PROJECT B5 S4 SUPPLY AND DEMAND

INTRODUCING OUR NEWEST PROJECT CAR, A B5 AUDI S4: WHO NEEDS NEW CARS?

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A poor economy can be a good thing. It means supply is up, demand is down, and cars are dirt cheap. So we went in search of a new project car and the original B5 Audi S4 grabbed our attention. It's got everything; all-wheel drive, twin-turbos, a bulletproof bottom end and a cornucopia of parts both OEM and aftermarket to throw at it. But there's a downside; most cars are either abused beaters you should avoid or heavily modified, high-dollar cars with their share of problems.

After a long search, we found a pristine, garaged '02.5 S4 with only 35k miles under the diligent care of wealthy grandmother who was tricked into buying it by her son. For the price of a new Hyundai, we had ourselves an all-purpose project but instead of the usual 700hp route every S4 owner aspires to, we're going to build the car for daily reliability and fun, yet fast enough to bitch-slap unsuspecting BMWs and Infinity G35s.

Before throwing aftermarket parts at it, we wanted a baseline of the stock car's performance since we'd be addressing the handling first. So we tagged along with *Motor Trend* to put the stock S4 through their figure-8 test.

As the name implies, it's a mini-autocross comprising two 200ft circles that's an easy way to evaluate acceleration, braking, transitional handling, understeer and oversteer, while obtaining an average lateral g-force number to measure grip.

Out of the box, the S4 lived up to its nose-heavy reputation. The stock suspension allowed the car to wallow through minor dips, making it impossible to maintain consistent cornering speed with any confidence.

We achieved a 26.355sec lap time, according to our vehicle telemetry system, averaging 0.87g of lateral acceleration in both directions.

The grip numbers are good on account of the Michelin PS2 tires on the car, but the overall lap time is slow for an all-wheel drive car with decent power.

First: Tires

Tires are the most important aspect of any car. All too often, car owners don't consider tires until the wheels are purchased and are stuck with

Picking the right size tires should come first in any project. We went with 245/35 R18 Kumho Ecsta XS since it was the stickiest in that size

PARTS	PRICE	CONTACT
18x8.5" BBS CH wheels	$520 each	bbs-usa.com
245/35 R18 Kumho Ecsta XS	$161 each	kumhousa.com
KW Variant 3 coilovers	$2195	kwsuspensions.com

Installation by MD Automotive (markdibella.com), prices provided by tirerack.com

It's important to ensure the tire diameter is close to stock to avoid interference issues with suspension as well as inaccurate readings from the speedo, ABS and traction control

KW's Variant 3 coilovers are ideal for high-performance street applications with adjustable compression and rebound damping, stainless bodies and an external gas bladder that makes the twin-tube damper act like a mono-tube

fitment issues or simply skimp on the rubber. So there's a benefit to doing our homework first, picking the right size tires and selecting the type of tire to meet our needs.

One of the drawbacks of the B5 platform is the limited real estate in the fenders wells. The car comes on 225/45 R17 tires and we also knew that (depending on the brand and shoulder profile) a 255-width tire would require fender rolling and cutting of fender liner. So we chose 245-width. And also decided on larger 18" wheels.

We then needed to opt for the aspect ratio (or sidewall height). Having more sidewall is good for comfort and avoiding bent wheels, but at the cost of steering response and clearance issues (especially with wider tires on different wheel offsets) with the double A-arm suspension.

As a rule of thumb: play it safe and don't exceed the overall diameter of the OEM equipment. There are plenty of tire size calculators online to help find the right size.

You can't go wrong with wheels that have the legendary BBS logo. These 18x8.5" CH wheels in satin black with a polished lip were a perfect fit for the stock fenders. The cast wheel is reinforced using a flow-forming process to strengthens the wheel hoop and reduce weight

As it happens, the perfect tire for us would be a 245/35 R18, which only increases the stock tire diameter by 0.89% – easily within the 3% tolerance that OEM traction control and ABS systems allow for tire wear, etc. This would also keep our speedo accurate.

Picking tires first becomes more critical if you decide to run staggered wheels on an all-wheel drive car, which can upset differentials, traction control or ABS.

The next step was to decide on a brand. And since we wanted something grippy, the Kumho Ecsta XS (KU36) was the stickiest option we could find in this size with a UTQG rating of 180 AA A. This means it won't wear too quickly but will offer plenty of grip since it's become a street-class autocross favorite with its dry traction and non-R-compound wear rate. Wet traction would also be reasonable, while sidewall stiffness was acceptable for a street tire.

Another advantage of the XS is its ability to generate grip at street temperatures, unlike many R-compounds. This means you don't have to bring your tires up to temp before the fun can commence. One draw back is the additional noise on account of the aggressive tread design that creeps in as the tire goes through a couple of heat cycles.

Second: Wheels

Picking the wheels was a simple matter once we had the tire size. So we opted for 18x8.5" BBS CH wheels in satin black with a +35ET offset. These beauties would give us the perfect fit on the S4 and, at 24.6 lb a piece, the CH is on the light side for a high-quality cast wheel of this size. But since we're not racing, we'd rather have the added material and strength that comes with a German-designed, TüV-approved street wheel rather than a specific race wheel.

As it happens, BBS increased the strength of the wheel hoop by using a flow forming technique that extrudes the hoop as the wheel

Before and after the KW V3 installation; you see the more purposeful, lowered stance and attractive BBS CH wheels

We cut a slot in the upper shock support bracket on the rear suspension to access the rebound damping adjuster. Hopefully it won't weaken the bracket. The rebound adjuster on top of the front suspension is similarly difficult to access on the car

is spun. This acts as a rolling forging process to increases the density of the hoop, elongating the metal grain and adding more strength from less material at an economic cost.

With that kind of technology from the masters of European wheel manufacture, we knew our S4 was on the best possible wheels for the job.

Third: Suspension

Bigger wheels and sticky tires will help the car stick, but only if the tires remain in contact with the road surface. You don't want it floating around like grandma's Buick. That's the job of the suspension.

Part of building a car you can drive daily is to be realistic about suspension. Suspension for racecars on slicks probably won't help a streetcar handle, and certainly won't be comfortable. For daily use, our S4 would need the comfort, height and wheel travel to absorb any bump and tackle any corner.

With these parameters set, we chose KW Variant 3 coilovers. The philosophy of softer springs with sophisticated damping to control wheel motion means that you get acceptable ride quality that remains composed over any type of pavement.

The adjustable low-speed compression and rebound damping would allow us to dial-in the car so roll and pitch angles inspire confidence yet are soft enough to maintain contact on uneven pavement, while inducing dynamic weight transfer.

PERFORMANCE

PARTS	LAP TIME	LATERAL g
Stock	26.355sec	0.87g
Stock tires plus KW V3	25.776sec	0.89g
KW V3 plus 18" BBS and Kumho	25.296sec	0.92g

The V3 is a fairly extreme street coilover, using a stainless steel body designed for the factory upper mount. This is to comply with the stringent TüV safety regulations. Since all vehicles in Germany must have a regular safety and smog inspection, all aftermarket parts must be TüV-approved. So KW designs its V3 kits to fit the OEM upper mounts. The shock body length is non-adjustable to ensure cars can't be lowered past TüV's maximum camber limits, or slammed to where tires can contact the chassis. All these safety measures make sense when you remember KW customers typically commute at over 100mph on the Autobahn.

Verdict

In terms of ride comfort, the new suspension seems almost as soft as stock over bumps and on the highway, but offers more control when thrown into turns.

Feeling good doesn't always equate to going faster, so we returned to the figure-8 to take new readings.

With the V3s installed (on conservative street settings) but on the tires, we knocked off 0.5sec from our lap time, reducing it to 25.776sec. We also increased the average g-force to 0.89g, even though the tires were the same. No doubt improvements could have been made by altering the damper setting but on the S4 the front rebound adjusters are fairly inaccessible when the car is on the ground.

In our final test we added the BBS wheels and Kumho tires. The advantage of more grip and sturdier sidewalls is increased lateral grip to 0.92g and produced a 25.296sec lap time – almost a second quicker than stock on our short track. Imagine what that would equate to on a two-mile road course!

The stiffer sidewalls had virtually eliminated the roll-induced understeer, allowing us to maintain faster cornering speeds. In fact, our records show the new lap time is faster than a '07 Subaru WRX STi.

Having made these improvements to our project S4, we'll investigate what can be squeezed out of the 2.7 liter V6 twin-turbo motor using some straightforward engine mods that won't adversely affect our long-term reliability. So don't miss next month's update.