Audi
MediaCenter

Communications Model Lines, Innovation and Technology
Tanja Lehner-Ilsanker
Phone: +49 841 89-34105
E-mail: tanja.lehner@audi.de
www.audi-mediacenter.com

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PRESS INFORMATION

Audi e-tron: Driving dynamics

In search of driving pleasure: quattro drive and suspension of the Audi e-tron

quattro and e-tron – adds up to the perfect combination for powerful performance and high efficiency. In the Audi e-tron, the brand with the four rings uses a new generation of quattro drive: electric all-wheel drive. In conjunction with the versatile suspension, the low center of gravity and the powerful electric motors, the electric SUV offers optimum traction, outstanding dynamics and unshakable stability on any terrain and in any weather – enormous driving pleasure in short.

Variable torque distribution: the electric all-wheel drive
With the electric all-wheel drive Audi transfers the combined know-how from four decades of quattro drive into the electric age. The premium brand combines the efficiency of a single-axle drive with the driving dynamics and traction of an all-wheel drive. This technology also reaches a new level of variability, dynamics and precision.

The electric motors are the ideal power source for the high-precision, ultrafast quattro drive in the Audi e-tron: The drive torque can be controlled instantly and distributed fully variably between both axles in fractions of a second – constantly tailored to the particular driving situation. In conjunction with the wheel-selective torque control, the electric all-wheel drive offers high traction in all weather conditions and on any surface. The dynamic talents of the Audi e-tron are especially apparent at low coefficients of friction, such as on snow.

In most cases, the electric SUV tends to use its rear electric motor to achieve the highest efficiency. For reasons of efficiency, the drive torque is generally distributed with a rear-axle bias. If the driver demands more power than the rear electric motor can supply, the electric all-wheel drive redistributes torque as required to the front axle. This also happens predictively even before slip occurs in icy conditions or when cornering fast, or if the car understeers or oversteers. It takes just 30 milliseconds or so from the system detecting the driving situation and the torque from the electric motors kicking in – much faster than with conventional quattro technology. The reason is that with the electric all-wheel drive a mechanical clutch is not engaged but electricity is simply distributed. And that is almost instantaneous with absolute precision. So even with sudden changes in the coefficients of friction and extreme driving situations the full quattro performance is guaranteed.

Intelligent connectivity: cooperation between control units
Thanks to the many years of experience and quattro expertise Audi has developed all the main software components and their connectivity in-house. Numerous control units work together closely in the Audi e-tron and coordinate all functions for the powertrain.

First and foremost is the drive control unit. It controls the distribution of the drive torque between the two electric motors, with the emphasis always on the optimum performance and, in turn, high efficiency. In addition to the state of charge and the temperature of the high-voltage battery and electric motors, the drive control unit also takes into account the selected drive range and the power requirement. For instance in drive range S with activation of the kickdown, the boost power of 300 kW is released to deliver maximum performance. In accordance with the required torque of the drive control unit, the power electronics incorporated in the electric drive supply the electric motors with power.

The central control unit for the suspension is the electronic chassis platform (ECP). For the first time, it integrates the driving dynamics control of the quattro drive, i.e. the all-wheel controller, as well as the wheel-selective torque control. The control is much quicker and much more precise thanks to this integration. In situations where handling dynamics are relevant such as understeer or oversteer, the electronic all-wheel controller overrides the specified torque distribution of the drive control unit. From data such as steering angle, engine torque, transverse and longitudinal acceleration it calculates the ideal torque distribution for the particular driving situation. If oversteer is imminent, more torque is sent to the front axle to pull the Audi e-tron out of the bend. The driver can thus accelerate in the bend early into the next straight and needs to intervene less to make corrections. Tracking stability is enhanced. The all-wheel controller decides on the basis of each situation whether it adjusts the engine torque or increases the brake intervention – and does so individually on each axle. That contributes to the agile handling of the Audi e-tron and makes for a sporty basic setup, particularly in terms of transverse dynamics. If there are signs of understeer with a sporty driving style, in other words the vehicle moves across the front axle, the all-wheel controller activates the hydraulic wheel brakes to distribute torque laterally and directly controls the brakes individually. This wheel-selective torque control gently brakes the wheels with reduced load on the inside of the curve, thus increasing the drive power to the wheels on the outside of the curve with the higher wheel load. This difference turns the car into the bend, allowing the car to follow the steering angle. The upshot: precise, neutral handling coupled with enhanced dynamic cornering.

Innovative traction control in the Electronic Stabilization Control (ESC) also delivers high traction and vehicle safety. Thanks to innovative networking and shifting of functional modules from the ESC to the power electronics, the wheel slip is now controlled at millisecond intervals. As such, it can be adjusted precisely to the driving situation and the road surface condition. The result is improved acceleration and enhanced stability on snow and ice. In conjunction with the all-wheel controller the new traction control delivers optimum grip between tire and road surface. The drive control unit coordinates the traction control and the all-wheel controller.

Wide-ranging character: Audi drive select
The Audi e-tron's characteristics can be adjusted via the standard Audi drive select dynamic handling system across seven profiles – from overtly comfortable, through extra-efficient, to distinctively sporty – according to the driving situation, road condition or personal requirements. Apart from the *auto*, *comfort* and *dynamic* modes, the driver can also choose from the *efficiency*, *individual*, *allroad* and *offroad* programs. They permanently influence the steering assistance, the drive characteristics and the air adaptive suspension with controlled damping. If the driver selects the *dynamic* mode in Audi drive select, the drive range S is active automatically and in turn also the boost mode. Here, the drive produces 300 kW and delivers 664 Nm *(489.7 lb-ft)* of torque. The *efficiency* mode moves the powertrain, the climate control and the standard-fit cruise control or the optional adaptive cruise control to a more economical basic setting and thus assists the driver with a driving style that optimizes fuel economy. In *individual* mode the driver can configure the setup based on their personal wishes. The driver adjusts the settings of the required drive mode via the button in the switch strip in front of or in the MMI.

Optimal traction for any situation: the Electronic Stabilization Control
The perceived response of the electric quattro drive is also changed in the four functional modes of the Electronic Stabilization Control (ESC). Apart from the standard ON mode the Audi e-tron also comes with a Sport and an Offroad mode as well as deactivation of the ESC. Depending on the driver's preferences, the traction and handling stability can be adjusted to various terrains. If the ESC has to act, its interventions are gentle and virtually imperceptible, assisted by the all-wheel controller.

In ESC ON the system controls the wheels with the innovative traction control to produce ideal wheel slip, thus accelerating the Audi e-tron safely and stably. Maximum power transfer is provided. By selecting Sport mode, the driver can drift on surfaces with a low coefficient of friction, such as snow, in a controlled, safe manner. By allowing more wheel slip coupled with high traction, the traction control provides greater driving pleasure in this situation. In ESC Off mode, the possible wheel slip is virtually unrestricted. The Audi e-tron offers purist handling and start-off assistance: low slip control is still provided in the low speed range only so the vehicle can move off better on ice, deep snow or sand.

Offroading is possible thanks to the *offroad* mode in Audi drive select, which at the same time activates the Offroad mode of the ESC. Here the Audi e-tron switches from drive range D to S to call up the maximum torque of 664 Nm *(489.7 lb-ft)* and 300 kW of power – an advantage on steep inclines. The ESC optimizes the traction and brake control and slightly reduces the stability control primarily in the lower and medium speed range. For instance the effect of the electronic differential lock is increased to achieve optimum power transfer and propulsive power when driving with lots of axial twist, i.e. where one wheel virtually has no load.

In addition, the ABS brake control is adjusted to achieve higher deceleration on gravel or sand too. In both cases the electrohydraulically integrated brake control system with its precise and rapid pressure buildup ensures optimum traction and short braking distances.

The standard hill descent control is activated in ESC Offroad mode. On steep slopes over six percent, this function provides support with automatic braking input. The system maintains a constant speed up to a maximum of 30 km/h *(18.6 mph)*, which the driver sets by accelerating or braking. This allows the driver to concentrate fully on the terrain.

Remarkably versatile: the adaptive air suspension
The Audi e-tron comes standard with adaptive air suspension with controlled damping. This ensures a vast difference between smooth rolling comfort and sporty, stable handling. As such, the electric SUV is well prepared for relaxed touring on the one hand, and for dynamic driving on winding roads on the other. The Offroad height also allows the driver to venture off the beaten track. The pneumatic springs adjust individually to the road conditions depending on the speed and the driver's preferences, varying the ride height by as much as 76 millimeters *(3.0 in)* starting from the basic setting of 172 millimeters *(6.8 in)*. It also offers a self-leveling function for various load conditions.

The air suspension with damper control is integrated into the electronic chassis platform and Audi drive select management. The central chassis control unit individually controls the shock absorbers at each wheel at millisecond intervals – according to the road condition, driving style and the mode set by the driver in the Audi drive select dynamic handling system. In *auto* mode this is very balanced. With the *comfort* setting, the shock absorbers are controlled so that they provide relaxed motoring even on poor roads.

If the driver selects *auto* or *comfort* mode, the Audi e-tron is at normal ride height. While the pneumatic spring reduces the ground clearance on long highway journeys in the *comfort* setting by 13 millimeters *(0.5 in)*, the body is lowered in *auto* mode in two stages by up to 26 millimeters *(1.0 in)* – depending on the road speed. In addition to stability and handling, the range also benefits from the lower drag thanks to the improved airflow. In the *dynamic* and *efficiency* modes the Audi e-tron basically sits 13 millimeters *(0.5 in)* lower than the standard ride height. For efficiency reasons, the body is also lowered from a certain speed so that the electric SUV reaches its lowest ride height of 26 millimeters *(1.0 in)* below the standard setting.

When selecting the *allroad* or *offroad* mode, the electric SUV is primed for driving away from paved roads. Here the air suspension increases the ground clearance by 35 millimeters *(1.4 in)* above the standard ride height. On rough terrain the driver can also activate the "Lift" function. Compared with *offroad* mode here the body is another 15 millimeters *(0.6 in)* higher, i.e. an increase of 50 millimeters *(2.0 in)*. In conjunction with the front angle of approach of 18.2 degrees and the rear angle of approach of 24.4 degrees with the Offroad setting, the Audi e-tron is well prepared to tackle gentle off-road terrain. The ramp angle of the electric SUV is 16.8 degrees in this configuration.

Basis of the high transverse dynamics: low center of gravity and torsional rigidity
The Audi e-tron provides outstanding transverse dynamics in the full-size SUV segment and responds agilely and stably in equal measure in any situation. This is thanks decisively to the low installation position of the powertrain components and the high-voltage battery. The center of gravity of the Audi e-tron is on a par with that of a sedan. The battery system is optimally matched to the dimensions of the Audi e-tron and is located between the axles in the form of a flat, broad block beneath the passenger compartment. This central position ensures high agility in combination with the low center of gravity. Axle load distribution is perfectly balanced at almost 50:50.

The weight of the battery system including the housing pan with intricate crash structures is roughly 700 kilograms *(1,543.2 lb)*. It is bolted to the body structure of the Audi e-tron at 35 points. Body and high-voltage battery act in unison, thus ensuring a high level of safety and rigidity. Compared with a conventional SUV, the torsional rigidity of the Audi e-tron has been increased by 45 percent – the decisive parameter for precise handling and acoustic comfort. The passenger compartment made of hot-formed, ultrahigh-strength steel also plays an important role. Steel accounts for 17 percent of the total body weight. Aluminum makes up 40 percent of the weight, including all attachments such as doors, hood and tailgate along with the battery housing.

Sporty, precise handling: suspensions, steering, wheels
The front and rear suspensions of the electric SUV are five-link designs. This axle principle enables optimal absorption of transverse and longitudinal forces. Its mounts are sportily rigid in a transverse direction and supple and soft longitudinally. All of which substantially improves comfort coupled with enhanced driving dynamics.

The standard progressive steering adjusts its generally directly configured ratio to the steering angle. It becomes more direct with increasing steering angle, which provides handling advantages when maneuvering and in tight curves. The car can be moved agilely and precisely with little steering effort. The Audi e-tron steers into the bend spontaneously without understeer and remains neutral for a long time even at high speeds. Despite its typical electric SUV unladen weight of 2,490 kilograms *(5,489.5 lb)* its handling is extremely light-footed. Power assistance is increased at low speeds for easier maneuverability.

The Audi e-tron is fitted standard with aerodynamically optimized 19-inch wheels. Their design is flatter than with conventional wheels, thus reducing the aerodynamic drag. The fitted 255/55 tires stand out with their low rolling resistance without compromising handling or braking performance. As an option, Audi also supplies aerodynamically optimized 20-inch wheels with 255/50 size tires and 21-inch wheels with 265/45 size tires.

Powerful 18-inch brakes work on the large wheels – with six-piston fixed calipers at the front and single-piston floating calipers at the rear. Optionally they stand out brightly with their e-tron-specific finish in the high-voltage signal color orange. At the front the internally ventilated discs have a diameter of 375 millimeters *(14.8 in)* and 350 millimeters *(13.8 in)* at the rear. The new electrohydraulic actuation allows the brake control system to build up brake pressure for the wheel brakes with great precision and roughly twice as fast as a conventional system. When automated emergency braking is performed, there are only 150 milliseconds – ever so slightly more than a blink of the eye – between the initiation of the brake application and the presence of maximum brake pressure between the pads and discs. Thanks to this rapid pressure buildup, the electrohydraulically integrated brake control system shortens the braking distance by up to 20 percent compared with a conventional brake system.

Powerful performance: electric motors and thermal management
Apart from the state-of-the-art suspension components and their intelligent control, the powerful electric motors in particular are a vital element in the superb driving pleasure. The electric motors have an output of 265 kW and develop 561 Nm *(413.8 lb-ft)* of torque. They can deliver this peak performance for up to 60 seconds. The vehicle can thus accelerate from a standstill to the electronically limited top speed of 200 km/h *(124.3 mph)* several times consecutively without output losses. The Audi e-tron sprints from zero to 100 km/h *(62.1 mph)* in 6.6 seconds. The maximum drive torque is available within fractions of a second and provides enormous pulling power. By shifting from drive range D to S and fully depressing the right-hand pedal, the driver can activate boost mode. It is available for eight seconds. Here, the drive produces 300 kW of system output and 664 Nm *(489.7 lb-ft)* of torque. The Audi e-tron accelerates from a standstill to 100 km/h *(62.1 mph)* in 5.7 seconds with this setup.

The sophisticated thermal management plays a crucial role in the performance of the electric motors. It allows the performance to be reproduced even if the powertrain components are subjected to high loads. For the customer that means brilliant driving dynamics at all times. The thermal management cools the electric motors together with their rotors, the power electronics and the charger. The rotors, which reach up to 13,300 revolutions per minute during real vehicle operation, consist of magnetically conductive electrical sheets and lightweight, high-purity aluminum. Coolant flows through the inside of the shafts to ensure that the temperature does not exceed 180 degrees Celsius.

The stators and end shields of the electric motors are also water-cooled. The gearboxes mounted on the end shields benefit indirectly from this solution. Effective cooling posed new challenges for the developers, particularly with the coaxially arranged electric motor at the rear axle. The solution is to supply the coolant via a double-wall pipe and its ceramic seal on the electric motor rotor. 22 liters *(5.8 US gal)* of coolant circulate around the 40 meters *(131.2 ft)* of cooling pipes in the Audi e-tron. Being the hottest components in the powertrain, the electric motors provide the thermal management system with a large quantity of heat. The standard-fit heat pump uses any waste heat to heat up or cool the interior. Depending on the outside temperature, that can boost the Audi e-tron's range by up to ten percent in customer operation. Efficiency and performance fuse perfectly in the Audi e-tron and provide the basis for the driving experience of a new technology era.

Successful in sport and volume production: the quattro drive and its history
quattro drive revolutionized Audi and continues to characterize the brand with the four rings. It was born in the winter of 1976/77 during test drives in the deep snows of Sweden. Audi engineers developed the quattro system as all-wheel drive for sporty cars. The Ur-quattro, the first Audi production model with quattro drive, debuted in 1980. A year later it joined the rally circuit, notching up numerous victories along the way. Audi won the manufacturer's world championship in 1982, with Finn Hannu Mikkola taking the driver's title in the rally world championship in 1983. In the same year Audi unveiled the Sport quattro, 24 centimeters *(9.4 in)* shorter with a wide track, developing 225 kW (306 hp) – the most powerful road-going automobile to date offered by a German automaker. The model provided the basis for a new group B rally car in which Swede Stig Blomqvist took the driver's championship and Audi the manufacturer's world championship in 1984. Equally unforgettable is Walter Röhrl's victory on the legendary Pikes Peak (USA) race in 1987. With the 598 hp Audi Sport quattro S1 (E2) he set a new record. In 10 minutes and 47.85 seconds he conquered the almost 20-kilometer-long *(12.4 mi)* course with 156 bends and a difference in altitude of 1,439 meters *(4,721.1 ft)*.

Audi has continuously refined the quattro technology over the decades – from a manually locking center differential to various types of self-locking center differentials. The developers are constantly optimizing these systems for dynamics and traction. The classic quattro technology is now available in all model lines, but there are conceptual differences between them. The quattro drive in the models based on the modular transverse matrix uses a hydraulically actuated, electronically controlled multi-plate clutch on the rear axle. In the Audi R8, the multi-plate clutch is installed on the front axle. Depending on the engine/transmission variant, models based on the modular longitudinal platform have either quattro drive with a self-locking center differential or quattro with ultra technology. This optimized all-wheel drive system is particularly efficient because it engages only when required. Despite this, the drive system exhibits no perceptible differences from permanent systems in terms of traction and driving dynamics.

In the Audi e-tron, the brand with the four rings is introducing a new generation of quattro drive as standard: electric all-wheel drive. It ensures the continuous and fully variable regulation of the ideal distribution of drive torque between the two axles – within a fraction of a second. In conjunction with the wheel-selective torque control, which drives the hydraulic wheel brakes individually with a sporty driving style, the electric SUV offers optimum traction in all weather conditions and on any surface.

In 2017, just under 44 percent of all Audi customers worldwide chose a quattro drive. It has proved most popular in Canada, in the United States, in Switzerland, Russia and in the countries of Eastern Europe. In January 2017, the eight millionth Audi with quattro drive drove off the assembly line – a Q5 with a mechanical center differential to distribute the torque.

Technology Lexicon Driving dynamics

Electric all-wheel drive

The electric all-wheel drive combines the efficiency of a single-axle drive with the driving dynamics and traction of an all-wheel drive. It ensures the continuous and fully variable regulation of the ideal distribution of drive torque between the two axles. It takes just 30 milliseconds or so from the system detecting the driving situation and the torque from the electric motors kicking in – much faster than with conventional quattro technology. The reason is that with the electric all-wheel drive a mechanical clutch is not engaged but electricity is simply distributed. And that takes just a fraction of a second. So even with sudden changes in the coefficients of friction and extreme driving situations the full quattro performance is guaranteed.

In most cases, the electric SUV tends to use its rear electric motor to achieve the highest efficiency. For reasons of efficiency, the drive torque is generally distributed with a rear-axle bias. If the driver demands more power than the rear electric motor can supply, the electric all-wheel drive redistributes torque as required to the front axle. This also happens predictively even before slip occurs in icy conditions or when cornering fast, or if the car understeers or oversteers. In conjunction with the wheel-selective torque control, the electric all-wheel drive offers high traction in all weather conditions and on any surface.

Electronic chassis platform

The electronic chassis platform (ECP) is the central control unit for the suspension. Apart from the movement of the automobile, including speed, roll and pitching movements, it also records the coefficient of friction of the road surface, the current driving conditions, such as understeer or oversteer, as well as the data from the involved suspension systems. From these, it quickly calculates and precisely coordinates the optimal function of these components in the integrated handling controller. Whether cornering behavior, transverse dynamics or ride comfort – the advantages of the networked control system can be felt everywhere. In the Audi e-tron the ECP acts on the adaptive air suspension, the driving dynamics control of the electric all-wheel drive and the wheel-selective torque control.

Wheel-selective torque control

Whether electric or mechanical all-wheel drive, whether front-wheel drive – the wheel-selective torque control rounds off the handling with electronic interventions. On all models with all-wheel drive, i.e. including the Audi e-tron, the wheel brakes decelerate minimally the wheels with less load on the inside of the curve with a sporty driving style, thus increasing the drive torque to the wheels on the outside of the curve with the higher wheel load. The difference in drive forces turns the car into the bend, allowing the car to follow the steering angle precisely.

The result: precise, agile and neutral handling. On the models with front-wheel drive, the wheel-selective torque control acts on the front wheel at the inside of a curve.

In the Audi e-tron the wheel-selective torque control is not integrated into the Electronic Stabilization Control, but into the electronic chassis platform and, in turn, forms part of the all-wheel control for the first time. As a result both systems can be optimally coordinated and supplement each other mutually.

Speed-controlled traction control

The Audi e-tron features innovative traction control, which substantially increases traction and handling stability. The Electronic Stabilization Control (ESC) and the power electronics have been networked in a new way based on the engine speed. By shifting function modules to the power electronics the wheel slip is controlled at millisecond intervals – 50 times faster than before. This enables the slip to be adjusted to the driving situation much more precisely and becomes noticeable to the driver particularly in combination with the four-stage function modes of the ESC – ON, OFF, Sport and Offroad. In conjunction with the electronic differential lock of the ESC and the all-wheel controller, the new traction control provides optimum power transfer between tires and road surface. The result is the high level of traction and stability under all conditions that is the hallmark of Audi.

Power electronics

The high-voltage battery delivers direct current; the electric motors use three-phase current, which is why every electric motor is connected to a power electronics module that converts the electricity. With a volume of 5.5 liters *(0.2 cu ft)* and weighing eight kilograms *(17.6 lb)*, the power electronics modules of the Audi e-tron are very compact. Both include a microcontroller for controlling the electric motor and are integrated into the thermal management system for the electrical units. They are extremely dynamic, reading sensor data 10,000 times per second and outputting current values for the electric motors.

Electrohydraulically integrated brake control system

With the electrohydraulically integrated brake control system, Audi is presenting a world premiere in a series production vehicle with an electric drive. The wheel brakes are actuated hydraulically, the reinforcement is actuated electrically, and the activation is actuated electronically. The control unit detects with how much force the driver is depressing the brake pedal and calculates how much braking torque is needed within milliseconds. If the recuperation torque is not sufficient, hydraulic pressure for the conventional friction brake is generated in addition. Put into motion by an electric spindle drive, the displacement piston pushes the brake fluid into the brake lines. The transition from generator operation of the electric motors to the pure friction brake is smooth, and the driver does not notice it.

A second piston generates the familiar pedal feeling for the driver's foot by means of a pressure-resistant element. Thanks to this brake pedal simulator, the driver is not affected by what is happening in the hydraulics. In the case of ABS braking, pressure buildup and reduction are not noticeable in the pedal in the form of irritating hard pulsations. In hazardous situations, the electrohydraulically integrated brake control system builds up the brake pressure around twice as fast as a conventional brake system. Maximum brake pressure is thus present after just 150 milliseconds. This is barely more than a blink of the eye and creates impressively short braking distances.

Audi drive select

With the Audi drive select dynamic handling system, the driver can experience different setups in their Audi. Selecting one of the *auto*, *comfort*, *dynamic* or *efficiency* modes changes the characteristics of important driveline and suspension components from comfort-oriented, through markedly dynamic to highly fuel-efficient. In *individual* mode the driver can configure the setup based on their personal wishes. The Audi e-tron also features the *allroad* and *offroad* modes which prime the electric SUV in combination with adaptive air suspension for driving off-road. In *offroad* mode the Electronic Stabilization Control, the drive control unit and the all-wheel drive are adjusted for optimum offroad capability.

adaptive air suspension

adaptive air suspension – an air suspension system with controlled damping – offers the Audi e-tron a wide range between smooth cruising and sporty handling. It adjusts individually to the road conditions depending on the speed and the driver's preferences, varying the ride height by as much as 76 millimeters *(3.0 in)*. The central chassis control unit, the electronic chassis platform, individually controls the operation of the shock absorbers at each wheel at cycles on the order of milliseconds – according to the road condition, driving style and the mode set in the Audi drive select dynamic handling system. The air suspension also offers a self-leveling function for various load conditions.

Progressive steering

With the electromechanical progressive steering a specially geared rack varies the ratio depending on the steering angle. The ratio becomes smaller and the steering more direct with increasing steering angle. Less steering movement is required in urban traffic and when maneuvering; the car is even more agile on tight bends. The progressive steering also adjusts the power assistance to the road speed. It is increased at low speeds for easier maneuverability.

Peak performance

Peak performance refers to the highest output of the electric motors, which can be delivered for up to 60 seconds, several times consecutively, and without output losses. The peak output of the front electric motor is 125 kW, with a torque of 247 Nm *(182.2 lb-ft)*. With the rear motor the peak output is 140 kW and 314 Nm *(231.6 lb-ft)*.

Boost performance

An asynchronous motor can be overloaded for a short period. The boost is available for a maximum of 8 seconds; during this time, the output of the front electric motor increases from 125 to 135 kW, while that of the rear motor increases from 140 to 165 kW. This constitutes an overall increase of 13 percent to 300 kW in total. The torque is also increased considerably by just over 18 percent, from 561 *(413.8 lb-ft)* to 664 Nm *(489.7 lb-ft)*.