5. Suspension: The Domain of the 3 Series – now even Better Than Before.

- **By far the best chassis in its class.**
- **Lightweight front axle and five-arm rear axle.**
- **Second-generation Active Steering.**
- **DSC with extended functions.**
- **Innovative cruise control systems.**

Throughout its entire history, the BMW 3 Series has been acknowledged as particularly agile and dynamic. The car stands for excellent driving qualities and performance combined with equally excellent motoring comfort. By tradition, the 3 Series has always set the standard in its class for chassis and suspension performance. Indeed, it is fair to say that driving dynamics is
the 3 Series' greatest forte.

Considering this supreme standard, the success of BMW's engineers in raising the entire chassis and suspension, in combination with the drivetrain and body, to an even higher standard, is all the more remarkable. And indeed, this progress is so significant that the driver and the car's occupants really
feel the improvement with even greater agility than before. In practice, this means that BMW has pushed the limits of physics even further than before.

Absolutely ideal: perfect axle load distribution and rear-wheel drive.
Perfect balance of axle load provides the foundation for genuine leadership in chassis and suspension engineering. Acting in combination with rear-wheel drive for optimum driving dynamics as well as the steering unaffected by drive forces, this is the prerequisite for that proverbial sheer driving pleasure so typical of every BMW.

Depending on the level of equipment and the load the car is carrying, rear axle load in the 3 Series varies from 48–56 per cent, thus keeping very close to
the ideal of 50:50 front-to-rear. Together with rear-wheel drive, this gives the car excellent traction, equally outstanding directional stability, a very good

response to the steering, and optimum braking qualities particularly in bends.

Fast laps on Nurburgring.
When it comes to handling and agility, the 3 Series once again sets a new standard in its class. This is borne out clearly by timed laps on the famous Nurburgring Northern Circuit acknowledged as one of the toughest race tracks in the world. It is one of BMW's traditions to put all our cars to the test on Nurburgring under racing conditions, requiring them to prove their performance and, in particular, the potential of their chassis and suspension.

Lapping the Northern Circuit in 8:49 minutes, the 3 Series is a substantial 9 seconds faster than its predecessor, which as such was everything but slow. This is a huge improvement in motorsport terms and clear proof of the enormous progress made by BMW's engineers concentrating on the chassis and suspension of their youngest "baby".

Longer wheelbase, wider track.
With wheelbase up by 35 millimetres or 1.38˝ and track wider by 29 millimetres or 1.14˝ both front and rear, the new BMW 3 Series has everything it takes
right from the start for this supreme performance and roadholding. The factor absolutely crucial to the car's excellent chassis and suspension is however
the ongoing optimisation and harmony of the axles, springs, dampers, steering and chassis control systems forming one harmonious blend and interacting perfectly with the drivetrain and the car's body. This is where BMW's typical configuration with the engine fitted lengthwise and the drivewheels at the
rear offers the greatest potential right from the start – an important reason why more and more competitors are now following our example and using the same benefits.

Lightweight front axle with enhanced dynamic performance.
Focusing on the front axle of the new 3 Series, BMW's engineers were able to use innovative concepts carried over from the brand's luxury performance class, where the 7 Series and 5 Series currently set the absolute benchmark. And now the 3 Series benefits from this superiority, its double-joint tiebar
axle with spring struts ensuring optimum kinematic qualities in terms of both agility and driving dynamics. And at the same time the entire configuration

guarantees supreme stiffness on minimum weight, the tiebars, track control arms and pivot bearings all being made completely of aluminium.

Intelligent lightweight of this calibre on the axles is of utmost significance, with every gram of unsprung masses saved significantly benefitting the car's handling and agility. And this, in turn, improves the qualities of the highly responsive steering with its sporting and direct features so typical of BMW.

With the entire front axle subframe also being made of aluminium, front axle loads are reduced accordingly, ensuring favourable weight distribution with the entire front end of the car retaining its optimum stiffness. Compared with various competitors' models also using multi-arm axles in most cases, BMW has shown the most consistent approach in the uncompromising use of lightweight aluminium.

Moving on to the engine mounts, the new 3 Series again proves its progress: Two hydraulic bearings taking the place of the usual rubber/metal mounts serve to optimise both noise control and vibration management separately from one another. This, in turn, offers significant advantages in motoring comfort, for example when it comes to engine noise while idling. In addition, the two engine bearings come with an integrated impact case reducing any unwanted movement of the engine and other components in a collision at relatively low speeds. The big advantage for the customer is the reduction of accident damage to a minimum and, as a result, cheaper insurance premiums.

Newly developed five-arm rear axle.
The five-arm rear axle is an all-new development giving the 3 Series perfect qualities in terms of driving dynamics plus supreme agility on the road.
As opposed to a conventional double wishbone axle with the track rod at the rear, the upper and lower triangular arms are replaced in this case by two individual arms on each side allowing free definition of virtual kinematic points regardless of the dimensions and space available.

Together with the broad support base on the wheel mounts for wheel camber and custor, the extremely stiff track control arms, the stiff rear axle subframe, and the tiebars linking the suspension to the body of the car, this allows superior elastokinematics providing exactly the right wheel guidance over a wide range of spring action in the interest of excellent driving characteristics in every situation. And thanks to its small effective leverage, the rear axle hardly responds to any interference or adverse forces.

Best solution in combining driving dynamics with motoring comfort.
The large rear axle support base is crucial not only to the car's driving characteristics, but also to the standard of noise control and insulation. And since the five-arm rear axle offers a very high standard of roll comfort, it is the ideal solution in combining dynamic driving performance with superior comfort on the road. A further asset is the very harmonious spring/damper setting underlining the active driving character of the BMW 3 Series.

Sports suspension available as an option.
A sports suspension lowering the entire car by 15 millimetres is available as an option for the true enthusiast dedicated to sports motoring. The lower centre of gravity provided in this way allows even higher speeds in bends. And in conjunction with Active Steering, the sports suspension comes for the first time with steering characteristics tailored to this specific suspension set-up.

BMW all the way: precise steering with equally precise feedback.
The driving pleasure, motoring comfort and driving safety so typical of a BMW are largely attributable to the accuracy of the steering system with its precise feedback to the driver. The BMW 3 Series comes with rack-and-pinion steering combined with hydraulic power assistance. Remaining unaffected by drive forces thanks to rear-wheel drive, the steering gives the driver a smooth, direct response, superior steering precision, and clear feedback, that is further qualities typical of a BMW.

Active Steering with an enhanced range of functions.
Only an active steering system is really able to solve the conflict of interests between agility, stability, and motoring comfort. Introducing Active Steering, BMW has already presented such a superior system in the 5 Series: an electronically controlled steering system with variable transmission ratios and additional driving dynamics and stability functions. Now this innovative system is available in the 3 Series as an option on all six-cylinder models.

Active Steering comes in combination with Servotronic. It differs significantly from conventional steering by its ability to adjust the steering angle required perfectly to the current road speed of the car. With Servotronic varying steering forces as a function of road speed and the steering angle, Active Steering
and Servotronic have different effects and qualities, but form a perfect team.

Perfect steering and control ensured at all times.
Active Steering is based on conventional rack-and-pinion hydraulic steering technology. Its additional feature is the overriding transmission in the steering column allowing an electric motor to modify the steering angle predetermined by the driver. This function is geared to various sensor signals such as
the rotational speed of the wheels, the steering angle, yaw rate and lateral acceleration. With the electric motor being shut down and cut off in the event of a defect, the steering retains its full qualities at all times, since the steering wheel and the front wheels are always connected mechanically with one another.

Significantly greater driving pleasure.
Under regular driving conditions Active Steering modifies the steering lock of the front wheels determined by the driver as a function of road speed and without any repercussions on the steering wheel. Given the small steering angle, the car becomes even more agile and easier to handle. Particularly in the lower and medium speed range up to approximately 100 km/h or 60 mph, that is in the particularly dynamic, active range, Active Steering, with its more direct transmission ratio than a conventional steering, offers significantly greater driving pleasure. At high and very high speeds, by contrast,
Active Steering becomes more indirect in the interest of better directional stability, without forfeiting its particular precision. And apart from being related to road speed, Active Steering also optimises the reaction of the car to the driver’s steering commands in the interest of greater precision.

No more crossing over your hands on the steering wheel in everyday motoring.
In city traffic Active Steering ensures optimum motoring comfort wherever you go, lock-to-lock operation of the steering wheel at a standstill dropping from more than three to less than two full rotations. This means that under everyday conditions the driver is hardly required any more to cross over his hands on
the steering wheel and is therefore able to operate the steering wheel buttons much more conveniently.

Technology transfer from the luxury performance class.
Active Steering is a good example of the transfer in technology between BMW’s model series: Originally presented in the 5 Series, this innovative BMW development now also benefits BMW drivers in both the 6 and 3 Series. In other words, BMW’s engineers do not hold back their

achievements
until the next luxury performance car enters the market, but rather introduce innovative technologies as quickly as possible throughout the entire range. With the next model series thus benefitting from such progress in technology, all BMW model series are always up-to-date in technical terms, regardless
of their class or segment.

In the 3 Series this kind of innovation is expressed inter alia by the driving stabilisation function adding an important everyday benefit to the car's Active Steering: Whenever the driver applies the brakes on surfaces with varying frictional coefficience, yaw forces are set off by active intervention in the steering. In practice this allows the motorist to drive the car more smoothly and safely to its physical limits – which means that you still have a safety margin even when capitalising on the outstanding agility of the 3 Series. And should the stabilisation function of Active Steering not be sufficient to keep the car steady in an extreme situation, DSC Dynamic Stability Control will take over.

Active Steering counteracting the risk of swerving.
For the first time the combination of Active Steering and DSC with enhanced brake functions on roads varying in their frictional coefficient allows active intervention in the steering in order to stabilise the car. Should the driver apply the brakes with the car aquaplaning on one side, for example, the ABS function will choose different levels of brake forces on the front wheels causing the car to react. So far this yaw momentum, as it is called, required the driver to countersteer in keeping the car on track. Now, in combination with Active Steering, active intervention in the steering system in such a situation is faster and more precise than the manual intervention of a "regular" driver.

The very best in steering technology.
Offering these optimised stabilisation functions, Active Steering ensures even greater driving pleasure and safety on the road. Whenever the car tends to oversteer, intervention in the steering independent of the driver serves
to stabilise the car and keep it on track. Steering action of this kind reduces the less comfortable intervention of DSC Dynamic Stability Control on the brakes, allowing the driver to maintain a smoother and more comfortable style of motoring.

Stability behaviour in the DTC (a sub-function of DSC) mode has also been improved. Activation of the DTC mode moves the response thresholds for intervening in the brakes further back, the stabilisation effects provided by Active Steering keeping the driver in control at all times, even with the car itself reacting more sharply.

DSC – the core system in vehicle electronics.
BMW's own DSC Dynamic Stability Control is increasingly becoming a core system covering the entire range of vehicle electronics. While initially, over and above the ABS brake function, DSC was "only" required to enhance driving safety on a slippery road – for example in an abrupt manoeuvre or with the car starting to become unstable in bends, DSC applying the brakes specifically on individual wheels in order to regain stability – the system now covers a much wider range of functions in terms of both safety and comfort. ASC Automatic Stability and Traction Control intergrated within DSC, for example, controls
the spin of the drivewheels by applying the brakes selectively on a drive wheel about to spin and stabilising the car accordingly. Using the DTC mode, in turn, the driver is able to enhance traction on snowbound roads, in sand or on
gravel simply by pressing a button. And he may also enjoy the sporting qualities of a quasi differential by slightly raising the response thresholds of DSC brake intervention in the interest of enhanced traction and drive force.

Yet another function of DSC is CBC Cornering Brake Control reducing any oversteer of the car when applying the brakes slightly in a bend by asymmetric control of brake pressure.

A first-time achievement: ongoing brake lining wear display.
DSC incorporates further functions such as BMW's two-stage brake lining wear indicator including calculation of remaining mileage as well as a direct connection to the car's electrical steering column lock. The customer benefits from both of these functions, first through greater precision in determining when the brake linings will have to be replaced next, second through innovative anti-theft security with the electromechanical steering wheel lock not being opened until receiving clearance from the Car Access System.

DSC in the six-cylinder with additional functions.
Over and above its standard functions, DSC offers supplementary functions in the six-cylinder 330i enhancing both driving safety and motoring comfort. First, DSC ensures an even higher standard of precision and smoothness in

ACC Active Cruise Control, building up, determining and modulating pressure on the wheel brakes with even greater accuracy. On the road this gives the customer even better deceleration and greater comfort in applying the brakes. Second, DSC compensates any tendency of the brakes to fade at high temperatures by increasing brake pressure as a function of temperature, keeping deceleration and stopping forces consistent under the same level of pressure on the brake pedal.

Gaining time when braking in an emergency and in the wet.
A very practical improvement is the brake standby function pre-setting the brake linings. Whenever DSC recognises an anticipated braking manoeuvre, for example when the driver quickly lets go the gas pedal, it bridges the
gap to the brake linings by reducing volume feed to the brake calipers, giving the driver an even faster brake response.

Safety in the wet is enhanced by the dry braking function: Receiving information from the rain sensor or windscreen wipers, DSC moves the brake linings up to the brake discs after a certain, predetermined period in order to remove the film of water from the discs and ensure an immediate brake process without the slightest delay whenever necessary.

Extra comfort when coming to a stop.
The Soft-Stop function reduces that well-known “jolt” when coming to a stop, a phenomenan encountered above all in cars with automatic transmission: With the system building up exactly the right level of pressure shortly before the car comes to a stop, the entire process is soft and smooth, without the slightest jolt.

A further comfort function is provided by the Setting-Off Assistant:
This system enables the driver to set off comfortably and smoothly both in a forward and reverse gear on a gradient, without rolling back and without having to use the handbrake, the Setting-Off Assistant holding the car in position for a short while after the driver has released the brake.

Lightweight brakes with optimum power.
It goes without saying that the brakes have been optimised to reflect the enhanced performance of the new BMW 3 Series. In particular they have been modified in terms of weight in order to minimise unsprung masses, the 330i, for example, featuring swing-calliper brakes made of aluminium.

All brake systems ensure fading-free durability and optimum long-distance qualities. Incorporating BMW's Demand-Oriented Service (DOS), the 3 Series is able to consistently forecast the remaining distance the brake linings are able to cover. This information is then used for Conditioned-Based Service informing the customer in good time of when his car needs to be checked.

BMW is the first manufacturer to offer this function described in greater detail in Section 7.

Punctures are a rare event – but scary an unpleasant all the same.
With tyre damage being relatively uncommon in statistical terms, but with punctures being one of the most unpleasant experiences for the motorist, BMW is the first manufacturer in the world to offer the Runflat System Component (RSC), a tyre safety package meeting both the statistical risk as well as any feeling of apprehension on the part of the driver.

RSC is a combination of RSC tyres on EH2 wheel rims and the TPI electronic warning system. Under loss of pressure, RSC immediately warns the driver but allows him to continue for a certain distance even when suffering a complete loss of air, the tyres remaining safely on the rim. Accordingly, there is no further need for a spare or an emergency tyre, a repair kit and car jack. And there is no need any more to change tyres by the roadside. But at the same time RSC still offers 100 per cent safety, as required.

Informing the driver of a loss of pressure – and allowing him to go on.
With their specially designed rim hump, EH2 (extended hump) rims prevent the tyres from "jumping off" the rims under a sudden loss of pressure. An RSC tyre differs from a conventional tyre through its runflat features, reinforced
side walls, additional insert strips and a rubber compound with a higher level of thermal resistance enabling such self-supporting tyres to run another 50–250 kilometres at a maximum speed of 80 km/h or 50 mph without even the slightest pressure, depending on the load the car is carrying.

The RSC tyre is its own spare tyre.
Only 20 per cent of all tyre damage involves tyres losing air suddenly or in a quick process. In other words, loss of pressure is a slow-gradual process in 80 per cent of all cases, enabling the driver with RSC tyres to continue for up to 2,000 kilometres or 1,200 miles. So it is fair to say that an RS tyre is its

own spare tyre. And this significantly improves the level of safety, also because ABS, ASC and DSC remain fully functional at all times.

The Tyre Pressure Indicator (TPI) included in the system monitors air pressure in all the tyres by permanently comparing tyre rotation speed. The driver is informed of any irregularities by a warning light and a sound signal, the system giving the driver a warning as of a speed of 15 km/h (9 mph) and with a drop in tyre pressure by more than 30 per cent.

It is nevertheless important to note that TPI does not replace the regular supervision of tyre pressure by the driver. And in a simple, convenient process, the driver is required each time after changing tyre pressure and after
fitting a new tyre to re-initialise the system in order to save the tyre's data.

Accident risk reduced to a minimum.
RSC technology ensures enormous progress in both safety and comfort. Enabling the driver to continue in his car at a moderate speed even after suffering a complete loss of pressure, RSC makes it unnecessary to pull over and stop the car because of a puncture at, say, narrow and dangerous points, in bends, in a construction area on the motorway, or in a tunnel, etc. The driver saves time and avoids inconvenience in changing a tyre, since he can have
the job done without problems at a workshop not too far away (which need not necessarily be the nearest workshop). And last but not least, there is no need any more for a spare wheel, a car jack and tools, which means a reduction
of weight enhancing the car's performance and reducing fuel consumption.

The BMW 330i comes as standard with 225/45R17 tyres on cast aluminium rims, the 320i and 320d run on 205/55R16 tyres. A wide range of both cast aluminium and hand-forged wheels in all kinds of design, finally, enables the customer to personalise his – or her – 3 Series as he or she desires.

Cruise control – the sheer pleasure of being driven.
Cruise control with active intervention in the brakes available as an option replaces conventional cruise control on the six-cylinder model. An alternative also available in the new BMW 3 Series is ACC Active Cruise Control.
Both of these systems are a significant innovation in this segment, in both cases offering the driver much greater convenience. So with enhanced

systems of this kind, cruising in that typical BMW style comes with the superior pleasure of being driven in a most enjoyable manner.

Cruise control with brake function.
The first of these options enhances conventional cruise control by adding a brake function, with the display and operating functions being upgraded accordingly. What this means in practice becomes clear under typical driving conditions, automatic intervention of the brakes when driving downhill, for example, keeping the speed set at a consistent level. Should the driver choose a speed below the speed level currently activated, in turn, the system quickly slows down the car to the new, desired speed.

In a car with manual gearbox the driver can even change gears without deactivating the function. So that by and large the driver remains in control of many driving situations without even having to apply the brakes himself – all he has to do is choose “his” speed by pushing the control lever.

This enhanced level of functions becomes even clearer when the driver uses the control lever actively: In such a case, operating the system at a specific level, the driver is able to call up pre-set acceleration and deceleration data, driving his BMW “by hand”, as it were, in the dynamic and active style typical of the marque.

ACC Active Cruise Control keeping a close eye on traffic conditions.
ACC Active Cruise Control available as an option adds automatic distance control to the brake function control just mentioned. Indeed, this distance control function is so comprehensive that one might by all means call this active system “intelligent”.

ACC Active Cruise Control incorporates a radar unit determining the distance and speed of vehicles driving ahead in the same lane. The system gives
the driver the choice of four distances: As soon as the actual distance deviates from the desired distance set in advance, ACC adjusts the speed of the car to that of the vehicle ahead by slightly giving gas or applying the brakes. If there is no car directly ahead in the driver’s lane, ACC will accelerate to the desired speed and operates the same way as cruise control with its braking function.

ACC Active Cruise Control is particularly convenient for cruising on the motorway or a main road, allowing the driver to “flow along” in style and comfort. The driver no longer has to constantly change from the gas to

the brake pedal, and therefore benefits from a far higher level of convenience.
And he is naturally able to intervene at any time, giving gas or applying the brakes as desired.