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The new Audi A4 Avant

Summary

The new Audi A4 Avant

The most beautiful wagon – the new way to drive

With the A4 Sedan, Audi advanced into a new dimension of the midsize class and it is now being followed by the A4 Avant – the most beautiful wagon in its class.

The A4 Avant offers a large cargo space of up to 1,430 litres with a great many sophisticated solutions. As is the nature of the Avant, it combines inspiring elegance with intelligent functionality.

The A4 Avant comes with the same engineering layout as the sedan; its newly-developed five-link front suspension has been moved far forward. This provides for an ideal axle load distribution and thus for the highest degree of handling precision and agility. The Avant also provides that emotion-packed, sporty driving experience which prompted journalists to vote the sedan best midsize car right away.

Audi offers the A4 Avant with two engines, both a petrol and diesel offering. While the engines provide ample power, their fuel consumption, compared to their predecessors, has been reduced by an average of more than ten percent – a convincing testimony for Audi's efficiency strategy.

The wide spectrum of optional sport and comfort technologies inherited from the luxury class make no secret of the high technical competence of the brand with the four rings.

A new language: The design

Beautiful wagons are called Avant – the design expresses the personality of the new Audi A4 Avant; it is charged with strength and dynamism. With its sculpted, curved surfaces, framed by distinct lines, the A4 Avant underlines the leading position Audi occupies in this area.

A barely visible zero-gap joint connects the side to the roof – a connection focusing the high degree of Audi-inherent precision. The headlights with their wing-shaped elements represent a staging of art in motion. Daytime running lights are standard, and with the xenon plus headlights, the running lights come as 14 white LEDs. The roof line descends early, giving the D posts a relatively steep angle and turning the entire silhouette into a flow of elegance. Strength expressed in horizontal lines emphasises the width of the rear.

Compared to its predecessor, the designers tweaked the proportions into a new sporty ratio. The front overhang was shortened, the hood and the wheelbase were extended visibly. The new A4 Avant measures 4.70 m, nearly 12 cm more than its predecessor.

The body is also significantly stiffer and safer than its predecessor, while, at the same time, dropping about 10 percent of its weight thanks to intelligent lightweight steel construction. In its 1.8 TFSI multitronic configuration, the new A4 Avant weighs in with a total of just 1,510 kilograms.

With a base size of 490 litres, the new Audi A4 Avant has a larger trunk than any of its immediate competitors. When the rear seat backs are folded down, the cargo space reaches up to 1,430 litres. The rear backrest is split at a ratio of 40:60, with an optional separate ski and snowboard bag. The A4 Avant rolls off the line with sophisticated solutions such as a reversible cargo floor and a convenient cargo cover. Optionally, Audi provides a number of luxury features, like an electro-mechanical tailgate drive and a luggage retainer set.

Light and spacious: The interior

The ambience inside the new A4 Avant is light and spacious. The legroom in the back measures 895 mm – the best figure in the premium midsize segment. The same goes for the headroom of 971 mm. The interior reflects Audi's traditional strengths – a noble impression, uncompromising quality of workmanship with attention to every detail, and logical, intuitive operation.

The cockpit is driver-oriented, with the centre console tilted by eight degrees to the right. In the design of a great many details, the A4 Avant has taken cues from the larger A8. The instruments bear the classic Audi look, but have been newly-developed.

Thanks to the new electro-mechanical parking brake, the manual parking brake lever was no longer necessary. Even the standard climate control system is a completely redesigned component. It supplies 10% more cooling capacity, yet operates 20% more efficiently than the previous system – thus saving up to 0.2 litres of fuel per 100 km.

Slipping into the ergonomic perfection of the seats of the new A4 Avant provides you with yet another typical Audi effect – you feel at home from the first moment on. Also, when it comes to safety, Audi has raised the bar: The adaptive airbags and two-stage belt force limiters have been even more finely tuned, providing even better protection for passengers. The backs of the front seats and the head restraints support the upper body in case of a rear impact. This integral headrest system has received high praise in independent tests.

The engines: More performance, greater fuel efficiency

The new Audi A4 Avant will be launched with two powerful and smooth-running direct injection engines – a 1.8 TFSI and a 2.0 TDI - both of which utilise turbocharger technology which provides high torque. A continuously variable multitronic transmission delivers the engine torque to the wheels for both variants.

The newly developed four-cylinder 155 kW 2.0 TFSI with quattro and S tronic will be available in Australia in Quarter 2, 2009.

Completely new: The dynamic suspension

The dynamic suspension of the new Audi A4 was redesigned from top to bottom.

The pivot bearings and the five links per wheel making up the front axle are made of aluminium, just like the front crossmember, which gives the front end of the body more rigidity. The steering box is located far to the front and deep down so that the steering impulse can be led directly to the wheels via the tie-rods. The rack-and-pinion steering provides an immediate feel for the road, and its highly efficient servo pump improves fuel consumption by about 0.1 litre/100 km.

For the rear axle, Audi applied the track-controlled trapezoidal link principle of the larger A6 and A8 series. For the most part, the suspension is made of aluminium; the separate layout of the springs and shock absorbers produces subtle responsiveness.

The new A4 Avant will roll off the production line on 16-inch alloy wheels as standard. Behind these wheels are powerful brakes; the front disks are ventilated. The electronic stabilization program (ESP) can be partially disabled when driving below 100 km/h.

A number of innovative technologies make the driving experience even more dynamic and exciting. The modular Audi drive select control system accesses those technology components which affect the driving experience. It influences the engine's gas intake and the power steering assistance provided. With the push of a button, the driver decides if these components are to operate in a comfortable, medium, or sporty mode. If the car is equipped with the MMI operating system, a fourth mode is available, which the driver can individually program.

In connection with Audi drive select, there are two additional modular components. One of them is an adaptive controller for the shock absorbers that is linked to a sports suspension which lowers the body by about 20 millimetres. The second component is Audi dynamic steering, which operates using a superposition gear. Depending on the driving speed, it varies the steering ratio continuously. In the limit range, it works with ESP to stabilise the new A4 Avant with small lightning-quick steering interventions. The system is also extremely useful when understeer occurs and when braking when traction is only available on one side.

The leading-edge Audi dynamic steering system far surpasses solutions offered by the competition. Audi drive select can be ordered with dynamic steering, damper control or both.

Even greater supremacy: The assistance systems

Upon request, Audi equips the new Avant with a wide range of high-tech systems which are derived from the luxury class and make driving an even more supreme and relaxed experience. These include the Audi parking system, a parking aid available in three versions, the lane-departure warning system Audi lane assist and Audi side assist, which warns of hazardous lane changes. By way of automatic acceleration and deceleration,

adaptive cruise control maintains the preselected speed, taking the distance to the vehicle in front into account.

The Audi A4 Avant also sets new standards in one of the most fascinating technical fields of the future – multimedia. The Audi Music Interface (AMI) is available for the audio systems concert and symphony. This fully integrates an iPod with all its functions.

The epitome of hi-fi enjoyment is the sound system by the luxury Danish brand Bang & Olufsen: 505 watts of sound power, controlled through 10 active channels, supplying 14 speakers.

The broad range of options includes luxury-class features such as the advanced key which allows keyless vehicle access, the new high-beam assistant, and the dynamic cornering light system known as adaptive light. The large panoramic glass roof with an area of more than 0.8 m2 bathes the interior in a refreshing wave of light and air.

At a glance

The new Audi A4 Avant

Body

- Length 4,703 mm, width 1,826 mm, height 1,436 mm, Cd value 0.31
- Low weight, sporty-athletic lines
- Roof rails standard

Cargo space

- Cargo capacity from 490 to 1,430 litres
- Reversible cargo floor, comfort cargo cover and partition net, standard
- Many practical details as standard, with optional electro-mechanically operated tailgate

Interior

- Generous amount of space on all seats, with a great many storage solutions
- Unsurpassed ergonomics, with optional MMI operating terminal
- Innovative safety concept based on new interaction of airbags and belt force limiters

Powerplants

- Two powerful engines with direct injection and turbocharging and multitronic transmissions
- Fuel consumption reduced by an average of 10 percent

Suspension

- Dynamic suspension with long wheelbase and front suspension moved forward
- Optional dynamic handling system Audi drive select in conjunction with dynamic steering and/or adaptive damper control

Full version

The exterior design

The most explicitly sporty wagon in the midsize class and, at the same time, the most beautiful – the new Audi A4 Avant exudes dynamism and athleticism. Its architecture of new proportions is charged with strength and emotion, and underlines the leading position Audi occupies in the area of automotive design.

With its length of 4,703 mm, and a width of 1,826 mm, the new Audi A4 Avant clearly surpasses its most important competitors, while it stays below them in height (only 1,436 mm with standard roof rails).

These sporty proportions follow the premise of elevated dynamics. Compared to the predecessor, the new A4 Avant has been extended nearly 12 cm in length and 6 cm in width, while, at the same time, the front overhang was shortened and the hood and wheelbase were extended. The new A4 Avant not only provides you with a higher degree of stature, but also with more power than its predecessor.

The body: Sculpted in one piece

In the new A4 Avant, the Audi designers have reinterpreted classic themes from the range of shapes used by Audi. The result is a focused, taut design – a personality with self-assured carriage. The exterior seems as if sculpted in one piece. The front of the wagon and the passenger compartment merge with one another. The coupe-like, early sloping roof line turns the entire silhouette into a flow of elegance, while dynamic lines frame and emphasise curved sculpted surfaces. In its precision, the design conveys the objective of uncompromising quality to which Audi is committed.

The front end of the new Audi A4 Avant underscores the image of self-confidence. Compared to its predecessor, the single frame is wider and lower. The grille is finished in stone grey.

The headlights are slightly angled from the top by the hood, and their curved lower contours accent their elegance. The elaborate design of the headlights emphasises their complexity – Audi presents technology as a work of art.

Depending on version, the headlights differ by a few details. Especially eyecatching are the chrome finished “wings,” which differ between the halogen and the xenon plus headlights. On the halogen lights, the wing shapes a second, short wing, while the xenon plus units are embedded in a single curved wing.

Both versions feature the daytime running lights. With the halogen lights, it is generated by incandescent bulbs, while the xenon plus headlights each have 14 integrated white LEDs, which have a total power consumption of only nine watts.

The daytime running lights, which were pioneered by Audi, not only represent a significant safety technology, but a consistent styling characteristic; they give the

face of the new Audi A4 Avant its unmistakable expression. All engine versions share halogen fog lights integrated into the air intakes in the lower front end.

Poised power: The side profile

The profile of the new Audi A4 Avant also conveys the impression of forward-urging power. The long, powerful hood and the correspondingly set-back passenger cell paint the picture of dynamic energy. Typically for the Audi look, the vehicle body accounts for two thirds of its height, the remaining third is reserved for the greenhouse.

The flow of elegance results from the roof line which descends early, as on a coupe, giving the D posts a relatively steep angle. Between the sides and roof there is a barely visible zero-gap joint – a connection focusing the high degree of Audi-inherent precision in body design and production. The “feature line,” a slightly slanted edge of the roof contour, gives the window area a flat and elongated impression.

In the side view, a sophisticated interplay of ascending and descending lines produces a dynamic feel without interfering with the overall balance. The sill area is the foundation, with the dynamic line above it extending all the way to the rear of the car. It rises toward the rear in a sweeping curve, thus shifting the visual centre of gravity to the middle of the new Audi A4 Avant.

The tornado line, on the other hand, which is just below the windows, descends toward the back. Accented by a distinct seam, it projects beyond the front and the rear wheel wells like a line drawn by a steady hand. The “feature line,” a slightly slanted edge of the roof contour, gives the window area a flat and elongated impression.

Sturdy door handles, large exterior mirrors with integrated LED turn signals, striking wheels and accentuated wheel wells underscore the impression of focused energy. A subtle spoiler along the roof edge adds a visual highlight; the standard roof rails, crafted of aluminium extruded section, are available in silver or in black.

To maintain optimal aerodynamics and harmonize with the elegant visuals, the two rails are of a low profile and sit directly on the roof.

The tailgate design presents yet another exercise in subtle sportiness. The vertically-segmented, inward pointing light assembly emphasises the vehicle width and creates a visual connection to the road, with the reflector technology providing a sense of depth.

When lit, the band-shaped tail lights generate flat light rings. The tornado line and the dynamic line traverse the tailgate and, in this way, underline the horizontal dimension – and thus the width of the A4 Avant.

A dark gray diffuser forms the lowermost part of the car. In the four-cylinder models up to 118 kW, the exhaust system ends in a dual tailpipe. The pipes are straight in both models, an indication of the sporty and clean nature of the Audi TDI powerplants.

The body

The body of the new Audi A4 Avant is quite something: Thanks to new high-tech materials and processes it is stiffer and safer than its predecessor, while its weight has been reduced considerably even though it is longer and wider. With a drag coefficient of 0.31, the Avant virtually glides lightly through the wind.

For midsize class standards, the new Audi A4 Avant is unusually sizeable and spacious. With it long wheelbase of 2,808 mm it clearly beats the competition. The generous interior space, the high degree of stability, and the supreme straight-line stability all benefit from this long wheelbase.

Moving the front axle forwards was what made this long wheelbase possible. This was facilitated by moving the differential 154 mm forward directly behind the engine – in fact, it switched places with the clutch (or the torque converter). This solution also allowed for the subtly balanced distribution of the axle loads – thus providing for the driving excellence that captivates in the new Audi A4 Avant. For the same reason, the battery was moved into the cargo area.

Lightweight steel construction: curb weight only 1,510 kg

One of the great strengths of the new Avant is its low weight – benefiting both sporty driving qualities as well as low fuel consumption. In its 1.8 TFSI multitronic configuration, the new A4 Avant only weighs in with a total of 1,510 kg. An important reason for this is that the steel body is built extremely lightweight – although much larger than its predecessor, it is almost nine percent lighter.

A prime example of the new technologies applied by Audi in the body structure are the hot-formed ultra-high-strength steel materials. On the new A4 Avant, they are utilised principally in those areas where only minor deformation is permitted – for example reinforcement of the center tunnel, the inner sills, the B posts and the firewall transverse beams in the engine compartment. In hot forming, boron alloyed steel plate blanks are heated in an oven to about 950 °C and then formed in cooled presses while being quenched. The molecular structure created in this way features a tensile strength of up to 1,600 Megapascal.

These steel components already make up 11 percent of the weight of the bodyshell of the new A4 Avant. 22 percent are higher-strength and ultra-high-strength steel, 29 percent are high-strength steel, and 38 percent conventional deep drawn steel. The bonding techniques employed also reflect the state-of-the-art body structure. As well as conventional resistance spot welding, Audi relies on a sophisticated structural bonding agent in many areas. This bonding agent increases the stability of the connection and thus improves the rigidity and crash characteristics of the body structure.

In addition, Audi employs two further sophisticated joining technologies. Laserbeam welding is used for the sill area and the doors. In the visible area of the tailgate rain duct, as well as the zero-gap joint between side element and roof, the relevant components are joined by plasmatron brazing. Here, Audi’s high-tech character and quality approach are evident, complemented by close joins throughout the body.

The highest standard possible: Occupant protection

Occupant protection also reaches the highest possible standard in the new Audi A4 Avant. For this development, the brand makes use of the broad knowledge base acquired from its own research: All over the world, the AARU (Audi Accident Research Unit) looks into actual accident situations and evaluates relevant databases.

In a frontal collision, the new A4 Avant protects its occupants with an exactly planned sequence of measures. Already at the onset of the crash, two acceleration sensors located below the headlights are activated. The front cross-member distributes the forces to the side members, which, thanks to their carefully designed deformation, absorb this energy. The aluminium subframe diverts the forces and moments in a controlled manner into the floor and tunnel structure of the occupant cell. The steering column can be deformed backwards by up to eight centimetres, while the main elements of the pedal assembly can be released from their mountings.

In a head-on crash, small people are still at considerably greater risk than tall occupants. Audi has therefore networked the occupant restraint systems more closely together than on any midsize car produced so far.

Sensors on the seat rails check the front seat position; this way, the computer can calculate how far the seat occupant is from the airbag and can ensure that the amount of forward movement – during which the seat belt and airbag can restrain the body – is optimally utilised.

The airbags in the new Audi A4 Avant are adaptive and operate based on a new strategy: They always inflate fully. If the control unit assesses the situation as relatively harmless – that is if the impact is not too violent and the seat occupant is sitting close to the cockpit – part of the gas from the airbag is discharged again through valves, so that the head and chest of the occupant are restrained relatively gently. If the crash is severe, the airbags remain fully inflated for longer. The same takes place if the impact is not very strong, but the passenger is sitting so far back that her or his torso would whip forward with great force.

Even more safety: Adaptive belt force limiters

The seat-belt force limiters also use an adaptive operating principle, with two integral torsion bars linked by gear wheels. In a less critical situation, the torsion bars are separated at an early stage in the accident. This gives the belt a greater range of movement – the torso plunges relatively deeply into the airbag and the load on the chest is reduced. In a more severe crash situation, however, the torsion bars are either disconnected later or not at all – the seat belt restrains the passenger more firmly.

In the event of a side-on impact, acceleration sensors in the C posts and sensors in the doors trigger the alarm. The B posts, the sills, and two cross-members in the floor take on most of the deformation work. This is aided by the doors, whose edges generously overlap the posts, sills and roof frame, and can therefore bear against them. Using their hinges, the door support members transfer the forces into the B posts.

Inside the car, occupants are protected by seat-integrated sidebags with a volume of 13 litres for the front seats (sidebags with a volume of 12 litres are standard for the rear seats), and large windowbags (25.5 litres). Furthermore, driver and front passenger in the new Audi A4 Avant are effectively protected by variable height seat belts, head restraints with a generous amount of vertical adjustment, and anti-submarining ramps in the seats. A sensor recognizes if the passenger seat is occupied.

Rear-end collisions also lose much of their injury potential in the new A4 Avant.

The side members and the rear subframe absorb the kinetic energy by deforming, while the rear wheels make contact with the body sills if necessary. The seats and head restraints are designed so as to protect the upper body of front seat occupants safely against a whiplash impact from the rear. This integral head restraint system has already been highly praised in independent tests. In case of severe rear-end collision, the seat-belt tensioners are triggered so as to firmly hold the occupants in the best position in their seats.

The new A4 Avant is one of the very first cars to comply with all the new Japanese and European legal regulations concerning collisions with pedestrians – aided by foam material ahead of the bumper crossmember, deformable sheetmetal zones and front fender mountings designed to yield on impact. And in the standard insurance-category crash test, with the car striking a barrier at 15 km/h and 40 percent overlap, the body structure suffers no damage.

Rigidity: Basis for comfort and dynamics

The rigidity of the new Audi A4 Avant's body is the basis for the peaceful ride, with virtually no unpleasant noise or vibration. At the same time, the rigid body shell is the key to the car's outstanding road behavior – ensuring smooth running and sporty precision in its handling.

In terms of the so-called global dynamic rigidity of the A4 Avant, the Audi engineers were able to significantly improve the already excellent values achieved by the previous model, with one of the top development priorities being the overall homogenous characteristics of the body.

In all those places where the driver and passengers could experience vibrations – at the steering wheel, on the floor pan in the foot area and on the seats, the level of vibrations was again lowered.

One challenge for the development engineers was that of offering the customer the same high levels of vibrational and noise insulation and comfort if a panoramic sunroof is selected. In its basic version, the panoramic roof would lead to reduction of body rigidity and a deterioration in the qualities named above. In the A4 Avant, however, the panoramic sunroof is fixed rigidly to the body by means of a reinforcing frame. This not only secures the roof module compactly, it also considerably improves acoustic comfort. A great degree of focus was placed by the engineers on local rigidity as well. All locations where driving operations produce interference and vibrations have been

targeted for reinforcement, such as the connection of the front suspension crossmember to the wheel suspension and the body. The front crossmember, for example distributes the frequency impulses from the wheels into a multi-element structure consisting of the side members and tunnel elements – thus greatly reducing the tyre roll noises in significant body areas.

Perfect peace: The aeroacoustics

The new Audi A4 Avant is a very quiet car that glides as smoothly through the air as a full-size sedan. With intensive detail work, wind roar – the biggest source of noise above 120 km/h – was significantly reduced below the level on the previous model. An important development tool in this work was Audi's extremely quiet aero-acoustic wind tunnel.

In the basic version, the new Audi A4 Avant achieves an exemplary drag coefficient of 0.31, significantly less than the previous model (0.33). Even though the wider body increases the frontal area from 2.14 m2 to 2.20 m2, overall drag has been reduced by two percent. 40 percent of the total drag of a car usually depends on the underfloor. By providing a nearly full underfloor coverage, the aerodynamicists succeeded in reducing the drag coefficient by 0.039. This result, in turn yields higher performance and lower fuel consumption – CO2 emissions are reduced by about 4.8 grams. At the same time, the plastic underfloor panels also protect the sheet metal and the mechanical assemblies against salt, moisture and stone impact.

The cargo area

Beautiful wagons are called Avant – intelligent and practical wagons as well. The new Audi A4 Avant once more offers a meticulously thought-out cargo area concept. The basic measurements alone impress with their generosity. The length of the loading space is 1.03 metres and the load-through width is exactly one metre. Two golf bags can be stored across. The volume is 490 litres for versions with front-wheel drive and quattro drive – unmatched in its field of direct competitors.

A characteristic Audi feature is the elaborate design of the cargo area. It is lined in its entirety with high-quality velour carpeting. Four strong lashing eyes in the floor are standard. The two hooks in the upper sides are made of chrome-plated metal. The precision with which they can be adjusted exemplifies the uncompromising quality standard of the brand with the four rings, which extends to even the smallest of details.

Beneficial for everyday use: The low loading edge

Due to its low loading edge – covered with a protective stainless-steel rubbing strip – and straight side walls, the cargo space is extremely practical. A storage compartment with horizontally adjustable net and a 12V outlet are convenient details for the sporty and active A4 Avant customer. The tailgate opens high enough for people up to a height of 1.89 metres to stand up under it. It can be closed with a single motion – the integrated handle is wide enough so that it can be immediately located.

The rear backrest in the new Audi A4 Avant is split at a ratio of 1/3 to 2/3, with an optional load-through hatch with removable ski and snowboard bag. The rear seats are folded down with two motions, whereby the head restraints can stay where they are. The extended cargo area has a volume of 1,430 litres and length of 1.77 m, an increase of four centimetres.

The protective partition net and the cargo cover are stored in separate compartments – a solution for easy handling of both. For the roll-up cargo cover, Audi devised an especially clever technology. When the tailgate is open, the so called convenient cargo cover, powered by a spring, automatically lifts along special guides within the D posts toward the headlining once it is lightly touched. It can later be pulled down again comfortably, without having to lean back into the cargo space. In addition, the rolling cover may be operated horizontally in the usual manner.

Aside from a roof railing, the reversible mat which covers the rear portion of the cargo space is another standard convenience. Its upper side is in exclusive velour, while the reverse side is shaped as a rugged, easy-to-clean dirt-resistant tray – the ideal place for wet ski boots and the like. Integrated into the reversible cargo floor are two practical handles on the side, so that wet shoes – or shopping bags – can be carried into the house like on a large tray. Or the picnic to a nearby pasture. Below the reversible cargo floor are located the battery, the tool set and the emergency wheel. As an option, Audi provides a reversible mat with an integrated fold-out protector that can be pulled down over the bumper.

Luxury special: Electromechanically operated tailgate

Life with the new A4 Avant is made even more comfortable by new luxury technologies available upon request. Opening and closing of the electromechanically operated tailgate is performed by electric motors in the hinges; they are controlled by the remote control car key, the electric handle in the tailgate itself, or by a button in the driver's door. To close it, a switch on the tailgate underside is activated.

The required opening angle is infinitely programmable, which avoids collision with low garage ceilings and accommodates smaller persons as well.

Optionally, Audi provides the so-called cargo space package which includes a luggage retainer set for smaller luggage items. There are two rails along the walls of the cargo space into which a telescopically extendable load lock and a spring-loaded belt can be hooked. This way, the cargo space can be divided up as required, horizontally or even at a slant.

To complete the scope of offerings, there is a trailer hitch, as well as various racks for transporting bikes, snowboard and skis on the roof.

The interior

More space, comfort and sporty elegance – the ambience on board the new A4 Avant is bright and spacious. It meets you with distinguished visual details; as usual in an Audi, no compromises are made in the quality of workmanship, and the controls can be understood and operated intuitively. Once you take a seat inside the new A4 Avant, you experience a typical Audi effect – a feeling of being absolutely at home there from the very first moment on.

The interior of the new A4 Avant is tailored like a sporty suit. Compared to the previous model, the interior is distinctly larger in every dimension: 20 mm longer to a length of 1,758 mm. The rear passenger head room has increased 15 mm to 971 mm, and the leg room in the rear was extended 16 mm to 895 mm.

The rear seats, notable for their sporty comfort, leave plenty of space for occupants' feet under the front seats. Cup holders in the doors can even hold large one-litre bottles. The rear footwells are illuminated, and a fold-out center armrest provides extra comfort – the interior of the new Audi A4 Avant is a convincing testimony of elegant functionality.

The front seats are also equipped with many pleasant features. In addition to the bottle holders in the large door pockets, there are two more cup holders on the centre tunnel, a holder for sunglasses, a parking ticket clip and a large glove box. An optional storage package includes two compartments under the front seats, nets on the front-seat backs, and a cup holder in the rear armrest.

As an alternative to the open compartment, for the front seats there is a centre armrest that can be moved forward and back and varied in height, and which includes a storage compartment and two 12V power sockets. As a further option, the rear socket can be changed for one with a 230V output – 110V in some countries. The thickly padded armrest element is of particularly generous dimensions because the new electromechanical parking brake eliminates the need for the conventional handbrake lever.

Perfect integration: The front seats

Installed low down and crafted with ergonomic contours, the front seats integrate the driver and passenger perfectly into the car's sporty ambience. Height adjustment is a standard feature of these seats, and their head restraints may be moved well up.

Optionally, Audi offers an electrically operated version with adjustment of seat height, forward/back movement, and seat-back angle. The four-way lumbar support is operated electrically as well. There is also a memory function available, along with seat heating which can be controlled in six stages – a typical Audi feature. The sports seats have boldly contoured side sections for firm support. The angle of the seat cushions can be adjusted and extended forwards, and the fourway lumbar support is standard. The air-conditioned comfort seats in the front are the highlight of the seating range – with their sophisticated technical features, controlled by the MMI operating system, they introduce the luxury of the full-size class to the A4 Avant.

They are upholstered in perforated leather and have small fans with six speed settings to ventilate the seat back and seat cushion. To avoid any risk of the seat occupant catching a chill, there is an automatic auxiliary heating function.

The air-conditioned comfort seats can be ordered in Milano leather and are available in the colors black, pale gray, cardamom beige and mustang brown. If Valcona leather is chosen, Audi offers these colors with the additional option of luxor beige. Standard seats are upholstered in Milano leather.

Intuitive to the touch: The operating elements

The new A4 Avant also sets the standards for ergonomics – as one would expect of an Audi. The sporty, clean exterior lines are consistently continued on the inside. The Audi designers succeeded in creating the man-machine interface in an elegant and intuitively clear fashion.

The driver's left hand instinctively drops to the short, sporty gear knob, and the positions and angles of steering wheel and pedals are as if individually tailored for maximum convenience. The steering column can be adjusted 60 mm axially and 50 mm vertically.

The standard multifunction steering wheel has four spokes. These wheels have selector drums and pushbuttons for operating the functions of navigation system, radio, car phone, and speech dialogue system. On the A4 Avant with automatic transmission, shift paddles located behind the steering wheel are available as an option.

Driver orientation: Centered around the person at the wheel

The cockpit has a definite bias toward the driver, so that all functions are turned toward the person behind the wheel. The centre console is inclined by eight degrees toward the driver. Complex graphics and the clear layout of the various zones communicate the athletic power and lightness that can be felt in every aspect of the new A4 Avant's character.

In many details, the new Avant has the sophistication of the A8 luxury sedan. All switches, for example, have short travel and lock into place when a defined amount of force is applied to them. The rotary knobs move as smoothly and precisely as the mechanism of a fine watch, and their 'click' is the sound of pure technical perfection. The instrument cluster, although it is a completely new development, presents the classic Audi design elements.

In every Audi A4 Avant, a 6.5-inch colour monitor is standard. This large display screen displays information from the audio and air conditioning systems as well as from the CAR menu, where the customer can configure many functions of their new A4 Avant. The large switches and pushbuttons of the standard audio system Concert with CD drive and MMI operating logic are ideally accessible just above the automatic climate control system – also standard – in the centre console.

If your new Audi A4 Avant has DVD-based navigation, it also comes with Audi's MMI system which can be used to control the navigation, information, CAR menu, set-up, telephone, directory, CD/TV and radio functions in an elegant, intuitive fashion. All information is shown on the large monitor. In combination with the high-end installation, the DVD navigation system, a 7-inch color screen is provided.

Advanced comfort: The electromechanical parking brake

Close to the MMI buttons, there is another large switch – it controls the new electromechanical parking brake, another luxury-class solution. Like the conventional handbrake, the parking brake's function is to prevent the car from rolling away. If the conventional brake system should fail, there is also an emergency brake function integrated into the electromechanical parking brake with a retardation rate of eight m/s2, scarcely less than a full brake application. In addition, the integrated drive-off assistant supports the driver when the car is set in motion.

The optional Audi hold assist complements the electromechanical parking brake and provides assistance to the driver for the duration of the journey. At a standstill, it prevents the Avant from moving. To drive off smoothly on a gradient, all the driver needs to do is to engage the clutch, which is detected by a sensor at the pedal. The computer

assesses the selected gear, the gradient angle and the engine data and thus manages the drive-off procedure.

The standard climate control system in the A4 Avant is an entirely new development. Compared to the previous version, it provides ten percent more cooling power and still yields 20 percent higher operating efficiency; as a result, it reduces fuel consumption by up to 0.2 litres of fuel per 100 km. As an option, a luxury version is available, the comfort climate control which regulates the air temperature, airflow volume and air distribution in three separate zones.

The new remote entry key for the A4 Avant has no projecting teeth. To start the engine, it is pressed into the ignition lock. It stores service information and warning messages which simplifies and speeds up the reception procedure when the A4 Avant is brought in for service. There is also the luxury option of the advanced key. This key stays in the driver's pocket, and the engine is started and stopped using a start/stop knob on the center tunnel. The lock system releases the locks by a sensor as soon as the driver touches a door handle or the tailgate release button locks again if the sensor at one of the four door handles is pressed.

In the headlights as well, Audi offers various upgrades. The xenon plus headlights are the high-tech solution, and can be combined with the adaptive light cornering light system. In both cases dynamic headlight range control is an integral feature, which raises the beam at speeds above 120 km/h for highway driving.

Safe and convenient: The high-beam assistant

Upon request, Audi offers a newly developed high-beam assistant. It switches the high beams on and off more quickly and precisely than the human operator. In tests, it turned out that the total time driven with high beams increased up to about 20 percent. The high-beam assistant increases traffic safety and operating comfort at the same time. Using a small, light-sensitive detector in the foot of the interior mirror, the system recognises oncoming vehicles and towns by their street lighting. Then it automatically switches from high-beam mode to normal dipped lights. Once the way is clear, it returns to high-beam mode within fractions of a second. The assistant is available together with the optional light and rain sensor and the automatic anti-glare interior mirror.

The luxury-class features in the new Audi A4 Avant are based on intensive networking of control units and data buses. Audi has installed a special management system to monitor and regulate the energy consumption of the A4 Avant. The most important principle is that the battery should always have a minimum charge that is sufficient to start the engine reliably.

The engines

More power, lower fuel consumption – the new Audi A4 Avant is being launched with a choice of two powerful yet refined engines. All powerplants have direct fuel injection and turbocharging – with a correspondingly impressive torque.

With their splendid flow of power, the powerplants in the new A4 Avant deliver pure driving pleasure. At the same time, compared to the corresponding predecessors, their fuel consumption dropped by an average of ten percent – for Audi, power and efficiency always belong together.

FSI: The supreme gasoline technology

The new A4 Avant is being launched with one petrol engine. The 1.8 TFSI is offered by Audi with 118 kW.

The newly developed four-cylinder 155 kW 2.0 TFSI with quattro and S tronic will be available in Australia from Quarter 2, 2009.

With these engines, Audi is once again extending its lead in engine design – using the gasoline direct injection technology known as FSI, which is superior to anything offered by the competition. With this technology, fuel is injected under high pressure into the combustion chambers and at the same time intensely swirled. The evaporation achieved in this way withdraws heat from the combustion chambers, thus allowing for a high compression ratio which contributes significantly to a highly efficient combustion process. FSI engines develop more power and are more dynamic than conventional engines with fuel injection into the intake pipes, yet also make more economical use of fuel.

Gasoline direct injection from Audi first demonstrated its potential for superior performance in June 2001, when an engine featuring gasoline direct injection took the Audi R8 sports prototype to overall victory in the Le Mans 24 Hours. In the years that followed, the car was entered for 80 races and won 64 of them – evidence not only of the power of the engines but also of the uncompromising commitment to reliability and quality that is typical of the Audi attitude to both motorsport and production.

In keeping with its efficiency strategy, Audi has improved its FSI technology further. In the new two-litre four-cylinder engine with 155kW, it is combined with the innovative valve control technology known as Audi valvelift system. All four cylinder engines have a turbocharger, which combines their free-revving nature with high torque – an exemplary blend.

The old turbo engine problem – the high combustion chamber temperatures and the resulting knocking tendency – is resolved by using direct injection. This allows Audi to achieve a higher compression ratio in its TFSI engines, which in turn leads to improved thermodynamic efficiency.

Even better than before: The 2.0 TDI

With a displacement of 1,968 cc, the four-cylinder TDI unit is a new interpretation of the TDI concept's outstanding qualities. The two-litre unit further improves on the characteristic strengths of its predecessor – the world's most-built diesel engine – and offers customers even more driving fun, economy and refinement.

The most significant advance was engineered into the cylinder head: It now has common rail injectors instead of the previously used pump injector elements. The 2.0 TDI also features modern piezo injectors and eight-hole injector nozzles. The high precision of up to five injection strokes per operating cycle has the effect of audibly reducing the noise level. The system pressure is 1,800 bar, which results in very fine atomization of the fuel and accurate, efficient combustion. The acoustics of the timing belt have also been reworked. As in the predecessor engine, two balancer shafts reduce the vibration generated by the crankshaft. The piston geometry has also been modified.

The turbocharger is also from a new design generation. So that torque builds up more rapidly, it has adjustable guide vanes on the turbine side. Electric motors control the position of the vortex flaps in the intake pipe, which continuously adapt the incoming airflow to match engine load and speed.

As a whole, these advances have provided for a higher maximum engine speed of 5,000 rpm, and, most of all, they have improved thermodynamics in the combustion chambers. Consequently, the 2.0 TDI can operate with a rate of up to 60 percent exhaust gas recirculation and exhaust cooling; this also significantly reduces untreated emissions of nitrogen oxides.

The 2.0 TDI engine generates 105 kW and a torque of 320 Nm, which is available from 1,750 to 2,500 rpm – yet has an average fuel consumption of just 6.0 litres per 100 km.

The drivetrain

Sporty driving dynamics and a luxury-car standard of comfort – this ambitious combination of objectives was pursued when developing the driveline for the new Audi A4 Avant. Audi presents a broad choice of state-of-the-art technologies, all of which are notable for exceptional ease of control, high efficiency and precise function.

The continuously variable multitronic has undergone an extensive improvement process. The transmission is integrated into the A4 Avant's new basic layout with the differential immediately behind the engine, i.e. ahead of the clutch or torque converter.

The dynamic suspension

The dynamic suspension on the new Audi A4 Avant once again sets new standards, combining precision and dynamism with a high level of stability and a supreme sense of control. It has been entirely redesigned, with the suspension mounts, steering, wheels and brakes developed for top performance and many aluminium components used to reduce weight and thus keep unsprung mass to a minimum. The innovative Audi drive select control system makes the driving experience even more compelling.

The new five-link front suspension greatly contributes to this technical advance.

By moving the differential to the front and the clutch back, the design engineers were able to reposition the front axle 154 mm further forward. Together with the relocation of the battery into the trunk, this solution ensures an excellent front to rear axle-load balance.

Even at a standstill, the new Audi A4 Avant displays its principal personality trait: The wide stance – 1,564 mm at the front, 1,551 mm at the rear – and the large wheels round off the picture of sporty dynamism. On the road, drivers will find that the A4 Avant is the sportiest of the midsize wagons. It responds promptly and willingly to steering movements, remains stable, and when the handling limits are reached exhibits a slight understeering tendency which the driver can easily control.

A solid base: The front suspension subframe

The largest chassis component of all is the subframe for engine and front suspension. It is made of aluminium and rigidly bolted to the front end of the car – due to its high rigidity, steering forces are applied without lag. On the new Audi A4 Avant, aluminium is also used for the bearing mount that links the upper suspension control arms with the body, and for the pivot bearing.

The front suspension is made up of five links per wheel – a support link and a control arm at the bottom and two control arms at the top. The fifth link – the track rod – connects the steering box and the pivot bearing.

All these links are made of forged aluminium, which ensures low unsprung weight, provides ultra-precise wheel control and a high level of crash safety. The tubular anti-roll bar also helps to save weight.

The five-link suspension can handle longitudinal and lateral forces separately. In the lateral direction, the bearings are rigid to promote sporty precision and high cornering speeds. Longitudinally, however, they act with supple subtlety – in this way, dynamism and ride comfort go hand in hand.

Breakthrough: The low-mounted steering box

The steering system also has been thoroughly revised. The decisive step is the repositioning of the steering box. It was high up and fairly far back on the predecessor model – now it is far in front and placed low, on the subframe just below the front axle. Since the steering impulse is now transmitted directly to the wheels by the track rods, the steering response is very spontaneous. The steering column is bolted to the cross-member below the windscreen and to the bearing mount on the firewall, which further increases precision.

With an overall ratio of 16.3:1, the steering of the new A4 Avant is sporty and direct. It provides precise, well-differentiated feedback from the road, and the drive forces and jolts are barely perceptible. The front suspension kinematics provide for precise centering of the steering, which adds to the sense of steering accuracy around the straight-ahead position.

The steering – a rack-and-pinion construction – was placed in an aluminium housing. A controlled-output vane-type pump supplies the necessary hydraulic energy. Unlike conventional power-steering pumps, which circulate a large volume of oil internally, it delivers only as much fluid as needed at the time. This reduction in energy consumption lowers the fuel consumption by about 0.1 litres per 100 km.

Perfect ground contact: The rear suspension

Guiding, self-steering action, cushioning – the rear suspension in the new Audi A4 Avant has many tasks to fulfil, and it does so magnificently. Its design is based on the toe-controlled trapezoidal layout chosen for the larger model lines, combining compact dimensions with excellent ride quality and comfort. The kinematics, however, were newly developed from the ground up – this also led to the benefit of greatly limited braking sway, thus further enhancing the impression of sporty dynamism.

The backbone of the rear suspension is formed by a torsion-proof and non-flexing subframe, welded together from two longitudinal and two lateral tubes of highstrength steel. This subframe is attached to the bodyshell by four rubber mounts; these are especially firm laterally for dynamic handling, but softer in the vertical and longitudinal directions for better ride comfort. All suspension control arms are acoustically decoupled from the axle subframe by means of so-called elastomer bushings.

If sporty handling is to be combined with a high degree of comfort, the unsprung masses must be kept as low as possible. The two trapezoidal links are cast in warm-hardened aluminium; the wheel carriers are of chill-cast aluminium. The upper control arms and the track rods are of forged aluminium. The tubular antiroll bar also combines low weight with high rigidity.

The compact design of the trapezoidal-link suspension has notable packaging advantages: The cargo floor in the new Audi A4 Avant is low and flat, with a load-through width of exactly one metre. There are only minor differences between the axles in the front-wheel-drive and quattro models, such as the subframes, which for the quattro models has an additional provision for rearwheel drive.

The suspension springs no longer act on the trapezoidal links as on the previous model, but directly on the wheel arms – in this way they can react with more subtlety while being able to extend the spring travel 20 mm.

Separate spring and shock absorber mountings improve initial response. The suspension bushings use special rubber mixtures that further enhance ride comfort. As an option, Audi also supplies the new A4 Avant with sports suspension; it has firmer springs and shock absorbers, and reduces the body's ride height by 20 mm.

The joy of driving in a new dimension: Audi drive select

Audi drive select represents a breakthrough in the midsize class, which propels the A4 Avant into new dimensions. The system integrates all technical components that govern the driving experience; using a button in the cockpit, the driver can determine how sportily or comfortably the system should operate. Audi drive select is available in different versions. It can be ordered in conjunction with dynamic steering and/or shock absorber control, and integrates three systems: The engine's throttle response, the speed-dependent servotronic power assistance and the multitronic shift points can all be programmed into three main fields. The 'comfort' mode is ideal for relaxed driving on long journeys or over poor road surfaces; 'auto' is the most balanced setting and 'dynamic' the tight, firm stage where the chassis of the new A4 Avant can fully demonstrate its package of power.

Changes between the modes are made using two arrow buttons on the centre console. All such changes are performed safely and smoothly: The driver can clearly discern them but is not distracted. If the A4 Avant is equipped with the MMI operating system – and therefore has a navigation system on board – the driver has a fourth mode available, known as 'individual'. Within practical limits, this personal profile can be assembled from a wealth of possible settings. With Audi drive select, the new A4 Avant is up to four cars in one.

Continuous control: The CDC shock absorbers

The Audi drive select can be augmented by yet another innovative technology – electronically governed shock absorbers. The central element is a new high performance control unit. The computer continuously analyses the signals from 14 sensors, and calculates the current for the electronically governed shock absorbers at each individual wheel 1000 times per second.

The so-called CDC shock absorbers (CDC = continuous damping control), are gas-filled hydraulic shock absorbers whose operation can be continuously varied. An electromagnetically triggered valve regulates the flow of hydraulic fluid between the inner and outer shock-absorber tubes. A smaller flow cross-section makes the damping characteristic firmer, a larger one makes it softer. Within the mode the driver has selected via Audi drive select, the control unit employs adaptive characteristics, adapts to match the driver's style and the road conditions.

Every single driving situation requires a specific damping force. In order to keep body movements as low as possible, for example, a high damping force is required. When driving over ridges, low forces are needed, so that when accelerating the jolts are felt as little as possible by the passengers. For good ground contact and minimal wheel load fluctuations, a medium level of damping force is required, as the wheel must not be damped too much or too little. The control unit selects the optimal damping force for every driving situation. The CDC shock absorbers are joined with sporty springs, which lower the body by 20 mm.

A new level of high-tech: Audi dynamic steering

Yet another innovative technology is available in addition to Audi drive select:
Audi dynamic steering. With this feature, Audi is opening a new chapter in the history of the automobile. At the heart of the system is a superposition gear that operates with no play and modifies the steering ratio in response to vehicle speed. When cornering at the handling limits, the dynamic steering system stabilises the A4 Avant by intervening instantly with small steering maneouvres. The new technology is currently available for engines delivering 118 kW or more. The superposition gear consists of a wave gear (also referred to as a “harmonic drive”) integrated into the steering column and powered by an electric motor.

Harmonic drives have been used with a great deal of success in the robotics and aerospace industries: A harmonic drive was used for the first time in space in 1971 on Apollo 15. It was part of the single-wheel drive of the lunar rover that explored the surface of the moon. In 1997 the drive traveled to Mars as part of the Pathfinder mission, in which it was part of the “Sojourner” expedition vehicle. The drive also had a role to play when the Hubble space telescope was launched in 1990.

Tested in the proving ground of outer space, the strengths of harmonic drive technology extend to a number of important areas. The system is extremely compact and lightweight with a high level of torsional rigidity. Its lack of play allows it to operate with extremely high precision and very little friction, while transmitting immense torque with a high degree of efficiency. Audi is the very first manufacturer to take all of these brilliant characteristics – that together far exceed the solutions offered by the competition – and apply them to automotive technology.

Audi dynamic steering can vary its steering ratio in response to both the vehicle speed and the Audi drive select mode in use. Transitions are continuous and imperceptible. System involvement is very direct when parking. Drivers can cover the entire steering range in just two turns of the wheel – a maneouvre made nearly effortless, thanks to a high level of power assist.

At moderate highway speeds, the system becomes less direct and provides less power assist. At top speeds, an indirect steering ratio and low level of power assist make it easy to keep the vehicle in its lane.

Safety and driving pleasure: The countersteering effect of dynamic steering

ESP and dynamic steering work together closely to improve handling characteristics and vehicle safety. Dynamic steering supports the stability program, because it can perform a countersteering maneuver in considerably less time than the brake system needs to generate braking pressure. These rapid manouevres eliminate the need for frequent braking and generate extra smoothness and dynamism. Despite their enormous effect, drivers generally do not notice the corrections.

Fishtailing – a classic critical situation – is triggered by counterforces produced in response to sudden evasive action. Audi dynamic steering can correct for small to medium fishtailing by countersteering. Braking is not required unless fishtailing is severe, and even then, it largely serves only to provide damping.

Dynamic steering also provides assistance for understeering (when the car slides toward the outside of a curve). Steering briefly becomes less direct, very likely preventing the driver from steering beyond where the tires have adequate contact with the road surface. This function is available exclusively from Audi – none of our competitors offer it. Braking on surfaces with different coefficients of friction (known as µ-split braking) is another situation that can be difficult to manage. Higher braking forces pull the vehicle toward the side with the greater coefficient of friction. Audi dynamic steering in the new A4 Avant resolves this problem – largely on its own.

Just about all the driver needs to do is turn the steering wheel in the desired direction of travel.

Uncompromising: The brakes

A braking system designed for uncompromising performance was a point of honour for the sportiest midsize wagon. The new Audi A4 Avant comes with completely redesigned brakes that have grown by an order of magnitude over its predecessor. The deceleration potential and precision of these brakes is greatly improved: The driver senses a brake pedal whose response is both firm and precise, allowing the perfect amount pressure with very little effort.

The four-cylinder 1.8 TFSI and 2.0 TDI versions leave the factory with large 16-inch wheels on the front and rear axles (diameter: 314 mm) at the front and 300 mm at the rear). The brake pads are around 20 percent larger; the new high-performance pads combine high coefficients of friction with very little fading.

The internally ventilated front disks were trimmed down for maximum heat dissipation – a feat accomplished by ideal integration of frictional surfaces and a new design that manages without traditional cooling channels. The two halves of the disc are joined by hundreds of small metal cubes that can disperse a great deal of hot air quickly.

This is another area where Audi has saved weight - the brake disks (up to two kg when installed) and aluminium cover plates. These reductions further reduce the weight of unsprung components, improving handling and comfort. An additional benefit for customers is the design of the calipers and wheel rims. When a car is brought in for

servicing, mechanics can measure the strength remaining in the brake pads without even having to remove the wheels.

New design: ESP

ESP plays a major role in the agile, sporty impression made by the new Audi A4 Avant. This new generation of the drive stabilisation system operates on the basis of highly exact hydraulic valves that manage braking pressure with unusual precision, regulating the brakes with no detectable vibrations and without the usual, notorious shuddering. The operating concept is also new. Like before, ESP can still be completely switched off by pressing and holding a button. In this case, ESP is deactivated in all operating situations. The only systems that remain active are EDL and ABS, as well as support of μ split steering stabilization by the optional dynamic steering system, to make it easy for the driver to control the situation. In the instrument cluster, the message “ESP switched off” appears. If the button is pressed a second time, ESP is switched back on again. Now, however, a second, lower level is available. Briefly pressing the ESP button at speeds below 100 km/h allows the driver to deactivate anti-slip control, which essentially switches off engine involvement and applies the brakes at a slightly reduced level. The stabilising steering manoeuvres provided by the dynamic steering system are not affected. A monitor light switches on in the cockpit as a safety feature.

“ASR-off” mode on the A4 Avant with front-wheel drive is a huge advantage when driving with snow chains. It allows the wheels to spin – which can often be helpful – without having to switch ESP off completely. At speeds exceeding 70 km/h front-wheel-drive models automatically switch back to full ESP mode.

ESP in the new Audi A4 Avant also has further capabilities. It stabilises trailers that are threatening to fishtail by acting on the wheels of the towing vehicle, braking them individually and out of phase with the vibrations. The system activates the hazard lights during emergency braking. On wet surfaces, it wipes the film of water off the brake discs with brief, imperceptible applications of the brake pads. And, finally, it compensates for the fading effect that can arise during repeated emergency stops.

Audi engineers designed ABS in close cooperation with the developers of the brand of tyres used in the original equipment. The brake control strategy was finely tuned to allow the new A4 Avant to take full advantage of the frictional potential of its tyres.

The assistance systems

Calmer, safer driving – the innovative assistance systems on board the new Audi A4 Avant help to make your trip more relaxed. Audi is the engine driving progress in this area, equipping the Avant upon request with high-tech systems taken directly from the luxury class. These systems regulate the distance to the preceding car, help the driver change lanes and stay in lane, and assist with parking.

Over the past decades, passive and active safety systems have significantly reduced the number of accidents and lessened their effects. And Audi is taking this progress to new levels. Its novel support technologies can, like human beings, register aspects of a car's surroundings and use that information to make correct decisions and take appropriate action. Audi systems make for a relaxed, safe drive.

Although responsibility still rests with the driver, these systems support the driver's ability to concentrate by alleviating some of the stress.

From 30 to 200 km/h: ACC maintains the distance

Another assistance system that comes from the luxury car class is radar-supported automatic cruise control (ACC). It not only keeps the car traveling at any chosen speed from 30 to 200 kilometres per hour, but also maintains a safe distance from the vehicle in front. The system reacts to vehicles up to 180 metres away: its radar sensor detects any change in the distance the car is maintaining from the vehicle ahead.

If the driver wants to overtake quickly, ACC is overridden by pressing the accelerator down hard, but it stays active and returns to the previously chosen road speed and distance from the vehicle in front. If the brake pedal is pressed down, ACC is switched off completely, and then has to be selected again at the control lever (Reset). The last speed setting before it was switched off is recovered.

Doppler effect and signal transmission/reflection time: how ACC gets its measurements

The radar sensor is in a casing with a plastic lens that is installed in the decorative grille at the right of the single-frame radiator grille. The sensor scans an angle of eight degrees each side of its centerline, and has a range of about 180 metres. The four radar transceivers operate in the 76.5 Gigahertz frequency band, which is licensed for radio transmissions. The transmission is of the Frequency Modulated Continuous Wave type.

The measured values that the system needs are the frequency differences between the transmitted radar signal and the one reflected back from the vehicle ahead. Using the Doppler effect and the time taken for the signal to return, the speed of the vehicle in front and how far away it is can both be calculated. The preceding vehicle's angle from the sensor's center axis can also be determined by comparing the signals received at the four antennas. But before the relevant vehicle can be isolated from the other objects

detected by the sensors, the car's own path (the 'tunnel' within which it is moving) has to be determined as well.

This 'tunnel' is computed from signals received from the ESP yaw rate sensor and the steering angle sensor, and from radar information derived from road boundaries (for instance crash barriers) and the movements of other vehicles. The system is integrated into the CAN network that extends through the whole car; it can therefore communicate with the other control units (for example engine management, transmission or brakes) within a few thousandths of a second.

Controls and displays

The driver chooses a preferred speed according to the scale markings on the speedometer – in 5 km/h steps from 30 to 80 km/h, or 10 km/h steps at higher speeds. The selected speed is shown by light-emitting diodes on the speedometer scale; the system's status (on/off – vehicle detected) can be seen on the center display. You can select the time lapse between the vehicle in front and your own car in four stages, between 1 and 2.3 seconds; the chosen value can be seen in the driver information system.

The system's dynamic response can be varied by choosing one of three drive programs at the MMI (dynamic/standard/comfort). The system then accelerates the car or slows it down at the dynamic rate chosen by the driver. The 'comfort' setting is limited to a maximum speed reduction rate of 3 m/s2.

Lane monitoring and collision warning – Audi braking guard

The Audi braking guard is an extra safety function that is part of ACC. If there is a risk of colliding with the vehicle in front, the system warns the driver in two stages: at first with an 'early warning' gong accompanied by a visual signal on the instrument panel. At this point the ESP increases hydraulic pressure in the brake system as a safety precaution, so that if the driver brakes, full stopping power is available immediately.

If the driver fails to respond and the risk is still present, the system builds up pressure rapidly in the brake circuits. This sudden braking action only slows the car down slightly, but nonetheless causes it to suffer a noticeable jolt.

The aim of this jolt, which Audi has investigated in an extensive series of tests and found to be very effective, is to draw the driver's attention to the need for urgent action. If the driver now applies the brakes, full braking power is available without any delay, and even hesitant pressure on the brake pedal causes the hydraulic brake assistant (HBA) to make a full brake application.

The Audi braking guard is still monitoring the situation when ACC is deactivated. On the other hand, either the early warning signal or the complete Audi braking guard function can be switched off at the MMI – to comply with the Audi policy of always leaving the driver in control of the situation to the extent that they may wish.

Looking back and to the side: Audi side assist

Audi side assist also makes use of intelligent radar technology. The system was designed to warn drivers of dangerous situations when changing lanes. Two radar sensors located in the rear bumper operate at 24 GHz, monitoring a space of up to 50 metres in width to the side and rear of the new Audi A4 Avant. A high-speed computer analyses the data.

Any time another vehicle going roughly the same speed moves into the blind spot or a vehicle approaches rapidly from behind, a yellow LED display lights up in the housing of either the left or right exterior mirror and remains lit. This warning signal is designed to be unobtrusive so as not to disturb – drivers do not see it unless looking directly in the mirror.

The LEDs brighten and begin flashing rapidly for roughly one second if, despite the initial warning signal, the driver signals a lane change. A series of tests conducted by Audi has shown that this flashing light is nearly impossible to overlook, because the human eye is extremely sensitive to changes in contrast in our peripheral vision.

This visual display is located on the inner surface of the mirror housing so that the driver is virtually the only one who can see it. The brightness of the display adapts to the surrounding light and can also be adjusted from the MMI operating terminal. The system is activated at speeds greater than 60 km/h and can be deactivated by pressing a button.

Audi lane assist: Risk-free lane changing

A third luxury-class, high-tech assistance system is also available in the new Audi A4 Avant: Audi lane assist. Audi lane assist operates at speeds greater than 65 km/h, warning drivers if they are about to leave their lane unintentionally. A small black-and-white camera located above the rear-view mirror monitors the street in front of the car; the lens of this camera is designed to cover a distance of 60 metres and a spread of 40 degrees. A powerful computer detects boundary and lane lines and prescribes the position of the vehicle with respect to these lines.

Any time the driver approaches one of these lines without signaling, Audi lane assist sends a warning vibration to the steering wheel. The intensity of the vibrations and the point at which they are activated can be configured at one of three levels via the MMI. Audi lane assist can also be switched off. If the boundary lines are difficult to detect, a display in the instrument cluster will indicate that the system has been activated but is not yet ready.

The APS systems: Parking made easy

Audi has included three parking assistance systems in the equipment package for the new A4 Avant that make parking easy. The familiar, successful Audi parking system advanced (APS) uses an audible signal to indicate distance to the rear. APS plus comes with front and rear visual displays, as well as eight ultrasound sensors in the bumpers.

Audi parking system advanced with its integrated rearview camera is the high-tech solution. Incorporated into the trunk lid and extremely sensitive to light, this camera contains a fish-eye lens providing a generous, 130-degree view of the area behind the car. The images generated by this camera are equalized and displayed on the MMI operating system monitor.

The system also guides the driver with a variety of suggested lines and fields. The image from the camera also shows the optional trailer hitch, allowing the driver to line up the Audi A4 Avant exactly with the trailer drawbar. In addition to realtime mode, APS advanced also offers the classic features of a visual/acoustic parking aid, aided by ultrasound sensing technology.

Multimedia systems

The Audi A4 Avant is also raising the bar in the midsize class in one of the most exciting of cutting-edge technologies – multimedia. It is being launched with an attractive array of communication and entertainment technologies.

The Audi A4 Avant comes standard with a powerful audio system. A member of the newest generation of Audi audio systems, the Concert system operates via a 6.5- inch color display. The user interfaces for both radios are based on MMI logic – a highly praised system consisting of a rotary pushbutton and large, intuitive buttons.

Audi Concert radio systems include an optional lifestyle feature that points the way to the future of transportable music: Audi music interface (AMI). AMI allows the customer to hook up an iPod to the system, incorporating it along with its entire user interface structure. The iPod menu structure (including playlists and information) appears on the on-board display and can be navigated through the radio or the optional multifunction steering wheel.

The AMI makes it possible to hook up a fourth generation iPod, while a separate adapter cable allows users to connect any audio player of their choice having a USB 2.0 interface. The AMI software is modular in design, with individually stored drivers responsible for communicating with players and reading their protocols. New driver updates can be installed quickly and easily any time a new player comes onto the market.

The concert radio operates with a dual tuner: Two tuners process signals before these proceed on to a digital processor. One of the tuners processes music while the other works in the background, scanning for stations that are clear enough to receive. This technology can pull in even the weakest of stations, because it can combine its receivers

in such a way that the two antennas of the A4 Avant operate like a beam antenna. Audi radios are true all-rounders – even without the AMI interface and dual tuner – it has a CD drive and an SD card reader (SD = Secure Digital) for audio files, and both can also play music in MP3 or WMA formats.

Bluetooth: The intelligent phone

From the concert equipment series, Audi has developed a cell phone (Bluetooth) interface that integrates the phone into the radio operating system with the option of voice control. Bluetooth is compatible with both Navigation and the Concert audio systems. It is integrated seamlessly and is operational via the MMI or the steering wheel mounted controls.

MMI: Navigation system and luxury user interface

The next two major levels in the equipment package incorporate the navigation systems, which are controlled in their entirety from the MMI user terminal. An extremely fast fibre optic cable links the components behind the user interface, while a special gateway acts as an interface with the rest of the vehicle control units.

In addition to a CD changer, the full optional Navigation version – a navigation system with a DVD drive and MMI system – offers a dual tuner and seven-inch color display. Navigation information is provided by a fast, powerful DVD drive. Voice recognition, an AMI interface and a TV tuner capable of receiving digital TV programs (DVB-T) are also available for the high-end system upon request. The system comes with a four-channel speaker system.

Audi offers an excellent sound system for its concert radio system: 180 watts of system power and 10 speakers give the Audi sound system impressive, well-balanced surround sound. In addition to the eight standard speakers, this system also includes a centre speaker in the instrument panel and a 260 mm subwoofer in the rear shelf. An extensive variety of settings are available for customising the systems.

Pure delight: The Bang & Olufsen sound system

The pinnacle of sound system technology and acoustics, Bang & Olufsen – once available only in the A8 luxury sedan – can now bring pure listening pleasure to drivers of the A4 Avant. Brilliant sound quality, faithful resolution, precise staging and a broad, finely differentiated frequency spectrum – the product of these Danish sound specialists will meet every demand.

Audi and Bang & Olufsen have come together as partners in pursuit of the same objectives. Both companies place a premium on the most modern technology available, intuitive operation and classic, technoid design. Furthermore, both manufacturers are experts when it comes to materials, quality craftsmanship and working with aluminium (which Bang & Olufsen uses in its speaker covers).

The heart of the Bang & Olufsen sound system is a 505W amplifier that digitally processes signals according to a proprietary surround-sound algorithm, guaranteeing pure listening satisfaction for everyone in the car. The numerous settings options include four different sound modes. Included in the system is a microphone for analysing the noise level within the A4 Avant; the system then changes the frequency, adapting the signal output to ambient sound conditions.

The Bang & Olufsen sound system includes 10 active channels with 14 speakers. Two three-way systems are found in the front (each including one speaker in the door, mirror triangle and instrument panel); two speakers are located in each rear door. The acoustic choreography is rounded out by a centre speaker in the instrument panel, a 260 mm subwoofer in the spare wheel well and two surround-sound speakers.