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October 2008

## The new Audi S4 and S4 Avant

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Appendix: Technical data

**The equipment, data, and prices specified refer to the models offered in Germany. Subject to amendment; errors and omissions excepted.**

Short version

## **Well-trained top athlete Audi S4 and S4 Avant**

**Faster, further, more agile: the new Audi S4 and S4 Avant are well-trained athletes. Their new engine, the 3.0 TFSI, combines the power of 245 kW (333 hp) with an astonishingly low fuel consumption of 9.7 (Avant: 9.9) liters per 100 km (24.25 US mpg or 23.76 US mpg for the Avant). The quattro permanent four-wheel drive system ensures practically loss-free transfer of this power to the road; a sports suspension and a high-performance brake system control it reliably. The dynamic look outside and in, together with the generous range of standard equipment, underline the exclusive character of both new S models from Audi.**

**The S4 and the S4 Avant are extending their lead even further with a package of optional performance technologies. The seven-speed S tronic changes gears with lightning speed without any interruption in the power flow and the new sport differential distributes the torque as needed between the rear wheels. With Audi drive select the driver can alter the working mode of the engine, S tronic and the sport differential as desired; dynamic steering and adaptive damper control round off the system. Delivery will commence in March; the basic price is very attractive at 50,950 euros (for the S4 sedan).**

The 3.0 TFSI, the heart of the new S4 and S4 Avant, is the youngest member of the Audi V-engine family, and is an outstanding example of how the brand with the four rings blends performance and efficiency. The V6 generates its power from a displacement of 2,995 cc, is equipped with a supercharger, and delivers 245 kW (333 hp). The sedan sprints to 100 km/h (62.14 mph) in just 5.1 seconds, the Avant in 5.2 seconds. They both have an electronically governed top speed of 250 km/h (155.34 mph).

Equally impressive is the mighty pulling power of the 3.0 TFSI – its maximum torque of 440 Nm (324.53 lb-ft) is available between 2,900 and 5,300 rpm. The supercharged V6 responds spontaneously and directly to the throttle in every situation. Despite its concentrated power it proves to be incredibly frugal – the sedan requires on average just 9.7 liters and the Avant a mere 9.9 liters of fuel per 100 km (24.25 US mpg and 23.76 US mpg respectively).

The V6 channels its power through a precise six-speed gearbox, fitted as standard. As an option, Audi offers a state-of-the-art dual-clutch transmission – the seven-speed S tronic is extremely dynamic and highly efficient. S4 drivers have the option of driving in fully automatic mode or selecting the gears with paddles on the steering wheel or directly with the shift lever – all of which provide impressively quick gearshifts. The gearshift feel is dynamic, comfortable and very precise – typically Audi.

quattro permanent four-wheel drive transfers this enormous power to the road with no loss. Under normal driving conditions it sends 40 percent of the torque to the front and 60 percent to the rear wheels; if necessary it can vary distribution within fractions of a second. The quattro drive system ensures safe self-steering characteristics, high stability and excellent traction in comparison with rear-wheel-drive competitors.

### **Customized torque distribution: the sport differential**

The sport differential is the ideal complement, lending the quattro drive even greater fascination. The innovative control system distributes torque between the rear wheels in continuously variable proportions, according to the driving situation. This controlled torque intervention enables the S4 and S4 Avant to take corners even more spontaneously and directly and to retain their directional stability for even longer.

The new Audi S4 and S4 Avant are natural, well-trained athletes. Their five-link front axle and the self-tracking trapezoidal-link rear axle are of a highly sophisticated design; thanks to several aluminum components they are particularly light in weight. The low-mounted steering gear transmits the steering forces to the wheels without any lag time and gives the driver a precise and sensitive road feel.

The spontaneity of the S4 and S4 Avant is enthralling and they possess the smooth, precise reactions of a thoroughbred sports car. In the drivetrain, the differential is positioned in front of the clutch, which allowed the engine to be moved 154 mm (*6.06 in*) towards the rear compared with the predecessor model. This layout perfectly evens out the axle loads, and in addition, affords the long wheelbase of 2,811 mm (*9.22 ft*) exceptional stability.

The chassis has been given stiffer axle bearings, and the sporty tuning with firm shock absorbers puts the body 20 millimeters (*0.79 in*) closer to the road compared with the A4. Behind the 18-inch cast aluminum wheels – 19-inch wheels are available on request – sit the large-dimensioned brakes. The black-painted brake calipers – at the front with the S4 logo – grip the ventilated disks with newly developed brake pads.

Another high-end feature in the new S4 and S4 Avant is the Audi drive select dynamic driving system. It influences the throttle response characteristics, the shift points for the seven-speed S tronic dual-clutch transmission and supports the speed-dependent servotronic steering. With the push of a button, the driver decides if these components are to operate in a comfortable, medium, or dynamic mode. If the vehicle is equipped with the large version of the navigation system and the accompanying MMI operating system, a fourth mode is available, which the driver can set up according to his or her individual preferences.

Audi drive select can only be ordered in conjunction with one or more of three additional technologies – the sport differential, adaptive control for the shock absorbers or dynamic steering, which is another high-tech solution. Its superposition gear varies the ratio by almost 100 percent; in terms of driving safety, it reduces the load on the ESP stabilization program as it stabilizes the car through lightning-fast steering interventions when cornering at the handling limits.

The standard-specification tire pressure monitoring system alerts the driver as soon as the pressure drops in one or several tires and thus provides additional safety.

### **Athletic look: the design**

Both the Audi S4 and the S4 Avant look athletic and muscular on the road. Some of the most striking modifications to the exterior design are the special aprons, the aluminum-look exterior mirrors, the 18-inch light-alloy wheels in the S design, the sill trims, the restrained spoiler at the rear and the quadruple exhaust system. The xenon plus headlights with LED daytime running lights and LED rear lights are further distinctive features.

The interior also underscores the sporty expertise that is the hallmark of both new S models. The sports seats in Alcantara/leather combination come as standard with electrical adjustment. The leather sports steering wheel, the key and the instrument cluster – featuring gray dials and white needles – bear the S4 logo. The interior is in black, with matt brushed aluminum inlays. Carbon and birch wood inlays are also available, as is a new stainless steel mesh inlay. The seats are also available in a choice of styles and materials.

Optional assistance systems provide the driver with even greater control on the road. Adaptive cruise control (ACC) maintains the distance to the vehicle in front. The Audi side assist makes changing lanes safer; the Audi parking system advanced makes backing into a parking space easier.

With regard to multimedia, Audi offers an attractive technology package. The communications and entertainment technologies portfolio includes the unrivalled MMI operating system, various types of radio and sound systems all the way up to the high-end solution from Bang & Olufsen, two navigation systems, an iPod interface, and a highly convenient Bluetooth car phone.

## At a glance

### **The Audi S4**

#### **Engine (performance figures for S4 sedan)**

- Newly developed 3.0 TFSI delivering 245 kW (333 hp) and 440 Nm of torque (*324.53 lb-ft*), mechanical supercharging for powerful performance and superior efficiency
- Dynamic performance: from zero to 100 km/h (*62.14 mph*) in 5.1 seconds, top speed of 250 km/h (*155.34 mph*) (governed)
- Fuel consumption 9.7 l/100 km (*24.25 US mpg*), 27 percent lower than for predecessor

#### **Power transmission**

- Six-speed manual gearbox as standard, optional seven-speed S tronic for lightning-fast gear shifts
- quattro permanent four-wheel drive with slightly rear-biased characteristics
- Optional sport differential for variable distribution of propulsive power to the rear wheels

#### **Chassis**

- Sports suspension with firm settings, optional Audi drive select dynamic driving system with adaptive damper control and dynamic steering
- High-performance brake system with large disks and black calipers
- Wheels 18 inches in diameter, or optionally 19-inch wheels

#### **Body**

- Length 4,717 millimeters (*185.71 in*), width 1,826 millimeters (*71.89 in*), height 1,406 millimeters (*55.35 in*) (sedan), large luggage capacity of 490 to 1,430 liters (*17.30 to 50.50 cu. ft*) (Avant)
- Dynamic proportions, sporty and elegant design details

#### **Interior and equipment**

- High-quality materials with an exclusive look
- Instrument cluster with special S design
- Xenon plus headlights with LED daytime running lights and LED rear lights
- State-of-the-art assistance and communications systems available

Long version

## **The top-class athletes from Audi Audi S4 and S4 Avant**

**The new Audi S4 and S4 Avant are top-class athletes ahead of their field. Their engine, the 3.0 TFSI, delivers 245 kW (333 hp) yet consumes only 9.7 liters of fuel per 100 km (24.25 US mpg). quattro permanent four-wheel drive, sports suspension and a high-performance brake system control the power reliably. With optional performance technologies – the seven-speed S tronic, the new sport differential and the Audi drive select dynamic driving system – both new S models from Audi are extending their lead even further.**

### **Engine**

It takes just two figures to comprehend the dynamic potential of the new S4 and S4 Avant: 5.1 seconds for the sprint from zero to 100 km/h (62.14 mph) and only 4.4 seconds for the intermediate sprint from 80 to 120 km/h (49.71 – 74.56 mph) in fourth gear. Behind these figures there is a fascinating driving experience, marked by the sonorous sound of the new mechanically supercharged V6 engine, its mighty propulsive power, its free-revving character and its sharp, spontaneous response to the throttle.

The 3.0 TFSI is the new range-topping unit in Audi's V6 engine family. It develops 245 kW (333 hp) and delivers a powerful 440 Nm of torque (324.53 lb-ft) to the crankshaft between 2,900 and 5,300 rpm. The 3.0 TFSI combines two state-of-the-art technologies – gasoline direct injection and mechanical supercharging. These technologies make it a prime example of Audi's downsizing philosophy for greater efficiency, i.e. engine capacity is replaced by a supercharger.

The brand with the four rings has a long tradition of supercharged engines. The legendary Grand Prix racing cars built by Auto Union back in the 1930s already featured mechanical superchargers, which coaxed as much as 440 kW (around 600 hp) out of the mighty 16-cylinder and 12-cylinder engines. From the late 1970s on, Audi focused its attention on the exhaust turbocharger, which helped it to a succession of noteworthy triumphs in the world of motor sport. The turbo engines also began to enjoy resounding success in the market.

Now the supercharger is staging a comeback – the T in the engine description no longer stands for the turbocharger alone. Extensive comparative tests revealed the mechanical supercharger to be superior to a biturbo concept for the big V6 engine. In conjunction with direct injection this concept has clear advantages in terms of the prioritized features of packaging, starting performance and responsiveness.

The supercharger is so compact that is easily accommodated in the 90-degree V of the cylinder banks, in place of the intake manifold. The engine-driven Poly-V belt that powers the mechanical turbocharger provides full thrust right from idling speed. The 3.0 TFSI delivers its maximum 440 Nm (*324.53 lb-ft*) at only 2,900 rpm and maintains this constantly until 5,300 rpm. The intermediate sprint from 80 to 120 km/h (*49.71 to 74.56 mph*) is completed in fourth gear in 4.4 seconds; even in sixth gear it takes a mere 7.1 seconds.

The gas paths after the supercharger are very short which is why the 3.0 TFSI builds up torque extremely quickly when accelerating, even more dynamically than a naturally aspirated engine of the same displacement. The 3.0 TFSI responds directly to the throttle in true sporty fashion, is agile and sprightly, revving up to the maximum of 7,000 rpm with playful ease.

### **27 percent decrease in consumption**

In terms of fuel consumption too, the new S4 and S4 Avant 3.0 TFSI score top marks – using only 9.7 liters per 100 km (*24.25 US mpg*), the sedan outdoes its predecessor by a remarkable 3.6 liters (*0.95 US gal*), as much as 27 percent. The Audi technology of gasoline direct injection according to the FSI principle was what made this trailblazing efficiency possible in the first place. Unlike conventional solutions, the supercharger is located behind the throttle valve. At loads below supercharging level and when coasting, i.e. when the throttle valve is closed, it lies in a vacuum: due to the low density its rotors are free-running and the amount of power required to drive them is low.



The supercharger is a so-called Roots blower. Inside it, two four-vane rotary pistons counter-rotate at a speed of up to 23,000 rpm, with the air gap between them measuring just a few thousandths of a millimeter. The rotors can deliver 1,000 kilograms (*2204.62 lb*) of air per hour and force it into the combustion chambers at a boost pressure of up to 0.8 bar. Two intercoolers made of aluminum, connected to a separate coolant circuit, are integrated into the housing in a particularly efficient way. Here, the compressed and thus heated intake air is cooled down again in order to increase the volume of air required for the combustion process.

The three-liter V6 engine itself belongs to Audi's family of ultramodern V engines. In addition to the standard cylinder angle of 90 degrees, their attributes include systematic lightweight construction – the three-liter's crankcase, which is made from cast aluminum/silicon, tips the scales at just 33 kilograms (*72.75 lb*). The entire engine, including the supercharger, weighs 189 kilograms (*416.67 lb*). The bore measures 84.5 millimeters (*3.33 in*) and the stroke 89.0 millimeters (*3.5 in*), producing a swept volume of 2,995 cc.

Audi has included a whole array of refined high-tech features on the 3.0 TFSI. The crankcase has been adapted to the higher prevailing pressures and all components are frictionally optimized. The intake camshafts can be adjusted through a 42-degree crankshaft angle. In the intake ports, tumble flaps aid mixture preparation.

The injection system is a fundamentally new design. A common rail system with six-hole injectors injects the fuel directly into the combustion chambers at a pressure of up to 150 bar. The injectors' highly dynamic response permits up to three fuel injections per operating cycle across an extensive range of the characteristic map. The high compression ratio of 10.3:1 also contributes to optimum combustion and therefore superior efficiency. The direct injection principle is once again the key, because the intensively swirled fuel cools the combustion chamber, reducing the tendency to knock.

## **Transmissions**

Audi delivers the S4 and S4 Avant with a six-speed manual transmission as standard – its short and precise lever travel and low operating force make every gear change a delight. Special selector fork mountings decouple the gear lever from the driveline so that the driver does not sense any vibration.

Internal friction in the transmission has been minimized, improving the already high level of efficiency still further. A change-up display in the driver information system helps the driver to adopt a more economical driving style. It shows which gear is in use and recommends a different gear if this would be a better choice.

The dual-mass flywheel and the hydraulically actuated single dry-plate clutch are not bolted to the crankshaft in the usual way, but supported on the transmission input shaft. On the S4 and S4 Avant, the differential is located in front of the clutch. Output to it is via a hollow shaft, which features a so-called beveloid gear on both sides, enabling it to be installed at an inclined angle of 7.2 degrees.

Interchanging the components has moved the front axle forward by 154 millimeters (*6.06 in*) compared with the previous model. This has many advantages – a long wheelbase, a short front overhang and good weight distribution. It results in handling characteristics that set new standards in terms of dynamism, precision and stability.

### **Dynamic and efficient: the seven-speed S tronic**

On request the new S4 and S4 Avant leave the assembly line equipped with the seven-speed S tronic transmission, which is exceptionally dynamic and at the same time remarkably efficient. The innovative dual-clutch transmission can be used in various ways. The fully automatic mode features the D (Drive) and S (Sport) programs. The gears can also be manually switched with the shift selector lever or with the paddles on the steering wheel – an amazingly fast process. The gearshift feel is dynamic, comfortable and very precise – typically Audi.

The seven-speed S tronic consists of two separate transmissions and uses two multi-plate clutches that control the various gears. The large outer K1 clutch transmits the power through a solid shaft to the gear wheels for gears 1, 3, 5 and 7; they are located at the rear of the aluminum transmission housing. A hollow shaft rotates around the solid shaft. It is connected to the compact K2 clutch, which is integrated into the inside of its larger sibling, and which controls the gear wheels for gears 2, 4 and 6, as well as reverse gear. All gear wheels are arranged one behind the other on both output shafts, in the order 4, 6, 2, R, 1, 3, 7 and 5.

Both transmission structures are continuously active, but only one is powered at a time by the engine. For example, when the driver accelerates in third gear, the fourth gear is already engaged in the second transmission structure. The shifting process takes place as the clutch changes – K1 opens and K2 closes with lightning speed. The gear change takes only a few hundredths of a second and is completed without interrupting traction. It is so fluid and smooth that the driver hardly notices it.

Each component of the new seven-gear S tronic attests to Audi's innovative approach and to the company's uncompromising quality standards. Carbon-coated synchronizer rings guarantee synchronization of unsurpassed quality and stability. The gears one through three and reverse are also designed as three-cone synchronizations. Both multi-plate clutches are managed with supreme precision when driving off and shifting between gears thanks to the compact pressure cylinders, electronically controlled speed compensation and optimized coil spring packages.

### **Mechatronics – the command center**

The command center of the transmission is a mechatronic module, a compact unit containing control units and hydraulic actuators. It can vary the speed of the gear change across an extensive range and controls the power required for the process with extreme precision. An efficient gear-driven oil pump builds up the control pressure; when the car is driven off, it helps a suction jet pump to cool the dual clutch. This almost doubles the oil delivery volume without any increase in drive power.

A further special feature of the seven-speed S tronic is the use of two separate oil supplies. While the dual clutch, mechatronic module and oil pump are supplied by their own oil circuit with seven liters (*1.85 US gal*) of automatic transmission fluid (ATF) oil, the wheel sets and the center and front-axle differential are lubricated with about 4.5 liters (*1.19 US gal*) of hypoid gear oil. This separation allowed the development engineers to position all of the components ideally, without being forced to compromise by using a single lubricant.

Audi has designed the new seven-speed S tronic to provide both exhilarating driving and maximum economy. It operates with very high efficiency and its intelligent control system maximizes fuel economy in automatic mode (sedan: only 9.4 liters/100 km *or 25.02 US mpg*). The transmission-ratio spread of 6.0:1 allows a sporty, close transmission ratio for the first gear as well as an rpm-sinking, wide ratio for the last gear. The seven-speed S tronic easily exploits the tremendous power and superior torque of the 3.0 TFSI to the full.

### **quattro drive and the sport differential**

Since 1980, quattro has been a synonym for cars with outstanding driving dynamics. In its basic setting, the torque-sensing centre differential delivers 40 percent of the tractive force from the engine to the front axle and 60 percent to the rear axle. Since the latest Audi RS 4 was introduced in 2005, this degree of rearward bias has been standard on all new Audi models; it guarantees a high level of driving pleasure. The torque-sensing differential redistributes engine output without delay if road surface conditions change, and is thus the most advanced technical principle on the market.

This exceptionally good traction puts the quattro system at an extremely high level as far as dynamics in a forward direction are concerned. But quattro technology also has distinct advantages in terms of lateral dynamics. By distributing traction among all four wheels, each wheel has greater potential to resist lateral forces, and tire grip is maintained for significantly longer. The action of the electronic differential lock (EDL) and the typical Audi settings adopted for the ESP electronic stabilization system also add to driving pleasure and a high level of stability.

## **Lateral dynamics redefined**

Both when the steering wheel is turned and when accelerating in a corner, vehicles with conventional drive to the axles tend to understeer for as long as the tires have adequate grip. The laws of physics cause a moving body to resist any change of direction initially. When a vehicle's steering is turned away from a straight line, the tires and suspension pivots absorb some of the initial movement before the direction changes. When accelerating in a corner, the front axle load is reduced and therefore less lateral force can be transmitted to the tires: the vehicle understeers and is forced out onto a larger-radius curve.

With its active sport differential, Audi elevates the road dynamics of cars with quattro permanent four-wheel drive to a new level. The innovative control system distributes the drive torque in continuously variable proportions between the rear wheels – if necessary, it diverts virtually all the power to just one of the two wheels – thereby achieving a substantial increase in agility, driving pleasure and active driving safety. This targeted control of the power flow causes the vehicle to turn even more spontaneously and directly into bends, as well as endowing it with much longer-lasting directional stability. The sport differential is not only effective under load but also when the car is coasting. Even when the clutch is depressed, agility-enhancing torque distribution is active.

## **As if on rails**

With the active sport differential driving the rear wheels, the car quite literally takes every corner as if on rails. Depending on the steering angle, lateral acceleration, yaw angle, road speed and other signals, the control unit calculates the most suitable distribution of torque to the wheels for every driving situation. When the steering wheel is turned, for example, or the car accelerated in a corner, power is redirected in a controlled manner to the outer rear wheel. This has the effect of “forcing” the car into the corner so that the angle of the front wheels is followed accurately. The difference in tractive force between the left and right wheels also exerts a steering effect, so that the usual corrections by the driver at the steering wheel are no longer needed. Understeer, that is to say the tendency for the car to run wide at the front, is completely eliminated.

When driven briskly along a typical country road, the car follows the successive bends in a manner similar to the precise track formed by carving skis in the snow. The sport differential redistributes the power input continually with great rapidity and counteracts any tendency for the car to understeer or oversteer before either of these effects can build up. For the driver, this means reduced effort at the steering wheel and higher maximum lateral acceleration.

### **A notable safety bonus**

Close to the car's handling limits, the sport differential acts like ESP, but with the principle reversed: corrective movements are not initiated solely by altering the engine settings or applying the brakes, but also by controlled redistribution of tractive force. The car's progress is distinctly smoother and free-flowing, its actual road dynamics and those sensed subjectively by the driver are both enhanced, and driving pleasure benefits too, since ESP comes into action much less frequently. Since its reaction time is extremely short – less than 100 milliseconds – the sport differential takes effect even more rapidly than ESP. Furthermore, ESP can only react to a discrepancy between the car's steering angle and its actual body rotation, whereas the sport differential influences the car's dynamic behavior before any such discrepancies occur.

Active torque distribution is based on an entirely new design principle for the rear-axle differential. So that the new high-tech unit can also divert torque to the outer wheel on the axle, which revolves faster than the inner wheel when cornering, the classic rear-axle differential has superimposed stages at the left and right, and a multi-plate clutch running in an oil bath. The clutches are activated by an electro-hydraulic actuator.

### **Superimposed stages for acceleration**

The superimposed output stage rotates ten percent faster than the half-shaft that normally drives the wheel; the two drivelines can be connected together by the multi-plate clutch. If the clutch is engaged, the wheel is accelerated by the superimposed stage that is running at a higher speed, and thus receives an additional torque input. The differential reduces the tractive force reaching the opposite wheel accordingly. In most driving situations, almost the complete input torque can be diverted to one rear wheel in this way. The maximum difference in torque between the wheels is 1,800 Newton-meters (*1327.61 lb-ft*).

The sport differential is even capable of completely eliminating the classic load-reversal reactions when the accelerator is lifted or the brakes applied suddenly while cornering; the driver can specify this function by selecting 'comfort' mode. If the accelerator pedal is released, torque distribution between the wheels is adjusted almost instantaneously.

Unlike other systems, the Audi sport differential is just as effective when the engine is driving the wheels as it is on the overrun or when the car is coasting freely. In simplified terms, here too one wheel is braked and the other accelerated with the aid of the superimposed drive stages. This diverts the torque to the wheels and the vehicle is given a precisely calculated impulse in the required direction.

### **A technically superior solution**

The task of distributing a high level of torque with minimum losses by way of a transmission that is compact and light in weight was an extremely challenging one. The solution arrived at by Audi's engineers is as ingenious as it is innovative. A new transmission stage, consisting of two sun wheels and a ring gear, performs the task in a very simple fashion. The ingenuity lies in the fact that the ring gear is displaced in relation to the sun wheels. The resulting generous gear tooth overlap enables torque transfer to take place using a minimum number of components. This is the first time that this principle has been used in a road-vehicle driveline.

The system needs no maintenance throughout its life, and operates at a high level of efficiency. The additional fuel consumption needed for the active sport differential is so small that it is hardly measurable. The device takes effect extremely quickly and has a very high level of control accuracy.

Thanks to its control unit, the sport differential is an intelligent unit. Audi developed the necessary software, which uses a unique operating principle, in-house. The computer obtains the information it needs from the steering angle, wheel speed, lateral acceleration and yaw-rate sensors and from current engine data. Twin yaw-rate and lateral acceleration sensors are installed for the sport differential. This explains the system's extremely high reaction speed: data from both sensors are continuously compared in the control unit, which means that reliable results are available more rapidly.

## **Audi drive select – the unique high-tech package**

The quattro driveline with active sport differential is part of Audi drive select, the innovative dynamic driving system premiered on the new Audi A4. As part of an optimal combination with Audi dynamic steering and electronic shock absorber control, the permanent four-wheel driveline and the sport differential demonstrate their immense capabilities with regard to driving dynamics.

Audi drive select integrates the technical components that determine the quality of the driving experience: engine, transmission, steering, shock absorbers and the sport differential. Drivers can adjust the characteristics of these systems at any time to suit their personal preferences. Audi drive select is a successful synthesis of comfort and convenience with dynamic sportiness at a previously unattained level.

Buttons on the centre console enable drivers to vary the operation of Audi drive select in three stages ranging from comfortable to sporty, or to put together a profile that suits their personal preferences. The engine's throttle response characteristic can be determined first, followed by that of the servotronic speed-dependent power steering and, if the car has automatic transmission, its shift points.

### **Three operating modes for the sport differential**

The functions of the sport differential can also be varied to suit the driver's individual wishes. In the 'comfort' mode, driving safety and the car's stability have absolute priority, with optimal damping of load reversals. In the 'auto' mode the program achieves a harmonious balance between all the functions. Finally, the 'dynamic' mode emphasizes the functions contributing towards agility, so that the dynamic effect of the sport differential is most easily felt. In this case, response to load reversals is both agile and easily controllable.



## **Audi dynamic steering**

Audi drive select becomes the ultimate dynamic driving system in conjunction with Audi dynamic steering. It is the perfect partner for the quattro driveline with sport differential. Its effect when combined with damping control and dynamic steering opens up a whole new dimension in safe, sporty driving.

The dynamic steering system uses a superimposed zero-play transmission to vary the effective steering ratio according to road speed. It is integrated into the steering column and combined with an electric motor. Here again, the Audi engineers have come up with a brilliant solution: the innovative axial transmission is extremely compact, light in weight and torsionally rigid. It operates without any play and is therefore extremely precise, with low friction. It can transmit very high torques and operates at a high level of efficiency.

### **Broader operating range: up to twice the ratio**

In accordance with the vehicle's road speed and the chosen Audi drive select mode, the dynamic steering system can vary its ratio by almost 100 percent. When the car is being parked, the steering is extremely direct, whereas when driving in a straight line at high motorway speeds a more indirect steering ratio and reduced power assistance help to maintain the car's outstanding directional stability.

The dynamic steering system can also correct a small to moderate angle of float as rapidly and effectively as a rally driver could ever react, by automatically turning the wheels slightly in the opposite direction. Brake applications are normally only needed if the angle is greater, and then in most cases only to exert a damping effect.

Dynamic steering furthermore intervenes in the event of understeering – when the vehicle runs towards the outer edge of the corner. The steering ratio is made more indirect for a short time, meaning that the driver is unlikely to turn the wheel beyond the limit of good tire grip.

With regard to road dynamics and safety, the dynamic steering system, damping control and sport differential work closely together with the ESP. They reduce the burden on the stabilization program because the corrections take place considerably earlier via the input torque, the damping force or the steering angle. These rapid, efficient interventions avoid the need for brake applications in many cases, so that the car can be driven more dynamically and smoothly.

Braking on surfaces with different friction coefficients, so-called  $\mu$ -split braking, is generally a situation that is particularly difficult to master – the side with more grip pulls the vehicle in its direction. The dynamic steering system 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.

### **Electronic damper control**

Audi drive select with the sport differential can be combined with electronic damping control. The gas-filled hydraulic shock absorbers have an additional valve with a continuous opening action. The control unit computes the optimal damping force at a cycle frequency of 1,000 per second.

The electromagnetically controlled valve selects a damping characteristic to match the current driving situation at any given moment. Higher damping force may be needed to resist body movement when cornering rapidly or braking, whereas a lower damping force will be appropriate on potholed roads and a moderate setting on poor country roads.

### **14 sensors, 1,000 calculations per second**

The central element in electronic damper control is the new high-performance control unit. It has the imposing data spread of 32 bits and operates at high speed. The computer analyses the signals from 14 sensors continuously, and calculates the current for the electrically controlled shock absorbers at each individual wheel a thousand times a second.

The so-called CDC shock absorbers (CDC = continuous damping control) are gas-filled hydraulic units based on the twin-tube principle, featuring an additional external valve and a connecting pipe.

An electromagnetically energized proportional-action valve opens against the force exerted by a spring and 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.

The control unit applies adaptive operating characteristics within the mode the driver has chosen via Audi drive select. Even from the comfort mode, the shock absorbers switch to a firmer setting at lightning speed if required. The control unit sets the optimum damping power for every driving style and for every type of road.

### **Dynamic suspension**

The dynamic suspension of the new Audi S4 and S4 Avant is based on the layout that has made the A4 the sportiest car in the midsize class. Numerous suspension components made of aluminum reduce unsprung masses. The five-link front suspension can handle longitudinal and lateral forces separately; a firmly mounted subframe ensures exceptional rigidity for the front section. The springs and shock absorbers of the self-tracking trapezoidal rear suspension, which permits a wide luggage compartment thanks to its compact design, are aligned separately to improve response.

In keeping with the dynamic performance of the S4 and S4 Avant, the suspension has been retuned. Stiffer bearings for the control arms guarantee elastokinematics for a sporty performance; lateral and camber rigidity are clearly enhanced. The minimal body movements lend the S4 and the S4 Avant maximum stability, even when braking. The shock absorbers have firmer settings and the body has been lowered by 20 millimeters (*0.79 in*).

### **Handling precision – without compromise**

All these measures lend the S4 and the S4 Avant the driving dynamics of a sports car – their reactions are smooth, almost reflex-like; handling precision knows no compromise. The steering connects the driver with the road to provide sensitive, well-differentiated feedback.

The low-mounted steering gear transmits the steering forces via the track rods to the wheels over the shortest distance, its ratio of 16.5:1 is sporty and direct. The regulated vane-type pump, which supplies the system with hydraulic energy, always delivers only as much oil as is needed; in this way it too contributes towards high consumption efficiency. As a servotronic system, it bases the amount of assistance on road speed.

The new Audi S4 and S4 Avant are fitted with impressive cast aluminum wheels, which carry size 245/40 tires on 8J x 18 rims. As well as the standard 5 parallel-spoke wheel in the S design, an additional design is available. Furthermore, there is a choice of winter wheels in two different widths, one of which is suitable for snow chains. quattro GmbH offers three 19-inch wheels with size 255/35 tires: the 5 segment-spoke design, 7 twin-spoke design and 20-spoke design (two-piece).

The large wheels provide space for a 17-inch brake system developed for maximum performance. All four disks are ventilated, the front having a diameter of 345 millimeters (*13.58 in*), the rear 330 millimeters (*12.99 in*). An innovative concept, which dispenses with the conventional cooling ducts, ensures impressive power and stability: the two halves of the disk are connected by hundreds of small metal cubes, between which a high volume of heated air can flow in a very short time. This design also lowers the weight – here too, drivers will experience the reduction in unsprung masses in the form of enhanced driving dynamics.

The black-painted brake calipers – sporting the S4 logo at the front – are of a composite design based on the floating caliper principle. The areas subject to high loads are made of nodular cast iron; the bolted-on piston housing made of aluminum conducts the heat effectively, and the calipers are extremely rigid despite being light in weight. Compared with the predecessor model, the surface of the brake pads has increased by 25 percent at the front, and as much as 60 percent at the rear. New materials increase the amount of friction.

The brakes on the S4 and S4 Avant set new standards in terms of power and precision, not to mention accurate feedback provided to the driver. The electronic stabilization program ESP also uses high-precision hydraulic valves, which control pressure build-up with great accuracy. It intervenes at a later stage and is more subtle. The ESP can be switched off completely: the driver can deactivate the traction control function separately at a speed below 70 km/h (*43.50 mph*).

## Design

The very design of the front section alludes to the power of the new S4 and S4 Avant. The LED daytime driving lights in the standard-specification xenon plus headlights can be seen from afar. The single-frame grille, in platinum gray, has the typical look of the S models from Audi – its vertical double struts bear chromed inserts and the S4 badge. Two ribs define the lower trapezoidal air vents and chrome rings encase the front fog lights. An aluminum-look “blade” forms the centerpiece of the striking bumper.

The side view also reflects the athletic character of the S4 and S4 Avant. Sill trims painted in the body color emphasize the width of the body; the aluminum-look exterior mirror housings gleam. The new midsize athletes have a powerful stance on the road with their 18 or 19-inch wheels, the rim spokes allow the black-painted brake calipers to shine through. The so-called high-gloss package adds elegant touches all round the side windows with aluminum strips and black trims.

At the rear, too, the new S4 and S4 Avant remain unmistakable – thanks to the badge on the trunk lid, the LED lights and the quadruple oval tailpipes. The rear bumper, incorporating a diffuser, has also been redesigned, its blade likewise in aluminum look. The spoiler – on the trunk lid of the sedan and the roof edge of the Avant – separates the airflow in a clean, defined way, further enhancing driving stability at high speeds.

Audi offers its midsize athletes in four solid colors – Ibis White, Brilliant Red, Brilliant Black and Imola Yellow – and in seven metallic and pearl effect finishes. These are Ice Silver, metallic, Quartz Gray, metallic, Meteor Gray, pearl effect, Phantom Black, pearl effect, Deep Sea Blue, pearl effect, Sprint Blue, pearl effect and Garnet Red, pearl effect. Imola Yellow and Sprint Blue are reserved exclusively for the S models.

The S4 and S4 Avant are large midsize cars with a high level of everyday suitability. They are 4,717 millimeters (*185.71 in*) in length, with a wheelbase of 2,811 millimeters (*110.67 in*), 1,826 millimeters (*71.89 in*) in width and 1,406 (*55.35 in*) and 1,415 millimeters (*55.71 in*) in height respectively. The luggage compartment of the sedan has a capacity of 480 liters (*16.95 cu. ft*); the Avant has a basic capacity of 490 liters (*17.30 cu. ft*) and 1,430 liters (*50.50 cu. ft*) when the rear seat backs are folded down.

## Interior

Dynamic, elegant, sophisticated – this is the interior of the new S4 and S4 Avant. The ergonomics are exemplary, the amount of space generous; the electromechanical parking brakes leaves room on the centre tunnel. The interior in cool black – the roof lining is optionally available in silver – creates an atmosphere of sporty and technical expertise, underlined by the uncompromising craftsmanship so typical of Audi.

The many meticulously thought-out details are another characteristic of the brand. The S4 logos are found on the door sill trims, the leather multifunction sports steering wheel, the remote control key and on the instruments, the dials of which are gray, the needles white. Understated aluminum-look inlays provide subtle highlights; the versions with seven-speed S tronic sport aluminum-look shift paddles, mounted behind the steering wheel.

The electric sports seats feature lumbar supports and pull-out thigh supports; the standard version is upholstered in a combination of black Alcantara/leather. For the S sports seat, Silk Nappa leather is also available, with the option of a bi-color look with contrasting stitching. The climate-controlled comfort seats represent the high-end option; they are equipped with small cooling fans in the seat backs and are upholstered in black or brown leather. Customers who appreciate firm support can order the strongly contoured S sports seat with integrated head restraints. A sliding front center armrest including two 12-volt sockets comes as standard with all seat versions.

The inlays in the new S4 and S4 Avant also have a sporty and individual look. Matt brushed aluminum is standard. Carbon, fine gray birch wood and genuine stainless steel mesh are optionally available. The filigree structure, consisting of numerous steel threads, feels slightly rough, but is fascinating to the touch.

## **Equipment and trim**

The new S4 and S4 Avant come off the assembly line with a wide range of standard equipment. The highlights – besides quattro drive, 18-inch wheels, sports suspension and servotronic – include many comfort and convenience features, namely automatic air conditioning, driver information system, a lighting package for the interior, leather multifunction sports steering wheel, electric sports seats with lumbar support and folding rear backrests – also for the sedan. Xenon plus headlights with LED daytime running lights and LEDs in the rear lights give the S4 a highly distinctive look.

Audi delivers the new S4 and S4 Avant, on request, with a range of high-tech systems that make driving an even more supreme and relaxed experience. These include the parking aid Audi parking system advanced with rear-view camera and Audi side assist, which monitors the blind spot during lane changes. The adaptive cruise control regulates the speed and distance from the car in front, while braking guard warns the driver of an imminent bumper-to-bumper collision.

The standard-fit tire pressure monitoring system informs the driver as soon as the tire pressure in one or several tires drops and thus provides added safety.

Audi also sets new standards when it comes to multimedia. The Audi Music Interface (AMI) allows an iPod and its entire range of control functions to be connected; an up-to-date mobile phone and its functions can be fully integrated into the Bluetooth car phone. The navigation system with DVD is combined with the competition-beating MMI operating system. The radio tuner receives digital programs on request and the luxury sound system from the exclusive Danish brand Bang & Olufsen boasts a 505-watt amplifier that controls 15 speakers through ten channels.

The range of options for the S4 and S4 Avant includes other excellent features such as a three-zone automatic air conditioning system, a convenient key for keyless entry, a high-beam assistant and the dynamic cornering light system adaptive light. An electric tailgate and a large panoramic glass sunroof are available for the S4 Avant. The 19-inch wheels, the active sport differential, the seven-speed S tronic and dynamic driving system Audi drive select incorporating adaptive damping and dynamic steering underscore the leading role in terms of sporty expertise that the S4 and S4 Avant enjoy in their competitive field.

Audi will begin delivery of its new S models in March. The basic price is particularly competitive: 50,950 euros for the sedan, 52,600 euros for the Avant.

### **The S models in the midsize class**

Audi adopted the letter S directly from the world of motor sport. In 1985, it appeared on a competition car from the World Rally Championship – the legendary S1. The Coupé, the last evolution stage of the Sport quattro, was a high-tech unit driven to the outer limits, which mustered up around 370 kW (approx. 500 hp) of power for its drivers.

In 1990 the letter S made its way into series production – in the S2 Coupé, whose turbocharged five-cylinder engine delivered 162 kW (220 hp). The small S family grew rapidly; its members had quattro drive and a visually understated appearance in common. At the end of 1992, Audi added an S2 Avant; one year later the sedan followed. 9,488 units of these three body variants were built up until 1995.

The first Audi A4, which was launched in 1994, also generated two S models, starting in 1997. The five-cylinder turbo made way for a newly developed twin-turbo V6; the 2.7-liter was derived from the V8 with a displacement of 3.6 liters. With five-valve cylinder heads and one turbocharger per cylinder bank it produced 195 kW (265 hp) and 400 Nm (*295.02 lb-ft*) of torque, which was available from as low as 1,850 rpm. Produced up until 2001, some 30,500 units of the first-generation S4 were built.

At the beginning of 2003 Audi switched its S models in the midsize class to naturally aspirated engines. The 4.2-liter V8 developed 253 kW (344 hp) and delivered 410 Nm (*302.40 lb-ft*) to the crankshaft at 3,500 rpm. The V8, which could also be combined with a six-speed-tiptronic, was introduced in the sedan, the Avant and the Cabriolet. Up until the model change, more than 38,000 units had come off the assembly line.