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The Audi h-tron quattro concept

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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

Zero emissions: the Audi h-tron quattro concept

High range, swift refueling, sporty road performance: The Audi h-tron quattro concept car can boast all these virtues. It combines a highly efficient fuel cell achieving an output of up to 110 kW with a powerful battery that can provide a temporary boost of 100 kW. The car can be fully refueled with hydrogen in around four minutes, and is then ready to drive for up to 600 kilometers (372.8 mi).

In another major step, Audi will go into production with its new technologies for piloted driving and parking in 2017 along with the next generation of the A8 luxury sedan. The technology study already provides a glimpse of things to come.

The Audi h-tron quattro concept is another milestone along the path towards future mobility. Whether with purely battery-powered drive, plug-in hybrid, combustion engine or fuel cell – Audi has a command of all alternative drive technologies and offers tailor made solutions for its customers worldwide.

The Audi h-tron quattro concept is closely related to the concept car Audi e-tron quattro concept. This latter concept car of a purely electric-drive SUV was first showcased by the brand with the four rings at the 2015 Frankfurt Motor Show. Both are based on the second-generation modular longitudinal platform (MLB evo). This concept is especially flexible. For example, both cars use a virtually identical floor assembly despite their different technology.

The Audi h-tron quattro concept presents the fifth generation of fuel cell technology from Audi and Volkswagen. Lighter materials reduce the weight and improve performance, responsiveness, service life and efficiency. With an efficiency rating in excess of 60 percent, the fuel cell now surpasses any combustion engine. The “stack” comprising 330 individual cells is housed in the forward structure.

The three hydrogen tanks are located beneath the passenger compartment or luggage compartment but do not impinge on the interior. At a pressure of 700 bar, they store enough hydrogen for a range of up to 600 kilometers (372.8 mi).

Every tank is made up of several layers – the inner tank from gas-tight polyamide is wrapped in carbon fiber reinforced polymer (CFRP) and glass fiber reinforced polymer (GFRP). Like a car with combustion engine, refueling takes about four minutes.

Powerful booster: battery supplies up to 100 kW of power

Ideally complementing the fuel cell that develops up to 110 kW, there is a compact lithium-ion battery designed for optimum power output. The battery, weighing less than 60 kilograms (*132.3 lb*), is located beneath the passenger compartment to optimize the center of gravity. It supplies up to 100 kW of power, ample for a temporary, forceful burst when accelerating. When the car is braked it stores the recovered energy. With 550 Nm (*405.7 lb-ft*) of system torque, the Audi h-tron quattro accelerates from 0 to 100 km/h (*62.1 mph*) in less than seven seconds; its top speed is governed at 200 km/h (*124.3 mph*).

The power from the fuel cell and the high-voltage battery drives two electric motors – one located on the front axle and with an output of 90 kW, the other on the rear axle and developing 140 kW. This concept makes the technology study an electrified quattro. An intelligent management system controls the interplay between them as appropriate for the situation, placing maximum emphasis on efficiency. A heat pump for the interior air conditioning and a large solar roof that generates up to 320 watts, equivalent to adding up to 1,000 kilometers (*621.4 mi*) to the range annually, also boost efficiency.

Zero global emissions with renewably produced hydrogen from the Audi e-gas facility in Werlte, Germany

According to the New European Driving Cycle its fuel consumption is around one kilogram (*2.2 lb*) of hydrogen per 100 kilometers (*62.1 mi*). The Audi h-tron quattro concept achieves not merely zero local emissions, but zero global emissions if the hydrogen it runs on has been produced with green power. The brand with the four rings realizes this at the Audi e-gas facility in North Germany.

Since 2013 the world's first power-to-gas plant has been using electricity generated by wind power to break water down into oxygen and hydrogen by electrolysis. In a further process, this gas is currently reacted with CO₂ to produce Audi e-gas, or synthetic methane, for the Audi A3 g-tron* and the A4 g-tron* with CNG drive.

Many customers are already using the e-gas fuel card to buy Audi e-gas via the existing natural gas network at conventional CNG filling stations, enabling them to drive almost CO₂-neutrally. But in future it will be possible to tap this hydrogen source so that fuel cell cars can run on this climate-friendly fuel.

Nerve center for piloted driving: the zFAS

Through the concept car h-tron quattro concept, Audi demonstrates just how emotion-packed piloted driving can be. It comes equipped with all the technologies that the brand has developed for piloted driving – radar sensors, a new kind of video camera, ultrasonic sensors and a laser scanner.

The driver assistance systems are now usually managed by spatially separate control units. In future, Audi will be implementing this function in a central domain architecture: All available sensor information is processed by a central driver assistance system (zFAS). It computes a complete model of the car's surroundings in real time and makes this information available to the assistance systems and the piloted driving systems. They can assume driving tasks during parking or in stop-and-go traffic on freeways at speeds of up to 60 km/h (37.3 mph).

Audi has been performing pioneering work in this domain for many years and in 2017 will be taking this technology into production for the first time ever with the next generation of its Audi A8 full-size sedan.

Elegant and streamlined: the exterior

The exterior design of the five-door technology study blends aesthetic appeal with aerodynamics. The Audi h-tron quattro concept is 4.88 meters (16.0 ft) long and 1.93 meters (6.3 ft) wide but just 1.54 meters (5.1 ft) high. Its silhouette with the extremely flat greenhouse that tapers strongly toward the rear lends it the dynamic character of a coupé. The flowing shoulder line forms distinctive blister contours above the wheels in an expression of the electrified quattro drive. Wide wheel panels and angular side sills underscore the robust character of the car.

The C_d value of 0.27 makes a major contribution to maximizing range and efficiency. Aerodynamic elements down the flanks, on the underbody and at the rear improve the way air flows around the car at higher speeds. Cameras take the place of exterior mirrors, further enhancing aerodynamics and efficiency.

The headlights of the technology study are divided into two sections. The upper section generates the light using the new, extremely high-resolution Matrix laser technology. The lower section, which corresponds to the slats in the Singleframe grille, forms the lighting signature.

In addition to the white daytime running lights signature, flat OLED (organic light emitting diode) elements radiate a homogeneous blue light to the sides and upwards. Beneath the lights there are two large air intake slots.

The sills incorporate a light strip in Matrix LED technology which again emits white light when the driver approaches the technology study with the remote control key. When the car is driving in piloted mode, this is signaled by blue horizontal lines lit up down its sides. Mirroring the front configuration, the rear lights likewise consist of two elements. Each of the upper zones features nine red OLED units that handle the tail light function, with three more below.

Fusion of architecture and operating concept: the interior

The package of the Audi h-tron quattro concept enables a spacious, comfortable interior for four persons and 500 liters (17.7 cu ft) of luggage. Intelligent software provides assistance when loading up: two small sensors scan the items of luggage and display the optimum loading order on a monitor mounted on the rear cutout.

The interior of the Audi h-tron quattro concept has a light and open feel to it; its architecture merges harmoniously with the operating and display concept. The three large displays in front of the driver are designed using OLED technology – their wafer-thin films can take on virtually any shape. There are also two touch displays in addition to the central Audi virtual cockpit curved OLED. The driver controls the lights and the systems for piloted driving with the left one. The large display on the right is for managing media and navigation, and also displays the drive system's operating statuses. The steering wheel serves as a further control level. Its spokes are equipped with contoured touch surfaces.

The selector lever for the driving mode is mounted on the console of the center tunnel. In front of it, there are two further OLED displays – for the drive status, the air conditioning and for freely programmable information functions. The front one offers gesture controls. The curved displays in the front section of the doors serve as digital exterior mirrors.

The two rear passengers sit on comfortable individual seats. They can share data with the driver via the Audi tablets, which again have OLED displays. The tablets are designed as a mobile Rear Seat Entertainment system.

At a glance

The concept car Audi h-tron quattro concept

Technology

- Fuel cell drive with additional lithium-ion battery for boosting and recuperation
- Fifth-generation fuel cell, new materials for added efficiency
- Range of up to 600 kilometers (*372.8 mi*) on one tank of fuel, consumption around one kilogram (*2.2 lb*) of hydrogen per 100 kilometers (*62.1 mi*), refueling takes around four minutes
- Fuel cell performance: up to 110 kW, extra boost of up to 100 kW for short periods, system torque in excess of 550 Nm (*405.7 lb ft*)
- From 0 to 100 km/h (*62.1 mph*) in less than 7 seconds, top speed electronically governed at 200 km/h (*124.3 mph*)
- Electrified quattro layout: one electric motor at front and one at rear, intelligent control strategy for interaction between power units
- Three hydrogen tanks with total capacity of around six kilograms (*13.2 lb*) at 700 bar
- Chassis with adaptive air suspension sport and 22-inch wheels
- Technologies for piloted driving and parking, central driver assistance system (zFAS)

Aerodynamics and design

- SUV with sporty styling, low greenhouse, tapered rear end
- Length 4.88 meters (*16.0 ft*), width 1.93 meters (*6.3 ft*), height 1.54 meters (*5.1 ft*), five doors
- C_d value of 0.27, elaborate detailed measures such as cameras instead of exterior mirrors and movable aerodynamic elements on underbody, sides and rear
- Outstanding aeroacoustics
- Lighting design with OLED elements at front and rear, headlights in Matrix laser technology
- World's largest in-car solar roof, up to 320 watts output or additional range of up to 1,000 km (*621.4 mi*) per year

Interior

- Optimized package: ample space for four persons, large luggage compartment with capacity of 500 liters (*17.7 cu ft*), “luggage butler” for optimum, quick stowing of luggage items
- Heat pump for high-efficiency climate control
- Progressive interior design, fusion with operating and display concept
- Audi virtual cockpit curved OLED as instrument cluster
- Mobile Rear Seat Entertainment with OLED Audi tablets
- Steering wheel with touch surfaces in the spokes
- Online connectivity via LTE, broad range of connectivity functions

Full version

Fuel cell drive for efficiency and power – the sport SUV Audi h-tron quattro concept

The brand with the four rings is unveiling its concept car Audi h-tron quattro concept at the NAIAS 2016 in Detroit – a sporty SUV that uses hydrogen as its energy source. The concept car combines a highly efficient fuel cell achieving an output of up to 110 kW with a battery that provides a temporary boost of 100 kW. Audi's fuel cell technology paves the way for sustainable mobility with the sporty performance for which the brand is renowned.

The Audi h-tron quattro concept uses only around one kilogram (*2.2 lb*) of hydrogen per 100 kilometers (*62.1 mi*). It takes only about four minutes to fill the tank, giving the car a range of up to 600 kilometers (*372.8 mi*). The conspicuously aerodynamic design with a C_d value of 0.27 plays a major part in its outstanding efficiency.

In another major step, Audi will go into production with its new technologies for piloted driving and parking in 2017 along with the next generation of the A8 luxury sedan. The technology study already provides a glimpse of things to come.

Perfectly equipped for the future

Audi is drawing on a wide variety of technologies in securing the mobility of the future, and thus providing an attractive proposition for every customer in every market. The concept car Audi h-tron quattro concept is closely related to the purely battery-powered Audi e-tron quattro concept exhibited at the 2015 Frankfurt Motor Show. But a new technical solution now comes into play: The “h” in its name represents the element hydrogen – the energy source for the fuel cell. With the Audi h-tron quattro concept, Audi documents its expertise in all areas of forward-looking technology.

Like the Audi e-tron quattro concept, the concept car takes the second-generation modular longitudinal platform (MLB evo) as its basis. This concept is particularly versatile; even though the energy sources differ, both cars share an almost identical floor assembly.

The fuel cell

In the concept car, the fuel cell is installed in the forward structure. Its 330 cells form what is known as a “stack.” Depending on the load point it operates in the voltage range of 220 to 280 volts. The core of each cell is a polymer membrane. On either side there are electrodes coated with a platinum-based catalyst. Hydrogen is supplied to the anode, where it is broken down by the catalyst into protons and electrons. The protons diffuse through the membrane to the cathode, where they react at the catalyst with oxygen from the air and the electrons to form water vapor (the membrane is only permeable for protons, not for electrons).

The Audi h-tron quattro concept demonstrates the fifth generation of fuel cell technology from Audi and Volkswagen. The focus is on new materials for the diaphragms and the bipolar plates that guide the gases in the stack while keeping the cells separate. They help to make the entire unit lighter, smaller, stronger and also more economical, especially as the content of the precious metal platinum has been reduced. The operating life and responsiveness are improved, and hydrogen consumption is cut. The fuel cell now achieves an efficiency of 60 percent, far more than that of a combustion engine.

The fifth-generation fuel cell technology operates at a temperature level of up to 95 degrees Celsius, an increase of 15 degrees compared with the previous generation. A high-efficiency heat pump that absorbs the waste heat from the electrical components and a thermoelectric auxiliary heating element maintain pleasant temperatures inside the car. The car starts with ease at down to minus 28 degrees Celsius.

Powerful boost: lithium-ion battery supplies up to 100 kW of power

Underneath the inside floor, roughly in the middle of the passenger compartment, lies a compact lithium-ion battery weighing less than 60 kilograms (*132.3 lb*) and featuring highly performance-optimized cells. It can temporarily deliver up to 100 kW of power to the electric motors, while its energy capacity is limited to around 1.8 kWh. The storage battery operates over the range of 220 to 460 volts – a high-efficiency triport DC converter in the engine compartment equalizes the difference compared with the fuel cell’s voltage level.

Two power electronics units convert the direct current into alternating current for the two high-performance electric motors. The front electric motor generates 90 kW and the rear one 140 kW. Their housings incorporate planetary gear trains with a single transmission ratio; a mechanical parking lock and a differential function round off the system.

A separate low-temperature circuit keeps the driveline and high-voltage battery components sufficiently cool even when the car is driven sportily.

The e-quattro drive

The Audi h-tron quattro concept is equipped with electrified quattro drive. Each motor powers one set of wheels – as on the technology demonstrator Audi A7 Sportback h-tron quattro, which Audi presented in November 2014. The torque can be varied continuously for both axles. Efficiency is the priority for the electric motor management concept. At low loads only the front axle receives propulsive power, and at very low speeds the power is supplied solely by the battery. The e-quattro concept requires precise coordination of the electric motors – the technology study Audi h-tron quattro offers the sporty, stable and high-traction drive of a production car with mechanical quattro drive.

The Audi h-tron quattro accelerates from 0 to 100 km/h (*62.1 mph*) in less than seven seconds; its top speed is governed at 200 km/h (*124.3 mph*). The silent thrust is already available in full from the start. The energy from moderate brake applications is channeled back into the high-voltage battery by the electric motors. The driver can influence the degree of recuperation by selecting either gliding mode or coasting recuperation. The four wheel brakes only cut in if harder or emergency braking is required.

Refueling in four minutes for a range of up to 600 kilometers (372.8 mi)

Like on a car with combustion engine, refueling with hydrogen takes about four minutes. The three high-tech tanks communicate with the refueling system by infrared interface and equalize the pressure and temperature levels. The stainless steel hydrogen tank cap is located on the front right wing of the sporty SUV; its flap opens electrically.

The hydrogen tanks of the Audi h-tron quattro concept differ in size. The front one is installed longitudinally beneath the center console, and the two other tanks transversely beneath the rear seats and luggage compartment respectively. Together with the battery, they are secured to a structural frame. Neither on the fuel cell drive version nor on its purely battery-powered sister model the Audi e-tron quattro concept do the tanks impinge on the interior. This demonstrates the versatility of the new MLB evo platform.

Every tank is made up of several layers – the inner tank from gas-tight polyamide is wrapped in carbon fiber reinforced polymer (CFRP) and glass fiber reinforced polymer (GFRP). Between them, the three tanks can store about six kilograms (*13.2 lb*) of hydrogen at a pressure of 700 bar, sufficient for a range of up to 600 kilometers (*372.8 mi*). According to the New European Driving Cycle, fuel consumption is only around one kilogram (*2.2 lb*) of hydrogen per 100 kilometers (*62.1 mi*) – an amount with an energy content equivalent to about four liters (*1.1 US gal*) of gasoline. Because the exhaust system carries only water vapor, it is made from lightweight polymer; in cold weather, a little water may trickle out of the tailpipes, just as with a cold combustion engine.

Zero global emissions with renewably produced hydrogen from the Audi e-gas facility in Werlte, Germany

The Audi h-tron quattro concept achieves not just zero local emissions, but zero global emissions – if the hydrogen it runs on has been produced from water using renewable energy, as is the case at the Audi e-gas facility in Werlte, Lower Saxony. Since 2013 the world's first power-to-gas plant has been using electricity generated by wind power to break water down into oxygen and hydrogen by electrolysis. In a further process, this gas is currently reacted with CO₂ to produce Audi e-gas, or synthetic methane, for the Audi A3 g-tron* and the A4 g-tron* with CNG drive. Many customers are already using the e-gas fuel card to buy Audi e-gas via the existing natural gas network at conventional CNG filling stations, enabling them to drive almost CO₂-neutrally. But in future it will be possible to tap this hydrogen source so that fuel cell cars can run on this climate-friendly fuel.

The 1.98 meter long (*6.5 ft*) solar roof plays an instrumental role in the technology study's energy management concept – it is the largest and highest-performance such roof in a car. It feeds electricity at up to 320 watts into the battery if the Audi h-tron quattro concept is parked or driven in the sun. In a region such as Central Europe, for example, that means it can contribute an extra range of up to 1,000 kilometers (*621.4 mi*) per year. In summer the solar roof generates enough energy to power the auxiliary ventilation for the interior. That substantially reduces the cooling performance required of the air conditioning system.

Leading role: the piloted driving

The Audi h-tron quattro concept is equipped with all functions for piloted driving and parking that Audi is developing for production use. The combination of radar, camera and surround sensors supplies a complete model of the car's surroundings. A laser scanner monitors the area in front of the car up to 80 meters (*262.5 ft*) away. All the data is brought together in the driver assistance system (zFAS) in real time. The computing power of the zFAS is equivalent to the entire electronics architecture of a well-appointed midsize automobile – but the high level of integration means the board is merely the size of a tablet PC. The zFAS and the surround sensors provide a compelling foretaste of technologies that will soon be going into production at Audi.

The function for piloted driving in congestion currently being developed by Audi will in future reduce the driver's workload in slow-moving traffic on express roads by taking care of the steering at speeds of between 0 and 60 km/h (*37.3 mph*). The system also accelerates and slows down on its own. With piloted parking from Audi, the driver will be able to control the car conveniently from outside, via the remote control key or a smartphone.

New lighting technology with laser and OLED

The concept car generates all main lighting functions with Matrix laser technology, the next step forward in the development of automotive lighting technology. Broken down into hundreds of thousands of pixels, their beam can illuminate the road in high resolution and with extreme precision control – without dazzling oncoming traffic. The use of Matrix laser OLED technology serves to highlight Audi's *Vorsprung durch Technik* specifically in the domain of automotive lighting.

At the front of the car, multiple narrow, individual OLED luminaries are arranged horizontally staggered one above the other. They complement the white daytime running lights signature with blue light that is emitted to the sides and upwards. In the upper section of the grille, slats act as visual ties between the five OLED (organic light emitting diode) elements of each lighting signature. Each of these combines an LED luminary with a flat OLED element. The OLEDs produce particularly homogeneous light and can create various different lighting scenarios.

Similar to the units up front, the rear lights are also split into two zones. The upper section contains nine upright OLED units that assume the tail light functions. There are three more horizontally staggered units below these.

The OLED displays: the next step for the display concept

The operating and display concept of the Audi h-tron quattro concept harmonizes perfectly with the sculptural, driver-oriented architecture of the cockpit, which is dominated by large OLED displays. Here Audi is continuing the line of its most recent concept studies – some details will make their way into production vehicles in the foreseeable future.

The middle of the three displays in front of the driver is the new Audi virtual cockpit curved OLED, a free-standing, thin OLED display with a narrow aluminum clip and a gently curving surface that renders all displays very easy to see. Its free-form shape transcends the hitherto customary rectangular format, all thanks to OLED technology with its wafer-thin films. Animated graphics give the two-dimensional displays a 3D look. In the main menu the Audi virtual cockpit curved OLED shows the speed, the fuel level of the hydrogen tanks and the range.

On the left and right below the Audi virtual cockpit curved OLED, there are two touch displays. The left display enables the driver to control the lighting functions and the systems for piloted driving. The 14-inch display on the right is asymmetrical, just like the instrument cluster. It is used to control media lists and navigation maps, and shows the h-tron-specific operating status.

Two further displays are located on the center console. One is fitted flush with the console and displays the selected drive status. The front display, which is curved upward, offers gesture controls and visualizes the climate control system, which is operated using virtual sliders. The driver can also use it to call up information such as weather, appointments or addresses using freely assignable preset buttons.

There are also two displays, again with gently curving surfaces, in the front section of the doors. These serve as digital exterior mirrors. Their specially processed camera image is bright even in poor light conditions, offers high contrast and is glare-free. Their position in the doors is ergonomically optimized, thus improving safety.

The operating concept of the Audi h-tron quattro concept makes it possible to manage a wide range of functions via the flat-bottomed, highly dished steering wheel. Its horizontal spokes feature touch surfaces, with fine contours in the glass acting as guides for the thumbs. Each input is followed by a gentle vibration to provide haptic confirmation. The flat, wide selector lever on the center console incorporates a button for the driving programs on its left side.

The OLED-based mobile Rear Seat Entertainment

The rear passengers in the Audi h-tron quattro concept have two Audi tablets with OLED displays at their disposal. Designed as a mobile Rear Seat Entertainment concept, they can be disengaged from their holders on the front seats for use outside the car, too. In the car, they can also be used to share media data with the driver. The concept study is connected to the Internet using the fast LTE (4G) standard. The passengers can surf and send mail as much as they wish, while the driver benefits from the services available in the Audi connect portfolio.

High-tech from Audi: the chassis

The chassis, too, highlights the character of the Audi h-tron quattro concept. The adaptive air suspension sport – the air suspension with controlled damping – contributes to efficiency. It lowers the body in two stages by up to 30 millimeters (*1.2 in*) as the speed increases, thus reducing drag. The driver can regulate the adaptive air suspension sport via the Audi drive select system.

The front and rear axles are lightweight, five-link constructions made of aluminum and high-strength steel. The 22-inch wheels are equipped as standard with reduced rolling resistance tires of size 265/40 R22. The large ceramic brake disks measure 20 inches in diameter on the front axle, and 19 inches on the rear axle.

The package: ample space for four

Thanks to its optimized use of space, the Audi h-tron quattro concept offers plenty of room for passengers and luggage. The driver and up to three passengers sit on sporty individual seats; rear leg room is generous. Despite the sporty cut of the roof, all of the car's occupants have ample headroom. The luggage compartment in the standard configuration has a capacity of 500 liters (*17.7 cu ft*), which increases to 1,610 liters (*56.9 cu ft*) when the rear seat backrests are folded down.

Audi has devised a new, intelligent technology for loading the luggage compartment. Two sensors on the tailgate trim monitor the items of luggage standing behind the car. A software function calculates the best way to arrange the items in the luggage compartment. A seven-inch monitor mounted on the rear cutout shows the driver the best order in which to load them.

Highly streamlined: the exterior design

Measuring 4.88 meters (*16.0 ft*) in length, 1.93 meters (*6.3 ft*) wide and with a 2.91 meter (*9.5 ft*) wheelbase, the Audi h-tron quattro concept is positioned between the Audi Q5 and the Audi Q7 SUVs. But at just 1.54 meters (*5.1 ft*) tall, it is much lower in height than the two production models. The greenhouse is particularly low, the roof line drops down again quickly and the D-posts are correspondingly flat, giving the body shape markedly coupe-like traits.

The design language of the technology study has been developed in close collaboration between aerodynamics engineers and designers. The drag coefficient of 0.27 enables the Audi h-tron quattro concept to cut through the wind with ease and also plays a major role in the car's high range of up to 600 kilometers (*372.8 mi*). The aerodynamic concept includes a long body along which the air flows cleanly, a tapered tail end with sharp separating edges, plenty of fine-detailing on the outer skin and the wheels, and an aerodynamically optimized floor pan with newly designed microstructures. These draw inspiration from the bionic model of shark skin.

The Audi h-tron quattro concept sports aerodynamic elements on the flanks and at the rear. At speeds of 80 km/h (49.7 mph) upward, they direct the flow of air to improve its movement around the vehicle.

Thanks to the refined aeroacoustics, the level of wind noise in the Audi h-tron quattro concept is impressively low even when traveling at speed.

The front end of the Audi h-tron quattro concept creates an impression of width, power and poise. The Singleframe grille is almost completely open. This is attributable to the higher amount of cooling air required by the fuel cell drive than by a battery-powered car. Behind the Singleframe grille and the large air inlets there is one radiator on either side.

In the upper section of the grille, slats act as visual ties between the five OLED (organic light emitting diode) elements of each lighting signature. Each of these combines an LED luminary with a flat OLED element. The OLEDs produce particularly homogeneous light and can create various different lighting scenarios.

The frame of the grille is made from brushed aluminum with polished edges, and it displays an h-tron logo in the lower clip. A compact sensor rack is integrated discreetly into the grille – it includes most of the sensors for the driver assistance systems and the new systems for piloted driving.

Aerodynamically shaped: the flanks

The side view, too, expresses the character of the concept car. The flowing shoulder line forms distinctive blister contours above the aerodynamically optimized wheels in a nod to Audi's quattro genes. Between the shoulder line and the greenhouse, there is a striking small-radius fillet that extends visually around the entire body. The door handles recessed into the body lie below the shoulder line. They extend outward electrically when touched.

Small cameras take the place of the exterior mirrors – this is a near-production technology from Audi that offers other advantages in addition to improved aerodynamics and aeroacoustics: it eliminates the blind spot of physical exterior mirrors. Even on tight bends such as hairpin turns on a mountain pass, the view diagonally to the front remains unobstructed.

The wheel arches have wide wheel panels that visually shrink the amount of paneling down the flanks and emphasize the robust character of the Audi h-tron quattro concept. The same applies to the angular side sills. They incorporate a light strip in Matrix LED technology that offers additional new functions: It emits white light when the driver approaches the technology study bearing the remote control key. This “lightway” dynamically adjusts to the position of the driver and accompanies them until they get in. A similar scenario plays out when exiting the vehicle. Two blue horizontal lines light up as distinguishing features during piloted driving.

The side walls end at the rear of the vehicle in vertical separating edges, at which the air flowing around the vehicle separates cleanly. Compact electric motors in the side sills are activated at higher speeds. These force the rear segments of the strips 50 millimeters (2.0 in) outward like a funnel so that the air is directed past the rear wheels.

Highly tapered: the rear end

The greenhouse of the Audi h-tron quattro concept tapers sharply towards the rear. The shoulder line extends across the rear cargo hatch, giving it a clear contour. Running along this line is an LED light guide that joins the rear lights, thus emphasizing the width of the car.

At higher speeds the spoiler on the tailgate extends by up to 100 millimeters (3.9 in). At the same time the diffuser extends to the rear. The targeted merging of the air flows from the roof and the underfloor improves the separation of the airflow.

Taut and light: the interior

Taut lines, clear shapes and sinuously stretched surfaces give the interior a clear, light character. The dashboard slopes downward toward the passengers in two levels. The air vents are integrated into the step between them and the large, encircling arc (wrap-around). The center tunnel console seems to float, while providing extra storage facilities. Two easy slots connect the driver’s and front passenger’s smartphones with the on-board electronics and recharge them inductively.

The dominant color inside the Audi h-tron quattro concept is a cool, technical gray, with a subtle gradation of hues from the top down. The floor is upholstered in fine Nappa leather, and the textile floor mats are made from a thick, rubber-like yarn that is very hard-wearing and affords good grip.

On the seating surfaces and door top shoulders, sporty Alcantara provides a subtle contrast to the soft unicum leather with which the head restraints and backrest tops are covered. The seats have a special stitching pattern with red and yellow contrasting stitching; the dashboard also has a leather surface. The frames and clasps of the controls and seats are made of darkened, brushed aluminum, with polished edges introducing subtle highlights.

Fuel consumption of the models named above:

Audi A3 Sportback g-tron:

CNG consumption in kg/100 km: 3.6 – 3.3**;

Combined fuel consumption in l/100 km: 5.5 – 5.1** (42.8 – 46.1 US mpg);

Combined CO₂ emissions in g/km (CNG): 98 – 89** (157.7 – 143.2 g/mi);

Combined CO₂ emissions in g/km: 128 – 117** (206.0 – 188.3 g/mi)

Audi A4 Avant g-tron:

This vehicle is not yet on sale. It does not yet have type approval and is therefore not subject to Directive 1999/94/EC.

**Fuel consumption, CO₂ emission figures and efficiency classes given in ranges depend on the tires/wheels used.