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Audi allroad quattro concept

Short version

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Debut in Detroit: Audi is proudly unveiling the allroad quattro concept at this year's North American International Automobile Show in Detroit. This unique crossover has been developed especially for this presentation at the most important car show in the USA – indeed an appropriate highlight entering the 25th anniversary of quattro drive. At the same time this concept car serves as a spearhead in technology demonstrating innovative electronic systems destined to enter series production in just a few years.

Through its design alone, the Audi allroad quattro concept clearly demonstrates its versatility: The elegant sporting character of the Audi Avant is visibly linked to the functional elements of an off-roader, creating a vehicle just as much at home on the highway as on a snowbound mountain track.

The visual appearance of the allroad quattro concept measuring 4.93 meters in length and 1.89 meters in width provides a perfect match for the many new highlights in technology it has to offer. Features quite natural on an Audi of this caliber are the powerful engine, permanent quattro all-wheel drive, and highly advanced suspension, simply perfect both for excellent ride comfort at high speeds and for supreme dynamic performance both on-road and off-road.

A brand-new power unit is all set for action within the engine bay: Displacing four liters, the V8 TDI boasting common rail fuel injection and piezo injectors is the world's most powerful and advanced eight-cylinder self-ignition engine. Maximum output of 210 kW (286 bhp) and peak torque of 650 Newton-meters ensure the muscle and performance of a thoroughbred sports car: Featuring six-speed automatic transmission, the allroad quattro concept accelerates to 100 km/h in just 6.4 seconds, with top speed limited electronically to 250 km/h. And fitted with a particle filter, the allroad quattro concept is the first eight-cylinder TDI to outperform the strict EU 4 European emission standard.

Audi's permanent quattro all-wheel drive featuring a torsen centre differential conveys the power of the engine to all four wheels both on-road and off-road, ensuring maximum traction and lateral stability at all times as essential prerequisites for the very best in driving dynamics and motoring safety.

This drive concept has become increasingly successful over the years ever since the first Audi quattro all-wheel-drive came off the production line 25 years ago: No less than 1.8 million production Audi cars have been equipped with this technology in the meantime, not to mention countless victories on the racetrack and in rallies attributable to this supreme drive system.

The chassis and suspension of the Audi allroad quattro concept also offer genuine all-round qualities: Adaptive air suspension, a combination of air suspension and electronically controlled dampers, offers a perfect synthesis of dynamic handling and supreme suspension comfort. Variable ground clearance adjustable from 160 to 210 millimeters enables the Audi allroad quattro concept to take even rough terrain without problems.

High-tech is the name of the game not only when it comes to the dynamic talents of the Audi allroad quattro concept. High technology in this cutting-edge vehicle goes a lot further, boasting several innovative driver assistance systems which Audi is now presenting for the first time and which will go into regular production in just a few years' time.

An outstanding world-first achievement is **Audi road vision**, an optical sensor system able to recognize the condition of the road and its surface, thus providing a quantum leap in terms of driving safety: The system not only informs the driver on potentially critical conditions such as gravel or black ice, but also gives the ESP electronic stabilization program and the adaptive cruise control additional, crucial parameters for even better proactive control.

Audi lane assist, a further feature of the concept car, induces vibrations on the steering wheel to inform the driver as soon as he inadvertently leaves his lane. **Audi side assist,** in turn, incorporates radar sensors monitoring the area behind and next to the car. So once the system detects vehicles approaching the Audi allroad quattro concept or driving in the car's blind angle, the driver is informed accordingly by a warning light coming on in the exterior mirror on the appropriate side

Long version

Audi allroad quattro concept

Debut in Detroit: Audi is proudly unveiling the allroad quattro concept at the North American International Automobile Show in Detroit. This very special crossover has indeed been developed especially for presentation at the most important car show in the USA, just as the very first allroad quattro concept car was also revealed in Detroit in January 1998.

Like its predecessor, this new Audi allroad quattro concept presents a completely new philosophy in the world's leading and most significant crossover market and will test both the press and the public for their response.

At the same time the allroad quattro concept serves as a spearhead in technology demonstrating innovative electronic systems destined to enter series production in a few years' time.

Through its design alone, the Audi allroad quattro concept sets a clear standard, visibly combining the elegant sporting character of the Audi Avant with the functional elements of an off-roader in creating a vehicle fully at home both on the highway and a snowbound mountain track.

The distinctive looks of the allroad quattro concept are matched perfectly by the car's equally outstanding technical features: It virtually goes without saying that an Audi of this caliber must come with a powerful engine, permanent quattro all-wheel drive, and the right kind of suspension designed for both outstanding ride comfort at high speeds as well as supreme dynamic handling on-road and off-road.

Design

The allroad quattro concept comes with the same bodyshell and body proportions as the latest production Audi to enter the market, the new A6 Avant. Like the A6, this concept car is clearly characterized by its striking single-frame radiator grille. The basic dimensions of the allroad quattro concept – 4.93 meters in length and 1.89 meters in width – are fundamentally the same as on the executive class Avant. But when it comes to height the allroad quattro concept, measuring 1.52 meters, is 60 millimeters higher than the Avant in the interest of greater ground clearance.

In its design, the Audi allroad quattro concept clearly accentuates the supreme function and elegant sporting character of the A6 Avant bodyshell in its own distinctive style. The wide track and the moderate increase in body height come together in perfection to provide a muscular, truly unique silhouette. The underfloor protection made of stainless steel in a special rib-type structure, striking bumpers, and distinctly flared wheel arches clearly bear testimony at very first sight to the off-road talents of the allroad quattro concept.

The very latest lighting technology lurks behind the clear glass covers on the headlamps: The allroad quattro concept comes with LED headlamps boasting the additional functions of daytime running lights. The headlamps themselves are modular in structure, the outer module being made up of 14 individual LEDs offering the same level of light intensity as xenon headlamps. The inner module, in turn, incorporates 10 individual light units for the high beam. In between these two main sections the horizontally arranged individual, square modules provide clear daylight illumination.

Both the direction indicators, the brake lights and the tail lights also come with high-speed LED light units. The direction indicator function, incidentally, is enhanced by additional indicator units integrated in the side mirrors and therefore supplementing the direction indicators at the front and rear.

Seen from the side, the classic silhouette of the Avant with its high shoulder and low-slung line of windows, the very coupe-like roof line, as well as the low rake of the tailgate builds up a new feeling of tension: Together with the doorsills and bumpers, the wheel arches come in a contrasting color set against the rest of the car's body – a distinctive element in both its function and design. The wheels themselves, incidentally, measure 19 inches across and run on 255/45 R19 tires as a special development for this concept car.

The powerful, horizontal look of the rear section with two-piece tail lights curved distinctly to the inside give the entire vehicle a strong and squat look on the road.

Further features clearly characterizing this concept car are the gently curved roof railing as well as the extra-large open sky glass sliding roof making almost the entire roof area between the A- and D-pillars completely transparent.

The open sky roof is made up of two large glass segments significantly enhancing the entry of light into the interior as opposed to a conventional sliding roof. The front segment opens electrically at the touch of a button.

Both the window glass and the exterior mirrors feature a significant but invisible innovation in technology: They are coated with hydrophobic molecules repelling both water and dirt. The result is much cleaner windows and better visibility in the rain. The coating measuring only a few nanometers in thickness is applied in an immersion bath, sticking firmly to the surface for lasting quality even under mechanical forces such as the screenwipers moving to and fro.

The interior ambience is truly outstanding, features specific to the allroad quattro concept offering their unique rendition of that supreme function and superior ergonomics so typical of Audi. Since the concept car is a four-seater, the seats both front and rear come with a high center console in between, with intelligently subdivided storage compartments beneath their two-piece armrests opening up separately.

Clear signs of sporty performance and perfect ergonomics – these features are consistently borne out also by the cockpit. The instrument panel in the middle and the upper part of the center console proudly boasting the 8.9-inch MMI monitor are joined by the same leather cover forming one complete cockpit unit. Featuring 1024 x 600-pixel resolution, the MMI offers a new world of brilliance and clarity, conventional 7-inch monitors currently offering just 480 x 270 pixels.

The horizontal section of the center console houses the engine starter button, the button for the electromechanical parking brake, the selector lever for the six-speed automatic transmission, and of course the MMI control unit.

New display technology

The extra-large rev counter and speedometer dials come in newly designed, teardrop-shaped surrounds housed together with the circular coolant temperature and fuel gauge displays in one large central instrument panel. A particularly important innovation is the large color display for the first time in an Audi featuring revolutionary Organic Light Emitting Diode (OLED) technology.

This technology uses an organic polymer for significantly enhanced presentation and clarity. Compared with a conventional liquid crystal display (LCD), an OLED monitor is much easier to read above all in bright sunshine and when looking at the display from the side. Indeed, you can still read the monitor with ease from an angle of 170°.

Further advantages of OLED technology are the very thin and slender structure of the entire system, very fast reaction times, and far lower uptake of energy compared with an LCD display.

Audi's new generation of steering wheels is now also making its debut in the Audi allroad quattro concept. Perhaps the most visible sign of distinction on the three-spoke steering wheel finished in brown leather is the single-frame trapezoid complete with four rings on the central airbag cover.

Trims on the instrument panel and the doors for the first time feature a metallised textile material. The contrast between this special surface with its high-tech look and the main padding and upholstery surfaces finished in leather builds up a unique aura of optical tension and creates a wonderful surface touch all in one.

The leather upholstery on the four seats comes in two colors and in varying surface structure, sturdy side supports holding the driver and passengers firmly in position even in fast bends. Forming a distinctive contrast to the gray surfaces of the seats as such, the front segments on the seat bottoms, the upper third of the backrests and the headrests are finished in a green-blue shade. The seams connecting the various leather sections on the seats, finally, are visibly separated from the surfaces themselves to form yet another design feature.

The rear seats tilt forward electrically to enlarge the luggage compartment, the armrests can be retracted into the floor to form one smooth, flush area.

Like the A6 Avant, the allroad concept car comes with an absolutely smooth and uncluttered storage compartment. Molded contours behind the wheel arches provide overall width of up to 1300 millimeters for accommodating golf bags with absolute ease. The entire luggage compartment, naturally, is finished in high-quality carpeting. Aluminum trim strips fitted lengthwise on the floor facilitate the process of moving even large and heavy pieces of luggage.

The roll-up mechanism for the electrically controlled, fully retractable luggage compartment cover is housed conveniently out-of-sight within the floor of the luggage compartment. The tailgate on the allroad quattro concept, in turn, comes with electrical remote control, opening and closing simply by pressing a button on the key.

Ambience illumination serves to dim the lights in the interior as desired in a smooth process with infinite control. Via the MMI control unit, the driver can indeed call up various light scenarios with individual brightness adjustment, thus responding to specific situations on the road such as bright lights in town or on Interstate highways which are not illuminated.

This illumination strategy makes it much easier for the human eye to adjust to different light conditions outside and inside. It also enhances control and operating safety, enabling the driver to find all the controls and switches much better and faster than before. And last but certainly not least, this illumination strategy creates an outstanding experience of interior design and sophisticated materials also at night, without impairing driving safety in any way by dazzling the driver or by creating reflections on the windows.

Additional light sources on the sides of the luggage compartment further enhance the interior illumination around the roof and in the footwells. These light sources use so-called electroluminescence film not only taking up very little space, but also ensuring particularly homogeneous light distribution.

Drivetrain

The 4.0 TDI eight-cylinder

The allroad quattro concept proudly boasts the very first eight-cylinder in Audi's new range of TDI powerplants complete with common rail technology and piezo inline injectors – the 4.0 TDI.

Like its six-cylinder counterparts with a displacement of 3.0 and 2.7 liters, this magnificent eight-cylinder features the most advanced fuel injection technology and interacts with a diesel particulate filter to outperform the demanding European EU4 emission standards not coming into force until 2006.

Displacement of the eight-cylinder version is 3,936 cc. The engine's power and performance, in turn, is expressed clearly and convincingly by some simple and very straightforward figures: 290 bhp/210 kW at 3200 rpm and maximum torque of 650 Newton-meters attained consistently from just 1600 rpm all the way to 3000 rpm for supreme acceleration throughout.

The results, obviously, are a spontaneous response to the gas pedal and enormous pulling power from very low engine speeds. Acceleration to 100 km/h from a standstill comes in just 6.4 seconds; top speed is at a governed 250 km/h.

Particularly interim acceleration on the road is an outstanding strength of this high-performance power unit, with Audi's new concept car accelerating from 80-120 km/h in just 4.9 seconds. This, believe it or not, makes it just as fast as Audi's high-performance S4 athlete.

The V8 32-valve powerplant complete with turbocharger technology and map-controlled, cooled exhaust gas recirculation is the first eight-cylinder TDI in Audi's new generation of V-engines. Both the camshafts and the oil pump are driven by chain.

Like all representatives of Audi's new V-engine family, this powerplant comes with extremely compact dimensions: Engine length is a mere 516 millimeters. This also helps to minimize the weight of the engine reduced to just 259 kg, making the 4.0 TDI the lightest diesel V8 worldwide.

Common rail technology and piezo inline injectors

Fuel is supplied to the engine by the very latest common rail injection system featuring a separate high-pressure pump and distributor rail for each row of cylinders. Injection pressure peaks at 1650 bar, 300 bar more than on former common rail systems.

This high injection pressure serves to atomize the diesel fuel even more consistently into minute particles, ensuring even better fuel/air supply and even more efficient combustion.

The most significant innovation introduced with this new common rail technology is without doubt the piezo injectors. Using the piezo effect, the injection system supplies electric tension to a ceramic unit which consequently changes its crystalline structures. The result is a minute change in geometry which, together with the effect of a hydraulic element, mechanically opens the injection jet needle.

Piezo injectors serve to minimize injection volume and maximize both the degree and accuracy of dosage control, enabling the “intelligent” injection system to vary the number of injections per operating cycle almost at random. In the case of the 4.0 V8, the engineers developing Audi’s TDI power unit have opted for up to five injection processes as a function of specific requirements.

This strategy serves to minimize emissions and, at the same time, smoothen the entire combustion process, helping in particular to reduce engine noise:
The 4.0 TDI is not only a lot quieter and smoother than its predecessor, but indeed clearly sets the benchmark in this respect in its class.

Six-speed tiptronic

Audi’s six-speed tiptronic is the ideal partner for the ultra-strong and powerful V8. Indeed, this unique transmission converts the full potential of the engine into genuine dynamism and ride comfort in supreme, unprecedented style.

Low weight, the fast gearshift, and the optimum gearshift strategy consistently combine the sporting performance of the allroad quattro concept with the equally superior comfort of this automatic transmission.

The transmission ratios and increments particularly in the lower gears ensure significantly enhanced acceleration and, in the higher gears, an equally significant reduction of engine speed. This, on the road, means both less noise and, at the same time, greater fuel efficiency offering the driver the best of both worlds.

Gearshift speed of the six-speed tiptronic is particularly dynamic, the driver benefiting from an even more spontaneous gearshift particularly when shifting down. At the same time the automatic intermediate gas function serves to further enhance the car’s agility on the road.

The electronic control unit responds to parameters such as longitudinal and lateral acceleration as well as the way the driver moves the gas pedal both in transmission mode D and in the S sports program, thus avoiding any unwanted upward gearshift in bends.

Permanent quattro all-wheel drive

Permanent quattro all-wheel drive is a natural feature on all high-performance Audi cars. Indeed, it was precisely this technology which revolutionized the car world no less than 25 years ago and is now featured in virtually all car segments not just with Audi. One out of every three Audi cars sold is currently a quattro model, with more than 1.8 million Audi cars being built with permanent quattro all-wheel drive by the end of 2004.

Audi quattro ensures excellent traction and side stability, at the same time minimizing the influence of drive forces on the car's steering behavior. And this, in turn, is the essential prerequisite for very high speeds in bends and a high standard of driving stability.

With the engine of the new Audi allroad quattro concept fitted lengthwise, a torsen differential automatically ensures the optimum flow of power to all four wheels.

The word "torsen" incidentally comes from "torque" and "sensing", signifying the perfect balance of torque and operating smoothness provided in this way. The torsen differential is a self-locking worm gear transmission system.

The big advantage of this concept is that the differential generates its locking effect only under power, while at the same time the transmission allows different speeds during application of the brakes and in bends. Under normal circumstances 50 per cent of the engine's power goes to each axle, but under extreme conditions up to 75 per cent of the drive power may go either to the axle at the front or at the rear.

Driving dynamics and ride comfort

The dynamic chassis and suspension of the Audi allroad quattro concept is based throughout on sporting, proven technology, featuring an enhanced four-arm front axle in typical Audi configuration and the track-controlled trapezoid-arm rear axle carried over from both the Audi A8 and the A6.

Technology of this kind ensures a standard of driving behavior unparalleled in its dynamics and setting the benchmark also in terms of easy control on rough terrain. Ease of control is also ensured by servotronic speed-related power assistance featured as standard and adding even more sensitive steering precision to the already precise handling of the allroad quattro concept.

Complete with adaptive air suspension

The first-generation Audi allroad quattro already provided clear proof of the all-round qualities of Audi's air suspension system. Now the allroad quattro concept, like the current A6 and A8, features the latest generation of adaptive air suspension for an even higher standard of perfection on the road. Indeed, this combination of air suspension and electronic damper control offers the perfect synthesis of truly sporty handling and supreme suspension comfort. And as an essential point on an off-roader, ground clearance is variable to four levels ranging from a minimum of 160 millimeters to a maximum of 210 millimeters.

Via the central Multi Media Interface (MMI), the driver can choose among three different suspension settings ranging from the very sporty to comfortable.

The **automatic mode** provides the perfect all-round set-up, lowering the body of the car by 20 millimeters at a road speed of 120 km/h versus the normal ride height of 180 millimeters. This change in the ride level not only lowers the center of gravity, but also helps to minimize air resistance at high speeds and reduce fuel consumption accordingly.

The **comfort** setting provides gentle spring action and superior long-distance comfort. In this case the car is not lowered as a function of speed on fast roads and highways.

Suspension performance in the **dynamic** mode is comparable to that of a sports suspension, keeping the entire car 20 millimeters lower at all times.

Following the request of the driver, adaptive air suspension serves additionally in the **lift mode** to consistently maintain maximum ride height of 210 millimeters for enhanced safety and handling on rough terrain. At a speed of more than 100 km/h, the vehicle is then lowered automatically to its normal level.

Pressing a button next to the instrument cluster, the driver is also able to choose his ground clearance manually on four different levels. In that case the automatic control mechanism will only intervene if the ride height – and, as a result, the center of gravity – chosen endangers the standard of driving safety.

The continuously variable dampers are adjusted automatically to the route profile and the driver's style of motoring in all selection modes and ranges.

Body level is kept consistently at the same point regardless of the load the vehicle is carrying by means of full-bearing air springs both front and rear.

A further special feature of air suspension specific to the system is that the occupants enjoy the same high standard of vibration control at all times, again regardless of the load the vehicle is carrying, with spring firmness consistently adjusting to the overall weight of the vehicle.

Driver assistance systems

Serving as a spearhead in technology, the Audi allroad quattro concept highlights a number of systems destined to enter series production in just a few years and staking out new terrain particularly in the area of vehicle safety.

Audi road vision

Audi road vision, an unprecedented sensor system recognizing the type of road and surface conditions, ensures a quantum leap in active driving safety: The system not only informs the driver on potentially critical conditions such as gravel or black ice, but also gives the ESP electronic stabilization program and the adaptive cruise control additional, crucial parameters for even better proactive control.

Audi road vision combines laser and infra-red spectroscopy to scan the road in front of the vehicle. In the process the frequency-optimized LEDs in the headlamps serve as an infra-red light source, sensors behind the windscreen monitoring the light beams reflected by the road and modulated in each case by characteristic features. This enables the system not only to distinguish between wet, dry and ice-bound roads, but also to recognize road surfaces with specific grip such as concrete, various types of asphalt, or gravel.

These two separate units are even able to distinguish between different road conditions to the left and right.

The driver is informed of possible risks via the instrument cluster. In addition, ESP is able, for example on road surfaces with poor grip, to intervene within fractions of a second and vary drive or brake forces as required before the vehicle becomes unstable.

Audi lane assist

Audi lane assist is a driver assistance system efficiently informing the driver as soon as he unintentionally leaves his lane by inducing vibrations on the steering wheel. This gives the driver very helpful support above all on long, straight-ahead routes like the Interstate, where it is very easy to lose attention.

This helpful function is provided by a forward-looking video-camera fitted on the upper windscreen frame and focusing on the usual lane marking lines to be found on most Interstates and expressways. And with the exception of very bad conditions – snow or heavy rain – the system works both during the day and at night.

The driver is able to activate or deactivate the system manually simply by pressing a button on the direction indicator lever. Whenever the system is active, vibrations induced intentionally on the steering wheel unit will inform the driver immediately he threatens to leave his lane. Operating the direction indicator briefly before changing lanes, the driver automatically deactivates the system for a short period while changing over to the next lane.

The system switches off automatically at speeds below 60 km/h, on very narrow or winding roads, when passing a construction site or roadworks, and on routes without lane marking lines. In each case the driver is informed by a signal in the instrument cluster.

Audi side assist

Incorporating radar sensors, **Audi side assist** monitors areas next to and behind the car to warn the driver – in addition to the image in the rear-view mirror – of vehicles approaching his car. The sensors themselves have a range behind the car of up to 50 meters, also covering the blind angles the driver cannot see next to the car.

Audi side assist is activated and deactivated at the touch of a button and operates as of a speed of 60 km/h.

The warning signal is provided by a special light element in the exterior mirrors operating in two stages:

- The driver is informed by the system of a vehicle on an adjacent lane (at a blind angle or approaching), which might be critical to the driver when changing lanes. In that case the warning light in the respective mirror comes on and stays on as long as the "other" vehicle is there, giving the driver a clear signal as soon as he looks in the mirror.
- Should the driver activate the direction indicator in his Audi to show that he is about to change lanes, the second warning signal will come on automatically if the lane chosen is occupied, with the warning light quickly flashing on and off.

Audi side assist does not intervene in the actual driving and control functions.

Infotainment

The infotainment systems featured in the Audi allroad quattro concept are just as trendsetting and progressive as everything else in the car. They include a 3D off-road navigation system controlled via the MMI operating system. A compass as well as a display presenting the car's current longitudinal and lateral angle are also integrated in the screen.

A new feature is the option for the driver to interactively record non-digitalized routes while driving. Then, once activated, the system will register the route taken including all bends and even differences in elevation.

A digital camera next to the interior mirror provides the further option of integrating real-life photos in the screen.

The driver is able to activate the screen and its presentation functions in three different modes: as a three-dimensional topographical map with colored shading, as a map with integrated elevation lines, or as a true-to-life picture with references to local vegetation. The photos provide a visual reference to recognizable points and highlights along the way, such as road junctions or buildings.

Audi's MMI system is able to use both radio and TV stations as well as the DVD changer as sources for the infotainment function. Audi Rear Seat Entertainment, in turn, comprises two 7-inch monitors integrated in the headrests, enabling the passengers at the rear to enjoy either TV programs or a DVD film. All control elements for the system are housed conveniently in the center console media compartment, where there are also various connections for electronic equipment, including USB slots. This even allows the passengers to enjoy DVD games with joystick control on the road – certainly a very pleasant entertainment option not only for children on a long journey.

ERL - High-Tech development in the USA

Audi Road Vision and the OLED display, hydrophobic coating and infra-red sensors: These components and modules featured on the Audi allroad quattro concept are just some of the many innovations developed by the Electronics Research Laboratory (ERL) in Palo Alto, California. This high-tech think-tank belonging to the Group, with a team numbering 40 research specialists in the meantime, has been developing new technologies for Audi cars and other brands within the Group since 1998. Right in the heart of Silicon Valley, ERL uses its direct contacts to leading manufacturers in the US electronics industry and direct proximity to the world-renowned Stanford University to cooperate closely in creating innovative applications and systems for implementation in future generations of progressive vehicles.