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The Audi A8 hybrid – systematic efficiency

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The equipment and data specified in this document refer to the model range offered in Germany. Subject to change without notice; errors and omissions excepted.

Summary

Efficiency on a grand scale – the Audi A8 hybrid

Audi is also setting standards for hybrid technology. The A8 hybrid, which debuts this spring, is the world's most efficient luxury-class hybrid sedan and also the only European full hybrid in the segment. It has an all-electric range of up to three kilometers.

The Audi A8 hybrid combines the performance of a six-cylinder with the fuel economy of a four-cylinder model. With 180 kW (245 hp) of system power, the 2.0 TFSI and the electric motor deliver powerful thrust, yet the brand's flagship consumes just 6.3 liters of fuel per 100 km (37.34 US mpg). The ultra lightweight aluminum body plays a major role in this efficiency.

The Audi A8 hybrid is a parallel hybrid – a high-efficiency concept. Its 155 kW (211 hp) 2.0 TFSI and the electric motor are mounted one directly behind the other and are linked by a clutch to work together, when necessary. System output is 180 kW (245 hp) and peak system torque is 480 Nm (354.03 lb-ft). The power is delivered to the front wheels via a highly modified eight-speed tiptronic. The lithium-ion battery in the rear provides 1.3 kWh of energy, and its sophisticated air cooling system switches between two stages as needed.

The Audi A8 hybrid combines the performance of a six-cylinder with the fuel economy of a four-cylinder model. The sprint from 0 to 100 km/h (62.14 mph) takes just 7.7 seconds, and top speed is 235 km/h (146.02 mph). In the standard cycle, the large sedan consumes just 6.3 liters of fuel per 100 km (37.34 US mpg) on average – a CO₂ equivalent of 147 grams per km (236.57 g/mile), and easily the best in its class.

In all-electric mode, the Audi A8 hybrid can cover roughly three kilometers (1.86 miles) at a speed of 60 km/h (37.28 mph). Top speed in this mode is 100 km/h (62.14 mph). The driver can choose between three driving programs, on the basis of which the hybrid manager – the control unit in the drivetrain – selects the best suited of five operating modes.

With a curb weight of 1,870 kg (*4,122.64 lb*), the Audi A8 hybrid is by far the lightest hybrid sedan in its class. This top value is due in part to the fact that the additional components weigh in at only around 130 kilograms (*286.60 lb*) and also to the ultra lightweight body. Featuring an aluminum Audi Space Frame (ASF), it tips the scales at just 231 kilograms (*509.27 lb*).

The chassis of the A8 hybrid also benefits from Audi's expertise in ultra lightweight construction, combining excellent ride comfort with sporty handling. The links are made of a lightweight alloy; the power steering uses a special electromechanical drive. The Audi drive select dynamic handling system and adaptive air suspension with damping control are standard. The large 19-inch wheels sport a special hybrid design.

Timeless and distinctive: the design

The exterior design of the large sedan is one of timeless elegance. The standard LED headlights give the front end an unmistakable expression. The Audi A8 hybrid is 5.14 meters (*16.86 ft*) long; the long-wheelbase A8 L hybrid is 13 centimeters (*5.12 in*) longer.

The interior features sporty and lightweight lines, simple controls and a finish of handcrafted quality. The driver can read all key information about the hybrid drive on special displays. The seats are available with optional ventilation and massage functions, while the ambient lighting package uses LEDs to set subtle accents. Other features include a continuous center console and a folding table.

Audi offers a wide range of infotainment systems for the A8 hybrid. The Bose surround sound system is standard, with a high-end system from Bang & Olufsen available as an option. The optional navigation and infotainment system MMI navigation with MMI touch includes a touchpad for entering letters and numbers.

The ideal complement to this media center is the online Bluetooth car phone, which connects to the Internet via UMTS. Passengers can use its integrated WLAN hotspot to surf and e-mail. For the driver, the system delivers the services of Audi connect to the vehicle, including up-to-the-minute Audi traffic information online.

The assistance and safety systems that Audi offers in the A8 hybrid are also state of the art. These include the night vision assistant with highlighting of detected pedestrians and a parking system that supports the driver with four small cameras. The safety system Audi pre sense basic is also standard.

The Audi A8 hybrid will launch in Europe in May. The standard-wheelbase version has a base price of €77,700, while the long version lists for €85,400.

At a glance

The Audi A8 hybrid

Drivetrain

- Highly efficient parallel full-hybrid system, 2.0 TFSI and electric motor linked via a clutch
- Special smooth-shifting hybrid transmission based on eight-speed tiptronic
- Lithium-ion battery with 1.3 kWh capacity and two-way air cooling
- System output 180 kW (245 hp); max. system torque 480 Nm (*354.03 lb-ft*)
- Zero to 100 km/h (*62.14 mph*) in 7.7 seconds, top speed 235 km/h (*146.02 mph*).
- EU-cycle fuel consumption just 6.3 liters per 100 km (*37.34 US mpg*) (147 grams CO₂ per km (*236.57 g/mile*))
- All-electric driving with a range of up to three km (*1.86 miles*) and speed of up to 100 km/h (*62.14 mph*)
- Total weight of all hybrid components just 130 kilograms (*286.60 lb*)

Chassis

- Aluminum suspension, new electromechanical power steering
- Audi drive select dynamic handling system, adaptive air suspension
- 19-inch alloy wheels with a special hybrid design

Body

- Weighs just 231 kilograms (long version: 241 kilograms) (*509.27 lb and 531.31 lb respectively*) thanks to aluminum ASF
- Available with standard and long wheelbase; LED headlights standard

Interior and controls

- Finish of handcrafted quality, intuitively simple controls, special hybrid displays in the instrument cluster
- Seats optionally with ventilation and massage function

Infotainment and Audi connect

- Bose surround sound system standard, optional Bang & Olufsen Advanced Sound System with 19 speakers
- Optional MMI navigation plus with touchpad (MMI touch), plus online Bluetooth car phone for Internet access and services from Audi connect

Driver assistance systems

- Advanced assistance and safety systems available, including night vision assistant, Audi side assist and Audi pre sense basic

Full version

Luxury sedan with systematic efficiency – The Audi A8 hybrid

The Audi A8 hybrid, which will be at dealers in the spring, is the only European full-hybrid in the segment and is also the world's most efficient luxury-class hybrid sedan. Its 2.0 TFSI and the electric motor together produce 180 kW (245 hp) of system power. The brand's flagship consumes on average just 6.3 liters of fuel per 100 km (37.34 US mpg).

Drivetrain

The Audi A8 hybrid is designed as a parallel hybrid – a straight-line concept with high efficiency. Its combustion engine and the electric motor are located one directly behind the other and are linked by a clutch to work together, when necessary. The interplay between the combustion engine and the electric motor briefly results in a peak system output of 180 kW (245 hp) and a maximum system torque of 480 Nm (354.03 lb ft).

The Audi A8 hybrid combines the performance of a six-cylinder with the fuel economy of a four-cylinder model. The sprint to 100 km/h (62.14 mph) takes 7.7 seconds, and top speed is 235 km/h (146.02 mph). In the standard cycle, the luxury sedan consumes just 6.3 liters of fuel per 100 km (37.34 US mpg) on average – a CO₂ equivalent of 147 grams per km (236.57 g/mile) and easily the best in its class. For the A8 L hybrid, these figures (all figures provisional) are 7.9 seconds, 228 km/h (141.67 mph), 6.4 liters per 100 km (36.75 US mpg) and 149 grams of CO₂ per km (239.79 g/mile). The 75 liter (19.81 US gallon) tank gives both versions a long range.

The 2.0 TFSI displaces 1,984 cc and produces 155 kW (211 hp). Its maximum torque of 350 Nm (258.15 lb-ft) is available between 1,500 and 4,200 rpm. The four-cylinder engine, which has been chosen as Engine of the Year five times in a row, combines gasoline direct injection with turbocharging – typical for the Audi philosophy of downsizing, which replaces displacement by forced induction.

The Audi valvelift system (AVS) further increases power, torque and efficiency by switching the stroke of the exhaust valves between two stages depending on the load and engine speed.

The 2.0 TFSI has been overhauled in some respects for use in the Audi A8 hybrid. The mechanical belt drive for the auxiliaries was eliminated; it was electrified for the hybrid. A secondary air system at the cylinder head makes sure that the exhaust gas treatment cuts in particularly fast after cold-starting.

Quiet on board: Active Noise Control

The Audi A8 hybrid comes standard with Active Noise Control (ANC). This innovative system eliminates intrusive engine noise by broadcasting a precise antiphase sound to the cabin through the sound system's speakers. This principle is known as interference: If two waves of the same frequency are superimposed, their amplitudes cancel each other out provided that they are equal and 180 degrees out of phase from one another.

A highly modified eight-speed tiptronic transfers the power to the front wheels. Instead of a torque converter, it includes the disk-shaped electric motor, which is combined with a multi-plate clutch operating in an oil bath. The clutch connects and disconnects the electric motor and the TFSI very precisely and gently.

With its eight widely spaced gears, the comfortably and fast-shifting hybrid transmission contributes significantly to the efficiency of the Audi A8 hybrid. When the 2.0 TFSI is deactivated, an electric pump maintains the oil pressure in the hydraulic system to safeguard the convenient start-stop feature.

The power electronics, connected to the battery and the electric motor by high-voltage cabling, are located in the plenum chamber of the engine compartment. They serve as a controller between the battery, which outputs direct current, and the electric motor, which operates on alternating current. Innovative technologies keep the volume and weight of the component low, with cooling provided by a separate water-filled circuit. The power electronics include a DC/DC converter that connects the consumers in the 12 V electrical system to the high-voltage network.

Electric drive is a permanent magnet synchronous machine; it serves as an electric motor, as a starter and – during deceleration – as a generator. The electric motor, which delivers up to 40 kW (54 hp) of power and 210 Nm (*154.89 lb ft*) of torque, is integrated into the engine's cooling system.

Energy is stored in a lithium-ion battery system weighing a mere 38 kg (*83.78 lb*). It is located in a crash-safe area of the trunk and protected by a separate housing. The battery consists of 72 cells; at 266 volts its normal energy is 1.3 kWh and its power 39 kW.

The lithium-ion battery is cooled by air in two ways. At low-temperature load, it draws temperature-controlled air from the vehicle interior by way of a fan. If its temperature exceeds a certain limit, a separate refrigerant circuit is activated. It is coupled to the main climate control system of the vehicle and uses a separate evaporator. This powerful active cooling makes Audi A8 hybrid superior to many other hybrid vehicles.

Driving states

The driver of the Audi A8 hybrid can use a button on the center console or the tiptronic selector lever to choose between three driving programs. The EV characteristic map gives priority to the electric drive; the D mode controls both motors efficiently; and the S mode as well as the touch control gate of the 8-speed tiptronic are designed for a sporty driving style.

The hybrid manager, a proprietary Audi development, is integrated into the control unit of the 2.0 TFSI and manages the transition between the modes. The Audi A8 can be driven in five different modes. Driving with the combustion engine alone, with the electric drive alone or in hybrid mode is possible, as are recuperation and boosting. None of its European competitors in this segment offer such a broad spectrum.

Both drive sources are deactivated when the vehicle is stationary. In this convenient start/stop mode, the automatic air conditioning remains active – its compressor has a high-voltage electric drive and is supported by a separate auxiliary heater.

Once the driver releases the brake, the Audi A8 hybrid starts rolling. It can drive at up to 100 km/h (*62.14 mph*) in all-electric mode. At a constant 60 km/h (*37.28 mph*), it has a range of up to three kilometers (*1.86 miles*) – enough for most residential areas. Top speed with the electric drive is 100 km/h (*62.14 mph*) – another best.

The TFSI becomes the power source as soon as the driver accelerates further. In many situations, the engine management system increases the load somewhat in order to operate at the ideal point with respect to fuel consumption. The excess energy flows to the electric motor, which uses it to supply on-board consumers and to recharge the battery. When accelerating quickly, or “boosting,” the electric motor operates together with the TFSI; at full throttle, the full system output is briefly available. The hybrid drive then supplies the propulsion power of a large, naturally aspirated engine, but with far more efficiency.

When the driver releases the accelerator, the electric motor recovers energy and stores it in the lithium-ion battery. In most situations the TFSI is then decoupled from the drive system and does not cause any drag losses. “Gliding” like this is possible up to 160 km/h (*99.42 mph*). If the driver only brakes slightly, the electric motor performs the deceleration itself; during more forceful braking, the hydraulic braking system is simultaneously activated. A complex control strategy adapts all braking actions to the conditions of electric driving and energy recuperation.

Well informed: the hybrid displays

The Audi A8 hybrid has a display concept on board for making the driving states of the hybrid drive tangible to the driver. A power meter replaces the rev counter in the instrument cluster; its needle indicates the drive’s total output on a scale of 0 to 100 percent. Color segments with green and orange sections show at a glance how efficiently the large sedan is currently operating. An additional instrument displays the charge level of the lithium-ion battery.

At the same time, the energy flow display clearly depicts the current mode of operation and active components of the hybrid drive. It can be called up via the driver information system and the MMI monitor. The large screen shows a bar diagram of the average consumption and presents the amount of energy recovered in five-minute increments.

Chassis

The Audi A8 hybrid combines luxurious ride comfort with sporty handling. Most of the components of its five-link front suspension and the self-tracking trapezoidal-link rear suspension are made of aluminum. The wheel brakes are large. Based on a concept from sports car design, pins connect the internally vented, cast iron friction rings to the aluminum brake caps. The ESC stabilization system offers a sport mode and includes a tire pressure monitoring system.

The adaptive air suspension, which includes controlled damping, is standard. The system modifies the performance of the dampers depending on the condition of the road and the driver's style. It adjusts the body's ride height in multiple steps in line with the car's speed and is also used to level the suspension. Audi also delivers the A8 hybrid with the optional adaptive air suspension sport, which features a standard ride height that is 10 millimeters (*0.39 in*) lower.

The adaptive air suspension is integrated into Audi drive select. This dynamic handling system enables the driver to switch the function of the engine management system, the hybrid transmission and the power steering between the four modes "comfort," "auto," "dynamic" and "custom." The belt tensioners in the safety system Audi pre sense basic can also be adjusted via Audi drive select.

Anthracite-colored, semi-polished 19-inch wheels of "Turbine" design and fitted with 255/45 R19 tires are standard. Optional 20-inch wheels with a 10 parallel-spoke design and shod with 265/40-series tires provide even greater dynamics.

Two key chassis components have been modified for electric operation. The hydraulic power steering has been replaced by an electromechanical unit that adjusts its level of boost according to the vehicle's speed.

Because it consumes no energy when the car is traveling in a straight line, it saves around 0.3 liters of fuel per 100 km. The electromechanical power steering is designed for a direct, sporty response.

Body

With a curb weight of 1,870 kilograms (*4,122.64 lb*), the Audi A8 hybrid is the lightest car in its class. It brings the full range of the Audi's ultra lightweight technology expertise to the streets. The special technical components and equipment features for the hybrid drive contribute just 130 kilograms (*286.60 lb*) of additional weight.

Except for the B-pillars, where hot-shaped, ultra-high-strength steel is used, the luxury sedan's ASF (Audi Space Frame) body is made entirely of aluminum. Weighing just 231 kilograms (*509.27 lb*), it is roughly 40 percent lighter than a comparable steel construction. The body of the A8 L hybrid, which is 13 centimeters (*5.12 in*) longer, weighs 241 kilogram (*531.31 lb*).

The ASF body of the A8 hybrid, assigns a specific task to each material and each component. The cast nodes connect the components, the extruded sections bridge spaces, the aluminum panels close off the spaces and lend rigidity to the framework. The material is used only where necessary and always in a tailored configuration.

The ASF body, for which Audi received the Euro Car Body Award, the world's highest honor for innovative car body design, has other strengths as well. It is very rigid and offers good protection in the event of a collision. The Audi adaptive restraint system also stands guard in the cabin. Both body variants of the A8 hybrid have a drag coefficient of just 0.26, thanks in part to the extensive fine-tuning of the underbody and in the engine compartment.

The ASF design ensures comfortably low levels of vibrations and impressive quietness, with additional noise reduction provided by an acoustically insulated windshield. If desired, Audi can also provide noise-insulating side windows of dual-pane acoustic glass, with tinting optional. A panoramic glass sunroof is available for the long version.

Exterior design

The exterior of the Audi A8 hybrid has a cohesive, homogenous appearance. The coupe-like roofline with the inclined C-pillars makes the silhouette flow. Sculptured surfaces conveying calmness and prestige contrast with sharp lines. The luxury sedan is 5,137 millimeters (*202.24 in*) long, 1,949 millimeters (*76.73 in*) wide and 1,460 millimeters (*57.48 in*) tall; its wheelbase measures 2,992 millimeters (*117.80 in*). For the A8 L hybrid, these figures are 5,267 millimeters (*207.36 in*) long, 1,949 millimeters (*76.73 in*) wide and 1,471 millimeters (*57.91 in*) tall. The wheelbase measures 3,122 millimeters (*122.91 in*).

The single-frame radiator grille of the Audi A8 hybrid is three-dimensional and rich in detail. The standard LED headlights use light-emitting diodes for all lighting functions. They give the sedan a distinctive appearance, do an excellent job of illuminating the road and are highly efficient. The integrated high-beam assistant switches automatically between low-beam and high-beam headlights. The rear lights also feature sophisticated LED technology.

Small hybrid badges on the trunk lid and the fenders indicate the new drive concept. 11 paint finishes are available, with Arctic Silver available as an exclusive option. The engine hood and key of the A8 hybrid also feature a unique design.

Interior

Audi has its own unique philosophy when it comes to luxury. Luxury does not mean excess, but rather individual, cultivated style. The selection and workmanship of all materials in the interior of the A8 hybrid are on a hand-built level. The light, elegant interior design conveys the large sedan's athletic character. A large arc – the wrap-around – encircles the cockpit. The front of the instrument panel is in the shape of a gentle wave.

The front seats feature 12-way electric adjustment. Audi also offers a number of seating options up to the comfort sport seats. These can be further upgraded with a ventilation system for the seat surface and backrest, and a massage function with ten air cushions, five programs and five intensities to pamper the back.

The A8 hybrid has clearly structured, intuitive ergonomics. The driver information system with 7-inch screen concentrates all important information and settings in a logical menu structure. The driver can operate it via the leather multifunction steering wheel. The MMI with its elegant, power-retractable 8-inch monitor serves as a second control unit. Its control terminal with the large rotary pushbutton is located on the console of the center tunnel, ideally positioned for the driver's right hand.

The standard three-zone automatic air conditioning enables quiet and low-draft indirect ventilation through a grate on the top of the instrument panel. It controls the temperature of the driver and passenger areas plus the back seat, and offers three climate styles. The ambient lighting, another standard feature, is an artistic overall orchestration of LEDs, light guides and light strips. Many LEDs are two- or three-colored. The driver can use the MMI control system to choose between and make fine adjustments to three different lighting scenarios.

Luxurious: the spacious rear seat

The extended wheelbase of the Audi A8 L hybrid provides for a generous amount of space in the back. Audi offers the option of two power-adjustable and heated individual rear seats. These can also be equipped with optional ventilation and massage functions, and features such as a folding table and a continuous center console make the passengers' journey even more enjoyable.

Audi offers the interior components of the A8 hybrid in a variety of colors. The headlining is available in a choice of three shades. A choice of three grades of leather and a leather/Alcantara combination is available for the seat upholstery. The two-segment decorative inlays are also available in a number of fine materials. The entry sills feature aluminum strips with hybrid logos, and an additional hybrid badge adorns the instrument cluster. A number of additional suggestions for further customization are included in the Audi exclusive program.

The trunk of the Audi A8 hybrid features a luggage capacity of 335 liters (*11.83 cu ft*) and a low loading lip. As standard, Audi includes a five-piece luggage set designed to optimally fill the available space. The trunk lid opens automatically when unlocked, and a power-assisted function helps to close it. Foot control of the trunk lid is available as an option.

Driver assistance systems

The Audi A8 hybrid can be optionally equipped with a series of assistance systems that make driving even more relaxing and composed. Audi side assist, whose radar sensors monitor what is happening behind the car, warns the driver of critical lane changes. It is activated upon reaching 30 km/h (*18.64 mph*).

Audi lane assist, which is active at speeds of about 65 km/h (*40.39 mph*) and above, uses a camera to observe the lane markings. If the driver approaches one of them without using the turn signal, there is an adjustable vibration at the steering wheel. The speed limit display recognizes speed limit signs and presents them on the display of the driver information system and on the MMI monitor. The parking system plus with surround view camera makes parking easier.

Four small cameras monitor the surroundings of the car. A computer combines their images and displays them in a variety of views.

The night vision assistant with highlighting of detected persons uses a far infrared camera that reacts to radiated heat. It displays the information it collects as black-and-white images on the display of the driver information system. The cooler surroundings appear dark, while people and animals are conspicuously bright. The system, which has a visual range of up to 300 meters (*984.25 ft*), can detect people at up to 100 meters (*328.08 ft*) away and highlights them with yellow markings. In a hazardous situation, they are marked red and a warning gong sounds.

A standard feature in the A8 hybrid is the safety system pre sense basic. If the ESC sensors report a critical state, the control unit activates the hazard warning lights and closes the side windows and the sunroof, depending on the situation; it also tensions the front seat belts and emits a tone to warn the driver.

If Audi side assist is also on board, then there is also the function pre sense rear, which mitigates the consequences of a rear-end collision.

Infotainment

An attractive lineup of infotainment modules is available for the A8 hybrid. Their centerpiece is MMI navigation plus. The high-end system includes a 60 GB hard disk, a DVD drive and a whole-word voice control. A fast graphics processor generates top-quality, three-dimensional images that are displayed tack sharp in vibrant colors on the 8-inch monitor.

MMI navigation plus also includes MMI touch. The driver enters a destination or the telephone number by drawing the letters and numbers – even using characters from Asian languages – on the touch-sensitive control panel with a finger. The system provides acoustic feedback after each character so that the driver's eyes can stay on the road.

MMI navigation plus works closely together with the other systems in the A8 hybrid. It looks ahead on the route selected and forwards all relevant data to the controllers that, for example, control the headlights and can thus illuminate bends or junctions early on. They also influence the way the hybrid transmission works. This means that these systems can adapt their function precisely to the given conditions.

The Audi A8 hybrid comes standard with the Bose surround system. A digital amplifier drives 600 watts to 14 speakers including a subwoofer to produce a finely balanced and simultaneously powerful sound on a strong base foundation. The system can also play stereo recordings in five-channel surround sound.

The Bang & Olufsen Advanced Sound System is a high-end alternative for hi-fi connoisseurs. It drives 19 active speakers with aluminum grilles via two amplifiers with over 1,400 watts of power. Located in the instrument panel are two acoustic lenses for the high frequencies. They extend outward when the system is switched on.

Upon request, Audi equips the A8 L hybrid with the rear seat entertainment system, which includes a separate DVD drive and a hard disk jukebox.

Mounted on the backs of the driver and front-passenger seats are two 10.2-inch displays that can display different content. Sound is supplied via the audio systems or two sets of Bluetooth headphones. Additional components such as a tuner for digital radio reception and a TV tuner round out the infotainment lineup.

Audi connect

The term Audi connect refers to all applications and developments that connect Audi cars to their owner, the Internet, the infrastructure, and other vehicles. The hardware module for this is the Bluetooth car phone online, an additional component of MMI navigation plus. It connects to the Internet via a UMTS module. Passengers can connect up to the eight mobile terminal devices to the integrated WLAN hotspot.

The Bluetooth online car phone is operated either via the MMI navigation plus terminal, using the multifunction steering wheel or by voice control. Data are encrypted and transferred via the roof antenna at rates of up to 7.2 MB per second. If the A8 hybrid is traveling outside the UMTS network, the system switches to the EDGE standard.

For the driver, the online Bluetooth car phone brings tailored Internet services to the A8 hybrid. These range from navigation using images from Google Earth to voice-controlled Google POI search and Google Street View to Audi traffic information online, which provides a precise, highly differentiated image of the traffic load along the chosen navigation route.

Market

The Audi A8 hybrid will begin start arriving at dealers in Germany and all other European countries in May. The standard-wheelbase version has a base price of €77,700, while the long version, which will follow a short time later, costs €85,400. A large share of the production is intended for export markets, primarily China.

Most of the future customers for the Audi A8 hybrid are relatively young, highly educated and have a high income. They have an open, cosmopolitan lifestyle with strong cultural interests and are striving to bring their economic success into harmony with ecological responsibility.