

# The BMW i3. Contents.



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# 1. The BMW i3. (Introduction)



The BMW Group is set to play a leading and groundbreaking role in shaping personal mobility at premium level in the future, too. The research and development work carried out since 2007 as part of project i has laid the foundations for sustainable mobility solutions influenced by environmental, economic and social change around the world. The BMW Group is pursuing an integrated approach, as embodied by the new BMW i brand, in its drive to achieve the necessary balance between individual needs and the global mobility requirements of the future. BMW i is committed to creating innovative vehicles and mobility services with premium character that is defined squarely in terms of sustainability. This vision is about to become reality: the BMW i3, the first series-produced model from the new brand, offers customers zero-emission mobility in a premium car package.

The BMW i3 is the world's first premium car designed from the ground up to be powered by an electric drive system. The result is hallmark BMW driving pleasure in undiluted form, delivered with zero emissions and an engaging intensity unmatched by any electrically powered vehicle. Like the car's unique vehicle architecture – based around the LifeDrive structure and its carbon-fibre-reinforced plastic (CFRP) passenger cell – the electric motor, power electronics and high-voltage lithium-ion battery have been developed and manufactured independently by the BMW Group under its BMW eDrive programme. This ensures that BMW's time-honoured Sheer Driving Pleasure is also a central feature of the BMW i brand's first electrically powered car. Also playing their part here are the driver assistance systems and mobility services from BMW ConnectedDrive and 360° ELECTRIC designed specifically for the BMW i3. Intelligent integration of these features allows them to accentuate the premium experience of all-electric mobility in urban environments.

## **LifeDrive architecture and BMW eDrive: a commitment to sheer driving pleasure.**

The familiar sense of driving pleasure embodied by the BMW i3 is the result of a rigorously implemented overall concept, part of which has involved creating the optimum balance of weight, performance and range for urban mobility. The key elements here are the LifeDrive architecture and BMW eDrive technology. The use of lightweight CFRP for the passenger cell cancels out the extra weight contributed by the lithium-ion battery, while the low, central

positioning of the battery pack enhances the car's agility thanks to perfectly balanced 50 : 50 weight distribution. Additionally, the electric motor mounted in close proximity to the driven rear axle offers unique performance characteristics for this type of drive system as well as providing unbeatable traction. The driving characteristics of the BMW i3 are dominated by its manoeuvrability – a direct response to the demands of city driving. The instantaneous power delivery of the electric motor, allied to the car's stiff suspension set-up, precise steering and impressively small turning circle (9.86 metres), produces a typically BMW take on electric mobility.

The electric motor generates output of 125 kW/170 hp and peak torque of 250 Newton metres (184 lb-ft), which is on tap from the word go. The motor weighs just 50 kilograms and boasts power density and responsiveness unprecedented in the world of electric mobility. The specific construction of the hybrid synchronous electric motor, developed exclusively for the BMW i3, maintains a linear flow of power into the higher reaches of the rev range. The BMW i3 sprints from 0 to 60 km/h (37 mph) in a mere 3.7 seconds and 0 to 100 km/h (62 mph) in 7.2 seconds.

The single-pedal control concept in the BMW i3 – configured by the BMW Group's drive system development engineers – also contributes to the engaging driving experience. Recuperation mode is activated the moment the driver takes his foot off the accelerator. The electric motor switches from drive to generator mode, feeding power into the lithium-ion battery. At the same time, it generates a precisely controllable braking effect. This recuperation is speed-sensitive, which means the car "coasts" with maximum efficiency at high speeds and generates a strong braking effect at low speeds.

The lithium-ion battery enables the BMW i3 to achieve a range of 130 to 160 kilometres (81 – 99 miles) in everyday driving. This rises by around 20 kilometres (12 miles) in ECO PRO mode and by the same distance again in ECO PRO+ mode. If desired, the BMW i3 is also available with a range-extender engine, which maintains the charge of the lithium-ion battery at a constant level while on the move as soon as it dips below a specified value. This role is performed by a 650cc two-cylinder petrol engine developing 25 kW/34 hp and mounted immediately adjacent to the electric motor above the rear axle. The range extender increases the car's maximum range in day-to-day driving to around 300 kilometres (approx. 180 miles).

**The world's first fully networked electrically powered car, courtesy of BMW ConnectedDrive.**

The BMW i3 is the world's first fully networked electrically powered car. No other model boasts such far-reaching exchange of information between the

vehicle, its driver and the outside world. A SIM card fitted as standard in the BMW i3 is the key that unlocks the BMW ConnectedDrive services – in their recalibrated 2013 guise – available to the new electric model. For example, it introduces navigation services specially developed to enhance electric mobility alongside familiar features including the Concierge Services information facility and the Intelligent Emergency Call function. Moreover, drivers can use the BMW i Remote app to share information with their car at any time using their smartphone. The pedestrian navigation function guides the driver from parking place to final destination and back, while BMW ConnectedDrive also offers unique intermodal route guidance as a world first, which incorporates local public transport connections into journey planning. The aim of this intelligent networking is to enable maximum driving pleasure in a car emitting zero local emissions.

The BMW ConnectedDrive services specifically designed for BMW i focus on the areas of navigation and energy management. The Range Assistant is engaged both for route planning and during journeys already under way. If the destination programmed into the navigation system is beyond the car's range, the system suggests switching to ECO PRO or ECO PRO+ mode and calculates a more efficient route. If the driver needs to charge the battery at a public charging station, a list of available stations in the area is displayed. The navigation system of the BMW i3 also comes with a dynamic range display, which supplies drivers with exceptionally precise, up-to-date and reliable information on whether there is sufficient charge to reach their destination and, if so, how much power will remain at the end of the journey. All the factors affecting range are considered in the calculation process, which is carried out on a BMW server and sent to the navigation system via the SIM card installed in the car. The range readout, presented in the form of a spidergram on the navigation map in the central information display, is extremely clear.

The link-up between driver and car also enters a new dimension in the BMW i3. The BMW ConnectedDrive Remote app for BMW i enables smartphone access to useful vehicle data for journey planning. If the BMW i3 is hooked up to a charging station or the BMW i Wallbox, the supply of energy can be controlled via smartphone, while the air conditioning and heating function for the high-voltage battery pack can also be activated remotely. In addition, customers can use their smartphone to send destinations to their car's navigation system. The app also shows the driver charging stations (both available and in use) and can establish if the car has sufficient power remaining to reach them. The car's range limit display on the smartphone screen replicates that provided by the car's navigation system.

The BMW i3 is also available with an array of other innovative BMW ConnectedDrive driver assistance systems developed specifically to enhance convenience and safety in urban conditions. These include Driving Assistant Plus, Parking Assistant, a rear view camera and Speed Limit Info.

**Integrated approach: 360° ELECTRIC provides an all-encompassing energy supply and mobility solution.**

The aim in determining the range of the BMW i3 was to ensure that customers could cover their typical energy needs by charging the car twice or three times per week. The studies carried out as part of project i – involving more than 1,000 participants and conducted over some 20 million kilometres (approx. 12.5 million miles) – revealed that the average daily distance covered was around 45 kilometres (28 miles). Customers can charge their cars using either the wallbox supplied by BMW i or a conventional domestic power socket.

BMW i offers an extensive range of products and services in its 360° ELECTRIC package designed to meet all individual customer needs for energy supply and journey planning. The spectrum of services ranges from the installation of the BMW i Wallbox in the customer's garage and special renewable energy supply offers, to the charging card for user-friendly access to the public charging infrastructure and additional assistance services from BMW ConnectedDrive. If the BMW i3 concept fails to meet mobility requirements in a specific situation, 360° ELECTRIC provides flexible mobility solutions including alternative vehicles from the BMW and DriveNow ranges.

## 2. Driving pleasure redefined: Drive system, chassis and lightweight construction.



The market launch of the BMW i3 also heralds the dawn of a new era for electric mobility. The first series-produced vehicle from the BMW i brand is also the world's first premium car with an all-electric drive system. The design, space concept and driving characteristics of the BMW i3 are part of an overall package that opens up an all-new experience of emission-free mobility. The revolutionary character of the BMW i3 is the result of a unique vehicle architecture combined with drive system technology developed in-house at the BMW Group exclusively for BMW i models. The LifeDrive architecture and BMW eDrive technology form the basis for electric mobility at a premium level and pave the way for undiluted driving pleasure.

The BMW i3 is the first series-produced model to benefit from the results of the research and development work carried out by the BMW Group as part of project i and focusing on sustainable solutions for day-to-day mobility. Its vehicle concept and drive system technology are based on the innovative power of the world's most successful manufacturer of premium cars. This ensures the BMW i3 is both an original BMW Group product and the embodiment of a new yet classically BMW interpretation of personal mobility.

The electric motor, power electronics and lithium-ion battery developed by the BMW Group for the BMW i3 are all examples of BMW eDrive technology. The BMW eDrive banner encompasses any BMW concept that delivers pure electric driving and zero local emissions, making it a particularly significant pillar of BMW EfficientDynamics in the exploration of future mobility. The all-electric drive system of the BMW i3 represents the fullest possible expression of BMW eDrive technology.

### **BMW i3 – designed from day one to deliver all-electric mobility.**

The vehicle concept behind the BMW i3 was designed from the outset to incorporate an all-electric drive system. This has numerous advantages over "conversion" vehicles, in which the original combustion engine is later swapped for an electric motor. Firstly, the engineers have free rein in terms of the construction, dimensions and configuration of all the electric drive system's components. The trajectory of the car's development is also dictated by the characteristics designed into by the car by the development team and not by the constraints imposed by a pre-existing vehicle design. For example, the space in a conversion vehicle set aside for the fuel tank or

exhaust system cannot be put to particularly constructive use. In the BMW i3 there has been no need for this kind of compromise.

Instead, the engineers were able to focus entirely on shaping the character of the BMW i3 as a sporty and agile, yet also comfortable premium car for an urban environment. When it comes to the driving attributes of the i3, the engineers have achieved a perfect balance of vehicle weight, performance and range. This is particularly important since these three factors are so inextricably linked. The operating range of electric vehicles can be extended by increasing battery size, but that adds weight and therefore has a negative impact on performance. Similarly, a more powerful motor requires more energy, which again means heavier batteries or restricted range. A lightweight body, on the other hand, enhances performance and the weight saving can be “invested” in larger batteries which, in turn, boost the car’s range.

In its mission to deliver driving pleasure in urban areas, the BMW i3 has come up with the perfect package. With a DIN kerb weight of 1,195 kilograms the car is lighter than most compact vehicles, yet offers significantly more space for up to four occupants. It also has the edge over conventionally powered models of a comparable size and output in the sprints from 0 to 100 km/h / 62 mph, which it completes in 7.2 seconds, and 0 to 60 km/h / 37 mph (3.7 seconds). Furthermore, extensive road tests conducted as part of project i proved that the car’s range of 130 to 160 kilometres (81 – 99 miles) in everyday conditions is adequate to comfortably meet the day-to-day mobility needs of the target customer group.

### **From drawing board to detail: intelligent lightweight design, rigorously applied.**

The BMW i3 embodies a particularly rigorous commitment to the principles of intelligent lightweight design as the basis for enhanced driving pleasure, a lower energy requirement and longer range. Every step in the development of the series production model has been shaped by the demands of weight optimisation, from the concept underpinning the vehicle architecture and the development of individual components to the smallest details of the car’s design. Every decision on the selection of materials and component geometry was driven by a central principle of intelligent lightweight design: the combination of maximum functionality with minimum weight.

The LifeDrive architecture developed specifically for BMW i models has created the perfect framework for purpose-built electrically powered car concepts. Here, the carbon-fibre-reinforced plastic (CFRP) construction of the passenger cell (Life module) plays a central role. Such extensive use of this lightweight and crash-safe high-tech material is unique in volume car production.

The principle of lightweight design also governs the aluminium Drive module and the connection between the two elements. The body structure – shaped by its LifeDrive architecture – enables the use of a trailing edge element made by glass-fibre-reinforced plastic injection moulding. And that contributes a 30 per cent weight saving compared with a conventional sheet steel solution. The direct connection between the power electronics and electric motor in the rear of the BMW i3 reduces the length of cabling required and cuts the overall weight of the drivetrain by around 1.5 kilograms. Weight-minimising construction also sets the tone for the chassis components of the BMW i3. For example, the forged aluminium suspension links weigh around 15 per cent less than in a conventional design, the hollow drive shaft is 18 per cent lighter than a conventional equivalent, and the standard 19-inch forged aluminium wheels of the BMW i3 are 36 per cent lower in weight than comparable steel rims of the same size.

Using a magnesium supporting structure for the instrument panel saves weight on two fronts. Superior material attributes over conventional sheet steel allow these components to boast optimised geometry, which results in a weight reduction of some 20 per cent. In addition, the high composite rigidity of the magnesium supporting structure lends it a strengthening effect, which allows a reduction in components and lowers weight by a further 10 per cent. The door trim panels are made from renewable raw materials and tip the scales around 10 per cent lighter than conventional equivalents. And the rigorous application of the lightweight design strategy extends to screws and bolts made from aluminium. The engineers' detailed commitment to the principle of lightweight design is lent visible expression by the honeycomb structure of the windscreen wiper blades. In addition, a cast aluminium mount was developed specially for the wipers of the BMW i3, its force-flow-optimised geometry also yielding a reduction in weight.

**Rear-wheel drive, a low centre of gravity, balanced weight distribution and a specific suspension set-up provide the perfect platform for agility and driving pleasure.**

The low and central position of the battery pack has a similarly positive effect on the car's agility to the balanced 50 : 50 weight distribution enabled by the arrangement of all the components in the Drive module. The battery is encased in aluminium sections and is particularly well positioned from a crash safety perspective. The electric motor and transmission unit are located in direct proximity to the driven rear axle. Underpinning their space-saving integration into the Drive module is a compact and harmonised construction facilitated by the in-house development of the drive components at the BMW Group. The clear subdivision of Life and Drive modules means no central tunnel is necessary – a particular feature of the car's construction that

has noticeable benefits for the freedom of movement and the generous space available inside the BMW i3.

The car's rear-wheel drive allows the front axle to remain free of torque steer and fulfil its steering function to full effect. As with current models from the BMW and MINI brands, electric power assistance also sends the BMW i3 driver's steering commands to the road with smoothness and precision. Its extraordinarily small turning circle of 9.86 metres and a steering set-up that demands just 2.5 turns from lock to lock enhance the agile handling of the BMW i3. This agility is the defining characteristic of the driving experience, especially in the car's preferred urban habitat. In addition, a long wheelbase (2,570 millimetres), the Drive module's rigid aluminium frame and advanced chassis technology provide the perfect ingredients for a sure-footed and relaxing ride.

The suspension components of the BMW i3 stand out with their minimised weight yet extremely stiff construction. The BMW i3 has MacPherson single-joint front suspension and a five-link rear axle mounted directly to the Drive module. This design assists the functional separation of wheel location and suspension, resulting in sporting driving characteristics defined by impressive longitudinal and lateral dynamics combined with superior suspension comfort. The rigorous adherence to lightweight design principles yields a reduction in unsprung masses to the benefit of ride comfort at all speeds. The BMW i3's forged aluminium wheels also boast outstanding rigidity and extremely low weight at less than seven kilograms each.

The dimensions of the standard tyres (155 / 70 R19) are specific to the BMW i3. The large and comparatively narrow tyres allow an excellent balance between dynamics and drag, and the aerodynamic properties and rolling resistance of the tyres are designed to provide extremely efficient driving. However, their contact patch barely differs from that of the tyres fitted as standard on conventional cars. Indeed, even when the BMW i3 is driven with sporting intent, longitudinal and lateral dynamic forces are always transferred with great assurance and poise. Interventions by the BMW i3's DSC (Dynamic Stability Control) driving stability system are only required in extreme situations, and body movements are minimal.

The standard DSC system offers all the functions familiar from current BMW models, including the Anti-lock Braking System (ABS), Cornering Brake Control (CBC), Dynamic Brake Control (DBC), Brake Assist, Brake Standby, Start-Off Assistant, Fading Compensation and the Brake Drying function. The DTC (Dynamic Traction Control) mode, activated at the touch of a button, raises the intervention thresholds of the stability control system and allows a

controlled degree of slip through the BMW i3's driven wheels when pulling away on snow or loose sand or in particularly dynamic cornering.

**BMW eDrive: electric motor sets new standards in power density and efficiency.**

The hybrid synchronous electric motor developed and produced specially by the BMW Group for use in the BMW i3 generates output of 125 kW/170 hp and puts maximum torque of 250 Newton metres (184 lb-ft) on tap from the moment the car pulls away. The BMW i3 dashes from 0 to 100 km/h (62 mph) in 7.2 seconds, having accelerated from rest to 60 km/h (37 mph) in just 3.7 seconds. With a time of 4.9 seconds for the sprint from 80 to 120 km/h (50 – 75 mph), it boasts a level of sporting ability that comparably sized combustion-engined cars would require far higher outputs to achieve.

Beyond the traditional immediacy of response offered by electric motors when pulling away, power development in the BMW i3 also remains unbroken through higher speeds. Power is sent to the rear wheels through a single-speed transmission, allowing the BMW i3 to accelerate with an uninterrupted flow of power up to its top speed, which is limited to 150 km/h (93 mph) in the interests of efficiency.

This linear power delivery extending into high rev ranges can be attributed to a special electric motor design developed exclusively for the BMW i3. BMW eDrive technology has been employed to take the principle of the permanently excited synchronous motor to another new level through detailed optimisations. A specific arrangement and dimensions for the components used to generate drive produces a self-magnetising effect only otherwise induced by reluctance motors. This additional excitation causes the electromechanical field formed by the current supply to remain stable even at high revs. The maximum revs of the motor developed for the BMW i3 – known as a hybrid synchronous motor on account of its specific combination of properties – are 11,400 rpm.

The innovative design principle behind the electric motor in the BMW i3 helps it to run extremely effectively across a wide load band. The motor's average power consumption of around 0.13 kilowatt hours per kilometre (0.21 kilowatt hours per mile) in the New European Driving Cycle (NEDC) plays a key role in optimising the car's range. This is an extraordinarily low figure, especially considering its maximum output and torque. The BMW i3 is therefore the most economical electrically powered car of its size and output class. The power density of the electric motor, weighing in at no more than around 50 kilograms, sets a new benchmark for electric vehicles. The BMW i3's motor also stands out with its smooth running and low vibrations, while

acoustic comfort and vibration damping similarly meet the high standards expected of a premium car.

**Driving pleasure, BMW i-style: instantly responsive, agile and uniquely assured.**

Zero local CO<sub>2</sub> emissions provide the most compelling argument for electric mobility in urban areas. But the appeal of all-electric vehicles is further enhanced by their instantaneous power delivery – which also allows the BMW i3 to deliver rousing acceleration in city traffic – and their quietness, which is a major contributor to the relaxed and comfortable driving experience on board the BMW i3.

Also helping to deliver the BMW i3's engaging driving experience is the single-pedal control feature carefully configured by the BMW Group's drive system development engineers. Recuperation mode is activated the moment the driver takes his foot off the accelerator. The electric motor switches from drive to generator mode, feeding power into the lithium-ion battery. At the same time, it generates a precisely controllable braking effect. This recuperation is speed-sensitive, which means the car "coasts" with maximum efficiency at high speeds and generates a strong braking effect at low speeds. The ability to accelerate and brake using just one pedal creates an unusually direct interaction between driver and car. Thinking ahead in city traffic can allow the driver to carry out 75 per cent of braking manoeuvres without applying the brake pedal. The brake lights illuminate if the amount of recuperation in progress produces the same braking effect as actually pressing the brake pedal. The conventional braking system only joins the action if the driver summons greater braking power by depressing the brake pedal.

Intensive use of this form of brake energy recuperation through the motor also increases the range of the BMW i3 by as much as 20 per cent. And the "coasting" facility further enhances the user-friendly nature of single-pedal control. The BMW i3's accelerator has a distinct "neutral" position; i.e. rather than switching straight to energy recuperation when the driver eases off the accelerator, the electric motor uses zero torque control to decouple from the drivetrain and deploy only the available kinetic energy for propulsion. In this mode, the BMW i3 glides along using virtually no energy at all. This is another example of how an anticipatory driving style can preserve energy and further increase the car's range on electric power.

**Optimised performance and range through the in-house development of storage technology and energy management.**

Specially developed lithium-ion storage cells supply the drive system with the energy required. The BMW Group also utilises its technological expertise in

the development of numerous battery system components in order to bring about a comprehensive optimisation of the high-voltage battery pack. These include specific components which ensure the interconnection of the cells themselves as well as the connection between the battery system and the vehicle. They also comprise the integrated control unit and the electronic components in the proximity of the cells, including battery management sensors. Apart from procurement of storage cells from a specialist manufacturer, all the development and manufacturing stages are carried out at the BMW Group. The high-voltage battery is produced on a state-of-the-art assembly line at BMW Plant Dingolfing.

The high-voltage battery in the BMW i3 consists of eight modules (each with 12 individual cells), which together produce a rated voltage of 360 volts and generate approximately 22 kilowatt hours of energy. The lithium-ion cells used in the battery stand out with their high energy density and impressive cycle life. They are designed to perform their energy storage function over the vehicle's entire lifespan. In order to maintain their output and storage capacity over time, the battery management system therefore controls both the charging and the discharging processes, as well as the operating temperature of the cells. When the vehicle is on the move all the cells are used equally to supply energy. However, it is also possible to replace individual modules in the event of a fault. The air conditioning coolant is used to provide extremely effective cooling of the high-voltage battery, and this fluid can also be warmed using a heat exchanger. All these characteristics enable the optimum operating temperature of around 20 degrees Celsius to be reached before a journey begins, even when the ambient temperature is low. This preconditioning ensures the battery operates to optimum effect in terms of power output, range and durability. The BMW Group has planned and developed this battery to last for the full life of the vehicle. The battery warranty is valid for eight years or 100,000 kilometres (62,000 miles).

As well as the drive unit, all the other electrically powered systems on board the BMW i3 are also designed to run as efficiently as possible. For example, energy-saving light diodes are used to provide interior and exterior illumination. And an optional interior heating system based on the principle of a heat pump uses up to 30 per cent less energy in city driving than conventional electric heating.

The battery pack is mounted flat in the Drive module and weighs approximately 230 kilograms. The battery casing and its model-specific attachment systems were developed by the BMW Group to provide the high-voltage battery with extensive protection against environmental factors and in the event of a crash.

Three levels of safety, including a cut-off mechanism, for the car's software and hardware provide reliable protection for the electrical system as a whole.

The power electronics responsible for the interaction between the battery and electric motor are also developed by the BMW Group. The power electronics serve both as an inverter for the power supply from the battery to the electric motor and as a voltage transducer interacting between the high-voltage battery and the 12-volt onboard power system. Highly sophisticated software control ensures the best possible current flow during energy recuperation on the overrun. And the operation of battery charging systems is also integrated into the power electronics, which regulate charge outputs of between 3 kW and 50 kW, depending on the electricity source.

**Flexible, fast and convenient: charging from the mains supply.**

In order to make topping up the car's power supply as user-friendly as possible for the driver, the BMW i3 lays on an extremely flexible and efficient charging system. Customers can charge their car from a conventional domestic plug socket or have a BMW i Wallbox installed, which uses the maximum current strength available at the property to charge the battery in around six hours – even in its basic configuration. Different versions of the BMW i Wallbox are available, depending on the country, to reflect the current strength and voltage in the individual markets. Charge times will therefore vary according to the power supply and type of wallbox.

When the BMW i3 is plugged into a modern public fast-charging station (50 kW) it only takes about 30 minutes for the battery to reach 80 per cent capacity. And even in the unlikely event of the car being almost down to zero range, a lunch break is still long enough to recharge the battery.

**Optional range extender acts as a spare tank.**

If desired, the BMW i3 is also available with a range-extender engine, which maintains the charge of the lithium-ion battery at a constant level while on the move as soon as it dips below a certain value. Performing this role is a 650cc two-cylinder petrol engine developing 25 kW/34 hp, which is mounted immediately adjacent to the electric motor above the rear axle. Specifying the range extender has no effect on luggage capacity: the nine-litre fuel tank is located in the front section of the car.

The combustion engine develops maximum output of 25 kW/34 hp and drives a generator to produce electricity. It is brought into play as required, responding optimally to match the load and running extremely efficiently. Driving in ECO PRO mode or ECO PRO+ mode can increase the range of the BMW i3, in each case by around 20 kilometres (12 miles). And if the range

extender is specified, the BMW i3 will be able to travel more than 100 kilometres (over 60 miles) further before refuelling. Maximum range stands at approximately 300 kilometres (186 miles). The BMW i3 is the world's first electrically powered car with a range extender engine used exclusively to generate electric power.



### **3. Intelligent connectivity for sustainable mobility: BMW ConnectedDrive in the BMW i3.**

The BMW i3 is the world's first electric car offering complete connectivity. Cutting-edge driver assistance systems coupled with mobility services from BMW ConnectedDrive that have been specially tailored for the all-electric drive technology serve to optimise safety, convenience and the usability of in-car infotainment products, as well as providing the ideal conditions for completing everyday journeys with zero emissions. BMW ConnectedDrive is unique in the way it helps drivers to implement their mobility plans to combine sustainability and driving pleasure in perfect harmony.

Navigation services that have been purpose-developed with the demands of electric mobility in mind complement the proven products from the revised BMW ConnectedDrive portfolio unveiled in 2013. These include mobility services, such as the Concierge Services for information and the Intelligent Emergency Call function, along with an array of innovative driver assistance systems that make an effective contribution to enhancing the convenience and safety of urban mobility. Access to the BMW ConnectedDrive services is ensured by a SIM card that comes built into the vehicle as standard.

Connectivity between driver and car is also taken into a whole new dimension in the BMW i3. The BMW ConnectedDrive Remote app for BMW i also makes the vehicle data used for mobility planning available on the customer's smartphone. Alongside the pedestrian navigation function for finding the way from the parked car to the final destination and back again, BMW ConnectedDrive also boasts a unique intermodal route guidance feature that is capable of incorporating local public transport connections into mobility planning. The BMW ConnectedDrive services for BMW i guide customers to any destination accurately and efficiently. They can plot the route for the BMW i3 from the driveway to a parking space, assist in the driver in changing to the correct bus or underground line, and help complete the final leg of the journey on foot.

#### **BMW ConnectedDrive services for safe, convenient mobility in the urban landscape.**

The Driving Assistant Plus that is optionally available for the BMW i3 comprises Collision Warning with brake priming function, which is activated at speeds up to 60 km/h (approx. 37 mph) and is able to respond to both moving and stationary vehicles ahead, as well as to pedestrians. It also comes with Active Cruise Control including Stop & Go function. In addition to visual and

audible warnings, the system is furthermore capable of braking the vehicle by itself, if required, with up to maximum stopping power. The Parking Assistant can likewise be found on the list of optional extras and performs the steering manoeuvres at the same time as controlling accelerator, brake and gear selection, enabling fully automated parallel parking of the BMW i3. There is also the option of a rear view camera for the BMW i3 to supplement the standard Park Distance Control (PDC) with rear sensors. Another handy optional extra is the Traffic Jam Assistant that allows drivers to delegate the tasks of pulling away, braking and steering to keep the vehicle in lane. Meanwhile, the Speed Limit Info system is also offered in conjunction with the navigation system.

The various mobility services from BMW ConnectedDrive und 360° ELECTRIC that have been specially developed for BMW i focus on the aspects of navigation and energy management. The comprehensive exchange of information between driver and vehicle allows the current mobility requirements to be checked against the available energy resources. Under everyday conditions, a fully charged BMW i3 is capable of covering a distance of 130 to 160 kilometres (80 – 100 miles) before having to be plugged into a power supply again. The field trials conducted as part of project i, which involved over 1,000 test customers and clocked up more than 20 million kilometres (approx. 12.5 million miles) of practical driving, revealed that this driving range is more than enough for day-to-day mobility requirements in urban environments, where the average distance covered daily is around 45 kilometres (approx. 28 miles). The BMW ConnectedDrive mobility services included with the BMW i3 as standard help to tailor this general compatibility to any individual driving situation. Intelligent connectivity paves the way to maximum driving pleasure in a car whose drive system produces zero local emissions.

### **Precise, up-to-date and reliable: navigation system with dynamic range display.**

The BMW i3 can be optionally equipped with a navigation system whose functionality has been extended to include the BMW ConnectedDrive services developed specifically for BMW i. The Driving Range Assistant is invaluable for both route planning and the current journey. If the destination selected in the navigation system lies beyond the vehicle's current range, it comes to the driver's aid by suggesting switching to the ECO PRO or ECO PRO+ mode, as well as calculating a more efficient alternative route. And if the battery has to be recharged at a public charging station, the driver is given a choice of available stations in the neighbourhood.

A further key element of the linked-up navigation unit is a dynamic range display, which delivers remarkably precise, up-to-date and reliable information by factoring in all the relevant variables. The battery's charge status, the

driving style, activity of electric comfort functions and the selected driving mode are all taken into account for the calculation, along with the route's topography, current traffic levels and the outside temperature. The system is therefore able to make allowance for the extra energy required for an upcoming climb, stop-start traffic or a traffic jam on the selected route, and lower its range calculation accordingly. The up-to-the-minute and detailed real-time traffic information provided by the RTTI system is also added to the equation. The information is analysed and evaluated centrally by the BMW ConnectedDrive server that is in permanent communication with the vehicle. The SIM card that comes built into the BMW i3 ensures a reliable connection between the vehicle and the BMW ConnectedDrive server.

The dynamic range display is visualised on the central information display in the BMW i3 as a peripheral contour within the navigation map. Taking the vehicle's current location as a starting point, all points that can be reached in the various driving modes are displayed in the form of a range spidergram.

### **BMW ConnectedDrive Services enable mobility planning to the current destination and beyond.**

Apart from the information required for the route guidance currently in progress, the navigation system also helps drivers to plan mobility requirements beyond their present destination. For the purpose of energy management, not only are the current battery capacity levels taken into account, but the various options for recharging are also considered. The lithium-ion battery in the BMW i3 can be recharged from any standard domestic socket to give maximum flexibility since the charging lead for connecting to the mains supply is carried in the vehicle at all times. However, energy levels can be topped up very quickly and conveniently at one of the charging stations specially designed for electric vehicles. The BMW ConnectedDrive services help drivers to quickly pinpoint these charging points by displaying all available charging stations along the route or in the vicinity of the destination on the navigation map.

In the same way that points of interest such as restaurants, hotels and tourist sights are visualised, charging stations and parking facilities can also be shown in the information display if desired. The driver can see which car parks and charging stations are full or have spaces, and the information is constantly updated via the connection to the BMW server. And it won't be long before drivers are able to reserve a space at a charging station from the comfort of their vehicle. The complete connectivity concept also gives customers the option of booking these and other products from BMW ConnectedDrive after taking delivery of their vehicle.

The BMW ConnectedDrive server additionally provides up-to-the-minute data indicating whether potential charging stations will actually have spaces available on arrival. For instance, drivers can call up a station located close to the journey's destination in advance. The system also notifies them of the charging time required before commencing the return journey or the onward journey to the next destination. The wealth of functions offered by the navigation system with its BMW i-specific BMW ConnectedDrive services makes it possible to plan journeys using electric power alone with supreme precision, reliability and convenience.

### **Intelligent link-up between driver and vehicle: the BMW ConnectedDrive Remote app for BMW i.**

The mobility planning information provided is made available on the customer's smartphone as well as in the vehicle. This connectivity is provided by an application developed especially for BMW i for mobile phones with the iOS and Android operating systems. The app is an enhanced version of the remote services offered by BMW ConnectedDrive.

The Remote app for BMW i allows drivers to access vehicle data and relevant information on route planning at any time. The driver is also able to use the app to call up a display of charging stations that are either full or have spaces, and see whether they are located within the vehicle's current driving range. To this end, the range contour is also displayed here just as it is in the vehicle's navigation system. This highly intelligent form of connectivity allows drivers to check the status of their BMW i3 and even plan forthcoming journeys while away from their vehicle – whether at home, at work or walking to the car park. A real-time overview of charging stations and parking facilities can also be found online by visiting the BMW ConnectedDrive customer portal. The recharging facilities provided by the ChargeNow network of charging stations are also shown.

If the vehicle is plugged into a public charging station or the BMW i Wallbox, the charging procedure can be controlled both remotely and using a timer function. A range calculation graphic identical to that in the vehicle can be viewed on the smartphone too. The BMW i App can also be used to search for and select a navigation destination or a free charging station and then import it to the vehicle's system. Besides this, the available charging stations along the route and in the vicinity of the destination are likewise visualised in the BMW i App, just as they are in the vehicle's information display. This enables the driver not only to plan the upcoming journey in good time and with foresight, but also to make adequate preparations for further mobility requirements beyond the immediate future.

Drivers furthermore have the ability to control not just the charging process remotely but also the advance preparation of the vehicle. If the BMW i3 is plugged into a charging station or the BMW i Wallbox, the energy supply can be controlled from the smartphone. The vehicle's air conditioning and heating of the high-voltage battery can likewise be activated remotely. Pre-heating the battery ensures optimum operating status for performance, range and battery durability, even at low ambient temperatures. There is also the option of programming the charging process using the app so that charging takes place when electricity is cheaper, for example using off-peak tariffs at night.

**Intermodal route planning: BMW i mobility services speed you to your destination efficiently and easily.**

After leaving the vehicle at a selected car park, customers can also use the pedestrian navigation function integrated in the BMW i App to guide them to their final destination. The navigation destination selected by the driver in the vehicle is automatically transferred to the BMW i App via the BMW ConnectedDrive server so that route guidance can be continued by smartphone. The navigation system specifically developed for BMW i and the demands of travel in urban centres also features a unique intermodal route planning function.

This function also includes local public transport networks, allowing the available transport connections to be incorporated into route planning if required and displayed by the navigation system in the BMW i3 en route. This gives drivers the option of selecting an intermodal route while driving in their BMW i3, initially being directed to a public car park by the navigation system. After leaving their car, the BMW i App is now used to guide them first to the correct bus or underground line, then on to their destination while completing the final leg of the journey on foot. When they return, they are directed all the way back to their car again. The app lets drivers see where they left their car parked at any time.

Once a journey has been completed, customers are able to compare the efficiency of their driving style anonymously with that of other BMW i3 users. At the same time, they are given further efficiency-enhancing pointers as well as tips for honing the way they drive.

In addition to this, BMW i offers pioneering mobility services under the umbrella of 360° ELECTRIC that can be incorporated into the customer's mobility planning. These include the premium car-sharing service DriveNow, which has been available in Germany since 2011 and in San Francisco since September 2012. It was here that the ParkNow facility was also introduced as a world first, enabling parking spaces to be booked via a smartphone app.

ParkNow and other services are offered to customers through BMW ConnectedDrive and made available for use in their navigation system.

## 4. Thinking outside the box : 360° ELECTRIC offers all- encompassing vehicle solutions.



So that customers can make the best possible use of their BMW i3, BMW i provides a comprehensive range of products and services to cover individual requirements beyond the actual vehicle. The comprehensive 360° ELECTRIC package provides an especially reliable, convenient and flexible way of harnessing the benefits of electric mobility during everyday driving, with customers deciding for themselves which particular features they wish to use. The 360° ELECTRIC portfolio has four mainstays essentially covering the areas of home charging, public charging stations, safeguarding mobility, and integration into innovative mobility concepts to overcome range restrictions.

### **Home charging: the most convenient option.**

BMW i is able to offer customers who have their own garage or a private parking space tailor-made solutions to make domestic charging a safe, simple and particularly quick procedure. To achieve this aim, BMW i entered into a far-reaching partnership agreement with Schneider Electric and The Mobility House (TMH) in January 2013. The aim of the collaboration is to provide customer-friendly and efficient charging facilities by the time the BMW i3 is launched that will allow for recharging in the comfort of the customer's own garage. The partnership agreement includes checking the electrical installation in customers' homes, supplying and assembling the charging point (the BMW i Wallbox), as well as providing maintenance, advice and other services.

BMW i also backs the use of electricity from renewable sources and has joined forces with selected partners to offer a choice of green power products. A strategic alliance between BMW AG and German eco power supplier Naturstrom AG will in future give customers in Germany the opportunity to obtain an eco power package for running their BMW i3. Naturstrom AG supplies electricity entirely from renewables, with a very high proportion of wind power, ensuring that the electric vehicle can be operated with zero CO<sub>2</sub> output. And BMW i can also assist if the customer decides, for example, to install a carport with solar panels.

### **Public charging: topping up on the move.**

360° ELECTRIC also comprises individual solutions for anyone who is unable to recharge their BMW i3 at home or at work. Thanks to collaboration with car park operators and public charging station providers, BMW i grants customers highly reliable access to the public charging infrastructure. BMW i together

with its partners fosters connectivity between vehicle, driver and the outside world, providing users with convenient features such as the display of available charging stations in the navigation system and on the customer's smartphone, along with a simple and transparent payment method with the ChargeNow card. This card enables universal access to charging poles and provides a cashless means of payment. In so doing, it groups together the maximum number of public charging infrastructure suppliers in all BMW i markets, allowing the customer to access the charging stations of different providers with a single card and receive a single standardised invoice from BMW i.

In Germany alone, there are over 70 different providers of public charging facilities, who currently operate a variety of payment and service concepts. Harmonising this situation is of crucial importance. BMW i already offers customers an intelligent solution with its ChargeNow card. The challenge now is to join forces with all the partners involved and further extend the range of products that are universally available.

One of the latest examples of how the public charging infrastructure can be interlinked is the recently unveiled portfolio of solutions from Hubeject GmbH, a joint venture between the BMW Group, Bosch, Daimler, the power companies EnBW and RWE, and Siemens. The company enables providers of electric mobility services to expand their product offering to include eRoaming. Drivers of electric vehicles therefore only need a single service provider contract to obtain access to every public charging point in an expanding European network, which BMW i customers can use with their ChargeNow card. In future, recharging electric vehicles will therefore become as straightforward as withdrawing money from a cash dispenser. The charging pole is accessed using a standardised QR code, which starts and ends the charging procedure by means of a scan function and smartphone app.

### **Flexible mobility: making smart use of alternatives.**

When the range of the BMW i3 is not sufficient for requirements, customers have recourse to various complementary mobility modules to help them cover larger distances, such as the temporary use of a BMW with a conventional engine or hybrid drive. For this purpose, individual annual quotas can also be booked through 360° ELECTRIC. Moreover, BMW i customers also have the DriveNow car-sharing service available to them.

### **Assistance services.**

To make sure the BMW i3 runs smoothly during everyday operation, the battery and remaining electrical systems are permanently monitored even while the vehicle is being driven. In the unlikely case of a malfunction, BMW Mobile Service or workshops are able to carry out vehicle diagnostics to

pinpoint any faulty components so that the BMW i3 is ready to be driven again in the shortest time possible. And the service provided is of exactly the same thoroughness and standard as offered for conventionally powered BMW cars. What's more, customers can also count on the assistance of the BMW roadside service when a depleted battery forces them to take an unscheduled break. A charging facility installed in the BMW Mobile Service vehicle acts as a sort of "spare fuel can", transferring power to the high-voltage battery in the BMW i3 so that customers can quickly resume their journey.

## 5. Overview of main vehicle specifications. BMW i3.



<b>BMW i3</b>		
<b>Body</b>		
Length	mm	3999
Wheelbase	mm	2570
Turning circle	m	9.86
Weight, unladen, to DIN/EU	kg	1195 / 1270
<b>Engine</b>		
Engine technology		BMW eDrive technology: hybrid synchronous motor with integrated power electronics, charger and generator mode for recuperation
Output	kW/hp	125 / 170
Torque	Nm	250
<b>High-voltage battery</b>		
Rated voltage	V	360
Energy capacity	kWh	22
Storage technology		Lithium-ion
<b>Driving dynamics</b>		
Drive concept		Rear-wheel drive
Front suspension		Aluminium single-joint MacPherson spring strut with anti-dive
Rear suspension		Five-link axle directly mounted to Drive module
Tyres front/rear		155/70 R19
Rims front/rear		5J x 19 light-alloy
<b>Transmission</b>		
Type of gearbox		Automatic, single-speed with fixed ratio
<b>Performance</b>		
Power-to-weight ratio (DIN)	kg/kW	9.6
Acceleration	0–100 km/h	s
	0–60 km/h	s
	80–120 km/h	s
Top speed	km/h	150
Range in everyday driving		
(Comfort mode)	km	130 – 160
(ECO PRO+ mode)	km	up to 200
(Comfort mode with Range Extender)	km	approx. 300
Range in EU cycle		
(Comfort mode)	km	190
<b>Charging times (for 80% charge)</b>		
	h	From < 30 min. at 50 kW fast charge to ~ 8 h for 100% at domestic socket
<b>Consumption in EU cycle</b>		
Overall	kWh/km	0.12
CO <sub>2</sub>	g/km	0

Specifications apply to ACEA markets; data relevant to homologation applicable in part only to Germany (weight)  
All technical data are provisional