



1989-95 5 SERIES BUYER'S GUIDE

THE MAGAZINE ABOUT BMW

Bimmer

POWER AND REFINEMENT

DINAN
M3



PLUS: 600+HP M5, NEW 325i TOURING, SUPERCHARGED 330i



WORTH THE WAIT

Years in the making, Dinan's supercharged S3-M3 is every thing a hot rod BMW should be, with lots of power, big brakes and great handling.

This, it could be argued, is the M3 as BMW should have built it in the first place. Had Munich delivered a car with the performance of the Dinan S3, its M3 would have been right up there with the Porsche Turbo and the Ferrari 360 Modena, two benchmarks of the era that instead eclipsed the M3 in every objective standard.

That includes price, of course. When BMW released the 113 to a waiting public, the 333-hp coupe bore an MSRP of just \$45,970 compared to the \$100,000+ for the





400-hp Porsche and \$150,000+ for the 400-hp Ferrari. The M3's relative lack of performance compared to those cars could always be explained away in terms of price, and in fact the comparison made the BMW sound like an incredible bargain.

One couldn't help but wonder, though, what the M3 could have been if BMW had given the M division free reign in the spending department. Let loose to compete against the best of the best, could M have worked sufficient magic to put the 3 Series on equal footing with the best from Porsche, or even Ferrari?

The answer is yes, as indicated by the latest M3 iteration from Dinan. With 423 supercharged horsepower and handling to match, the S3-M3 puts the BMW on par with just about anything in the sports-car universe, yet it doesn't sacrifice the car's innate civility to do so; in fact, it may even be more civilized than stock.

A lengthy R&D process

When we last checked in with Dinan in 2003, the Morgan Hill, CA-based company had just released its S2-M3. Although Dinan's upgraded S54 engine put out just 28 hp more than stock, the S2 delivered much better acceleration thanks to shorter gearing. It also treated drivers to massively improved handling via revised suspension and a wheel-tire combination that put a lot more rubber on the road.

With the new S3-M3, Dinan delivers a more intense package in every respect. Not only is power boosted by 91 hp via a Vortech supercharger, the car's handling and braking are also beyond S2 levels thanks to even more aggressive suspension and a Brembo

big brake kit along with Dinan's signature forged wheels.

The biggest news, however, is the supercharger. Dinan fans have been waiting a long time for a supercharged version of the S54 six, and the finished version shows the delay to have been worthwhile.

With 423 horsepower (measured at the flywheel) at 8,000 rpm, the Dinan supercharged engine puts out 91 more ponies than the S54 in naturally aspirated stock form, an increase of 27%. Torque jumps by 51 lb-ft, from 262 lb-ft at 4,900 rpm to 313 lb-ft at 5,500 rpm, a 19% increase.

Those numbers will inevitably beg comparison with the figures generated by Active Autowerke's supercharged S54 [see *Bimmer* #49], but beware of direct comparisons. For one thing, it's impossible to compare readings from different dynos—even with software to correct for all the variables of temperature, humidity, altitude, etc., no two dynos read exactly alike—and for another Dinan is measuring output at the flywheel, not at the rear wheels like Active Autowerke does.

What can be compared, however, are power gains: Active Autowerke claims an increase of 80.5 hp over stock, with a peak that occurs at 7,600 rpm instead of the 8,000 rpm of Dinan's 91-hp increase. AA's torque figure increases by 34.3 lb-ft at a new peak of 5,250, slightly lower than Dinan's 5,500 rpm peak.

Were the Active Autowerke car permitted to rev past 7,700 rpm, those gains would probably be similar, but AA restricts revs to help preserve the S54 engine. Dinan doesn't do so, because it's confident that BMW has fixed the S54's problems via its crank-bearing recalls.

We asked Dinan about the worst-case sce-

nario, in which an S54 blows up after being supercharged by Dinan and then has its warranty denied by BMW; we were told that the customer would be covered one way or another because Dinan will match the factory's four-year, 50,000-mile new car warranty. The customer will be taken care of first, and any disputes regarding cause and/or responsibility will be handled behind the scenes between Dinan and BMW.

Addition and subtraction

For now, however, let's leave warranty issues and comparisons with other tuners aside and discuss what Dinan has done to achieve those extra 91 hp. In addition to bolting on a Vortech supercharger running at 4.6 psi of boost, Dinan also adds its own high-flow cold air intake system, throttle bodies that are 1.5mm larger than stock, larger capacity fuel injectors and a free-flow exhaust. An aluminum racing radiator with 35% more capacity than stock addresses a well-known weakness among recent BMWs, the plastic radiator, and aids cooling at the same time.

All of that new equipment needs to work together, so Dinan recalibrates the engine management system as it controls the drive-by-wire throttle, VANOS cam timing, ignition timing, air/fuel mixture, etc. Naturally, the top speed limiter is also removed.

In making these changes, no OBD-II diagnostic functions are sacrificed, and the customer won't have to live with false warning signals on the dash. We've driven a few modified Porsches that routinely display error messages for problems that don't exist, and we agree with Steve Dinan that they're "totally unacceptable." In the case of the S3, all diagnostic systems and procedures remain as stock.

DYNO RESULTS FOR THE SUPERCHARGED M3 (S3-M3) HORSEPOWER

RPM	STOCK HP	DINAN HP
2500	116	118
3000	138	146
3500	164	178
4000	193	213
4500	227	256
4900	252	287
5000	256	292
5500	279	328
6000	299	348
6500	318	382
7000	324	408
7500	329	422
7900	333	423
8000	332	423



The car also continues to meet California emissions standards, though as of this writing it's only 49-state legal. Soon, Dinan tells us, "It will definitely be CARB legal. It's the Dinan way."

The Dinan way is also to make smooth, usable power whose delivery is as seamless as that of a stock BMW, and on that count the S3-M3 performs perfectly. It may have taken a while, but Dinan has totally nailed forced induction on the S54 motor.

Everyone who supercharges the S54 will encounter the same basic challenges, the greatest of which is created by the layout of its intake tract. Where most engines locate a single throttle upstream of the intake manifold or plenum, the S54 locates its six throttle bodies downstream of the plenum, attaching them almost directly to the cylinder head.

Supercharging, therefore, is made especially difficult, because closing the throttles doesn't stop the flow of pressurized air into the plenum. Since the air can't get past the closed throttles, it "compresses like a spring and bounces back through the intake tract," as Dinan says. The resultant pulsing "causes stumbles (poor drivability) and pressure spikes that fatigue the intake system components [and cause] an objectionable noise."

Those problems are handled by a Vortech bypass valve that relieves the pressure before the wave can bounce back. Or break the plenum: Dinan says that plenum breakage hasn't been a problem in testing, but other tuners (notably Active Autowerke) have found that the plenum can break if the bypass valve doesn't open quickly enough. AA has chosen to replace the stock part with a stronger unit of its own design; Dinan opts to retain the stock plenum with its elegantly

engineered internals and large volume, a reduction of which would cause a power loss.

Using the bypass valve to eliminate pressure waves is in itself enough to retain drivability by keeping air and fuel flow consistent, but Dinan also eliminates the mass air sensor and instead uses the throttle position sensor alone to provide the variable for various ECU functions, just as on a racing engine.

Does it work? Absolutely. Dinan's engine delivers seamless, classically supercharged

power in huge quantities right off the bottom. That's not to say that revving it out won't yield big dividends: The Dinan motor pulls strongly and smoothly all the way to 8,000 rpm, mimicking the stock horsepower curve but making a lot more power everywhere.

With respect to drivability and passing power, note that the dyno charts reveal a substantial increase in torque from about 3,000 rpm onward. The Dinan motor may peak later than a stock S54—at 5,500 rpm vs. about 4,700—but it's making so much more torque than stock even before that point that the higher rpm figure is largely irrelevant to the driving experience. Moreover, torque doesn't drop off nearly as quickly as stock: Once the normally aspirated S54 has reached its peak, it quickly loses

Under the hood, a Vortech supercharger pumps the S54's output by 91 hp over stock, to 423 hp at the flywheel. Dinan struttower braces add chassis rigidity, which comes in handy given the massive 1pinch wheels fitted to the S3-M3.





steam, while the S3-M3 continues to generate over 300 lb-ft to at least 7,000 rpm.

Accessing that torque is made easier by the use of a 3.91:1 limited slip differential in place of the factory's 3.64 unit. The lower ratio delivers 7.4% more torque to the rear wheels, and Dinan's engine management software raises the rev limit in the lower gears to allow the car to reach 60 mph without a second-to-third gear shift.

On the road, the additional power means that the engine pulls strongly almost regardless of where it's running, and the lower final drive gearing means that power is more accessible, as well. Downshifts are rarely needed to pass, unless you want to do so

explosively, and maneuvers that would be completely hairball in lesser-powered cars seem perfectly sane in the Dinan M3.

An intricate relationship

Exceptional handling and braking are also needed to make that possible, so Dinan upgrades both to bring the chassis in line with the increased engine power.

Dinan may have made its reputation with engine upgrades, but we've always been equally impressed by the firm's ability to make any BMW handle better without sacrificing ride quality. The S3-M3, which Dinan claims is its best-handling car to date, is no exception.

Because the M3 comes stock with fairly

stiff suspension, Dinan assumed that its S3 customers would prefer to have better handling at the expense of a little ride comfort than would the customers of its other cars. They biased the setup accordingly, but ride quality remains excellent.

In fact, we'd argue that the ride quality is actually better than stock even though it's stiffer, because the damping from the Dinan-developed JRZ shocks is so much more precise than that of the stock dampers. Much of the stock suspension travel remains intact—a Dinan car is never slammed—which also makes for a better ride.

There's more to it than just shocks and springs, however. "All good race engineers





understand that it's the relationship of the anti-roll bars, springs and dampers that really makes a car handle well," Steve Dinan says. Interestingly, the rear bar on the S3-M3 remains stock, while the front bar is only 1mm larger. It is adjustable, however, and it's 47% stiffer than stock on its stiffest setting (as it was when we drove it).

Dinan wants to keep the rear bar stock to aid acceleration — "Making the front bar stiffer and leaving the rear bar stock is why the car puts down power so well," Dinan says—yet stiffening the front bar without also stiffening the rear is usually a recipe for increased understeer. The Dinan car, however, has far less understeer than a stock M3—virtually none. How is this achieved? "That's the real question!" Dinan says.

The answer lies in a number of setup factors: more negative camber (-1° front, $-.5^{\circ}$ rear), less progressive shock valving with more low-speed damping (which also helps inexperienced drivers handle a car with less understeer) and less high-speed damping, and springs that reduce understeer by carefully tuning the relationship between front and rear spring rates.

The biggest reduction in understeer, however, has to come as a result of Dinan's enormous wheels and tires. Measuring 19 inches in diameter, the wheels are 10 inches wide at the rear and 9.5 inches wide in front, which allows Dinan to fit 285/30-19 tires at the back and 275/30-19s up front. Not only are the rear tires wider than stock by 30mm per wheel, but the front tires are wider by an enormous 50mm at each end. That's nearly four inches more rubber at the front axle compared to the stock 225/45-19s. Want more front-end grip? Here it is!

Dinan's proprietary wheels are spread-forged from aluminum, a process whereby a warmed ingot of alloy is spread into the shape of the wheel by powerful mechanical "hands." The process makes for an exceptionally strong wheels that weigh just 20 lbs. each—compa-

It may look fairly stock inside and out, but this Dinan S3-M3 delivers a driving experience that represents the ultimate in E46 performance. Brembo brakes add massive stopping power to match the added horsepower.

nable wheels from BBS and OZ Racing weigh at least 5 lbs. more, though they're also slightly less expensive as a consequence.

The end result of all those factors is handling that we would frankly describe as perfect, with neither oversteer nor understeer to contend with and ride quality that remains impeccable regardless of road surface. Put simply, this setup allows you to do virtually anything you want, whether it's cruising down a concrete freeway without feeling sharp hits through the chassis or making demon passes on a back road with total confidence and precision.

You can even take it to the track: The S3 suspension is designed to work equally well for road use and track days, though it stops short of being a full-race setup. Given that our public-road test of the car took place on isolated backroads that bear more than a passing resemblance to Sears Point and Laguna Seca, we're inclined to agree.

Big brakes by Brembo

A Dinan-by-Brembo big-brake kit further aids track compatibility. Regardless of what Steve Dinan may have said about big brakes being overrated, we'll gladly take these in place of the stock M3 brakes or any other BMW stoppers, even at more than \$6,000. We've extolled the virtues of Brembos for years, and we'll happily continue to do so even if the improvement can't be quantified in a single-stop 100-to-0mph test. What we really like about these brakes is their feel, which is firm and progressive and inspires total confidence, and their utter lack of fade even when asked to make repeated hard stops.

Dinan's customized brake setup features

355mm front rotors and 345mm rears—all gas-slotted and floating on aluminum hats. Calipers are four-piston aluminum at all four corners, fitted with Dinan-spec Ferodo pads that retain the stock brake wear sensor. Fluid flows through DOT/TUV-approved Goodridge stainless steel lines.

When we drove the S3-M3, it was riding on a set of Michelin Pilot Sport Cup tires. These DOT-legal tires are basically race tires, and their grip is phenomenal whether braking or accelerating. The influence of tires on a car's overall performance can't be underestimated—witness the fact that BMW installed Pirelli P-Zero Corsas on its M6s for the press launch of that vehicle even though the cars won't be delivered that way, at least not in the U.S. Even so, we can't help but be unconditionally impressed by the Dinan S3 M3. In a way, it's what the car could have been all along had BMW been unconstrained by liability and cost concerns.

The latter is crucial because it's undeniably amazing that BMW was able to bring such an incredible vehicle to market for under \$50,000. Yet as much as we admire that achievement, we can't help but be even more impressed by what can be achieved with the car on an even bigger budget. The Dinan S3-M3 is expensive—the base package of engine, suspension and driveline upgrades goes for \$21,350; adding the wheels and brakes brings the parts total to \$33,195, and you've still got almost 60 hours of labor to pay for on top of that, for which you'll have to budget about \$5,000.

Is it worth it? Absolutely. An S3-M3 is still cheaper than any Porsche or Ferrari with similar performance, yet it remains a true BMW, with no compromise whatsoever to its essential virtues of versatility and usability. It's worth the money, and it was certainly worth the wait, even if it did take a year or so longer than anyone expected, including Dinan. The best things always take time, and the Dinan S3-M3 is no exception. 🍀