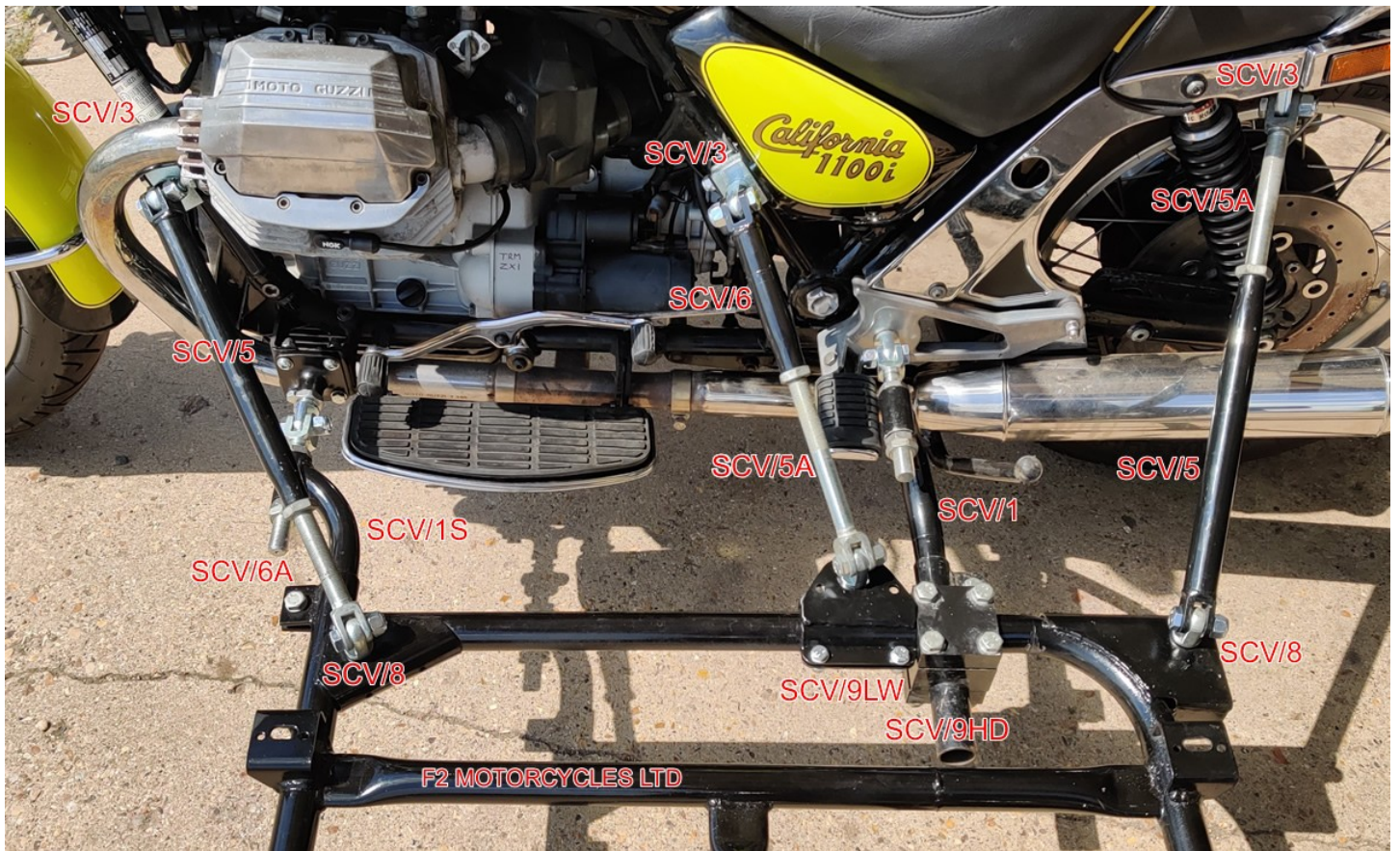
Velorex sidecars are supplied with the lights on the mudguard pre-wired and a long cable to reach the motorcycle. The colour code is red for the brake light, brown for both the front and rear marker lights, green for both the front and rear direction indicators and finally white for the earth. These can normally be connected to the motorcycle loom under the seat where the original motorcycle wires go to the rear lights and indicator. It is a good idea to use a 4-way plug and socket connector so the sidecar wiring can be easily unplugged if the sidecar needs to be removed for any reason. The original motorcycle indicators on the sidecar side (left in this case) can be removed or have the bulbs removed. For this build I removed the bulbs and later sprayed the lens of the indicators black. Modern bikes using CAN bus wiring will cause all sorts of headaches, I have done it, but it's beyond the scope of this simple fitting guide. Contact me if you need more information for CAN bus, I will try to help.

Additional chassis weight

This is certainly not needed in all cases, but giving some thought to the weight of the sidecar and the weight of the bike is a good idea. The Moto Guzzi 1100 is not a light motorcycle and in this case the sidecar is intended to be used either empty or lightly loaded most of the time. I decided to add 19kg of steel plate to the chassis as a semi-permanent weight. It sits low, below the sidecar body and most of the weight is towards the rear to keep the weight over the axle. An alternative approach would have been to space the sidecar further away from the motorcycle or to carry weight in the sidecar body behind the seat, but this takes up space needed for other items such as shopping.



I did not mention the width of the sidecar outfit earlier, it is nearly always governed at least in part by how long the lower front fitting is. The further away the sidecar is from the motorcycle the harder it is to lift off the ground when cornering, but the more it will pull and push on the motorcycle when accelerating and braking. If the motorcycle is fairly light weight I tend to build the sidecar close to the motorcycle, if the motorcycle is heavy I tend to build a slightly wider outfit. There is no right or wrong.



About Me

I'm David Angel, I am the UK agent for Velorex sidecars and have decades of experience both fitting sidecars and advising others about fitting sidecars. I like to keep things simple and straight forward, I do not believe people should have to pay for simple advice that may help them build a safe sidecar outfit. If I can help with advice, I will. However, I do not know it all, I haven't got the t-shirt and I didn't write the book as the sayings go. If you find a strong and simple way to put your sidecar together that is different to the way I would do it, it just proves there is more than one way to achieve the same thing, a safe and strong sidecar outfit.

