

# Technology and innovation workshop on the new BMW 7 Series model range. PreDrive Miramas. Contents.



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# 1. At a glance.



- BMW presents an initial wave of selected technology innovations spawned by the development of the next-generation BMW 7 Series model range; the new edition of the luxury sedan once again blazes a trail for pioneering innovations in lightweight design and intelligent connectivity; the new BMW 7 Series is aiming to lead the way in the luxury segment in terms of driving dynamics, long-distance comfort, efficiency and driver assistance.
- BMW EfficientLightweight in the new BMW 7 Series: vehicle weight reduced by up to 130 kilograms compared to predecessor models.
- Carbon Core: extensive use of carbon-fibre-reinforced plastic (CFRP) in the passenger cell through technology transfer from BMW i.
- New six-cylinder in-line petrol engine from the BMW Group's latest generation of power units; latest BMW TwinPower Turbo technology raises efficiency another notch.
- Engine power channelled through a further developed eight-speed Steptronic gearbox with optimised internal efficiency, an increased ratio spread and a gear-change strategy assisted by navigation data.
- New-design standard-fitted Driving Experience Control switch now including ADAPTIVE mode.
- Unique balance between sporting capability and ride comfort in the luxury sedan segment; both expressions of driving pleasure significantly enhanced by the application of sophisticated chassis technology and innovative chassis systems; car settings can be tuned to the situation at hand either adaptively or as specified by the driver.
- Two-axle air suspension with automatic self-levelling and Dynamic Damper Control as standard.
- Additional improvement in ride comfort, dynamics and poise brought about by optional chassis technology; Integral Active Steering now also available

in combination with BMW xDrive; further developed Dynamic Drive reduces roll by means of electromechanically driven stabilisers.

- Exceptional commitment to use of BMW EfficientDynamics technology; unique overall package of BMW EfficientLightweight technology, latest-generation engines, predictive operating strategy and segment-leading aerodynamics ensures a significant reduction in fuel consumption combined with further enhanced driving pleasure.
- iDrive operating system gains Touch Display for intuitive operation of numerous functions; display and control unit of the automatic climate control system likewise with touch-sensitive capability.
- World premiere for BMW gesture control: 3D sensor allows intuitive and easy interaction with the infotainment system using pre-defined hand movements.
- Remote control parking using the BMW Display Key.
- Driving Assistant now with additional rear collision prevention and cross-traffic warning functions.
- Driving Assistant Plus now includes steering and directional control assistant, as well as Lane Departure Warning Assistant with active side collision protection.



## 2. Technology and innovation workshop on the new BMW 7 Series model range. **PreDrive Miramas. (Short version)**

BMW is using a technology and innovation workshop to present an initial selection of development highlights which the next generation of the BMW 7 Series model range will use to set new benchmarks in lightweight design, driving dynamics, comfort, intelligent connectivity and operation. The extensive use of carbon-fibre-reinforced plastic (CFRP) in the structure of the passenger cell, the rigorous and detailed application of lightweight design and a new generation of engines combine to reduce the weight of the luxury sedan along with its fuel consumption and emissions figures. The comfort, safety and driving experience offered by the new BMW 7 Series benefit from new chassis technology, exceptional scope for interaction with the car's infotainment technology and a wider selection of driver assistance systems from BMW ConnectedDrive.

### **BMW EfficientLightweight: Carbon Core helps to reduce weight by up to 130 kilograms.**

Thanks to the BMW EfficientLightweight strategy, the new BMW 7 Series line-up will tip the scales up to 130 kilograms lighter than the outgoing generation of models. At its heart is a body structure with a Carbon Core based on the transfer of technology from the development of the BMW i models. The use of CFRP – whose material properties lend themselves to use in the passenger cell areas exposed to heavy loads – increases torsional rigidity and strength. The configuration of the sheet metal elements can be adjusted accordingly, allowing body weight to be significantly reduced.

### **Six-cylinder in-line engine from the new generation of power units.**

The new BMW 7 Series model range will be powered by engines including a six-cylinder in-line variant from the BMW Group's latest generation of power units. The new petrol engine with BMW TwinPower Turbo technology links up with a likewise further developed eight-speed Steptronic gearbox.

### **Dynamics and ride comfort made to measure – and to the highest standard.**

Sophisticated, precision-honed chassis technology and additional chassis control systems – fitted as standard or available as an option – enhance both the driving dynamics of the next-generation BMW 7 Series and its ride quality. At the same time, the balance between these two facets of driving pleasure reaches a level without parallel in the luxury sedan segment. The inclusion of

two-axle air suspension with automatic self-levelling as part of the standard specification leads to noticeably improved ride comfort. Dynamic Damper Control also features as standard. Its electronically controlled dampers improve the primary and secondary ride of the sedan and sharpen its dynamic attributes. The latest update of the Integral Active Steering system, along with the first electromechanically driven Dynamic Drive roll stabilisation system, contribute to a further boost in comfort, dynamic prowess and assurance on the road in the new BMW 7 Series.

The latest innovations offer drivers greater freedom when choosing the right vehicle set-up for the situation at hand: they can elect to enjoy even sportier handling or further optimised ride comfort as desired. In addition, they can use the newly designed Driving Experience Control switch to activate the ADAPTIVE mode. In this setting, the vehicle set-up adapts as required to the driving style and the character of the road.

#### **Intuitive operating with Touch Display and BMW gesture control.**

In the next generation of the BMW 7 Series, the iDrive operating system's monitor comes in Touch Display form for the first time. This means customers will also be able to operate the system in the same way as modern electronic devices. In addition to using the Controller to operate the system in familiar style, its functions can also be selected and activated by touching the screen's surface.

Another new addition to the iDrive system's functionality is BMW gesture control, which is being introduced for the first time. Hand movements detected by a 3D sensor control infotainment functions in an extremely intuitive and user-friendly fashion. The gestures can be used for a number of functions, including controlling the volume in audio applications and accepting or rejecting incoming telephone calls. There is also the option of pairing a specific gesture with an individual choice of function.

#### **Unique in the luxury sedan segment: remote control parking.**

The new BMW 7 Series is the world's first series-produced car that owners will be able to manoeuvre in or out of parking spaces or garages without anyone at the wheel. The remote control parking option thus allows drivers to access extremely tight parking spaces. Using the likewise newly developed BMW Display Key, the driver can prompt the car to enter or exit a parking space fully automatically.

#### **Innovative driver assistance systems from BMW ConnectedDrive enhance comfort and safety.**

New strings to the bows of the Driving Assistant Plus and Driving Assistant systems include the steering and directional control assistant, Lane Departure

Warning Assistant with active side collision protection, and the rear collision prevention and cross-traffic warning functions. When using the Active Cruise Control system with Stop & Go function, a press of a button now suffices to acknowledge speed restrictions detected by the Speed Limit Info function.

### 3. Technology and innovation workshop on the new BMW 7 Series model range. PreDrive Miramas.



The technology and innovation workshop focusing on the next generation of the BMW 7 Series model range offers the opportunity to gain an early insight into the latest developments in BMW EfficientLightweight technology, driving dynamics and ride comfort as well as driver assistance and connectivity. The world's most successful manufacturer of premium cars is once again accompanying the handover between generations at the top end of its model range with the introduction of numerous innovations unmatched in the segment. Groundbreaking technology in the areas of lightweight design, powertrain, chassis, system operation and intelligent connectivity highlights the intention of the new BMW 7 Series to raise the bar for maximum driving pleasure and long-distance comfort in a luxury sedan.

The extensive use of carbon-fibre-reinforced plastic (CFRP) in the structure of the passenger cell lies at the heart of the BMW EfficientLightweight technology for the next-generation BMW 7 Series. A new generation of power units, meanwhile, helps to sharpen the dynamics of the new car at the same time as optimising engine refinement and reducing fuel consumption and emissions. A raft of innovations in the field of chassis technology ensures the sporting ability and ride comfort of the new BMW 7 Series demonstrate equally palpable improvements. The car's standard specification includes two-axle air suspension and Dynamic Damper Control, while the further developed Integral Active Steering system and the latest version of Dynamic Drive active roll stabilisation can be added to its repertoire as options. Comfort, safety and the driving experience on board all benefit from unique interaction options for the infotainment system (including BMW gesture control and a Control Display with touchscreen capability) and from an extended selection of driver assistance systems from BMW ConnectedDrive.

#### **BMW EfficientLightweight: Carbon Core reduces the car's weight by up to 130 kilograms.**

Weight-minimising measures courtesy of the BMW EfficientLightweight strategy enable the new BMW 7 Series models to tip the scales up to 130 kilograms lighter than their previous-generation counterparts, despite significant additions to the roster of comfort and safety equipment on board. A central element here is the Carbon Core body structure of the luxury sedan. The use of CFRP for structural elements of the passenger cell based on hybrid construction with ultra-high-strength steels – such as the B-pillars –

increases both the overall strength and the torsional and bending stiffness of the passenger cell. To this end, the configuration of sheet metal elements can be adjusted as required, allowing for a significant reduction in the weight of the body.

The foundations for the Carbon Core body were laid by the transfer of technology from the development of the BMW i models. The next generation of the BMW 7 Series therefore benefits from the BMW Group's experience and expertise – unequalled by any other carmaker – when it comes to the appropriate use of CFRP in mass-produced vehicles. At the same time it leads the way in exploring new applications for the high-tech material. The new BMW 7 Series is the first car to use industrially manufactured CFRP in its body construction not as a visible material in the outer skin, but in combination with steel, aluminium and plastic. It is also the first car in which the CFRP has been fully integrated into the production process, largely based on a globally unique paint application process. Its Carbon Core is thus also an indicator of how significantly the CFRP technology developed for BMW i models can contribute to the minimisation of a car's weight as well as its material strength and stiffness.

Furthermore, the intelligent material mix encapsulated by the BMW EfficientLightweight strategy includes the carefully calculated use of aluminium and ultra-high-strength steels in the body and chassis. This is complemented by the introduction of innovative, weight-minimising bonding technologies and at-source heat- and soundproofing for the engine, which allow reductions in the overall quantity and therefore the weight of the insulation materials required.

As well as the development of ultra-lightweight concepts and an intelligent material mix, the BMW EfficientLightweight approach also drives a systematic process of detail optimisation for all components with the aim of achieving the best possible result for each class of car. For the new BMW 7 Series this has meant combining the model's impressive driving dynamics with outstanding comfort. To this end, the engineers have explored innovative new directions in areas such as weight distribution, unsprung masses and acoustic concepts. Unsprung masses have been reduced by as much as 15 per cent over the predecessor models through a focus on lightweight design for the suspension, brakes and wheels. The implementation of an at-source insulation concept and the use of superabsorbers have led to excellent interior acoustics coupled with a reduction in weight.

The resulting integrated lightweight design concept also enables the car's centre of gravity to be lowered still further and weight to be distributed

between the two axles at a near-perfect 50:50 ratio. In this way, BMW EfficientLightweight technology does even more to ensure that the next generation of the BMW 7 Series can build on its lead in the area of driving dynamics while also offering outstanding ride and acoustic comfort.

### **New-generation six-cylinder in-line engine.**

Among the power units available for the new BMW 7 Series will be a six-cylinder in-line variant from the BMW Group's latest engine generation. The BMW TwinPower Turbo petrol unit impresses with further improvements in efficiency. Aided by a lower vehicle weight, the new engine helps to give the car a noticeably more exuberant character on the road, combined with significantly lower fuel consumption and emissions compared with the equivalent models in the previous-generation BMW 7 Series.

The crankcase, cylinder head and oil sump of the new drive unit are made from aluminium. The TwinScroll turbocharger uses an indirect intercooler integrated into the intake manifold and teams up with High Precision Injection, the latest version of VALVETRONIC fully variable valve control and Double-VANOS variable camshaft control for the intake and exhaust valves. As well as its enhanced efficiency, the new generation of the straight six also boasts even more rapid responses.

### **Dynamics and ride comfort made to measure – and to the highest standard.**

Sophisticated chassis technology with improvements to various details and additional standard-fitted or optional chassis control systems enhance both the driving dynamics of the next-generation BMW 7 Series and its ride quality. Indeed, the new car strikes a more successful balance between these two facets of driving pleasure than any other luxury sedan.

The latest wave of innovations offers drivers greater freedom when selecting the perfect set-up for their car; the standard-fitted Driving Experience Control switch allows the option of even sportier handling or further improved ride comfort. With a press of the switch, it is now also possible (for the first time) to activate another new setting whereby the car's set-up adapts to driving style and route characteristics. In this way the new BMW 7 Series lays on a driving experience of unparalleled richness, one which showcases the BMW Group's outstanding development expertise in the field of chassis technology.

### **Air suspension and Dynamic Damper Control as standard.**

The standard-fitted two-axle air suspension with automatic self-levelling noticeably enhances the ride comfort of the next-generation BMW 7 Series. The springs are supplied with air by an electrically driven compressor with

pressure accumulator. The height of the car body above the road is therefore adjusted to the load on board even when the engine is switched off. Regulating the supply of air for each wheel individually allows an unevenly loaded car to be balanced out. An additional function is manual activation of the self-levelling function. At the touch of a button, the height of the body above the road can be raised by 20 millimetres – e.g. on uneven surfaces or in multistorey car parks with sharply-angled ramps. At speeds over 35 km/h (22 mph), the self-levelling function automatically restores the default setting. Moreover, at high speeds and when SPORT mode is activated using the Driving Experience Control switch, the body is automatically lowered by 10 millimetres.

The benefits of air suspension at the front and rear axle are felt particularly keenly when the system teams up with the likewise standard Dynamic Damper Control. The electronic dampers further improve the sedan's primary and secondary ride, as well as its dynamic properties. The Driving Experience Control switch can be used to select from three damper control settings enhancing ride comfort (COMFORT and COMFORT+ modes) and sporty, agile handling (SPORT mode) respectively.

#### **Further developed Integral Active Steering and Dynamic Drive.**

A further development of the Integral Active Steering system can be specified as an option for the new generation of the BMW 7 Series. The planetary gear set at the front axle used previously has been replaced by a variable rack and pinion ratio. This allows Integral Active Steering to be offered for the first time in conjunction with the BMW xDrive intelligent all-wheel-drive system. By steering the rear wheels either with or in the opposite direction to the front wheels (as the situation demands), this system increases both manoeuvrability in urban environments and agility when dynamic progress is the order of the day. It also guarantees extremely comfortable and assured reactions when changing lanes and through corners.

There is also the option of the further developed Dynamic Drive active roll stabilisation system. This innovative technology employs, for the first time, electromechanically driven stabilisers to reduce roll during dynamic cornering. Dynamic Drive enhances both sporty driving and comfort in the new BMW 7 Series, so that instead of having to opt for one or other of these aspects, the driver is granted a system that heightens driving pleasure in every situation.

#### **Driving Experience Control switch now with ADAPTIVE mode.**

The next-generation BMW 7 Series now also allows the driver to activate ADAPTIVE mode using the standard-fitted Driving Experience Control switch.

In this setting, the car set-up adapts with clearly noticeable responses to driving style and route characteristics. The system reacts to movements of the accelerator and steering wheel and to the position of the selector level (in D or S). According to the situation, either the sporty or the comfort-oriented characteristics of the powertrain and chassis systems are brought to the fore. In cars equipped with the optional Navigation system Professional, map data is also used to ensure the right set-up is selected when moving from city streets to motorway, for example, and when negotiating twisty roads or approaching a junction.

The Driving Experience Control switch positioned on the centre console has been given a new design. COMFORT, SPORT, ECO PRO and ADAPTIVE modes can now be selected directly by using buttons. The COMFORT button is also used to select the COMFORT+ mode should an even more cossetting ride be required. SPORT and ECO PRO modes allow drivers to configure the set-up as they desire via the iDrive menu. For example, in SPORT mode drivers can combine dynamic shift characteristics and direct steering responses with a comfort-oriented damper setting. In ECO PRO mode the range of efficiency-enhancing settings can be adjusted to individual preferences. And dynamic functions – i.e. the damper control tuning and steering responses – can now also be configured separately for ECO PRO mode.

### **iDrive system now with Touch Display.**

In the next generation of the BMW 7 Series, the monitor for the iDrive operating system will, for the first time, take the form of a Touch Display. This means drivers will also be able to operate the system as they do consumer electronic devices. In addition to using the Controller to operate the system in familiar style, many functions can also be selected and activated by touching the screen surface. And that adds another intuitive input technique to the iDrive system's tried and tested operating logic – via Controller, direct menu control buttons and favourites buttons – to ensure optimum operation whatever the situation.

### **BMW gesture control: intuitive operation at your fingertips.**

The iDrive system in the new BMW 7 Series also hosts the debut appearance of BMW gesture control. Pre-defined hand movements near the centre console – registered by a 3D sensor – provide an extremely intuitive and user-friendly way of operating frequently used infotainment system functions. Gestures can be used to adjust the volume of audio programmes, for example, and to accept or reject incoming telephone calls. Users can determine the function to be activated by another pre-defined gesture – e.g. navigation instructions to a home address or screen deactivation – as they wish.

BMW gesture control can be used as an alternative to conventional operating methods without having to activate it separately. A symbol on the Control Display indicates whether gesture control may be used, depending on the situation.

### **Unique in the luxury sedan segment: remote control parking.**

The new BMW 7 Series is the world's first series-produced car that owners will be able to manoeuvre in or out of parking spaces or garages without anyone at the wheel. As such, the remote control parking option allows access to extremely tight parking spaces. Using the likewise newly developed BMW Display Key, the driver can prompt the car to enter or exit a parking space fully automatically. To activate the remote control parking function, the car has to be positioned at a maximum angle of 10° to the selected parking space. The maximum distance that can be covered by the car during driverless manoeuvres in and out of parking spaces is 1.5 times the length of the car.

Even when they are ensconced in their seat behind the steering wheel, drivers of the new BMW 7 Series will receive more assistance than ever when parking. The latest version of the optional Parking Assistant makes it easier to select and use parking spaces positioned parallel or transversely to the road. The system takes over the entire parking process, including all the steering, gear changes, acceleration and braking manoeuvres required. In addition, the system also includes the Active Park Distance Control function. During reversing manoeuvres, it uses precisely timed braking inputs to help avoid collisions with obstacles around the rear or sides of the car.

### **Innovative driver assistance systems from BMW ConnectedDrive enhance comfort and safety.**

Offering the widest variety of driver assistance systems ever available for a BMW model, BMW ConnectedDrive guarantees a level of comfort and safety unmatched in the luxury sedan segment. Rear collision prevention and cross-traffic warning for the area around the rear of the car have been added to the functions of the optional Driving Assistant system. For both functions the data supplied by radar sensors mounted on the sides of the rear end is analysed. In order to reduce the risk of a rear-end impact, high-frequency hazard warning lights alert vehicles following behind, as required. If a collision can no longer be avoided, the Active Protection system's protective measures, such as belt tensioning and closing of the side windows and sunroof, are activated automatically. The cross-traffic warning system helps the driver when reversing out of a parking space in situations where visibility is restricted. Audible alerts and an LED light in the exterior mirror warn the driver of cross traffic. If the optional rear view camera is specified, an extended image of the traffic situation behind the car appears on the Control Display.

As well as the Active Cruise Control system with Stop & Go function and cross-traffic warning system (front), the Driving Assistant Plus system also includes the steering and directional control assistant with Traffic Jam Assistant and the Lane Departure Warning Assistant with active side collision protection. These systems use a stereo camera and radar sensors at the front and sides of the car to detect road boundaries, vehicles travelling ahead and those approaching from the side or rear. At speeds up to 210 km/h (130 mph) they use smooth steering inputs to help drivers stay in the centre of the lane or avoid unintentional departures out of their lane. When changing lanes, the systems can also help avoid collisions with vehicles on either side of the car or approaching from behind. Additions have also been made to the functionality of the Active Cruise Control system with Stop & Go function. Once in use, the touch of a button will now suffice to acknowledge speed restrictions detected by the Speed Limit Info function and adapt the selected speed accordingly.