

BMW M3



The high-performance version of the 3 Series coupe gets V8 power, other significant upgrades.

by *Stuart Birch*

BMW's new M3 coupe is all about power, torque, and performance. It is the first time the M3 has been given a V8 engine, and it ups the power of the ultimate version of the 3 Series coupe from the 252 kW (338 hp) of the old six-cylinder model to 309 kW (414 hp) at 8300 rpm.

The evolution of the M3 has covered 21 years. It was originally powered by BMW's first 16-valve four-cylinder engine. Later came 3.0- and 3.2-L sixes. Racing derivatives have won more Touring Car titles than any other car.

The 4.0-L engine is able to rev to 8400 rpm to give the M3 performance figures

that include a 0-100 km/h (0-62 mph) time of 4.8 s and top speed electronically limited to 250 km/h (155 mph). Maximum torque is 400 N·m (295 lb·ft) at 3900 rpm, with 85% available over a rev spread of 6500 rpm. Fuel consumption is improved by 8% compared to the previous model, demonstrating that BMW is applying its Efficient Dynamics concept successfully across its vehicle range.

The V8 engine is a cousin of the 5.0-L V10 used in BMW's M5. It has a mass of 202 kg (445 lb), which is about 15 kg (33 lb) lighter than the previous M3's 3.2-L six-cylinder unit. Its block is built alongside those for F1 cars at BMW's light-alloy foundry in Landslut. The crankcase is manufactured from what the company describes as a special aluminum silicon alloy, and conventional cylinder liners are replaced by hard silicon crystals. The crankcase includes a bedplate to give added stiffness. The forged crankshaft has a mass of 20 kg (44 lb).

As would be expected, the engine

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uses—in M form—BMW's established variable double-VANOS camshaft management to enhance torque, response, fuel economy, and emissions. The engine has a wet-sump lubrication system with two sumps, one ahead of the front axle sub-frame with a larger one further back to cope with the effects of fierce retardation. A separate reflow pump extracts oil from the front sump as necessary and pumps it to the rear.

The M3's V8 unit has individual throttle butterflies for each cylinder under fully electronic management, an extrapolation of motorsport technology. The butterflies in the intake manifolds are positioned very close to the intake valves and the specific length and diameter of the intake funnels benefit from the oscillating pipe charge principle, says BMW. Both the intake funnels and air collector are manufactured from composite material.

The engine's exhaust manifolds are made in an internal high pressure remolding process, shaped from inside under an 800-bar (11.6-ksi) pressure to provide thin walls of 0.65-1 mm (0.026-0.04 in). Ion-flow technology is used in the combustion chamber to detect engine knock and each

New Vehicle Technology HIGHLIGHTS



Individual throttle bodies for each cylinder help the new M3 4.0-L V8 engine produce 309 kW (414 hp) at 8300 rpm.

cylinder is monitored via its spark plug. The spark plug serves as an actuator for the ignition and as a sensor observing the combustion process.

Brake-energy regeneration is used on the car's intelligent engine current management, concentrating the generation of electric power for the onboard network on the overrun phases and the application of the brakes, charging the car's battery without tapping engine power, says BMW. As long as the engine is running under power, accelerating and pulling the car, the alternator generally remains effectively disconnected.

BMW combines brake-energy regeneration with AGM (absorbent glass mat) batteries, which are better able to withstand the increased number of intermittent charging phases. In an AGM battery, the acid is held in micro-glass-fiber mats between the individual layers of lead. The battery is able to store energy over a long period even when regularly charged and discharged.

The engine drives through a six-speed manual gearbox and an M differential. It is understood that BMW is considering an SMG (sequential manual gearbox) for the car. The former-generation M3 CSL had an SMG system.

The weight-saving philosophy applied to the M3's powertrain extends to its bodyshell. It is claimed to be the first full production car in its class to feature a carbon-fiber-reinforced plastic (CFRP) roof panel with exposed weave. It saves

about 5 kg (11 lb) and helps to lower the car's center of gravity.

Although sharing many design cues with the regular 3 Series coupe, only the doors, trunk lid, windows, and front and rear lamps are carried over; some 80% of parts are different. Some M3 distinguishing styling features are a power dome and two air intakes in its aluminum hood, three large air ducts in the front lower bumper valance, side gills, and a rear diffuser. Wheel diameters are a standard 18 in or optional 19 in.

BMW fitted a CFRP roof to the previous high-performance M3 CSL and has refined the production process to make it easier to manufacture and fit in with the manufacturing requirements of the new M3's larger-scale production cycle.

The roof comprises individual layers of woven and non-crimped carbon-fiber fabric placed on top of each other and then pre-formed together in an automated process. The pre-form is placed in a closed steel tool, where a strong bonding epoxy resin is applied to bind the layers together. A clear top coating was chosen rather than a matching paint color so that the intricate weave of the M3 coupe's roof could be kept visible to highlight its construction.

Compared to the outgoing M3 coupe, the fourth-generation model is larger. It is 123 mm (4.8 in) longer at 4615 mm (181.7 in), 24 mm (0.9 in) wider at 1804 mm (71.0 in), and 35 mm (1.4 in) taller at 1418 mm (55.8 in) to create greater interior space. The heavily sculptured front



The steering wheel of the M3 provides an MDrive button for EDC (electronic damper control) and enhanced DSC+ (dynamic stability control) settings.

intakes have been designed to channel up to 400 L (14.1 ft³) of air per second into the engine. The spoiler and sculpted wing mirrors create additional downforce. At the rear, the quad exhaust pipes protrude in pairs on either side of a small venturi, while a modest rear spoiler on the trunk lid provides further downforce.

The new M3's multilink rear suspension incorporates aluminum components. Its control arms and dampers are 2.5 kg (5.5 lb) lighter than regular examples.

The M3's electronic damper control (EDC) allows the driver to adjust the suspension compliance among three settings: Comfort, Normal, and Sport. Changes can be made via the EDC button located on the transmission tunnel. Alternatively, the MDrive Manager function can be used to set the damper requirements with activation occurring via the MDrive button on the steering wheel.

BMW says the new M3 has the most advanced stability control system currently available, being refined for the car. Although DSC+ can be switched off completely, it has two program levels. The first corresponds with the standard BMW road car setup and offers a near-complete electronic safety blanket that includes traction control, Anti-slip + Traction, and Corner Brake Control. The second stage of DSC+, called MDynamic mode, appeals to the sport-oriented driver. This program is pre-selected using the MDrive menu and can be called up by pressing the MDrive button on the steering wheel. MDynamic mode allows for a greater degree of wheel slip without the interruption of the DSC+ retarding power or braking individual wheels. **aei**