Fitting Modern Alloy Wheels to your Beetle

by Trevor Brady
Nov 21, 2003

Overview

Lately there has been somewhat of an explosion in the aftermarket car accessories industry. Movies like "The Fast and the Furious" have had no small part to play, making huge wings a common sight on the rear ends of Honda Civics and big shiny wheels with rubber band tyres almost a prerequisite for any self-respecting car modifier.

A side effect of this increase in interest is that the price of alloy wheels has dropped and there are loads of them around on the second hand market too. Some of this modifying craze has filtered down from the plastic body-kitted modern cars to infiltrate the hot-rod and classic car scene. You may have seen a few of our old Beetles at the shows sporting something other than the stock steel wheels with cross ply tyres.

If you would like to know how you too can fit modern wheels to your Beetle, read on ...

Method

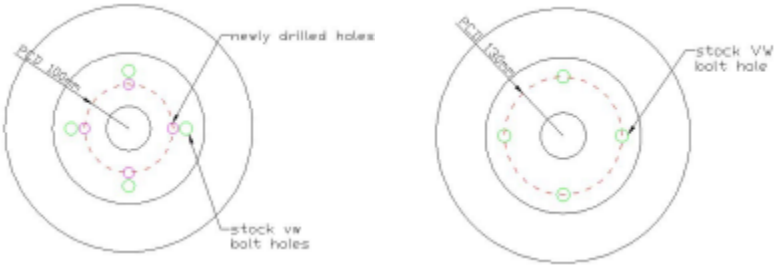
I will base this article on the standard torsion bar front axled Beetles, and to narrow it down a bit further, the ones from 1967 onwards in particular. These are the ones that came from the factory with 4-stud wheels. What I write about the rear axles of the torsion bar Beetles will apply to the 1302 and 1303, but I will deal with the front ends of them in a seperate paragraph since they are a different kettle of fish.

First of all I'll keep it simple, and stick with the 15" diameter wheels since this is the same diameter as the stock VW, from there I'll cover the larger 17" wheels and their issues. The basics however are the same, so here we go ...

The main considerations when fitting modern wheels to your Beetle are:

- Bolt pattern, or PCD (Pitch Circle Diameter) of the hub
- Width of the wheel
- Offset of the wheel
- Centre bore size of the wheel
- Diameter of the wheel and its relationship to overall wheel/tyre diameter

The bolt pattern, or PCD (Pitch Circle Diameter) is the number of bolts used to hold your wheel onto the hub and the size of the circle they lie on. If you draw an imaginary circle through the centres of the bolt holes on your Beetle and measure its diameter you will find that it measures 130mm. There are 4 bolts, so the PCD is expressed as 4x130 i.e. 4 holes on a circle of 130mm diameter. The older Beetles had 5 bolts, on a much larger circle of 205mm. Their PCD was 5x205. Most modern cars have a much smaller PCD, such as 100mm or 108mm.



When deciding upon which wheels you would like to fit to your car, you are going to find that none of the modern wheels suit the air-cooled VW PCD. The bolt pattern for the air-cooled VW is almost unique. While some other car manufacturers have made their hubs with the same PCD, (Skoda had a 13" steel wheel in the '80s with the same PCD, and Morgan used Beetle "Sprintstar" wheels on one of their models. The Porsche 914 came with the same PCD as the Beetle too) all the rest use one of a few common preset PCDs.

These are:

- **4x100** in the case of Honda, Nissan, Toyota, Seat, Skoda, VW (until 1997 or so), Mitsubishi, Renault, Rover, BMW and Opel to name a few.
- **4x108** in the case of Ford and Peugeot

- **5x110** in the case of the more modern BMWs and VWs and in the case of Mercedes and Audi.

There are a few exceptions, like the more modern Hondas use 5x112.5 or something odd like that, and Porsche use 5x130. In order to fit anything other than VW wheels or the well tested aircooled VW aftermarket wheels to your Beetle, you're going to have to have your hubs redrilled, or buy predrilled hubs with a different bolt pattern.

While it is very easy to buy some of the aftermarket wheels that have been made for the Beetle since the '70s such as the EMPI 8-spokes or Sprintstars, or bolt on some of the Porsche 914 alloy wheels, all of these styles have been used over and over again all over the world. While these wheels no doubt suit the VW, if it's originality you're after, then modern wheels are the way to go.

To make your hubs more receptive to modern wheels they will have to have new holes drilled at one of the modern PCDs and tapped with the same thread as the modern bolts. Any competent precision engineer will be able to do this very accurately, and is the cheapest option. However, if your car is a daily driver it might not be the best solution, as the hubs will have to be removed from the car and sent to the engineer's workshop for him to do the work.

Specialist companies, like Machine7 or German Car Company in the UK sell replacement hubs off the shelf predrilled and tapped to modern PCDs. If you cannot afford not to drive your car for a few days, then these might be the best bet.

I think the 4x100 PCD is the best to go for in terms of choice of wheel, as there will be plenty on the second hand market from Toyotas or VWs and 99% of the new wheels in the shops will be available in this pattern. Another advantage of the 4x100 PCD is the fact that when this pattern is drilled into the stock VW hub and the holes ar kept co-linear with the stock 4x130 holes, the material they will be drilled through is actually thicker than the material the stock 4 holes are drilled through.

This is because there is a reinforcing web cast into the drum at this location and it gets thicker as it approaches the centre of the hub. Some people will try to tell you that redrilled hubs are dangerous due to the fact that they are drilled through thinner material. This only applies when the new holes are drilled away from the stock holes. Unfortunately the Ford 4x108 pattern is too large to be drilled co-linear with the stock holes. This is another reason for choosing 4x100.

The Porsche 5x130 pattern actually uses one of the VW 4 stud holes, has two more drilled though the reinforcing webs and the last 2 are drilled through the thinner section between the reinforcing webs. I personally used Porsche wheels on redrilled hubs for 18 months without any adverse effects. Blank disks and drums are available new in the VW parts shops with a uniformly thicker-than-stock face for drilling through.

The thread size for the drilled holes is an important consideration after choosing your bolt pattern. With the 4x100 pattern, a thread size of M12x1.5 (12mm bolt shaft thickness, 1.5 threads per mm of bolt length) will be suitable for use with modern wheels. The stock VW 4 stud thread is M14x1.5, unfortunately the holes in the modern wheels will be too small to allow you to re-use the stock bolts, plus the fact that the VW bolts will be too short to have adequate contact with the hub.

You will either be able to buy new bolts from your local alloy wheel dealer or you can take a trip to the local scrap yard and salvage some from a modern car. Since the material of the alloy wheels is thicker than the steel ones, insert a bolt into the bolt-hole of the wheel with the wheel away from the car and measure how much of the bolt protrudes out the back. You'll need at least 15mm, but definitely no more than 25 or so, or you'll be catching the brake mechanisms inside the drums.

Your bolts will have to be selected with the wheels in mind. Inspect the seating surface for the bolts (inside the bolt holes of the wheels). This will be one of two possible shapes: tapered at 60 degrees or a radius. Purchase your bolts with the shoulder design to match or you may see your shiny new wheels and tyres passing you out on the road some day because the bolts never sat tight enough to secure the wheel.

As Beetle owners we are fortunate in that the wheel arches are cavernous inside when compared to most modern cars or even the Karmann Ghias from the same era as our cars. This means that we can safely use much wider wheels under our cars without too much consideration for rubbing tyres or extended wheel arches. The stock VW steel wheel came in pretty narrow widths, from 3.5" way back in the '50s to a more respectable 4" in the '60s and an almost beefy 4.5" wide in the '70s.

The first thing you will find with modern wheels is that they are going to be at least 5" wide and more often than not, they'll be in the 6"-7" region. Some styles of wheel can even be gotten in widths up to 10" but fitting these to your Beetle is going to be a lot of trouble. We'll keep it at a respectable 7" wide for the purposes of this article. This width will allow you to get some meaty tyres on there too, for better grip. However, there's a more important consideration then just the width, and that's the offset.

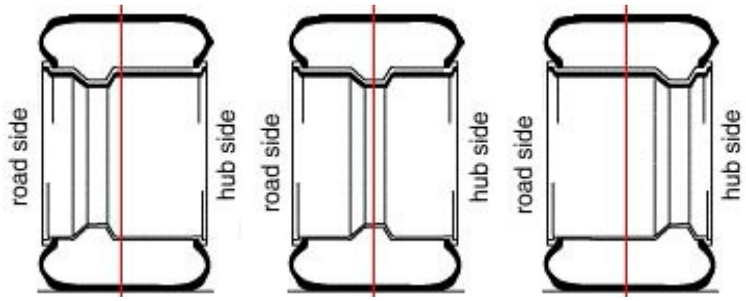
The offset of the wheel is the relationship between the mounting surface of the wheel (the face that actually touches the hub) and the centreline of the outer wheel itself. This is measured in millimetres, and usually the mounting face is outside of the centreline, resulting in a positive offset figure. This will be stamped on the wheel somewhere, usually between the spokes or on the back of the rim, represented by the letters ET accompanied by a number, i.e ET35 means that the mounting face of the wheel is 35mm from the centreline, towards the outside of the wheel. See the diagram for more details.

The offset is so critical, because it determines where the wheel will sit when bolted to the hub. A low ET figure, ET20 or so will have the wheel sticking out of your wheel arch, and every time you drive over a bump, it will rub on the outer lip of your wing. A high ET figure, like ET50 will have the wheel well away from the outer lip, but rubbing on the inner wing or the trailing arms when you turn the steering wheel.

An offset of ET35 is just about ideal for the Beetle, as it is a happy medium, keeping the wheel in from the outer lip, and away from the inner wing. However, if you are stuck and can't find your wheels in ET35 (which would be unusual, since it's ideal for most modern cars too), it's best to opt for a larger ET figure than a smaller one.

This is because if the wheel has a large ET figure, and is rubbing on the inner wing, it can be moved outward by means of simple wheel spacers.

but if the wheel has a small ET figure, and sticks out of the wheel arch, then very little can be done to get it back inboard, short of having your front axle beam shortened, which is a major major job. ET35 is also suitable for the rear axle of the Beetle, but you will get away with ET25 or ET40 so long as the wheel is no wider than 7".



Positive offset **Zero offset** **Negative Offset**

The centre bore size of the wheel is pretty insignificant if you have 4-wheel drums, as the centre bore of most modern wheels is plenty big to clear the front hub dust covers and the rear hub nuts. If you have disk brakes on the front of your Beetle, then you will find that there is a large flange cast into the hub to help in mounting the standard steel wheels.

This unfortunately will have to be machined down flat so the modern wheel will fit flush onto the bolt face of the disk. A thick spacer could also be used to clear the flange, but if your width and offset are tight, a thick spacer might not be the best solution.

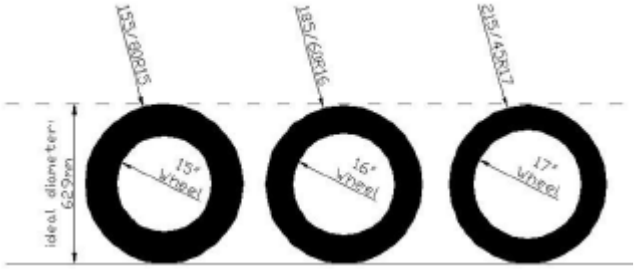
With most modern wheels being wider than stock VW, the opportunity is there to have wider tyres fitted, both for the safety aspect of having more rubber in contact with the road, and the fat sporty look of wide tyres. The make of tyre is up to you and your budget, but the size of the tyre needs to be chosen carefully to avoid upsetting the accuracy of your speedometer at the front and the gearing of the gearbox at the back.

Since the stock Beetle tyre was 155/80 R15, then the overall diameter of the tyre has to be preserved as closely as possible, or the speedo will give you a false speed reading, which could get you in trouble with the law. The numbers on the tyre, 155/80 R15 for example, describe three variables in tyre sizing. The "155" refers to the width of the tread, in millimetres, the "80" refers to the height of the sidewall, as a percentage of the width of the tread, and the "R15" refers to the width of the rim the tyre is fitted to.

The stock 155/80R15 tyre has an overall diameter of 629mm and this is what VW calibrated their speedometers and gearbox gearing to use. While any increase in width of the tyre will require a decrease in sidewall height, an exact match is impossible, so we'll have to match it as closely as possible, so as not to alter the speedometer reading or the gear ratios.

A 185/65 R15 tyre has a diameter of 621mm, meaning the speedometer will read slightly fast for the actual speed of the car, and the engine will have to work a little harder to achieve the same speed as before. (this will adversely affect fuel economy) A 195/65R15 tyre has a diameter of 634mm which will have the speedometer reading slightly slow for the speed of the car, but will make the car slightly faster for the same amount of work the engine has to do.

While this sounds like a good idea, and you might be encouraged to fit tractor tyres to the rear of your Beetle, going too far with the height of the tyre will result in the engine straining to keep you at the same speed, and it will eventually overheat, and potentially cause serious engine damage. Still, in the case of the 195/65R15, it's only 5mm, so shouldn't cause too much strain on the old engine, and will give you plenty more contact with the road.



Fitting the huge wheels you see on the boy-racer cars can be done quite easily, so long as you keep the principle of keeping your overall diameter of tyre as close as possible to stock. If you chose a 16" wheel, then a 185/60R16 tyre would be just about ideal at 628mm diameter, or a 205/55R16 tyre would also be close enough at 632mm diameter.

If you opt for a 17" wheel, then 205/50R17 comes close at 637mm diameter, or 215/45 is better at 625mm diameter. The further away from stock you go however, the harder it will be to match the tyre diameter. The lower profile your tyres get too, the harsher the ride will be, and the

car might tend to "tramline" at speed. This is when the car wants to follow ruts in the road, due to the light weight of the Beetle and the width of the tyres.

For those of you that own 1302s or 1303s, you might have some difficulties in fitting wide aftermarket wheels to the front of your car, especially the large diameter wheels like 17" because the inner edge of the wheel/tyre will foul on the stock suspension springs. This can be remedied by replacing the springs with special narrow springs, or tapered ones, which narrow in the middle, so making some more room for wide rims. These are available from the likes of Machine 7 in the UK, but can be pricey, so decide whether or not you really need those super wide wheels up front or whether you can live with a slightly narrower version.

Wide wheels are also liable to touch the trailing arms at the front of torsion bar Beetles during manoeuvering, like in a car park. This can be remedied by limiting the steering range through the steering stops on the front axle. It makes for a 5-point turn instead of a 3-point when in a tight spot, but won't make any difference on the open road.

If you plan on lowering the front of your torsion bar Beetle by means of CB Performance dropped spindles, bear in mind that the spindles will increase the front track of your Beetle by at least 12mm per side, make sure you allow for this when selecting your wheel, and add 12mm or more to the ideal offset figure. If it's too much you can always buy an inexpensive spacer to move the wheel back out. You can order a set of wheels with two different offsets for the front and back pair when buying them new from the shop, but if you're after a second hand set, then your options may be limited.

If you don't wish to drill your hubs then wheel adapters are available, but make sure you find out what thickness they are before ordering your wheels, and add that figure to your ideal offset figure, or the wheels will stick out of your wheel arches.

Another thing to consider after having your hubs drilled and you have selected your wheels is the bolts that are going to hold them on. The stock beetle bolts will almost certainly not do the job as they are very short, you will either be able to buy new bolts from your local alloy wheel dealer or you can take a trip to the local scrap yard and salvage some from a modern car. Since the material of the alloy wheels is thicker than the steel ones, insert a bolt into the bolt-hole of the wheel with the wheel away from the car and measure how much of the bolt protrudes out the back. You'll need at least 15mm, but definitely no more than 25 or so, or you'll be catching the brake mechanisms inside the drums.

After selecting your style of wheel, having the hubs drilled, chosen the correct width and offset of wheel, bought the right height tyres, sorted your bolts out and FINALLY fitted them to your car bear in mind that you'll need a spare wheel to suit your new setup. If you used the 4x100 bolt pattern, there's no reason why you can't keep your stock VW 15" steel wheel as a spare, just remember to keep 4 of the original VW bolts in the glovebox to use.

Alternatively, a quick tour of the local scrapyard should yield a nice shiny space-saver wheel and tyre to fit your drilled hubs. These can be gotten pretty cheaply. I got mine for £10 a few years ago. The wheel and tyre were NEVER used, so were guaranteed to be in good shape. If you have drums all round, then spare wheels as small as 13" will work with your car. If you have disk brakes on, you'll need to get a 15" wheel to get it around the caliper.

Enjoy the new look of your bug with it's modern wheels and individual style!

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