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40 years, 40 figures, 40 images: fascinating facts and tales about Audi's quattro technology

- **Four rings, four driven wheels – a 40-year success story**
- **From the lockable center differential to electric torque vectoring**
- **Ahead of the competition: a triumph in motorsports and among customers**

Ingolstadt, in October 2020 – The quattro drive has been a technical core area and pillar of Audi for 40 years now. The great success story ranges from the manually lockable center differential in 1980 to the three electric motors that drive the new S models in Audi's e-tron product line. Four rings and four driven wheels, 40 figures from 40 years – a small collection of facts that not everybody knows.

0 clutches and differentials are at work in the Audi e-tron (combined electric power consumption in kWh/100 km*: 26.6–22.4 (WLTP); 24.3–21.0 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) and in the e-tron Sportback (combined electric power consumption in kWh/100 km*: 26.3–21.6 (WLTP); 23.9–20.6 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)). The fully electric SUV models utilize [electric all-wheel drive](#), whereby the electric motors implement all quattro functions.

0.5 seconds is how far ahead the control unit always calculates in the [quattro with ultra technology](#). The intelligent open- and closed-loop control works predictively thanks to high-performance sensors and data evaluation. The quattro with ultra technology uses two clutches that allow it to switch from front-wheel drive to all-wheel drive in the blink of an eye. During moderate driving, the quattro with ultra technology enjoys all the advantages of the efficient front-wheel drive. All-wheel drive remains continuously available however, and is there immediately and even in advance when needed.

3 times in a row, the Audi R18 e-tron quattro won the Le Mans 24-hour race between 2012 and 2014. A V6 TDI drove the rear wheels, while a flywheel accumulator supplied recuperated energy to two electric motors on the front axle. As a result, the race car was able to utilize this temporary quattro drive system during acceleration.

** Information on fuel/electric power consumption and CO₂ emission figures given in ranges depend on the tires/wheels used as well as the equipment selected for the vehicle.*



3 electric motors supply propulsive power in the new Audi e-tron S (combined electric power consumption in kWh/100 km*: 28.4–26.8 (WLTP); 28.2 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) and Audi e-tron S Sportback (combined electric power consumption in kWh/100 km*: 28.1–26.4 (WLTP); 27.6–27.5 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) – a world first in volume production. The two electric motors on the rear axle enable electric torque vectoring, the need-based distribution of propulsive power to individual wheels on the left and right.

3.1 seconds is how long it takes the Sport quattro S1 with the medium manual transmission ratio to accelerate from 0 to 100 km/h (62.1 mph). The rally car that Audi used for the first time in 1985 produced 350 kW (476 PS) with its five-cylinder turbo engine and weighed only 1,090 kilograms (2403.0 lb).

4 different all-wheel drive clutches and 4 different center differentials are in use across the entire Audi model range. The self-locking center differential was designed for the models with longitudinally mounted front engines and [eight-speed tiptronic](#). In some engine versions, it works with the [sport differential](#) on the rear axle, which distributes the drive torques between the wheels depending on the driving situation. In the models with longitudinally mounted engines, [the seven-speed S tronic](#) partners with the [quattro with ultra technology](#), which uses two clutches. In the compact Audi models with transverse engines, a hydraulically controlled multi-plate clutch takes charge, which sits on the rear axle for better weight distribution. The R8 high-performance sports car (combined fuel consumption in l/100 km*: 13.6–13.0 (18.1–17.3 US mpg); combined CO₂ emissions in g/km*: 311–297 (500.5–478.0 g/mi)) also features a controlled multi-plate clutch, but in this case it is positioned on the front axle.

5 kilograms (11.0 lb) was the approximate weight of first self-locking Torsen center differential used in the original Audi quattro in 1986. The basic distribution was 50:50 between the front and rear axles. Today, the self-locking Torsen center differential in the models with longitudinally mounted engines weighs only around 3 kilograms (6.6 lb) and has a basic distribution of 40 percent to the front axle and 60 percent to the rear axle.

6 minutes and 29 seconds was the lead that Walter Röhrl held over the runner-up at the Rallye Sanremo in 1985 with the Sport quattro S1. In the last race of the season, the British RAC Rally, Röhrl used a dual-clutch transmission that was actuated pneumatically. A precursor of today's S tronic, it was a real first at the time. Today's electronic possibilities are what make the efficiency and functionality of our modern dual-clutch transmission and the active integration in the overall tuning of the car possible.

10 minutes and 47.85 seconds was the time with which Röhrl triumphed with the Audi Sport quattro S1 at the Pikes Peak Hill Climb (USA) in 1987. In the fastest part of the 20-kilometer course (12.4 mi) with an altitude of 1435 meters (4,708 ft), an average incline of seven percent and 156 bends, he was measured traveling at a speed of 196 km/h (121.8 mph).

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11 degrees was the steering angle the engineers chose for the rear wheels in an experimental all-wheel steering design in a quattro prototype in 1984. Today, top Audi models such as the RS 6 Avant (combined fuel consumption in l/100 km*: 11.7–11.5 (20.1–20.5 US mpg); combined CO₂ emissions in g/km*: 268–263 (431.3–423.3 g/mi)) are equipped with [dynamic all-wheel steering](#) upon request. At low speeds, it turns the rear wheels a maximum of 5 degrees in the opposite direction to make maneuvering and parking easier, for example. At higher speeds, it turns them up to 2 degrees in the same direction in order to increase stability when changing lanes quickly, for example.

12 engineers assisted project manager Walter Treser in the development of the first Audi with permanent quattro drive from February 1977.

23 races were won by quattro drivers Michèle Mouton, Hannu Mikkola, Stig Blomqvist and Walter Röhrl in the Rally World Championship with Audi in the five years from 1981 to 1985. As a result, Audi was able to celebrate the superiority of the quattro principle in rallying.

32 S, RS and R models currently offered by Audi on the market. All of them have quattro drive as standard.

30 milliseconds is how long it takes for the Audi e-tron (combined electric power consumption in kWh/100 km*: 26.6–22.4 (WLTP); 24.3–21.0 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) and e-tron Sportback (combined electric power consumption in kWh/100 km*: 26.3–21.6 (WLTP); 23.9–20.6 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) to shift torque from the rear axle to the front axle. It takes three times as long for a human to blink. No mechanical clutch is engaged with the [electric all-wheel drive](#); instead, electricity is simply distributed – and with lightning speed, too.

40 millimeters (1.6 in) is how much wider each of the wheel arches are on the Audi RS 6 Avant (combined fuel consumption in l/100 km*: 11.7–11.5 (20.1–20.5 US mpg); combined CO₂ emissions in g/km*: 268–263 (431.3–423.3 g/mi)) with its pronounced quattro blisters compared with the A6 Avant. The designers are thereby emphasizing the strong quattro character.

40:60 (front axle:rear axle) is the basic distribution of the self-locking center differential in Audi models with longitudinally mounted engines. When necessary, the center differential can divert up to 70 percent of the torque to the front, or up to 85 percent to the rear.

45.3 percent of all Audi customers worldwide opted for a quattro in 2019, i.e. almost half.

The **75th** Geneva Motor Show was where Audi presented the original quattro for the first time on March 3, 1980. Internally, it had the designation model 85.



80 percent was the incline of the ski jump in Kaipola, Finland, where Audi filmed a legendary commercial in 1986. Professional rally driver Harald Demuth mastered the snow-covered 47-meter (*154.2-ft*) ascent in the Audi 100 CS quattro.

More than **80** percent of the roughly 20 models that Audi will present in 2020 will be launched on the market with at least one quattro variant.

92.2 percent of all cars that Audi delivered to customers in Canada in 2019 had a quattro drive. As a result, the country in North America has the highest proportion of all-wheel drive cars in the world.

From **110 kW** (150 PS) in the Q2 35 TDI quattro S tronic (combined fuel consumption in l/100 km*: 4.8–4.6 (*49.0–51.1 US mpg*); combined CO₂ emissions in g/km*: 128–122 (*206.0–196.3 g/mi*)) right through to **456 kW** (620 PS) in the R8 V10 performance quattro supercar (combined fuel consumption in l/100 km*: 13.1 (*18.1 US mpg*); combined CO₂ emissions in g/km*: 299–297 (*481.2–478 g/mi*)), Audi provides its customers with the benefits of permanent all-wheel drive throughout the entire model range.

200 PS (147 kW) is what the original quattro had at its disposal – 40 years ago, that was a value truly worthy of a sports car. At this point, the Porsche 911 SC produced just 4 PS more.

Around **720** PS (530 kW) is what the five-cylinder-turbo in the Audi 90 quattro produced, which competed in the IMSA GTO series in 1989 – the 2.2-liter four-valve powerplant summoned no less than 329 PS from every liter (*0.04 cu ft*) of displacement. The drivers, Hurley Haywood and Hans-Joachim Stuck, won almost every second race in the North American series. Audi exploited the technical rules of the IMSA series to the full: A tubular trellis frame supported a greatly widened plastic body, while the tires were up to 360 millimeters (*14.2 in*) wide.

Up to **973** Nm (*717.6 lb-ft*) of torque is produced by the three electric motors in the Audi e-tron S (combined electric power consumption in kWh/100 km*: 28.4–26.8 (WLTP); 28.2 (NEDC); combined CO₂ emissions in g/km: 0 (*0 g/mi*)) and Audi e-tron S Sportback (combined electric power consumption in kWh/100 km*: 28.1–26.4 (WLTP); 27.6–27.5 (NEDC); combined CO₂ emissions in g/km: 0 (*0 g/mi*)). The two fully electric SUV models achieve a power output of 370 kW (507 PS) in boost mode.

The winter of **1976/77** is when the idea of developing the quattro technology came about at Audi. A series of test drives in Scandinavia, in which a VW Iltis also took part, brought it about. On the snow-covered roads, the military all-terrain vehicle developed at Audi impressively demonstrated the potential of its all-wheel drive.

1981 was the year Audi officially entered the rallying scene for the first time with the quattro. Finishing around 21 minutes ahead of the competing cars, Franz Wittmann won the Jänner

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Rallye in Austria, which was part of the European Rally Championship. The local hero triumphed in all 31 special trials. Prior to that, in November 1980, a quattro had been used at the Algarve Rallye in Portugal as an unclassified but timed course car with tremendous success.

1984 was the most successful year for Audi's quattro drivers in the Rally World Championship. They won the double – both the manufacturer's and the driver's titles – with Stig Blomqvist claiming the latter.

In **1988**, the Audi 200 competed in the TransAm Series in America. Here too, the Four Rings topped the manufacturer's and driver's rankings at the first attempt. The quattro principle proved its superiority on the race circuit as well.

1994 saw Audi launch the RS 2 Avant on the market, the first ever RS model. Its quattro drive incorporated an electromechanically activated locking differential at the rear axle.

In **1999**, Audi introduced the quattro drive to the premium compact segment for the first time in the A3 1.8 T with 110 kW (150 PS).

In **2005**, Audi presented an RS 4 (combined fuel consumption in l/100 km*: 9.2 (25.6 US mpg); combined CO₂ emissions in g/km*: 211–210 (339.6–338.0 g/mi)) featuring the first center differential with asymmetric, dynamic basic distribution. It is still being used today in a more refined form. Its asymmetric, dynamic torque distribution results in sporty, rear-biased handling.

In **2007** the Audi R8 high-performance sports car (combined fuel consumption in l/100 km*: 13.6–13.0 (18.1–17.3 US mpg); combined CO₂ emissions in g/km*: 311–297 (500.5–478.0 g/mi)) launched on the market in its first generation. Its quattro drive was tailor-made: A cardan shaft ran from the transmission in the rear to an unregulated viscous coupling on the front axle. In its current generation, the R8 uses a controlled multi-plate clutch here.

2019 saw circuit and rallycross champion Mattias Ekström drive up part of the snow-covered "Streif" ski racing course at Kitzbühel. In an Audi e-tron quattro (combined electric power consumption in kWh/100 km*: 26.6–22.4 (WLTP); 24.3–21.0 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) with three electric motors, he overcame an incline of up to 85 percent.

2,100 Nm (1548.9 lb-ft) is the approximate torque differential at wheel level that the rear wheels can develop in the fully electric Audi e-tron S (combined electric power consumption in kWh/100 km*: 28.4–26.8 (WLTP); 28.2 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) and e-tron S Sportback (combined electric power consumption in kWh/100 km*: 28.1–26.4 (WLTP); 27.6–27.5 (NEDC); combined CO₂ emissions in g/km: 0 (0 g/mi)) when cornering at speed. Each of the two rear electric motors drives an individual wheel. Usually, the wheel on the

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outside of the curve receives significantly more torque than the unloaded inside wheel due to its greater traction. This increases driving dynamics and cornering speed considerably.

11,452 units of the original quattro were made between 1980 and 1991. Originally, only 400 were planned.

49,900 German marks was the base price of the original Audi quattro at its market launch in 1980. Porsche offered the 911 SC for the same price.

486,000 euros was the price a fan paid for an Audi Sport quattro at an auction in London in 2016. Only 214 units of this super-quattro with 306 PS (225 kW) were built. At its launch in 1984, it cost 195,000 German marks.

804,224 is the number of quattro models Audi produced worldwide in 2019, of which 258,765 were made in Germany.

Nearly **11 million** cars have been built by the brand with the four rings with [quattro drive](#) since 1980 (as at: September 30, 2020).

- End -

**Fuel consumption of the models named above:**

Fuel consumption, CO₂ emission figures, and efficiency classes given in ranges depend on the tires/wheels used as well as the selected vehicle equipment

Audi e-tron:

Combined electric power consumption in kWh/100 km*: 26.6–22.4 (WLTP); 24.3–21.0 (NEDC);
Combined CO₂ emissions in g/km: 0 (0 g/mi)

Audi e-tron Sportback:

Combined electric power consumption in kWh/100 km*: 26.3–21.6 (WLTP); 23.9–20.6 (NEDC);
Combined CO₂ emissions in g/km: 0 (0 g/mi)

Audi e-tron S:

Combined electric power consumption in kWh/100 km*: 28.4–26.8 (WLTP); 28.2 (NEDC);
Combined CO₂ emissions in g/km: 0 (0 g/mi)

Audi e-tron S Sportback:

Combined electric power consumption in kWh/100 km*: 28.1–26.4 (WLTP); 27.6–27.5 (NEDC);
Combined CO₂ emissions in g/km: 0 (0 g/mi)

Audi Q2 35 TDI S tronic:

Combined fuel consumption in l/100 km*: 4.8–4.6 (49.0–51.1 US mpg);
Combined CO₂ emissions in g/km*: 128–122 (206.0–196.3 g/mi)

Audi RS 4:

Combined fuel consumption in l/100 km: 9.2 (25.6 US mpg);
Combined CO₂ emissions in g/km: 211–210 (339.6–338.0 g/mi)

Audi RS 6 Avant:

Combined fuel consumption in l/100 km: 11.7–11.5 (20.1–20.5 US mpg);
Combined CO₂ emissions in g/km: 268–263 (431.3–423.3)

Audi R8:

Combined fuel consumption in l/100 km*: 13.6–13.0 (18.1–17.3 US mpg);
Combined CO₂ emissions in g/km*: 311–297 (500.5–478.0 g/mi)

The specified fuel consumption and emission data have been determined according to the measurement procedures prescribed by law. Since September 1, 2017, certain new vehicles are already being type-approved according to the Worldwide Harmonized Light Vehicles Test Procedure (WLTP), a more realistic test procedure for measuring fuel consumption and CO₂ emissions. Starting on September 1, 2018, the New European Driving Cycle (NEDC) will be replaced by the WLTP in stages. Owing to the more realistic test conditions, the fuel consumption and CO₂ emissions measured according to the WLTP will, in many cases, be higher than those measured according to the NEDC. For further information on the differences between the WLTP and NEDC, please visit www.audi.de/wltp.

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We are currently still required by law to state the NEDC figures. In the case of new vehicles which have been type-approved according to the WLTP, the NEDC figures are derived from the WLTP data. It is possible to specify the WLTP figures voluntarily in addition until such time as this is required by law. In cases where the NEDC figures are specified as value ranges, these do not refer to a particular individual vehicle and do not constitute part of the sales offering. They are intended exclusively as a means of comparison between different vehicle types. Additional equipment and accessories (e.g. add-on parts, different tire formats, etc.) may change the relevant vehicle parameters, such as weight, rolling resistance and aerodynamics, and, in conjunction with weather and traffic conditions and individual driving style, may affect fuel consumption, electrical power consumption, CO₂ emissions and the performance figures for the vehicle.

Further information on official fuel consumption figures and the official specific CO₂ emissions of new passenger cars can be found in the "Guide on the fuel economy, CO₂ emissions and power consumption of all new passenger car models," which is available free of charge at all sales dealerships and from DAT Deutsche Automobil Treuhand GmbH, Hellmuth-Hirth-Str. 1, 73760 Ostfildern, Germany, or at www.dat.de.

The Audi Group, with its brands Audi, Ducati and Lamborghini, is one of the most successful manufacturers of automobiles and motorcycles in the premium segment. It is present in more than 100 markets worldwide and produces at 16 locations in 11 countries. 100 percent subsidiaries of AUDI AG include Audi Sport GmbH (Neckarsulm, Germany), Automobili Lamborghini S.p.A. (Sant'Agata Bolognese, Italy), and Ducati Motor Holding S.p.A. (Bologna, Italy).

In 2019, the Audi Group delivered to customers about 1.845 million automobiles of the Audi brand, 8,205 sports cars of the Lamborghini brand and 53,183 motorcycles of the Ducati brand. In the 2019 fiscal year, AUDI AG achieved total revenue of €55.7 billion and an operating profit of €4.5 billion. At present, 90,000 people work for the company all over the world, 60,000 of them in Germany. With new models, innovative mobility offerings and other attractive services, Audi is becoming a provider of sustainable, individual premium mobility.
