Audi e-tron Sportback concept

Design study and technology demonstrator, electric car and power pack in the guise of a coupé: A versatile concept car makes its world debut in the Chinese metropolis of Shanghai as the Audi e-tron Sportback concept. The brand with the four rings presents the study of a four-door Gran Turismo with a powerful 320 kW electric drive at the Auto Shanghai 2017 this spring. The formal idiom of the coupé with Lux Silver paint finish combines classic Audi elements with an array of trendsetting details: an electrifying architecture, tailored consistently to the technology and the package of the electric drive.

Illuminating: new highlights of Audi lighting technology
Audi opens another chapter of innovations in automotive lighting technology with the e-tron Sportback concept. The brand with the four rings was the first in the world to adopt full LED headlights, and gave Matrix LED technology, laser lighting and OLED technology a significant push towards their breakthrough. The technology study for Shanghai now premieres a whole host of complex functions that steer vision and interaction with the surroundings in a new direction.

Narrow light strips on both sides below the front lid – the daytime running lights – become the eyes on the face of the study. Thanks to a combination of LEDs and a micromirror-studded surface plus complex control technology, a large number of animated movements and signatures are possible. When the e-tron Sportback starts and also when the doors are opened, the system uses switchable segments to generate dynamic visual welcome signals.

In their basic setting the daytime running lights reveal two rows of finely structured illuminated segments that lend the smooth surface conspicuous three-dimensionality – this is the signature of the e-tron Sportback.

The design of the brand logos at the center of the Singleframe and on the rear is no less striking. The four rings, too, are illuminated and appear to float on the dark background. The rear illuminated rings emblem acts as a third brake light.

Below the daytime running lights, to the left and right of the Singleframe, there are two large-area light fields each comprising an arrangement of around 250 LEDs. They offer a vast array of possibilities for creating engaging graphics or specific communicative signs, even while on the move.

Another highlight is the two projection modules – by the name of Digital Matrix Light (DML)

– which are integrated into the car's front end below the LED fields. These light units, ultra-high resolution laser projectors each with more than 1.3 million pixels, serve as the driving lights and high beams. Oncoming road users can be precisely masked out of the light cone and are not dazzled.
A new solution: In narrow passages, the road width required for the car can be projected precisely onto the road by the headlight cone. In construction zones, for example, this helps the driver to spot in advance if they are at risk of drifting out of line – a clear gain in terms of active road safety.

The laser projectors can also cast signs on the road surface – such as a zebra crossing pattern if the driver stops to allow a pedestrian to cross the road. Numbers and letters, too, can be produced and animated – enabling graphic-verbal communication with the world outside.

LEDs are also used in the large-area rear lights; their characteristic light strip with aluminum edging accentuates the vehicle body's width and dynamism. External lighting elements that appear to float introduce the typical e-tron signature into the tail lights. Audi's typical wipe-action turn signals that perform a wiping movement from the inside outwards are also a feature of the rear end. Digital matrix light allows the signaling effect to be markedly intensified, for instance in an emergency brake application.

There are small matrix laser projectors on all four edges of the vehicle. These are trained on the road surface, so they can add an extra dimension to dynamic signals such as the wipe-action turn signals, sending out a clear message to other road users. Audi thus yet again steps into the role of lighting pioneer with the e-tron Sportback and demonstrates how effectively improvements to traffic safety can be combined with trendsetting design.

Standard drive configuration for the future: three electric motors
The Audi e-tron Sportback concept technology study uses three powerful electric motors – one on the front axle and two on the rear axle. Total output is 320 kW, with boosting enabling the driver to temporarily mobilize up to 370 kW.

The electric motors are highly efficient over a wide engine speed range, including at low and intermediate load. They thus combine emotional driving pleasure above all with a high range. The electric motors are liquid-cooled, as are the compact power electronics.

The brand first showcased the concept for the three electric motors in its Audi e-tron quattro concept study car at the 2015 Frankfurt Motor Show. It will now find use in future production versions. And it turns the Audi e-tron Sportback concept into an electrified quattro, because torque is delivered to all four wheels.

The operating principle is as follows. A controller continuously computes the optimal interplay of the electric motors for every driving situation. At low load, solely the motor on the front axle is responsible for propulsion. When the driver floors the accelerator in the S driving mode and all three electric motors are working together, 370 kW of output and more than 800 Nm (590.0 lb-ft) of torque are available in the boost mode. The sprint from zero to 100 km/h (62.1 mph) is completed in 4.5 seconds; the electronically limited top speed of 210 km/h (130.5 mph) is quickly reached. In the standard D driving program, the e-tron Sportback musters 320 kW.

The key drive train management parameters are the position of the accelerator, the mode chosen in the Audi drive select dynamic handling system, the driving program – S or D – and the battery charge level. The data on the near surroundings from the sensors for piloted driving, the predictive route data from the navigation system and the real-time traffic information from Audi connect also flow into this computation, always with the aim of optimally adjusting the drive train to the prevailing conditions.

The focus is on not just powerful performance, but also maximum efficiency. Before even starting out, the driver can have the Audi e-tron Sportback concept compute a drive train strategy to minimize energy consumption. When under way, the Audi e-tron recovers large amounts of energy. Because up to moderate braking, the electric motors are solely responsible for decelerating the vehicle. The hydraulic brakes only come into play for heavy braking. The driver can adjust the degree of recuperation in stages. At the lowest setting, no energy is recovered at all in certain situations. Instead, the isolated drive allows the coupé to coast without any retardation torque – one of the most effective strategies for increasing the range.

The concept with the two electric motors on the rear axle offers major advantages when it comes to sporty handling. The Torque Control Manager, which works together with the Electronic Stabilization Control (ESC), actively and variably distributes the power between the wheels as necessary. This torque control provides for maximum dynamics and stability. Thanks to the virtually instantaneous response of the electric motors, the control actions are lightning-quick. The drive concept of the Audi e-tron Sportback concept adapts perfectly to every situation, whether involving transverse or longitudinal dynamics.

Ideal installation position: the lithium-ion battery

As previously on the e-tron quattro concept, the technology study’s lithium-ion battery is positioned between the axles below the passenger compartment. This installation position provides for a low center of gravity and a balanced axle load distribution of 52:48 (front/rear). And that gives the sporty SUV outstanding driving dynamics and driving safety compared with other vehicles in the segment. The large battery block is bolted to

the floor structure. Thanks to its modular design, the battery is in principle also suitable for other automobile concepts.

The liquid-cooled battery has an energy capacity of 95 kWh. A full charge provides for a range of over 500 kilometers (310.7 miles) in the NEDC. The Combined Charging System with two connectors enables charging with alternating current (AC) and direct current (DC). With direct current and the charging power of 150 kW targeted by Audi, the large battery can store enough energy for up to 400 kilometers (248.5 miles) in around just 30 minutes.

With its geometry and slightly inclined installation position, the innovative charging socket on the front fender is particularly ergonomic. Alternatively contactless inductive charging of the Audi e-tron Sportback concept is possible with Audi Wireless Charging (AWC). This is done by siting a charging pad with integral coil on the floor where the car is to be parked, and connecting it to the power supply. The piloted parking system positions the Audi e-tron Sportback concept over the charging pad with centimeter precision. The charging process then starts automatically. The alternating magnetic field induces an alternating voltage in the secondary coil fitted in the floor of the car, across the air gap. The alternating current is converted into direct current by the on-board power electronics and the battery is charged with an output of up to eleven kilowatts.

The charging process stops automatically when the battery is fully charged. Audi Wireless Charging technology reaches an efficiency of more than 90 percent, making it comparable in efficiency to charging with a cable. The alternating field represents no danger to humans or animals. It is only generated when a car is standing above the induction pad. Drivers can monitor the charging process on their smartphone using an app from the Audi connect portfolio. All charging and climate control functions can be controlled remotely with this app.

The heat pump also contributes to the efficiency of the concept study. It uses the waste heat of the electrical components to climatize the interior and is thus a central component of the thermal management system.

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