

The new BMW M6-UK Edition Contents

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1. The BMW M6 – short story

A new benchmark for BMW and M GmbH

They say lightning never strikes twice. But when two 507hp, 205mph, V10-powered M cars are launched in one year, stay indoors when the storm clouds gather.

Following the May arrival of the world's most inspirational saloon car, the fourth generation M5, the world's most sophisticated production car engine finds its way into the GT class with the arrival of the BMW M6. Packed with technology, inspired and built from Formula 1-derived processes, and offering unparalleled levels of lightweight engineering, the new M6 takes its place in the UK as the 18th official BMW M car.

The new M6 is the first production car from BMW that can justifiably compete with rival cars from the factory gates of Newport Pagnell, Maranello or Sant' Agata, whilst taking the challenge once again to the best that Stuttgart has to offer. Facing these challenges, the M6 is launched in November 2005 in the UK as the first series production car to offer a high revving V10 engine combined with a seven-speed sequential gearbox and a carbon fibre roof. Allied to a pin-sharp lightweight chassis that delivers fluid responses and poised handling, the M6 presents a new benchmark for the BMW badge.

The world's best engine?

Born with the world's best engine under the aluminium bonnet would give the new M6 a head-start over many rivals. And that's just what the highly regarded International Engine of the Year jury agreed upon. The naturally aspirated, high-revving, 5.0-litre V10 that powers the M6 won the 2005 award by an unprecedented margin and added to BMW's list of awards from the jury. A list longer than that of any other car manufacturer, with 26 trophies garnered in the awards' history. So, let's take a closer look at the new V10.

Key facts

Engine		90° V10 4,999cc
Maximum power	(hp@rpm)	507@7,750
Maximum torque	(Nm@rpm)	520@6,100
Maximum engine speed	(rpm)	8,250
Specific output	(hp/litre)	101.4
Top speed	mph (limited)	155
Top speed	mph (unlimited)	over 200
0-62mph	(secs)	4.6
Transmission		7-speed SMG

F1 technology takes to the road

It will not escape the notice of aficionados that the new M6 engine shares its V10 configuration with the BMW F1 engine in the 2005 BMW Williams F1 car. But that is not the only link to the pinnacle of world motorsport. The engine's manufacturing process and its electronic management system have their roots in the sport. Add to that the design, manufacture and fitting of a carbon fibre roof (the first in any series production car other than the very limited-volume M3 CSL) by BMW. Formula 1 has clearly inspired the team at M.

Engine

The V10 is not, of course, directly related to the F1 racing car's unit— it has 5.0 litres and the F1 engine is 3.0 litres – but apart from sharing the V10 layout it is a high revving engine, like the F1 unit, and much of the inspiration for the electronics and engine design was drawn from F1 experience. The high-speed nature of the engine is a case in point. The new 'ten-cylinder' has broken the 8,000rpm barrier and reaches a maximum of 8,250rpm. At 8,000rpm each piston covers 20 metres a second. At 18,000rpm the pistons of the F1 engine move at 25 metres a second. The difference is that the M engine must last for a 'lifetime' while the F1 engine only has to travel 500 miles or so.

The brain behind the brawn

A high-speed engine requires high speed electronic management to ensure that every last ounce of performance can be extracted. To achieve this objective, BMW has developed one of the world's most advanced engine management systems, MS S65, designed and built entirely in-house using know-how from BMW's F1 programme.

Made up of more than 1,000 individual components it co-ordinates and controls all engine and gearbox functions by using three 32-bit processors that can perform a truly incredible 200 million individual calculations each second. This represents a performance increase by a factor of eight when compared with the M3 unit launched four years ago and MS S65 has ten times the memory capacity too.

Same birthplace

So it is abundantly clear that the M6 engine has technological principles and production methods in common with the F1 engine. It is the product of technological transfer. The M6 blocks are cast at the BMW light alloy foundry in Landshut – the same place as the F1 blocks are born – before they journey to the special engine plant in Munich for assembly.

The engine features a Formula 1-inspired bedplate design for the crankcase that provides a compact and extremely stiff configuration to withstand the very high engine speeds, combustion pressures and high temperatures. Another motorsport-

motorsport-inspired technology is that each of the ten cylinders has its own throttle butterfly and each cylinder bank is served by its own activator.

Dropping the roof

The final piece in the F1 / M6 jigsaw is the attempt by the engineers to lighten the car using carbon fibre technology never before applied to a series production car.

The incorporation of a BMW-manufactured carbon fibre roof, bonded to the body, contributes to a 45kg weight reduction over a 'standard' steel car, for example, but also benefits the car's dynamics in a far more subtle manner. As weight is removed from the top of the car, its centre of gravity is lowered (by as much as 60mm in the case of the M6), and its handling and performance subsequently improved. Again, BMW's F1 experience has helped the engineers incorporate carbon fibre into the M6 design, both on the roof and on the front and rear bumper supports.

The fastest and most high tech BMW ever proudly displays its F1-inspired roof as an unpainted crowning achievement, but at the heart of the M6 lies the true glory behind the car.

Committed to 'natural' power

The V10 engine configuration has so far been the preserve of racing cars and exotic low volume sports cars. BMW is, therefore, breaking the mould with this new five-litre unit: it produces 507hp, thereby achieving a specific power output of no less than 101.4hp per litre - a remarkable result from such a large capacity engine.

BMW achieved this performance by adhering to its philosophy of developing a high revving normally aspirated engine. This was by no means the easiest route – forced induction or increasing engine capacity could more easily have generated the required 507hp - but it demonstrates BMW M engineers' quest to offer only the purest and lightest solution for its M6 customers.

The result is an engine that reaches maximum power at 7,750rpm and goes on to reach maximum revs of 8,250rpm.

High revs + power + torque + gearing = thrust

High power outputs and engine revs are not, however, an objective in themselves. To produce the driving response required by M6 drivers these characteristics must be melded with high torque and gearing throughout the driveline that blend to produce thrust.

Acceleration characteristics and driving dynamics depend on the balance of forward thrust and vehicle weight and this has been the main focus for M engineers. The new M6 engine produces 520Nm at 6,100rpm and 450Nm is available from only 3,500rpm thus providing a wide engine range from which to produce thrust.

Weight-watcher – every gram counts

This masterpiece of an engine weighs in at just 240kgs. There are a host of super-light components inside the engine – for example the forged steel crankshaft, carried in six bearings, weighs only 21.8kgs while each piston weighs a mere 481.7 grams. This same engine features in the new M5 and, as an example of the lengths the engineers have gone to in reducing weight, overall moving masses in the valve train have been reduced by 17.5 per cent when compared with the new M5's predecessor, the E39 V8 powerplant.

Each small contribution to weight reduction helps to ensure that the goal of perfect 50/50 front to rear weight distribution is achieved.

Breathing and exhaling

BMW's familiar Bi-VANOS infinitely variable camshaft control has been developed to suit the new high-speed engine. The system enables increased performance, an improved torque curve and lower fuel consumption and exhaust emissions.

Stainless steel five-into-one tubular exhaust manifolds, with a wall thickness of just 0.8mm, feed exhaust gases into two dual flow exhaust pipes equipped with four trimetal-coated catalytic converters. These reach optimum temperature quickly and enable the M6 to meet European EU4 and American LEV2 emission standards with ease.

The devil is in the detail

The technical details of this new V10 engine could fill a book (see engine section) but to highlight just three items:

- There are ten individual throttle butterflies, each individually electronically controlled, which read the position of the throttle pedal 200 times a second.
- A clever transverse lubrication system ensures that the two cylinder heads receive oil even when 1g+ cornering forces are experienced and a quasi-dry sump system keeps the bottom end lubricated even under extreme 1.3g braking.
- The spark plugs use ionic current technology to act as a sensor and inform the MS S65 control unit about combustion conditions and control engine knock, as well as igniting the fuel / air mixture.

Seventh heaven

To extract the best from this gem of a V10 engine BMW has developed a seven speed Sequential M Gearbox (SMG). This manual gearbox is an all-new transmission designed to handle up to 550Nm of torque and engine speeds of up to 8,500rpm, giving capacity to spare. Naturally, seven gears allows shorter steps from one gear to the next than a five or six-speed 'box so this gearbox matches torque to the prodigious power output and translates it into maximum forward thrust.

Drivelogic – bespoke gear changes

BMW is the first manufacturer to offer such a seven-speed sequential gearbox in a production car. It also features Drivelogic – eleven gear change programmes available to every driver to select his or her preferences.

The selection of programmes is made by pressing a button next to the gear lever. A preferred default mode can also be programmed into MDrive Manager via the iDrive menu and activated by the MDrive button on the steering wheel.

Six programmes in S mode are manual changes that must be determined by the driver – either using the gear lever (forward for down changes, back for up) or the paddles behind the steering wheel (left for down changes, right for up). The remaining five in D mode are automated changes.

Each programme differs in gear change time – the higher the programme the shorter and faster the shift times and the longer the engine holds onto the revs. In the automated modes use of the throttle can influence the change: for example, releasing the throttle encourages an up-shift while pressing it harder calls up a down change.

Ten times quicker than you or I

The SMG system in the current M3 (SMG II) is already very fast but the new seven-speed SMG in the M6 (SMG III) is 20 per cent quicker still. To put this in perspective the new gearbox can make changes in 50 milliseconds while a seasoned driver will take around half a second with a normal manual gearbox.

Other features of the new SMG gearbox include:

- Gearchange lights and engine revolutions graphic in the Head-up Display (HUD).
- SMG includes a launch control system that gives perfect F1-style starts from zero to maximum speed. (Programme six in S mode)
- Hill start assistant prevents roll back when stopping on a gradient after releasing the brake.
- Hill recognition allows SMG to change gear points on gradients eg holding lower gears on downhill stretches and vice versa.

Agility and poise

An outstanding drivetrain cries out for a chassis that can exploit its potential. To harness 507hp effectively M engineers were presented with a considerable challenge.

They did, of course, already have a head start. The chassis of the 'normal' 6 Series Coupé was engineered to be the most competent in its segment. The high torsional rigidity of the bodyshell, well-balanced 50/50 weight distribution, long wheelbase, wide track, aluminium suspension and, of course, rear wheel drive all coalesce into a fine springboard.

Starting at this high level the engineers made a number of detailed changes to meet the extra demands made by the M6's potential. They stiffened the front subframe and changed the bearings at the front while at the rear additional supports, links and joints ensure greater precision for poised handling. The suspension bushes have also been tuned with high performance in mind. The final drive casing is made of aluminium and finned to reduce weight and improve cooling. Lightweight but stiff tubular drive shafts keep moving masses low.

Steering

M Servotronic power steering is both road- and engine-speed related which resolves the dilemma of the need for lighter steering at parking speeds and firmer, 'heavier' steering to provide driver feedback at speed.

The M6's Servotronic mapping offers two alternatives to the standard default setting and both relate to the prevailing Electronic Damper Control (EDC) mode. In the sporty EDC mode steering is more direct giving the driver an immediate, precise response while in Comfort EDC mode a higher ratio gives an easier, more comfortable steering reaction.

Electronic Damper Control (EDC)

EDC provides continuous and infinitely variable shock absorber control. In normal mode the damping is adjusted to achieve the optimum balance for normal conditions while 'Sport' and 'Comfort' provide firmer and softer reactions respectively.

Variable M Differential Lock

Like the M3 and the new M5, the M6 has a unique and variable, torque-sensing differential developed by BMW M GmbH. Unlike a normal limited slip differential the M differential lock can provide between zero and 100 per cent of the drive forces to either driven wheel. This ensures maximum stability and optimum traction.

Dynamic Stability Control (DSC) with MDynamic mode

A new generation of DSC was developed exclusively for 2005's M cars and can be programmed to act in one of three stages. The first corresponds to a standard DSC system found on all BMWs, while the second, MDynamic mode is unique to the M5 and M6 and allows the driver to really 'push the envelope' of the M6's performance capabilities.

MDynamic mode is a development of BMW's Dynamic Traction Control system. DSC set at this stage will not intervene to save things until the last possible moment. Therefore the M6 can reach amazing slip angles and still recover. The desired programme is initially selected using the MDrive Manager programme (see page 11) but is then subsequently activated by simply pressing the MDrive button on the steering wheel.

In addition the driver can also switch between DSC fully operational or completely disengaged via a button on the centre console. Understandably, this should not be practised on the public road.

Brakes

Large, drilled compound disc brakes with aluminium twin-piston sliding callipers provide braking to match the M6's performance. From 62mph the M6 is stationary after just 26 metres. From 124mph the braking distance is less than 140 metres.

Wheels and tyres

To accommodate the huge brake discs the M6 is equipped with 19-inch M Light Alloy double spoke wheels of unique design (8.5 inches at the front and 9.5 inches at the rear).

Specially developed tyres were designed and tuned on the Nordschliefe, where all new BMWs are rigorously tested, to deliver both comfort and feedback to the driver. Tyre sizes are 255/40 ZR 19 at the front and 285/35 ZR 19 at the rear.

A tyre defect system warns if pressure drops below a certain threshold and the familiar M Mobility System allows tyre damage of up to 6mm to be sealed effectively by the roadside. Hence there is no need for a spare wheel and tyre saving 20kgs, which brings the benefits of a power-to-weight reduction and better driving dynamics.

The 6 Series diet

The M6 engineers and designers have raised the bar on the use of lightweight technologies within the industry.

The engineers were challenged to shed all unnecessary weight in the transformation from 6 Series grand tourer to M6 performance car yet still maintain the car as a comfortable and safe 2+2 continent crusher. BMW's traditional use of lightweight technologies was merely a starting point. A tour around the car reveals weight-saving on every plane, including the world's first carbon fibre (CFP) roof in series production, CFP front and rear bumper supports, aluminium doors and bonnet, thermoplastic front wings and a sheet moulding compound (SMC) boot lid.

Carbon lightens the load

Inspired by the reaction to 2002's M3 CSL, and using experience gained from Formula 1 engineering, BMW replaced the conventional steel roof of the 6 Series Coupé with carbon fibre. This reduces the weight of the roof by 50 per cent (nearly five kilos) and aids handling as, with weight removed from the top, the car's centre of gravity is lowered.

Designed and manufactured at BMW's own Landshut Plant, the roof not only contributes to weight loss through its composition, but also through the fact that it is bonded to the body of the car rather than welded. This allows the rear window to be re-designed as a thinner and lighter structure. The roof remains unpainted on the production car to highlight the performance benefits to the M6 driver.

Air flow: from the roof to the floor

With 507hp and 205 mph potentially on tap, in a car that begs to be driven hard, it was imperative that the engineers ensured the efficient supply and extraction of cool air. Again, in-house designers and engineers worked closely together to ensure maximum performance.

The front air dam sits close to the road and features large air intakes to maximise the supply of cool air under the bonnet and a separate flow of cooling air is also directed over the ventilated disc brakes and underneath the bonnet via side openings to the left and right of the central air scoop. Flaps on the front air dam also reduce lift forces on the front axle.

At the back, a diffuser on the rear air dam maximises the flow of cool air over the final drive and, in combination with the car's smooth floor pan and subtle boot-lip spoiler, reduces drag and lift forces. The larger rear air dam now houses the car's number plate, with the rear light units slightly raised accordingly.

Side on

From a side view, the shape of the front wings has been modified to suit the larger, but lighter wheels, which weigh nearly two kgs less than comparable 'normal' light-alloy wheels. The wheels are shod with high performance Continental tyres.

Low, and dynamic re-styled side sills emphasize the length of the M6 and optimise the flow of air along the underside of the car, improving its aerodynamic properties. As do the new door mirrors with their dramatic two-tone design. Honed in the wind tunnel, they contribute towards reducing lift on the front axle.

Weight to the rear

Battery and fuel tank placement was replicated from the M5 design following a redesign of the 6 Series Coupé boot floor. The battery location over the rear axle and the 70-litre plastic fuel tank situated in front of the rear axle helps weight distribution front to rear. A jet pump and pressure-controlled dual pump in the fuel tank permanently ensure a reliable fuel supply.

M body colours

Launched on the M5 in May, four exclusive metallic paints – Sepang Bronze, Silverstone II, Indianapolis Red and Interlagos Blue – are also available on M6. Other colours available include Alpine White, Black Sapphire metallic and Silver-grey metallic. The air vent gills in the front wings, the boot lid and the doorsill trims all bear the M6 logo.

The interior: sports car characteristics with a touch of comfort

The M6 interior offers the sporting touches and luxurious traits expected of such a thoroughbred sports car. Passengers are presented with performance-related functions, but space, comfort and safety remain fundamental criteria.

A total of six airbags, belt force limiters, intelligent safety electronics and the automatic or manual emergency call via the BMW Assist function (if the car is fitted with Bluetooth and telematics capability) are all standard.

Even with regard to luggage space, the car compares well with the M5 super-saloon. Confirming its credentials as a cross-country (or continent) GT, the M6 offers 450 litres boot space, just 50 litres shy of the M5.

Sporting luxury inside

The M6 features Merino leather upholstery as standard with Full and Perforated Merino leathers offered as an option. Full Merino leather adds a leather dashboard and centre console while Perforated Merino leather features active ventilation of the driver and the front passenger seats.

Comfort is all-important when seated at the wheel of a sports car and the M6's contoured M seat is both supportive and comfortable. Featuring passive backrest width adjustment that offers superb side support, they also come with seat memory function, seat heating for driver and front seat passenger, and an electrically adjustable lumbar support.

2 + 2 = room for four

Space in the rear will always be a compromise for a sports car, but the new M6 offers sufficient room for two youngsters, or even two adults on short journeys. Access is easy as the front seats slide a long way forwards and tip, whilst contoured back rests on the rear seats ensure good support.

At the wheel

The newly designed M leather multi-function sports steering wheel is ergonomically designed with the SMG shift paddles (down on the left, up on the right) within fingertip reach.

The M6 features the same new design of speedometer and rev counter as introduced on the M5. A round black dial with white numerals and the typical M red needles provide all essential information. Yellow and red warning fields indicate rev limits while the engine is warming. An oil temperature gauge and odometer complete the instruments while a display between the speedo and tachometer shows the SMG gear selected and Drivelogic transmission programme operation. It can also display the engine's oil level and on-board computer functions.

MDrive Manager

MDrive is a new function activated by the M button on the steering wheel. It enables the driver to change the smooth and comfortable grand tourer into a thoroughbred sports car at the touch of a button.

At the press of a button the following functions are activated (after they have been pre-selected by the driver from the MDrive Manager menu within iDrive):

- The power button - P400, P500 or P500 Sport programmes
- SMG Drivelogic - which of the 11 programmes is preferred
- DSC - on, MDynamic mode or off
- EDC - Sport, Normal or Comfort damper settings
- HUD - normal or M specific display

All the driver has to do is select his favourite settings within iDrive then press the M button on the steering wheel.

Head-up Display

The standard Head-up Display (HUD) provides driving information directly in the driver's line of sight – i.e. it appears to be at the end of the bonnet. The driver can choose to have the normal HUD display, including navigation information, or specific M information.

The M-specific display shows engine revs in a coloured map image that flash at the point of gear change, gear in mesh and vehicle speed. In either display the Check Control messages such as "door open" or "low fuel" are still shown.

The market

The M6 sees BMW entering a new niche market. Never before has the company offered a high-performance 2+2 sports GT that is able to stand toe-to-toe with Italian supercars.

Only 400 cars will be available in the UK in 2006 and the waiting list already covers that allocation. Performance-wise the car competes with far more expensive cars from the likes of Ferrari and Aston Martin, and at £80,755, outperforms many similarly priced cars. Typically, owners will have at least two other cars in their garage and will be slightly younger than the driver of a standard 6 Series Coupé (mid-40s compared to late-40s).

As with the M5 that was launched in May 2005, BMW UK is working hard to ensure that prospectors do not benefit at the expense of genuine customers on the waiting list.

Owners will be predominantly male, mostly successful businessmen or entrepreneurs. And with the combination of searing performance and practicality, they will use the car day-to-day, rather than as a weekend toy.

"BMW is enjoying a very successful new decade with record sales in the UK and the M badge is a key special ingredient in our achievements," said Jim O'Donnell, managing director of BMW (UK) Ltd.

"The M5, and now the M6, are fantastically aspirational models within our range. They are an inspiration for true car enthusiasts and continue to set the benchmark for performance versions of standard road cars. For many of our customers, the M cars are the reason for joining the BMW family, whether they own a new M6 or our 1 Series sports hatch, where the company's engineering principles, honed at the M division, clearly filter down through the range.

"As showcases for technological innovation, combined with driving dynamics that continue to appeal to the enthusiast, special cars like the M6 put the M in BMW," O'Donnell concluded.

2. The perfect ten

BMW's V10 wins hearts and minds

Highlights

- The most sophisticated BMW production car engine ever
- 2005 International Engine of the Year
- Formula 1-inspired technology and manufacturing processes
- In-house electronic 'brain' making 200 million calculations per second
- Naturally aspirated for engineering purity

Designed and built by BMW, the ten-cylinder heart of the M6 is forged from Formula 1 principles, and is officially the best engine in the world.

International Engine of the Year

Nearly ninety years after BMW began its life producing aero engines, the judges of the 2005 International Engine of the Year awards unequivocally crowned BMW's new V10 naturally-aspirated powerplant as the number one engine in the world. More successful than any other manufacturer in these highly regarded industry awards, with 26 trophies in all, BMW rightly prides itself that the engines it produces today offer the finest blend of power, response, and economy. A blend wrapped in an emotional aura distilled in the sound of an M engine at full throttle.

With a history steeped in the production of first aeroplane engines, then racing and road-going motorcycle and car engines, it is only natural that BMW offers the widest choice of engine configurations of any brand worldwide. One, two and four-cylinder motorcycle engines and four, six, eight, 12 and now ten-cylinder engines make BMW the most prolific of all.

New BMW V10 engine

Layout	90° V10
Capacity	4,999cc
Bore/stroke (mm)	92.0/75.2
Valves	40
Power (hp) @ rpm	507@7,750
Torque (Nm) @ rpm	520@6,100
Maximum engine speed	8,250
Specific power output (hp/litre)	101.4
Weight (kgs)	240
Compression ratio	12.0:1

First high revving V10 engine in a production car

The V10 petrol engine has so far been the exclusive preserve of racing cars and exotic low volume sports cars. 2005's M cars (M5 / M6) break the mould as the first series production cars equipped with a high revving V10. This five-litre unit produces 507hp allied to a torque of 520 Newton metres with an engine speed peak at 8,250rpm.

Equally impressively, these statistics are achieved without any form of forced induction: this is a pure thoroughbred that achieves a specific power output of no less than 101.4hp per litre - a remarkable result from such a large capacity engine.

Achieving a new performance benchmark

507 horsepower is a new peak for BMW, but achieving this milestone is more than just a matter of increasing power. In order to stand out in an ever-increasing market for performance cars it was essential to balance the power with an engine performance fit for the fastest ever M car.

BMW engineers considered three possible routes to boost performance:

- 1 increase cubic capacity thereby raising torque,
- 2 forced induction via a turbocharger or supercharger or,
- 3 develop a high revving engine to increase torque

The conclusion was that there is more to an engine than pure output. Acceleration characteristics and driving dynamics are equally, if not more, important, both of which are dependant on forward thrust and vehicle weight. The forward thrust delivered by the driven wheels is the result of the blend of torque, power and gearing. Would BMW's traditional concept of a high revving engine with a close ratio gearbox and an appropriate final drive ratio realise this blend and unleash the desired drive forces and driving experience?

Separating the wheat from the chaff

Deploying the cubic capacity or forced induction route may well deliver the similar power and torque statistics, but both routes present drawbacks.

Increasing the engine size adds weight at the front of the car, requires more space under the bonnet and increases fuel consumption. Supercharged engines also have drawbacks. Rarely do they excel in the fuel economy stakes and their response to driver inputs is never as spontaneous as a purebred normally aspirated unit. Forced induction engines also offer very high levels of torque, but therefore require massively reinforced, and therefore heavy, drivetrains.

High revving, instant power – naturally

So, BMW M engineers chose the third option of a high-revving, naturally aspirated engine as the perfect solution for the new M5 and M6. It was a far more challenging approach and much more difficult to bring such a concept to reality but, in BMW M's view, it was worth these sacrifices for the purity and integrity of the whole design.

This solution only adds 20 Nm of torque to the engine's spiritual predecessor, the E39 M5's 5.0-litre V8, but it is the sophisticated combination of power, torque and gearing that places it on a new plane as far as driving dynamics is concerned. It reaches maximum torque at 6,100rpm and 450Nm is available from 3,500rpm. This is a very wide engine speed range for such an engine and fully exploitable through the car's seven speed SMG manual transmission.

Brains and brawn

But the beauty of this engine is that it combines traditional engineering principles with the most technologically advanced electronic systems. It truly is unique.

Mastermind

BMW's V10 is controlled by the MS S65 engine management system that can perform over 200 million individual calculations per second – a new record for a regular production car engine. Made up of more than 1,000 individual components it co-ordinates all engine and gearbox functions via different control units.

This is not a component bought in from outside BMW: the hardware, software and functioning of MS S65 are all BMW M in-house developments and it is one of the main reasons for the M6's outstanding performance and emissions data.

High engine speeds demand high performance electronics

The demands placed on the MS S65 control unit are many and varied. Not least by the engineers' insistence of a naturally aspirated high-revving engine and the large number of control and regulation tasks required. Therefore the control unit has three 32-bit processors that perform an incredible 200 million individual calculations per second.

Compare this to the not exactly slovenly E46 M3 control unit presented only four years ago and the new system represents a performance increase by a factor of eight. It has ten times the memory capacity too.

The brain behind the brawn

Receiving over 50 input signals, the system calculates the optimum ignition point, the ideal cylinder charge and the injection quantity for each individual cylinder on each individual combustion cycle. At the same time MS S65 calculates the optimum camshaft angle and the ideal position for each of the ten individually controlled throttle butterflies, and then makes the necessary adjustment.

The system also manages many ancillary functions:

- It manages the electronic throttle valve control on a power and torque matrix according to a potentiometer on the accelerator pedal. This meets the driver's wish for power and performance. The power and torque manager adjusts requests by adding power signals from auxiliary engine units such as the air conditioning compressor and the alternator.
- Functions such as idle speed control, emission control and knock control are also coordinated and aligned to the maximum and minimum output and torque curves permitted by DSC (Dynamic Stability Control) and EDFC (Engine Drag Force Control). The target output and torque calculated in this way is maintained while taking into account the current ignition angle.
- MS S65 also carries comprehensive on-board diagnosis for use by BMW service engineers.
- The engine management system manages new and innovative ionic current technology to manage engine 'knock', misfiring and combustion 'misses'. See more detail at the end of this section.
- A 'Power' button beside the gear lever allows a 400hp or 507hp engine programme to be selected. Each time the M6 is started it is in P400 mode: in other words, the engine is programmed to deliver 'only' 400hp. This is to suit normal urban traffic conditions when the driver doesn't necessarily want 507hp on tap. Pressing the POWER button brings in the full 507 horses. The 507hp setting can be pre-selected in MDrive Manager and activated immediately from the MDrive button on the steering wheel, along with other bespoke selections. See section 5 for more details.

The V10's electronic wizardry is working its magic on tried and trusted, but still state-of-the-art, BMW engineering principles. Since the launch of Bi-VANOS technology on the E36 M3, BMW's engines have been fine-tuned to offer the best systems for air intake and exhaust.

Breathe in

The new V10 engine features Bi-VANOS variable camshaft control pioneered on the 1995 M3, and now available across the range of petrol models. This latest incarnation ensures the optimum charge cycle helping to achieve very short adjustment times.

The adjustments of camshaft position relative to the crankshaft are infinitely variable and map-controlled. The Bi-VANOS allows a variation of the angle of the intake cam by up to 66° while the outlet varies by a maximum of 37° relative to the crank. These angle adjustments are a function of accelerator position.

In practice this means increased performance, an improved torque curve, optimal response to driver inputs, lower fuel consumption and fewer emissions. For example, at the lower end of the load and engine speed range the engine increases valve overlap thereby boosting internal gas recirculation. This reduces charge cycle losses and lowers fuel consumption.

The M Bi-VANOS technology requires very high oil pressures to achieve ultra-precise high-speed camshaft adjustment. A radial piston pump in the crank chamber increases engine oil pressure to 80 bar and this map-controlled high-pressure adjustment permits optimum angles, precise ignition points and injection quality under all conditions.

Breathe out

Although the intake system contributes a considerable amount to the performance of the new M6 engine, the importance of the exhaust cannot be underestimated.

Two stainless steel 5 into 1, equal length, tubular manifolds carry the exhaust gases from the engine. To achieve exact pipe diameters, the seamless pipes are formed from the inside using an interior high pressure forming technique (hydroforming) at a pressure of up to 800 bar. The pipe walls have a thickness of just 0.8mm – a sign of the M engineers' incredible attention to detail.

A paragon of cleanliness

Two trimetal-coated catalytic converters per exhaust clean the exhaust gases to meet European EU4 and American LEV2 standards. There are two underfloor catalysts and two more close to the engine. In conjunction with the thin-walled exhaust manifolds, these catalysts quickly reach their optimum operating temperature, even after a cold start.

The exhaust gases finally leave the system through four prominent tail pipes that give the M6 so much character from the rear and they produce a symphony for car lovers, both inside the car and out. A sound that echoes the spiritual home of M GmbH – the Nürburgring - where all BMWs are tested to the limits.

Motorsport technology takes to the road

With M born of a desire to replicate motorsport performance in a road-going car, it will not escape the notice of aficionados that the new M6 engine shares the V10 configuration with the most recent of BMW's F1 engines. It is not, of course, directly related – it is a 5.0 litre and the F1 engine is a 3.0 litre - but apart from sharing the V10 layout, it is a high-revving engine like the F1 unit and much inspiration for the electronics and engine design was drawn from F1 experience.

The high-speed nature of the engine is a case in point. The new ten-cylinder has broken the 8,000rpm barrier reaching a maximum of 8,250rpm. At 8,000rpm each piston covers 20 metres a second. At 18,000rpm the pistons of the F1 engine move at 25 metres per second. The difference is that the M engine must last for the life of the M6 while the F1 engine only has to travel 500 miles or so.

It is abundantly clear that the M6 engine has basic technological principles, production methods and materials in common with the F1 engine. It is the product of technological transfer.

The M6 blocks are cast at the BMW light alloy foundry in Landshut – the same place as the F1 engines. The engine features a Formula 1-inspired bedplate design for the crankcase that provides a compact and extremely stiff configuration to withstand the very high engine speeds, combustion pressures and high temperatures. Finally, another motorsport-inspired technology is that each of the ten cylinders has its own throttle butterfly and each cylinder bank is served by its own activator.

Technical Highlights

Weightwatcher

Every gram counts when building an engine to the lowest possible weight. The weight saving measures made in the new BMW M6 engine are too numerous to detail but below are a few highlights:

- The very stiff and finely balanced crankshaft made of forged high tensile steel carried in six bearings weighs a mere 21.8kgs.
- Each piston is made of high temperature resistant aluminium alloy with an iron coating and weighs only 481.7 grams including gudgeon pins and piston rings.
- Each fracture split connecting rod is 140.7mm long and made of high strength 70MnVS4 steel. They weigh 623 grams each including the bearing shells.
- The two aluminium cylinder heads of the V10 engine are also produced at the BMW light alloy foundry in Landshut. They feature integrated air ducts that are important for rapid catalytic converter warm-up. Each has four valves per cylinder, with valves actuated by spherical tappets with hydraulic valve play compensation. The tappet diameter has been reduced to 28mm and each one weighs only 31 grams.

Compact engine design

- The two cylinder banks are angled at 90° in a Vee configuration with a 17mm offset. 90° was chosen due to low vibration and good balancing properties.
- The cylinder crankcases are cast using low pressure gravity die-casting and are made of hypereutectic aluminium-silicon alloy. This special alloy contains 17

per cent silicon. There is no need for cylinder liners, so the iron-coated pistons run in uncoated bores.

- The M6 engine is a short stroke engine: that is to say the bore at 92mm is broader than the stroke at 75.2mm. Overall capacity is 4,999cc.
- The piston compression height is 27.4mm and the compression ratio is 12:1.
- Diameters of the valves are 35mm (intake) and 30.5mm (exhaust).
- The valves are exclusive to the BMW V10 unit. Each has a shaft only 5mm in diameter thereby improving intake flow.
- Hydraulic valve play compensation automatically provides optimum valve adjustment at all times. This lowers maintenance costs for the customer and ensures the correct valve adjustment at all times.
- Cross flow cooling concept ensures even temperature distribution in the cylinder head and the reduction of temperature peaks. It also minimises pressure losses in the cooling system.

Ten individual throttle valves

Each of the ten cylinders has its own throttle butterfly and each cylinder bank is served by its own activator. This is another system pioneered in motorsport. The highlights are:

- All throttle valves are electronically controlled.
- Two contact-less Hall potentiometers determine the position of the throttle pedal 200 times per second.
- The engine management system reacts to these readings and causes two activators to adjust the ten throttle valves.
- The whole operation happens at lightning speed: it takes just 120 milliseconds to completely open the valves, about the time an experienced driver needs to fully depress the accelerator.
- This gives instantaneous response.
- The V10 engine uses ten flow-optimised intake trumpets to breathe air from two intake plenums. Both the plenums and trumpets are made of a lightweight compound containing 30 per cent fibreglass.

The bottom end

The new V10 engine is the first series production V-engine to feature a bedplate design for the crankcase. It provides a compact and extremely stiff configuration to withstand the very high engine speeds, combustion pressures and high temperatures. The highlights of bedplate design are:

- The aluminium bedplate has integral grey cast iron inserts to ensure high precision crankshaft alignment. This keeps the main bearing clearance over the entire operating temperature range to a minimum.

- The grey cast iron helps to reduce thermal expansion of the aluminium casing.
- Main bearing diameter measures 60mm at a bearing width of 28.2mm.
- Two conrods connect to each of five crank pins that are offset at an angle of 72°.
- A reduced cylinder spacing of only 98mm enables the use of a short crankshaft that gives flexural strength and torsional stiffness, as well as low weight.

Constant lubrication even at 1.3g

The M6 has 1g plus cornering capability, while under extreme braking negative acceleration rates of up to 1.3g can be reached. Under such extreme circumstances it is critically important that oil can continue to lubricate the two cylinder heads and the crankcase. To solve this problem the M6 has a quasi-dry sump system and a 'traverse' force regulated supply. The highlights are:

- The traverse force regulated oil supply system incorporates two electrically operated duo-centric pumps that pick up oil from the outer cylinder head and transport it to the main oil sump when lateral acceleration rates exceed 0.6g.
- A lateral g-sensor transmits signals to pumps that are continuously variable, with volume control, to determine the exact amount needed.
- The quasi-dry sump oil system consists of two oil reservoirs – a smaller one in front of the cross member and larger one behind. When braking hard, a re-circulating pump integrated into the housing of one of the two oil pumps picks up oil from the smaller front sump to send it to the rear one which is carefully shielded. This ensures that the crankcase is never short of oil regardless of the g force.

Ionic current technology

Anti-knock control is necessary in high compression engines to detect and correct engine knock, misfiring and combustion misses. The uncontrolled ignition of fuel causes this condition and has an adverse effect on output, torque and fuel economy.

Conventional anti-knock systems employ several detectors on the outside of the cylinder to send 'knock' signals to a controller. In BMW M vehicles one sensor monitors two cylinders but the multi cylinder, high revving nature of the new V10 engine demands more. This is where ionic current management comes in.

- Ionic current technology uses the spark plugs in each cylinder to sense and control engine knock. It also checks for correct ignition misses.
- The spark plug has a dual function – as an actuator for the ignition and as a sensor for monitoring the combustion process.

- Conventional knock and ignition sensors are located outside the combustion chamber. Ionic current measuring occurs at the heart of the combustion process.

- Temperatures in an internal combustion engine reach 2,500 degrees. These temperatures and the chemical reactions taking place lead to a partial ionisation of the fuel-air mixture. The gas becomes conductive through the generation of ions by means of separation or accumulation of electrons. This is ionisation.
- The spark plug electrode, which is electrically isolated from the cylinder head, is linked to a small control unit – the ionic current satellite – that is supplied with DC voltage and measures the ionic current between the electrodes.
- The ionic current satellite receives signals from the five spark plugs in each cylinder bank, amplifies them and sends the data to the engine management system for analysis. The MS S65 unit then makes the necessary interventions for each cylinder to ensure perfect combustion.
- The spark plug also serves as a diagnostic resource for servicing and maintenance.

3. New seven-speed transmission Ultra-fast shifting with Sequential M Gearbox

Highlights

- World's first production car seven speed sequential manual gearbox
- 11 choices of manual or semi-automatic change patterns
- Rapid manual changes, ten times quicker than the hand
- In-house design showcases BMW engineering expertise

The M6 is fast. It covers the 0 – 62 mph sprint in just 4.6 seconds, faster than a DB9, a Vanquish, an SL 55 AMG or a 911 Carrera S. And it is the exemplary transmission of over 500 horsepower through the gears that gives the car this phenomenal speed.

Designed to handle torque of up to 550Nm and engine speeds of up to 8,500rpm throughout the M's entire lifecycle, the seven speed sequential M gearbox (SMG III) is exactly the right gearbox for the BMW M6's new V10 engine. It is completely new and sets BMW up as the first and only manufacturer to offer a seven speed sequential gearbox with Drivelogic.

But why seven speeds?

It's all about thrust

Seven speeds offer closer ratios than six – in other words there are smaller steps between each gear. This reduces dips in torque and power as each higher gear is selected. The transmission, with its short overall transmission ratio, therefore matches the torque to the prodigious power output and translates it into optimum forward thrust – thrust being closely related to high engine speeds.

Changing gear is a sublime pleasure with SMG

The seven-speed SMG is a true manual gearbox but the changes are handled by super-fast electronic programmes. Gears can be changed using the gear lever – forward to change down, backwards to change up – or by using the paddles behind the steering wheel. There is no clutch to press and SMG efficiently matches engine speed, even in the case of full throttle upchanges.

SMG offers all the benefits of a manual gearbox – engine braking and lower fuel consumption for example – and does not require the energy-sapping torque converter of an automatic.

How it works

Gears are shifted electro-hydraulically using shift-by-wire technology, a product of the aerospace industry. This new third generation SMG system has the hydraulic unit and actuators integrated into the gearbox casing. When a change is called for, the control unit actuates magnetic valves controlling the system's hydraulics.

The hydraulic oil, operating under 90 bar pressure, flows via a magnetic valve into the clutch master cylinder to open the clutch. Then, using solenoid valves, four hydraulic cylinders in the actuator are switched effecting the gear change process by means of four rods. When shifting down the engine the transmission double de-clutches automatically, including giving a throttle blip.

Warp speed changes smoothly

The second generation SMG system featured in the current M3 is already a very effective and fast shifting system. The new seven-speed SMG is, however, 20 per cent quicker.

To put this into perspective the new gearbox changes gear in 50 milliseconds. Compare this to even a seasoned driver using a normal manual gearbox who will take ten times that speed - around half a second.

This speed also reduces the jerkiness sometimes felt in earlier systems because the forward thrust is so seamless. It is also safer. Not having to concentrate on matching engine speed to gear changing allows more driver focus on the road, while enthusiastic down changes at overly high engine revs are an impossibility with the SMG system watching over the driver. The driver is also informed of optimal up-change points when the rev band in the Head-up Display flashes.* HUD additionally shows the gear in mesh, a tachometer graphic and road speed.

Drivelogic – a gearbox of many possibilities

An essential feature of the new seven-speed SMG system is Drivelogic. This function offers no less than eleven gear change options that are determined by the driver. Each programme differs from the others in gear change time – the higher the programme selected the shorter are the shift times – and drivers will quickly determine which of the eleven are their preferred settings.

There are six manual gear change programmes (S mode) and five automated (D mode) which, essentially, alter the shift speed of the transmission – one bar indicated on the programme is a slower shift speed than two and changes up a gear earlier, for example. These programmes are selected using the Drivelogic button beside the gear lever. A preferred mode can be permanently programmed via MDrive Manager* and then simply activated by pressing the MDrive button on the multi-function steering wheel.

* See section 5 for more details on Head-up Display and MDrive Manager

Automatic mode

Each of the five automatic programmes will change gears up and down according to the driving situation, car speed and throttle position. For example, with D1 programme selected the gearbox sets off in second gear and ensures smooth clutch engagement. The driver can influence this process by, for example, releasing the throttle to encourage an up-shift. Alternatively, pushing the accelerator hard calls up a down change.

Launch control

The whole idea of a sequential manual gearbox comes from motorsport. Fast, accurate and foolproof changes ensure the best progress from start lights to chequered flag.

So, as an indulgence, BMW M engineers have included launch control within the new SMG gearbox – a system very similar to that which we see at the start of each Grand Prix. The system is honed to ensure that the rear wheels transmit the maximum power to the road without spinning excessively. In other words it provides the absolute optimum in straight-line acceleration.

Launch control is activated by, first, switching off DSC fully and then selecting the 'S6' manual gear change mode. The driver then needs to push and hold the centre gear lever forward and depress the accelerator pedal fully. When the optimum engine speed for take-off is reached (4,200rpm), releasing the gear lever allows the SMG system to take over. By keeping the accelerator pedal fully depressed the car rapidly accelerates with the gearbox continuing to up-shift and go on to the car's maximum speed. If the accelerator pedal is released, even by a fraction, the launch control function is cancelled.

Launch control is not a function for regular use on the public roads but on a track it is a lot of fun and perfect for the quick get away.

Three more SMG benefits

For safety and comfort, the new SMG transmission offers a hill start assistant that almost completely eradicates roll back when stopping on a gradient. Application of the footbrake activates the system that then holds for 1.5 seconds the car when the brake is released and before the throttle is re-applied.

Hill recognition allows SMG to change gear change points on gradients and descents. It holds lower gears for longer when going downhill to make use of engine braking. Going uphill the system prevents gear 'hunting'. In 'D' automated mode gear selection is adjusted to the steepness of the gradient.

Finally, if the system detects wheel slip it controls clutch operation to stabilise the M6 in the event of high drag torque on the rear axle.

These many functions of the new system are possible because the SMG control unit and the engine management system communicate with each other in a very powerful CAN databus. The SMG system receives data from the sophisticated MS S65 engine management system on the accelerator position, wheel and engine speed, temperatures, steering angle and key memory. SMG and Dynamic Stability Control (DSC) also communicate directly with one another.

4. Harnessing the power

A chassis providing agility and poise to complement performance

Highlights

- Strong lightweight chassis achieves a new peak in BMW's advanced lightweight engineering
- Renowned M differential lock offers reassuring safety net
- Latest DSC system offers MDynamic Mode
- Exclusive 19" M wheel design featuring high performance brakes

So, we have heard that the new BMW M6 features an award-winning technologically advanced new V10 engine as well as a unique high-performance transmission system. But these would be wasted if the car's chassis cannot instantly transfer the generated power to the wheels and the road at the extremes of dynamic driving.

One of the guiding principles when designing an M car has always been that the suspension must be 'faster' than the engine. With such performance under the bonnet of the M6 the engineers at BMW M GmbH had a considerable challenge ... but one to which they rose admirably.

The recipe had a good stock as its base. The 'standard' 6 Series chassis presents high torsional rigidity of the bodyshell, well-balanced 50:50 front/rear weight distribution, long wheelbase, wide track, aluminium suspension components front and rear and, of course, rear wheel drive.

Combine the experience garnered from developing the M5 chassis, with a shortened wheelbase and lowered centre of gravity, and it is no surprise that the result is an engineering feast. To be served piping hot.

Front and rear suspension

The familiar BMW double joint strut front axle is made largely of aluminium to reduce unsprung weight.

The use of aluminium and reinforcement of the front axle subframe with a special thrust plate delivers maximum lateral stiffness, poised handling and a smooth ride. Separate bearings on the subframe for suspension and dampers contribute to accurate wheel guidance.

The aluminium subframe also features NACA air intakes (used in aeroplanes and racing cars to reduce drag) to direct cooling air to the gearbox without adversely affecting under body aerodynamics.

The rear axle, which is also made almost entirely of aluminium, is a development of the integral axle of the 6 Series. It was adapted for the needs of the M6's higher demands by fitting additional supports, links and joints to optimise the elastokinematics. For example, rigid links have replaced rubber joints to ensure even more accurate guidance and centring of the wheels.

As on the M5, the M6's final drive has been substantially modified to keep weight down and convey the huge power potential to the rear wheels. Cooling fins on the aluminium differential case have enabled the engineers to reduce rear axle temperatures by 15°C. The final drive is connected to the seven-speed SMG gearbox via a two-piece cardan shaft featuring a Hardy disc at the front, a constant velocity joint at the rear and a central bearing.

The drive shafts are lightweight and have a torsionally stiff tubular design to keep moving masses as low as possible.

Steering

The power-assisted steering is controlled by M Servotronic mapping. This means that the assistance is related to both road- and engine-speed, thereby resolving the problem of obtaining a balance between the need for light steering at parking speeds and more 'feel' at speed.

The M6 offers two different M Servotronic maps set to the chosen EDC (Electronic Damper Control) mode. In the sporty EDC mode steering is very direct giving the driver an immediate precise response. The comfort mode has a higher ratio for an easier, more comfortable steering reaction.

A gripping tale: The variable M differential lock

Like the M3 and M5, the M6 features a differential with a variable, torque-sensing differential lock developed by M GmbH. This provides the car with a high level of driving stability and optimal traction, especially when driving out of bends.

Unlike a normal limited slip differential with a 25 or 50 per cent locking capability, the variable M differential lock can, in extreme conditions, provide up to 100 per cent locking. This means that when one of the rear wheels loses traction on a more slippery part of the road, or when the inside wheel spins on very tight bends, the M6's differential will ensure that the drive shafts send the required amount of drive to the wheel that can transmit it to the road.

The system works by either driven rear wheel threatening to lose traction. With one driven wheel running at a different, faster speed, pressure is built up in an integrated shear pump. This pressure is transferred to a multiple-disc clutch, via a piston, where drive forces are directed to the wheel with better grip, as determined by the difference in rotational speed of the wheels. When the difference in rotational speed decreases the locking action diminishes.

The advantages of the variable M differential lock are:

- 0-100 per cent drive force can be delivered to either driven wheel.
- On snow, gravel or ice a conventional torque-sensing differential does not offer enough flexibility. The variable M differential provides a substantial advantage when the driven wheels are subject to greatly varying coefficients of friction.
- When combined with a finely tuned DSC system and the near 50/50 weight distribution, this differential lock helps the M6 to excel in very slippery conditions.
- The system delivers rewarding handling on roads with average to high frictional coefficients.

Only on M: DSC with MDynamic Mode

A new generation of Dynamic Stability Control was developed exclusively for 2005's new M models.

As on all BMWs, the M5 and M6 DSC system offers two-stage programming. However, the driver of an M5 or M6 is able to explore the limits of traction a little further than other BMW owners

The first DSC programme corresponds to that of the typical DSC system found on the 'normal' 5 or 6 Series. This provides a safety net should the physical limits of traction threaten to be exceeded. Engine speed is retarded or brakes applied to inside wheels if traction is being lost, ensuring that the car will be brought back under control.

The second level DSC – the new MDynamic Mode (MDM) – is similar to a 5 or 6 Series Dynamic Traction Control system (DTC), but offers the M driver the opportunity to push the car to its absolute limits.

MDM, a drifter's delight

MDM is engaged via the M button on the steering wheel. In this mode DSC is not activated until the absolute limits of adhesion have been reached. This means that the M6 can reach almost any slip angle the driver wants before cutting in to save the day. Understandably, it should not be used on the public road.

The driver is informed of MDynamic Mode by the illumination of a light on the driver's instrument cluster marked 'MDM'.

The DSC system on the M5 and M6 can be switched off completely, which also activates another warning light.

EDC – from sportingly firm to comfortable

The M6's Electronic Damper Control (EDC) allows the driver to adjust the suspension's characteristics from sportingly firm to a softer and more comfortable setting. Three settings are available – Comfort, Normal and Sport – and can be set in iDrive via the MDrive Manager and activated through subsequent use of the MDrive button on the steering wheel, or by activating the EDC switch next to the gear lever.

EDC is a continuous and infinitely variable electronic damper control. In 'Normal' mode the damping is automatically adjusted to achieve the optimum balance between 'Comfort' and 'Sport'. In 'Sport' mode the damping is firmer and employs higher damping forces, thereby reducing lift. In 'Comfort' mode EDC produces lower damping forces in favour of greater ride comfort.

EDC facilitates an improvement in body control (roll and sway) that provides a greater element of safety.

Brakes

The penultimate mechanical element in the M6 performance equation is the brakes, which take the same system as on the M5, but apply them to a lighter and faster car to ensure a reliable and predictable braking performance.

Drilled, compound brake discs are standard equipment all round. At the front the discs are 374mm x 36mm while at the rear 370mm x 24mm units are fitted. The perforations in the discs are the result of stringent testing and motorsport experience.

Low weight, aluminium twin-piston sliding callipers substantially reduce unsprung weight and make a further contribution towards agility, safety and motoring comfort.

Whether it is wet or dry the M6 provides powerful and dependable braking properties. When the brakes are applied at 62mph the M6 is stationary in less than 36 metres. From 124mph the braking distance is less than 140 metres.

The brakes, too, feature an on-board diagnostic system for pad wear. A sensor measures wear at specific points and transmits the values to the DSC system. The system then evaluates driving style and pad condition to determine how many miles to go before the pads need changing. The information is used by the Condition-Based Servicing module to determine adequate service intervals and to inform the driver in plenty of time before a trip to the dealer is required.

Wheels and tyres

The final link between the M6 and the road is the wheel and tyre combination. To accommodate the huge brake discs the M6 is equipped with 19-inch diameter cast alloy wheels unique to the car. These are 8.5 inches wide at the front and 9.5 inches at the rear. The visually delicate five contoured double-spoke styling is a design form that reflects the wheel's lightweight engineering. The wheels being, in fact, approximately 1.8 kilogrammes lighter than conventional 19-inch aluminium wheels.

These stunning wheels are shod with tyres specially developed for the 2005 M cars. The compound and dimensions were designed for precise transfer of lateral and longitudinal forces in both wet and dry and offer an amazingly high degree of comfort. They are also 'tuned' to provide valuable driver feedback so that one can 'feel' the limits approaching.

The tyre sizes are 255/40 ZR19 at the front and 285/35 ZR19 at the rear.

Tyre Pressure Warning System

Since there is no spare wheel and tyre, the M6 is equipped with a Tyre Pressure Warning System (TPWS) and a second generation M Mobility System (MMS).

The warning system provides visual and acoustic warnings as soon as a tyre's pressure falls below a certain critical value. Due to the geometry of the rims, even a completely deflated tyre will not jump off the rim, so the M6 can be brought safely to a halt.

The MMS has become a tried and trusted tradition on M models since the M Roadster in the late 1990's. It uses a sealant that can seal holes of up to six millimetres in length thereby enabling the car to be taken to the nearest garage. The system can repair almost any type of puncture without having to change the wheel on the spot.

Consequently there is no need for a spare that results in a weight saving of more than 20kgs and brings the attendant benefit of power to weight ratio and driving dynamics, along with added storage space.

5. Body

Inside and out, the M6 is clearly focused

Highlights

- World's first carbon fibre roof on a series production car
- Aerodynamics and air flow honed to exploit car's chassis and engine
- MDrive Manager offers personal levels of performance
- Body colours exclusive to M
- M Multifunction seats ensure body grips as well as the tyres
- Head-up Display as standard

The engineers and designers responsible for the new M6 have not only set a new performance benchmark at BMW, but also raised the bar on the use of lightweight technologies within the industry. Taking the same body dimensions as the existing BMW 6 Series Coupé, the new M6 incorporates further innovative lightweight structures that ensure the driver is able to wring the full performance from the car.

The challenge for the engineers was to shed all unnecessary weight in the transformation from 6 Series grand tourer to M6 performance car, yet still maintain the car as a comfortable and safe 2+2 continent crosser. A challenge they approached with relish.

Functionally the car is a clear step up from the 6 Series Coupé. And, in form, the M6 stands out with carbon roof, bespoke wheels and metallic colours exclusive to M.

The exterior: body design

The aluminium front and rear suspension systems detailed in section 4 are just the beginning. BMW's "intelligent lightweight construction" principles ensure that a tour around the car reveals weight-saving on every plane.

- Carbon fibre roof
- Carbon fibre front and rear bumper supports
- Aluminium doors and bonnet
- Thermoplastic front wings
- Sheet moulding compound (SMC) boot lid

- Steel 'tailored blanks' on panels where steel deemed necessary

Carbon lightens the load

Inspired by the reaction to 2002's M3 CSL, and using experience gained from Formula 1 engineering, BMW replaced the conventional steel roof of the 6 Series Coupé with a carbon fibre design. This reduces the weight of the roof by 50 per cent (nearly five kilos) and aids handling, because the car's centre of gravity is lowered with weight removed from the top.

BMW's commitment to the use of lightweight technologies is clearly highlighted by this roof design. Built in-house at the Landshut Plant, the roof is bonded to the body of the car rather than welded and allows the rear window to be re-designed as a thinner and lighter structure. The roof remains unpainted on the production car to visually indicate the performance benefits to the M6 driver.

Power to weight: the right formula

The use of carbon in the design of the M6 is a major contributor to the car's handling and speed, but weight has also been pared through BMW's other recent innovative processes.

The use of plastics in the boot and front side-panels, aluminium in the bonnet, doors and most suspension units and tailored steel blanks on all other body panels, contributes to a power to weight ratio of just 3.3 kg:hp. This lightweight philosophy takes a holistic approach, combining well with BMW's adherence to naturally aspirated high-revving performance engines. Alternative engine designs, as discussed in section 2, were considered too heavy and would have negated much of the good work that the weight-reduced bodywork offers.

The M6 is 45 kgs lighter than the M5, but with the same V10 engine, same high-performance brakes, and lower centre of gravity, it is clear that the super-saloon's performance will be bettered. The M6 shaves 0.1 seconds off the M5's 0 – 62mph time.

Air flow

With 507hp and 205 mph recorded in testing, in a car that begs to be driven hard, it was imperative that the engineers ensured the efficient supply and extraction of cool air. Again, designers and engineers worked closely together to ensure maximum performance.

The front air dam sits close to the road and features large air intakes to maximise the supply of cool air. The airflow is then directed through a bespoke cooling system of high-performance fan, engine radiator, air conditioning capacitor, power steering fluid cooler and engine oil cooler. All sit directly behind the air dam, with the radiator split in two for packaging purposes.

Meanwhile, a separate flow of cooling air is directed over the ventilated disc brakes and underneath the bonnet via side openings to the left and right of the central air scoop. Flaps on the front air dam also reduce lift forces on the front axle.

At the back, a rear diffuser on the rear air dam maintains the car's visually powerful distinction over its 650i Coupé cousin and contributes to its performance. The flow of cool air over the final drive is maximised, whilst drag and lift forces are reduced by the combination of rear diffuser, the car's smooth floor pan and subtle boot-lip spoiler.

The larger rear air dam now houses the car's number plate, with the rear light units slightly raised accordingly. Four chrome exhaust pipes finish the car with its emotive M 'signature'.

Side on

From a side view, the shape of the front wings has been modified to suit the larger, but lighter wheels. Exclusive 19-inch five double-spoke alloy wheels look almost impossibly delicate and weigh nearly two kgs less than comparable 'normal' light-alloy wheels. They are shod with 255/40 ZR 19" tyres at the front and 285/35 ZR 19" tyres at the rear.

Low and dynamic re-styled side sills emphasize the length of the M6 and offer technical advantages over the standard 6 Series. The design of side-sills optimises the flow of air along the underside of the car, improving its aerodynamic capabilities.

New door mirrors display bold styling with a body-coloured upper part and a black section below. The aerodynamic shape was honed in the wind tunnel and the mirrors make a contribution towards reducing lift on the front axle. They can be folded inwards when the car is parked to avoid being damaged.

Battery in the boot

Battery and fuel tank placement was replicated from the M5 design following a redesign of the 6 Series Coupé boot floor to accommodate the dual exhaust system. The battery is located there to help facilitate an improvement in weight distribution front to rear. This type of battery offers advantages in charging behaviour because the number of charging cycles is three times higher than those of conventional car batteries. This has a positive effect on the lifespan.

The 70-litre plastic fuel tank is located in front of the rear axle. A jet pump and pressure-controlled dual pump permanently ensure a reliable fuel supply even under high longitudinal and lateral acceleration.

M body colours

Launched on the M5 in May, four exclusive metallic paints – Sepang Bronze, Silverstone II, Indianapolis Red and Interlagos Blue – are also available on the M6. Other colours available include Alpine White, Black Sapphire metallic and Silver-grey metallic. The air vent gills in the front wings, the bootlid and the doorsill trims all bear the M6 logo.

The interior: sports car characteristics with a touch of comfort

The M6 interior offers the sporting touches and luxurious traits expected of such a thoroughbred sports car. Passengers are presented with performance-related functions, but space, comfort and safety remain as fundamental criteria.

A total of six airbags, belt force limiters, intelligent safety electronics and the automatic or manual emergency call via the BMW Assist function (if the car is fitted with Bluetooth and telematics capability) are all standard.

Even luggage space compares well with the M5 super-saloon. Confirming its credentials as a cross-country (or continent) GT, the M6 offers 450 litres boot space, just 50 litres shy of the M5.

Sporting luxury inside

The M6 offers a sporting and luxurious ambience inside. It features extended leather upholstery in the exclusive Merino leather available in three colour options – Black, Silverstone II and Light Sepang Bronze. The trim features leather in the centre area of the instrument panel, on the centre console and handbrake lever gaiter as well as the armrests. In the rear the side panels are also finished in this leather.

An even more sophisticated all-leather Merino trim is available in five colours as an option (Indianapolis Red and Portland Natural Brown added to the standard colours). This option includes all-leather instrument panel, centre console, door lining and rear side panels and an alcantara-anthracite roof lining. A further special option is the 'Climate Leather' version featuring active ventilation of the driver and the front passenger seats.

Geared to the needs of the driver

Seated at the wheel of the M6, the driver will be placed perfectly for a B-road blast or a long distance trip. The contoured M seat with passive backrest width adjustment offers superb side support. Due to its diverse range of adjustment options the driver is able to find the optimum seat position ranging from very sporty to supremely comfortable. The standard seats include seat memory function, seat heating for driver and front seat passenger, and an electrically adjustable lumbar support.

2 + 2 = room for four

Space in the rear will always be a compromise for a sports car, but the new M6 offers sufficient room for two youngsters, or even two adults on short journeys. Access is easy as the front seats electronically slide forwards and tip, whilst contoured back rests on the rear seats ensure good support.

M instruments more informative than ever.

With the unprecedented levels of technology beneath the bonnet, the M car's instrument panel becomes an ever more vital means of communication between car and driver.

As on the M5, a new design of speedometer and rev counter now feature on the M6 featuring round black dials with white numerals and needles in traditional M red. A white corona-ring illumination is permanently switched on.

The tachometer display is unique: a yellow pre-warning and a red warning field inform the driver of the recommended engine speed depending upon oil temperature. As the oil temperature rises the available speed range increases allowing the driver to observe the optimum engine warm up routine. This arrangement is reflected in the rev range display within HUD and works as a simple indication to let the driver know when it is acceptable for full throttle inputs.

Communication between driver and car continues with a new display on the instrument panel that indicates oil level to an unprecedented level of accuracy. An electronic control unit replaces the traditional dipstick in the engine and constantly monitors oil levels, with an acoustic and optical warning to the driver should engine oil need topping up.

Control lamps, oil temperature gauge, mileage counters and SMG display with gear and Drivelogic information are located between the speedometer and rev counter.

Head-up Display with M-specific information.

The standard Head-up Display now shows additional information, providing the driver with important driving information directly at eye level. This Head-up Display has been designed in such a way as to allow the driver to decide at the touch of a button whether to have standard information or specific M information projected into his line of sight. This can be programmed as a default display.

The M-specific display highlights the engine revolutions and the shift lights. This function has been derived directly from Formula 1 racing and the display shows the current gear and vehicle speed.

Head-up Display can be activated or switched off via the button adjacent to the headlight control switch to the right of the steering wheel.

Deleted: Das Cockpit des M5 ist ganz auf die Wünsche des sportlichen M Fahrers zugeschnitten. Es vermittelt durch die Instrumentierung in der Armaturentafel und die **Schaltwippen** am Sportlenkrad eine maßvolle Rennsportatmosphäre.

A good steer

The newly designed M leather sports steering wheel is ergonomically proportioned. Reshaped and relocated SMG shift paddles facilitate fingertip gear shifting – down on the left and up on the right. While shifting gears, the driver can keep his hands firmly on the steering wheel, enhancing road safety at high speeds or on winding roads.

Deleted: Manager

MDrive Manager for even more control

MDrive is a new function activated via the M button on the steering wheel. This function allows the driver to turn the comfortable coupé into a thoroughbred sports car at the push of a button and vice versa. It entails calling up the driver's favoured settings and drive modes personally configured in the MDrive Manager menu of iDrive. The preset values can be stored in the key memory system and activated whenever the car is started.

The following individual functions can be pre-selected in the MDrive Manager menu of iDrive and subsequently activated via the MDrive button on the steering wheel:

- The Power button, with which the engine characteristics (i.e. output and response) can be specified. Three stages are offered P400, P500 or P500 Sport. The latter can only be selected via MDrive Manager and not the button on the centre console.
- SMG Drivelogic with one of six manual programmes and five automatic shift modes available.
- DSC in three stages: DSC active, MDynamic mode on or DSC deactivated.
- EDC with Normal, Comfort or Sport damper settings.
- HUD with normal or M specific display.

MDrive Manager allows a comfortable day-to-day GT to metamorphosise at the touch of a button into a hardened sports car with, for example, P500 programmed for power, the SMG set at the fastest shift setting, DSC selected to MDM and EDC on 'Sport'. And with Head-up Display set on the M visuals, pressing the M button gives the driver his ideal set up.

SMG selector lever with illuminated selector lever position indicator

Deleted: Beleuchteter Wählhebel

The selector lever illumination and gear position indicator is activated as soon as the ignition is switched on. Adjacent to the SMG selector lever, there are four buttons that facilitate direct operation of the M6's dynamic functions - Power, DSC, EDC and Drivelogic.

Other fine details

An M6 owner will be able to make good use of any additional features optionally fitted to the car such as High Beam Assist (the automatic control of the high beam illumination), Adaptive Headlights (lights that follow the course of a bend as if guided by magic) and Active Cruise Control.

Finally, Automatic Climate Control, incorporating Automatic Air Recirculation, can be set to the desired temperature in both the front and rear compartments. This air conditioning system also includes the comfort functions, integrated solar sensor and anti-mist sensor, as well as filters for outside air and recirculated air.

6. A new beginning for the M coupe M6 buyers and its market

A rich and unique M heritage

Though the new M6 has no direct descendants, it takes much of its inspiration from two great M cars of the past, the M1 and M635CSi.

The M1 of 1978 was BMW's first foray into linking motorsport technologies with the road. The two-seat, mid-engined sports car was powered by a 3.5-litre straight-six developing 277 bhp and featured a four-valve cylinder head lifted straight from BMW's motorsport endeavours. The car's motor racing competencies were highlighted during the 1979 ProCar Series that pitted that season's Formula 1 stars head-to-head with local wild cards – a quite impossible scenario to imagine today.

Five years later, M GmbH engineers fitted the M1's engine to the original 6 Series, in the process offering what is generally considered to be BMW's first true M production car, the M635CSi. The 2+2 coupe took the M badge between 1984 and 1989 and followed the M535i of 1980, which simply featured an uprated 214 bhp six-cylinder engine rather than a true motorsport inspired powerplant. The M635CSi was also engineered for the US market where it was actually known as the M6.

As with these landmark BMWs, the new M6 is expected to appeal to a discerning clientèle, many of whom have traditionally bought Aston Martins, Ferraris or Porsches.

A new market for BMW M cars

The new M6 is BMW's fastest and most expensive production sports car ever. And with that benchmark comes new customers.

Fifty per cent of owners are expected to come from two-person households, a distinct difference over the market for the new M5. He (for the majority of owners are expected to be male) will own a number of other cars bought for emotional rather than rational motives.

As with the new M5, the average age of an M6 owner will be around 45 years old in the UK, slightly younger than the owner of a BMW 630i or 650i Coupé. Technology is a passion for buyers in this market, whether it be in their cars, homes or at work. Most owners will be senior managers, entrepreneurs or successful self-employed businessmen.

The USA, Germany and the UK are expected to be the biggest markets for the M6, in that order, with around 400 cars available to the UK in 2006, just over ten per cent of the Dingolfing Plant's production plans for the year.

Orders currently extend towards the end of 2006 and BMW is trying, with its dealers, to verify that there are no speculators seeking to profit from early orders at the expense of bona fide customers.

The new BMW M6 goes on sale at BMW's UK dealers in November 2005 priced at £80,755 on-the-road.

7. The BMW M6 production process

As bespoke as possible

Highlights

- Flexible production line allows specification amends just six days before build
- World's first carbon fibre roof in series production
- High levels of logistics and training as M6 formed from three separate plants
- Formula1-inspired production and engineering technologies

Assembling the new M6

The BMW M6 is built at the Dingolfing Plant, the largest facility within the BMW Group's network of 23 production plants. Highly flexible in all its operations, the Dingolfing Plant employs a workforce of approximately 23,000 BMW associates – more than 80 per cent of which are skilled – and builds some 1,300 BMW 5, 6, and 7 Series every day.

A sophisticated logistics system – BMW's **Customer-Oriented Sales and Production process (COSP)** – ensures that each car is built exactly on time to its specific national specifications and, of course, in line with the customer's personal preferences. This highly flexible process reduces delivery periods and incorporation onto production lines for components, allowing customers to amend specifications up to six days before their car begins its assembly.

This is facilitated by the ready-painted body treated as any other component rather than regimentally following the pre-determined sequence from Bodyshop to Assembly. It can then be kept on hold and delivered to the production line only when all final specification requirements are confirmed.

Production of the body-in-white together with other 6 Series models

The body-in-white of the new M6 is built by highly flexible robots on the same lines and facilities that also produce the bodyshells of the BMW 6 Series Coupé and Convertible in the regular production process. Just one per cent of 6 Series models are expected to receive the coveted M badge each day.

Naturally, the bodyshell of the M6 also benefits from all the innovative bonding and joining technologies used in series production of the BMW 6 Series. Production of specific parts and components exclusive to the M6 is fully integrated into the production process. For example, additional mounting points and bolts are fitted to

support the new V10 engine and carbon roof brackets are bonded into position manually on the production line, providing the foundation for the carbon fibre roof.

Introducing carbon fibre technology into series production

BMW's motorsport experience, and successful technology transfer into racing-inspired production cars such as the M3 CSL, has furnished BMW with the in-house expertise to manufacture and fit the carbon fibre roof to the M6.

Experts in lightweight technology based at BMW's Landshut facility make the roof from layers of carbon fibre reinforced plastic (CFP). Pre-moulded in a dry state, the roofs are then moistened with resin before being finished then fitted at Dingolfing as the world's first carbon roofs in series production.

The Landshut Plant also manufactures the carbon fibre front and rear bumper supports. Individual segments of CFP are layered around a cast resin core, then hardened before the core is removed, leaving a strong, hollow, lightweight support structure for the bumpers.

Engines from the experts: from Landshut to Munich to Dingolfing

The 507hp high-performance powerplant featured in the new BMW M6 is also a key component that reflects the proficient processes in place at BMW's production facilities. The production of the most powerful production car engine in the company's history is a complex process that requires premium quality.

And BMW's Landshut plant again features as a true centre of excellence. The cylinder heads and the crankcase for the new V10 engine are produced at the light alloy foundry at Landshut, which also produces components for the BMW Formula 1 engines.

Due to the demands of such a high performance engine, the finest manufacturing tolerances are then required at the BMW plant in Munich where the engine is assembled. For example, components are processed at an accuracy of up to $\frac{1}{1000}$ millimetres. By comparison: a human hair is 0.05 millimetres in diameter ($\frac{50}{1000}$).

Flexible assembly

The flexible final assembly is performed in a two-shift pattern in the special engine department at the Munich plant, where, in addition to the V10 engine, they also produce the six-cylinder unit for the M3, the V8 diesel and the twelve-cylinder for the BMW 7 model series.

This diversity calls for a great deal of flexibility, profound product knowledge and the most finely honed skills. This is why the staff responsible for BMW engine construction are both highly trained and very experienced.

8. Standard equipment

Engine

- V10-cylinder 90° angle (S85)
- Digital Motor Electronics MS S65 (DME)
- M Double-VANOS (high pressure)
- Four-valve technology
- Individual throttle butterflies (10)
- Electronic throttle butterfly control
- Hydraulic valve play compensation
- Solid State ignition system
- IONIC-flow engine knock control system
- Engine Drag Force Control (EDFC)
- Intake manifold with regulated variable resonance induction system (DISA)
- Exhaust system, twin-chamber with dual tailpipes, chrome-plated
- Three-way catalytic converter with heated oxygen sensor, activated carbon filter and controlled tank purge
- EU4 Emission standard
- Oil supply with lateral force control
- On-board diagnosis (OBD)

Transmission & Differential

- 7-speed Sequential Manual Gearbox (SMG)
- DRIVELOGIC with 11 programmes (5 Automatic/6 SMG)
- M Launch Control
- Variable M differential lock
- Corner Recognition Control
- Hill Recognition Control

Wheels, Tyres, Steering & Suspension

- M Light Alloy Style 166 8.5 J x 19/9.5 J x 19
- Tyres: 255/40 ZR 19 (front) / 285/35 ZR 19 (rear)
- M Sports suspension
- M Servotronic Steering – two programmes linked to EDC
- Power Steering – rack and pinion
- M Mobility system (tyre puncture repair system)
- Lightweight double-joint spring strut front axle with aluminium strut brace
- Lightweight integral rear axle
- Anti-roll bars front and rear
- Dual-mass flywheel
- Electronic Damper Control (EDC) with 3 settings: Normal, Comfort and Sports

Exterior Equipment

- Metallic Paintwork (with four M specific paintwork options)
- M Aerodynamic body styling
- M Aerodynamic door mirrors with folding function (automatic dimming)
- M side gills with M6 logo
- Chrome kidney grille with chrome vertical slats
- Bumpers and rear-view mirrors in body colour
- Heated exterior door mirrors
- Heated windscreen washer jets
- Heat-insulating glass all-round
- Clear indicators
- High Gloss Shadow Line (trims around window and mirror frames)
- All round anti-corrosion system with partial hot galvanizing, phosphate treatment and cathodic dip paintwork, preservation of hollow cavities, under floor protection

Safety & Technology

- Airbag features:
 - o ID driver and front passenger airbags (Impact-Depending Airbag System)
 - o Advanced Head Protection System (AHPS) front to rear head airbags
 - o Side airbag for driver and front passenger
 - o Seat occupancy detector for front passenger airbag
- Seat belts, inertia-reel at the front with pyrotechnical belt latch tensioner, belt force limiter and belt retainer
- Battery terminal and alternator isolators (SBK)
- Crash sensor
- Anti-lock brake system (ABS)
- Aluminium brake calipers at the front and rear
- Brake Force Display
- Compound disc brakes, inner-vented and cross-drilled all round
- Corner Brake Control (CBC)
- Dynamic Brake Control (DBC)
- Automatic Stability Control + Traction (ASC+T)
- Dynamic Stability Control (DSC) with M Dynamic Mode
- Adaptive Headlight control system
- Bi-xenon headlights
- Automatic headlight activation
- Automatic headlight adjustment
- Headlight washing system
- Rear fog lights
- Third rear brake light (rear windscreen)
- Alarm system (Thatcham Category 1)
- Central locking switch in centre of dashboard
- Central locking with electronic immobiliser and integrated fuel tank filler flap lock
- Check Control warning system

- ISOFIX child seat fixings
- First Aid kit and warning triangle
- Crumple units with aluminium impact absorbers front and rear, reversible up to 2.5 mph impact speed, crumple elements at front up to 9.5 mph
- Parking protection, all round, by wrap-around bumpers and side impact strips
- Park Distance Control (PDC)
- M Drive Manager (individual vehicle set-up options)
- Oil level indicator in instrument panel
- Rev Counter with variable engine temperature pre-warning display
- Ergonomic belt system at the rear with three-point belts on all seats
- Headrests in all seats
- Rain Sensor
- Remote control key with boot release (rechargeable)
- Tyre Puncture Warning System

Interior Equipment

- M Leather Multi-function steering wheel with SMG paddles and M Drive control
- M Sports seats, fully electronically adjustable with driver's seat angle adjustment and Memory function
- iDrive with 8.8 inch split screen display
- Head-up Display with M specific functions (rev counter band, speed reading, gear selection and gear change indication)
- Heated front seats
- Extended Merino leather upholstery
- Automatic air conditioning – advanced
- Air Micro filters
- Central air outlet, rear centre console
- Armrest front with storage compartment
- Carbon fibre interior trim
- Anthracite headlining (cloth)

- On-board computer (OBC) including:
 - o Fuel consumption
 - o Journey Computer
 - o Outside temperature display
 - o Speed limit function
- Ambient interior lighting
- Reading lights front and rear
- Automatic interior light system
- Automatic interior dimming rear-view mirror
- Follow-me-home headlight function (time adjustable)
- Front sun visors with vanity mirrors and lights
- Digital clock
- Lights-on warning
- Car/Key Memory
- Controller on centre console (iDrive)
- Cruise Control, programmable
- Fogging sensor, front windscreen
- Oil temperature display
- Instrument panel with permanently white-illuminated displays for speedometer, rev counter, fuel and oil gauge
- Permanently red-illuminated needles for speedometer, rev counter, fuel and oil gauge
- Electric seat adjustment
- Electric windows front with anti-trap function
- Electric steering column adjustment
- M door entry kick-panel trims
- Glove compartment, illuminated and lockable

Audio & Communication

- BMW Professional radio with:
- Single disc CD player
- Twin tuners
- LOGIC7 Hi-Fi loudspeaker system with ten speakers
- Professional Navigation, with split screen functionality
- Six-disc CD changer in glove box
- Extended Voice Control
- Traffic Message Channel (TMC)

Interior Equipment

- Double-sided luggage compartment mat
- Floor mats in velour
- Service Interval indicator (CBS Condition Based Servicing)
- Smoker's Package (can be deleted)
- Toolkit (in luggage compartment)
- Twin-tone horn
- Visible VIN

9. Optional equipment

x = can be fitted	M6	Retail Price (incl. VAT)	Comments
Universal Remote Control	x	£165.00	Replaces up to three remote control devices (e.g. garage door openers, electric gate openers).
Chrome Line Exterior	x	£0.00	Chrome finishers instead of Black High Gloss. Evident on exterior finishers for side windows.
Climate Comfort Laminated Glass	x	£285.00	Infra-red reflective laminate for windscreen, side and rear windows. Adapted to green coloured side windows with reduced interior heat build up from sun.
Madeira Walnut wood trim, high gloss	x	£0.00	Interior trim strips, dash and centre console in Madeira Walnut Wood trim, high gloss.
Natural Olive Carrara wood trim	x	£0.00	Interior trim strips, dash and centre console in Carrara Wood trim, high gloss.
Piano Black trim	x	£0.00	Interior trim strips, dash and centre console in Piano Black trim.
Ski bag	x	£235.00	Ski bag enabling skis to be transported within the car
Alcantara headlining	x	£995.00	Included with Full Merino leather
TV Function	x	£820.00	Enables reception of Digital and analogue television programmes via the 8.8-inch colour display screen when the car is at a standstill. Only Freeview programmes can be received.)
BMW Assist	x	£0.00	Telematics service including automatic and manual emergency SOS call, BMW Breakdown Service and BMW Information Plus (location based operator service). Includes subscription to services for six months.
Bluetooth Telephone Preparation with telematics capability	x	£465.00	Preparation for a mobile phone with Bluetooth interface (includes limited voice control functionality). Please note that this does NOT include a handset or optional phone cradle and these need to be purchased separately. Includes a pre-fitted SIM card for the use of BMW Assist. Option 612 BMW Assist is automatically included when this option is specified.
Bluetooth Telephone Preparation	x	£465.00	Preparation for a mobile phone with Bluetooth interface (includes limited voice control functionality). Please note that this does NOT include a handset or optional phone cradle and these need to be purchased separately.
Tracker - Retrieve	x	£299.00	Excludes subscription fee.

		Dealer fit only.
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x = can be fitted	M6	Retail Price (incl. VAT)	Comments
Tracker - Monitor	x	£449.00	Excludes subscription fee. Dealer fit only.
Tracker - Horizon	x	£679.00	Excludes subscription fee. Dealer fit only.
BMW Online	x	£450.00	WAP-based vehicle browser and access to the BMW mobile internet portal. Services include mobile office (email, personal address book) and portfolio of online content (e.g. latest news, weather). Includes subscription to services for one year.
Full Merino Leather Upholstery	x	£5,320.00	Full leather covered dash, seats, door panels, and centre console.

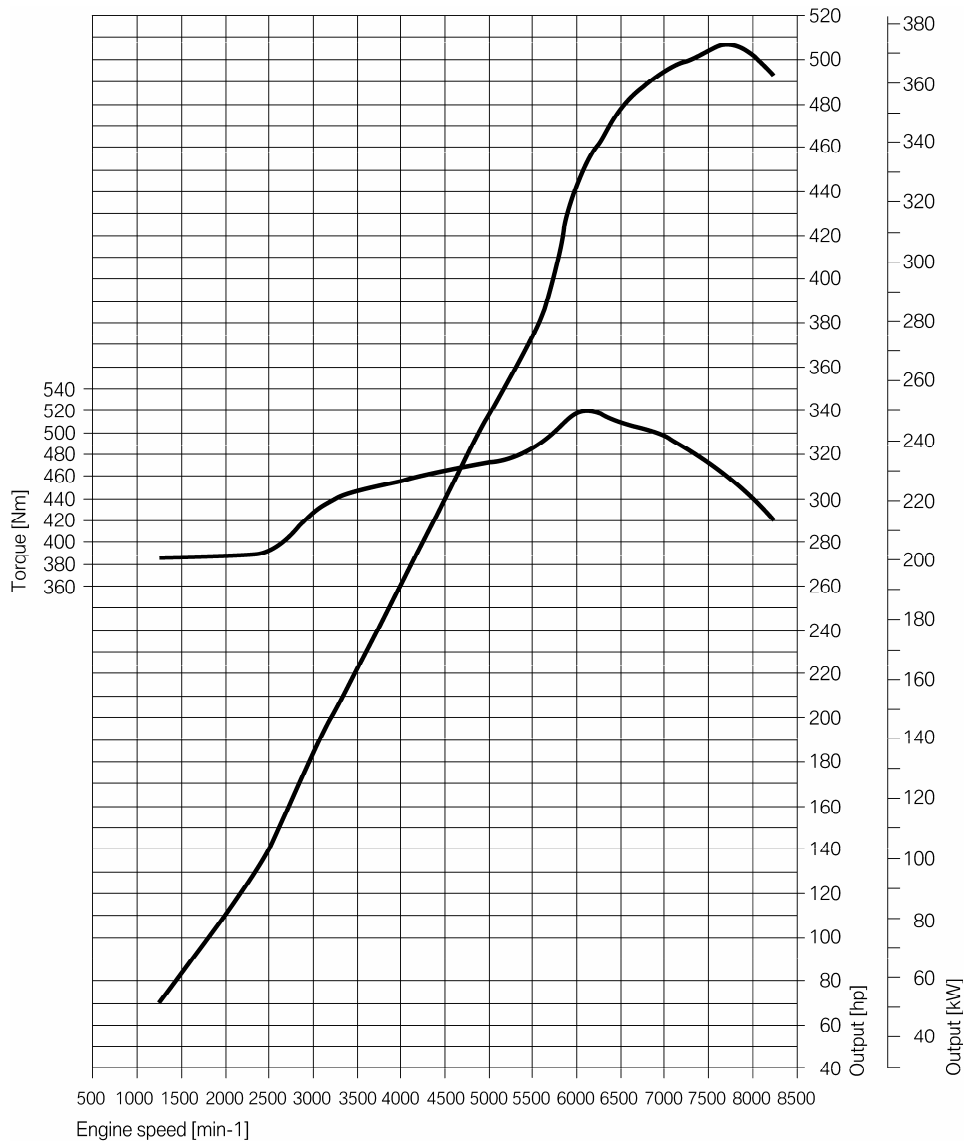
10 Technical specifications

Body		M6
No. of doors/seats		2/2+2
Length/width/height (unladen)	mm	4,871/1,855/1,377
Wheelbase	mm	2,781
Track, front/rear	mm	1,567/1,584
Turning circle	m	12.5
Fuel tank capacity	approx. ltr	70
Cooling system incl. Heating	ltr	15
Engine oil	ltr	13
Transmission fluid	ltr	1.2
Final drive fluid	ltr	2.6
Weight, unladen (EU ¹)	kg	1,785
Max. load (DIN)	kg	415
Max. permissible weight (DIN)	kg	2,200
Permissible axle load front/rear	kg	1,090/1,200
Max. trailer load ²		
braked (12%)/unbraked	kg	-
Max. roof load/trailer nose	kg	-
Luggage comp. capacity	ltr	450
Drag coefficient	c _x x A	0.32 x 2.15
Engine		
Layout/No. of cylinders/Valves		V90/10/4
Engine management		MS S65
Displacement	cc	4,999
Bore/Stroke	mm	92.0/75.2
Compression ratio	:1	12.0
Fuel grade	RON	95-98
Max. output	kW/bhp	373/507
At engine speed	rpm	7,750
Torque	Nm	520
At engine speed	rpm	6,100
Electrics		
Battery/Location	Ah/–	90/boot
Alternator	A/W	170/2,380
Chassis		
Front suspension	Double-joint thrust rod spring-strut axle in aluminium; traverse force compensation; anti-dive	
Rear suspension	Integral axle (aluminium), wheel suspension with special effect anti-squat/anti-dive	
Brakes, front	Single-piston floating-caliper Compound disc brakes	
Diameter	mm	348 x 36, vented
Brakes, rear	Single-piston floating-caliper Compound disc brakes	
Diameter	mm	345 x 24, vented
Driving Stability Systems	ABS, CBC, DSC	
Steering	Rack-and-pinion, hydraulically assisted steering and M Servotronic	
Overall ratio	:1	12.4
Type of transmission	SMG III	
Transmission ratio I	:1	3.985
II	:1	2.652
III	:1	1.806
IV	:1	1.392
V	:1	1.159
VI	:1	1
VII	:1	0.833
R	:1	3.985
Final drive ratio	:1	3.620
Tyres front / rear	255/40 ZR 19 / 285/35 ZR 19	
Wheels	8,5 J x 19 EH 2 IS 12 Alloy/9,5 J x 19 EH 2 IS 28 Alloy	
Performance		
Power to weight ratio (DIN)	kg/kW	4.6
Output per litre	kW/ltr	74.6
Acceleration 0–62 mph	sec	4.6
50–75 mph in 4 th gear	sec	4.4
Top speed ³	Mph	155
Fuel consumption (EU cycle)		
In town	Mpg	22.7
Out of town	Mpg	10.2
Overall	Mpg	14.8
CO ₂	g/km	357
Miscellaneous		
Emission classification	EU4	

¹Weight of the car in road trim (DIN) plus 75 kg for driver and luggage.

²Deviations are possible under certain conditions.

³Electronically limited.



Interior and exterior dimensions

