

AUDI AG
Product Communication
85045 Ingolstadt
Germany
Phone +49 (0)841 89 32100
Fax +49 (0)841 89 32817

January 2007

The Audi R8

Short version	2
At a glance	8
The exterior	9
The interior	13
The body	16
The drivetrain	22
The suspension	29
The equipment	34
The market	41

Annex: Technical data

The equipment, data and prices stated here refer to the model range offered for sale in Germany. Subject to amendment; errors and omissions excepted.

Short version

The precision sports car The Audi R8

Audi is entering the most discerning segment of the car market with its R8 mid-engine sports car – and immediately taking up a position among the leaders: equipped with the expertise that Audi has gathered from its involvement in motor sport and from building sporty premium-class cars, the R8 is the embodiment of superlative road behaviour, pioneering technology and fascinating design. The 420 bhp V8 FSI engine, quattro permanent four-wheel drive and the aluminium space-frame body endow the R8 with outstanding qualities to challenge for leadership of this segment, as do its excellent everyday suitability and Audi's typical standards of perfection in quality and finish. The basic price is EUR 104,400, and deliveries will commence in the second quarter of 2007.

Following on from rally success with the revolutionary Audi quattro and the triumphs of its touring car, Audi has added another chapter to the history of motor sport with the R8 racing car: with five wins to its name in the Le Mans 24 Hours, the R8 is the most successful model ever to have competed on the legendary circuit at Le Mans. In a total of 79 starts at venues all over the world, this exceptional athlete has emerged victorious on a total of 62 occasions.

The genes of the winner

The repeat winner was thus the ideal role model for the new production sports car. The genes of the triumphant racing car were also passed on to the passenger car – which admittedly feels distinctly at home on the racetrack, too – in the model designation R8. The mid-engine concept is as integral to this genetic stock as the high-revving V8 engine with FSI petrol direct injection and the sequential gearbox with steering-wheel control. Whereas the use of quattro permanent four-wheel drive was prohibited on the racing version, the new R8 can of course now be equipped with it, for superior road behaviour and safety in all conditions.

There are even design parallels – not just in functional terms – in the way it cuts its way supremely through the air even at very high speeds. The same design team that had previously styled the racing car was given the task of styling the R8 roadgoing sports car. The striking wing structure of the Le Mans version did, however, have to be abandoned. After all, the roadgoing version was meant to express its sports qualities through a typically Audi quality of elegant styling.

With power and elegance

The wide, full shape of the R8 seems to hug the road. It demonstrates its potential through its imposing proportions, accentuated wheel arches and substantial air apertures. It is like no other Audi before it – with the unmistakable proportions of a mid-engine car. These proportions are dictated by the forward position of the cabin and the clearly separate engine compartment behind it. A characteristic feature of the side view of the R8 is the "sideblade", which visually accentuates the engine's position as well as acting as an air deflector.

And yet the R8 is undeniably first and foremost an Audi, not just because of the characteristic single-frame grille at its front end. For the first time, the four rings are positioned not over the grille, but on the lid above it. The sparing but always very precise use of lines is another typical Audi characteristic, as is the curved arc of the roof. And the continuous line running from the front apron across the wheel arches and flanks to the tail end, then back down the other side, is significant for the brand. This "loop" naturally encompasses the air apertures, the headlights and the rear lights.

Unmistakable face by day and night

The passion expressed through the elaborate design of the lights is another typical Audi trait. The R8 already acquires an unmistakable frontal aspect through the standard bi-xenon headlights and daytime running lights comprising twelve light-emitting diodes – day and night alike. Nor is anyone likely to overlook this Audi sports car from behind: for the very first time, LED tail lights with a three-dimensional effect have successfully been used.

But the absolute highlight will be the all-LED headlights, available for the Audi R8 as an option from the end of 2007, and making their first ever appearance worldwide on a production car. With their lenses and reflectors, these innovative light sources not only look progressive; they also have an enormous functional advantage: with its colour temperature of 6,000 Kelvin, LED light resembles daylight much more closely than xenon or even halogen light. Drivers will consequently suffer much less fatigue when driving at night.

The interior offers a luxurious standard of motor racing atmosphere. Its design is as sporty and exclusively as the exterior: the characteristic element here is the monoposto – an expansive arc running around the steering wheel and instruments, connecting the driver to the car. The interior consequently picks up on the dynamism of the R8 and gives it tactile expression in a form that is accessible the moment you climb in.

Exceptionally spacious

For a sports car, the exceptional everyday suitability of the R8 is highlighted by the large amount of space, due in no small measure to the generous wheelbase of 2.65 metres. Whatever the build of the driver and passenger, they will always be able to find their perfect seated position. The view is also very good for a mid-engine vehicle. Narrow A-posts optimise the field of view to the front and sides.

The luggage compartment is an important aspect of everyday suitability: 100 litres fit beneath the front lid, and there is room for bags with a total volume of a further 90 litres behind the seats. And even passionate golfers need not forgo their sport when driving the R8: two full-size golf bags can be stowed behind the seats.

The impression of quality in the interior is striking: even in the basic specification, the surfaces of the driving area and door trims are meticulously trimmed, with neatly finished decorative seams. And the scope for customisation is as diverse as the preferences of the R8's future owners could conceivably be: piano finish, carbon fibre and a wide variety of leathers are just some of the options.

Light but highly rigid body

The body of a sports car needs to be particularly light and rigid: low weight permits superior road performance, and rigidity is the crucial starting point for an agile driving feel allied to high precision. The Audi Space Frame body, made from aluminium, provides the ideal basis for this. Audi has more expertise than any other manufacturer worldwide in the designing and production of cars based on aluminium technology, and has channelled its accumulated know-how into the R8.

The entire bodyshell of the R8 weighs just 210 kilograms, the pinnacle of achievement among sports cars in terms of lightweight design quality. It comprises extruded sections, aluminium panels and highly complex cast nodes, joined together by 99 metres of weld seams, 782 punch rivets and 382 self-tapping screws.

Superlative precision in the production shop

This structure is created largely by hand at the R8 production shop in Neckarsulm, but with precision measuring and machining methods keeping a watchful eye over the whole business: a laser measuring system checks 220 points on each body to within one-tenth of a millimetre, and a special computer tomograph can investigate the absolute quality of every join with micron precision. A central processing plant cuts and drills all 52 connecting points on the running gear and steering in a single pass. This assures maximum precision in the axle geometry.

The aerodynamics experts at Audi have done their work so thoroughly on the R8 that, as an added benefit of its elegant shape, the body actually produces a downforce – unlike many other sports cars. This promotes directional stability at high speeds. It is achieved by means of the extending rear spoiler, but above all thanks to the fully clad diffuser underbody.

Enormous propulsive power across wide speed range

The heart of the sports car is of course the engine. As well as being exceptionally compact, the eight-cylinder power unit of the R8 runs lustily and effortlessly up to very high engine speeds, peaking at 8,250 rpm. The reward is 420 bhp and an even buildup of torque that produces enormous propulsion across a wide range of engine speeds. The engine's dry sump lubrication, typical of a race engine, permits a particularly low installed location and assures a constant oil supply in even the toughest of driving conditions – for instance on a racetrack. And the FSI direct injection underpins the very good full-load performance with a highly efficient combustion process.

The road performance is correspondingly impressive: the R8 dashes from 0 to 100 km/h in just 4.6 seconds, whether with manual gearbox or with R tronic sequential gearshifting. The needle hits 200 km/h after only 14.9 seconds, and the engine's propulsion is only finally held in check by rolling resistance and drag at 301 km/h.

However, the captivating character of the V8 stems not just from its effortless propulsion, but equally from its ample, versatile sound characteristics. Thanks to ingenious fine-tuning measures, Audi's engineers isolated disagreeable frequencies and then orchestrated an impressive opus from the intake and exhaust sound.

Lightning start thanks to Launch Control

The R8's transmission comes with six well-spaced ratios that can be operated either manually, in conjunction with the clutch, or automatically via the R tronic. The R tronic is an entirely new development that operates faster than even the most adept of drivers and offers racing-style thrills with the shift paddles on the steering wheel. The R tronic accomplishes lightning-fast starts worthy of the racetrack thanks to Launch Control.

The quattro permanent four-wheel drive provides that decisive extra dose of traction and driving safety.

The system was adapted to the mid-engine concept, with its ideal axle load distribution of 44:56 percent, and directs between 10 and 35 percent of the engine's power to the front wheels as necessary.

Precision suspension provides safety boost

The precision suspension of the Audi R8 remains supremely in control of the sporty performance, but is equally capable of assuring relaxed driving pleasure over long distances. The sports car obeys steering movements with spontaneous agility, always demonstrating exceptionally good driving safety. The suspension, with double wishbones at both the front and rear, is optimised for a neutral self-steering response and maximum ease of control.

A particularly innovative damping technology is available for the R8 as an option: Audi magnetic ride adapts the suspension characteristic to the profile of the road and the driver's style within milliseconds. A generously-dimensioned brake system supplies the necessary braking force. It applies a total of 24 pistons to the four studded brake discs. This braking performance can only be topped by the optional ceramic discs. They are even capable of withstanding the rigours of racing-style use.

Exclusive standard equipment

The Audi R8 combines its superior performance with both a surprising measure of everyday suitability and an exclusive equipment specification. It comes ready-equipped for example with a 140 watt audio system, an alarm system, deluxe automatic air conditioning and the driver information system with integral stopwatch for taking lap times. The sports seats are trimmed in combined Alcantara/Leather and the 18-inch wheels are fitted on cast alloy wheels.

The list of optional extras nevertheless includes a couple more highlights: for example, the wide range of customisation options, the Audi parking system advanced with integral rearview camera, and the superb Bang & Olufsen sound system. Surround sound from twelve high-end speakers with a 465 watt music output delivers an exceptional music experience.

At a glance

The Audi R8

Body:

- Powerfully dynamic, elegant design
- Lightweight aluminium body based on Audi Space Frame
- Aerodynamic negative lift for high directional stability
- Dimensions: L 4.43 m, W 1.90 m, H 1.25 m, wheelbase 2.65 m
- Generous amount of space for a mid-engine sports car
- Luggage compartment 100 l at front, a further 90 l behind the seats

Road performance:

- Acceleration 4.6 seconds
- Top speed 301 km/h

Engine:

- High-revving V8 developing 309 kW (420 bhp), 430 Nm between 4,500 and 6,000 rpm
- FSI petrol direct injection
- Dry sump lubrication for a low centre of gravity and high loadability

Transmission and drivetrain:

- Six-speed manual gearbox with short gearshift travel
- R tronic sequential gearbox (optional)
- quattro permanent four-wheel drive, perfect weight distribution 44 % to 56 %

Suspension:

- Double wishbone axles at front and rear, safe self-steering properties
- Innovative damping system Audi magnetic ride (optional)
- 18-inch or 19-inch wheels, high-performance brake system
- Ceramic brake discs (optional, to follow)

Equipment:

- Sophisticated interior character, wide range of customisation options
- Extensive standard specification, xenon plus headlights with LED daytime running lights
- Bang & Olufsen sound system (optional)
- First car in the world with all-LED headlights (optional, from end 2007)

The exterior design

The genes of the winner

As the first mid-engine sports car of the Audi brand, the R8 not only exploits the entire technological expertise of the company. It also interprets Audi's widely acclaimed design in a new, extreme form: the R8 emerges as a formal statement of sheer dynamism.

"Our aim was to create a powerful sports car – but with an exceptional quality of elegance," remarked Walter de'Silva, Head of Design of the Audi brand group.

In the case of a sports car, the challenges facing the designers are more demanding than for other vehicle concepts. Here, the shape needs to be even more emotionally charged and captivating. On the other hand, the design here has to fall in line with functional requirements to an exceptional degree: a sports car in the 300 km/h league needs to have perfectly balanced aerodynamics.

Plenty of experience with top performance

The large air apertures at the front and rear of the R8, for instance, naturally serve as important design features. Their size was however initially determined by the considerable amount of cooling air required by the high-performance engine, and also of course by the brakes. But Audi's design people are amply experienced in creating high-performance and ultra-high-performance vehicles, over and above its S and RS models: the shape of the multiple Le Mans-winning R8 was created by the same design team that was behind the exterior design of the R8 road version of the sports car.

Admittedly, the issue of aerodynamics needs to be handled with greater subtlety on an elegant, roadgoing car that is intended for every use than on a competition car. Eye-catching spoilers on the body were for instance immediately ruled out, and directional stability is maintained by the complex diffuser underbody in conjunction with the visually restrained, automatically extended rear spoiler.

Technical elegance

The basic idea behind the vehicle body is based on the tension-filled contrast between the calm and flowing surfaces that give the Audi R8 its elegance. The technology is exhibited just as overtly: the car's sculpture is opened up at the decisive points, revealing its technology for all to see.

The surfaces are explicitly tactile. They are stretched between the lines and edges, and describe a muscular sculpture whose quality resides in the permanent interplay between concave and convex surfaces. The R8 adeptly plays with light. This enhances its corporeal qualities and introduces movement into the flow of lines and surfaces.

Every line neatly placed

Whatever else may be true, the R8 is instantly recognisable as an Audi. This fact is evident both from the single-frame grille and from the entire powerfully elegant formal idiom, with its neatly placed lines and minimal number of meticulously crafted details. Take for instance the line running around the entire vehicle known as the "loop": it starts at the front spoiler, swoops over the shoulder, encompasses the clearly structured tail end and then returns down the other side to the nose. It particularly accentuates the four wheel arches as symbols of quattro four-wheel drive.

The proportions are of course dictated by the mid-engine concept: the driver's seat is positioned well forward, with the V8 engine located behind it – as on the racing car that shares the same name. The sideblade is a characteristic feature of the side view: in addition to performing the function of directing induced and cooling air to the engine, it divides the vehicle body up into two sections: the occupant cell and the assemblies zone. The large arc of the roof line is another typical Audi feature.

The front end is dominated by the trapezoidal Audi single-frame grille, flanked on either side by large air inlets. For the first time, the four rings of the logo are positioned not over the grille, but on the lid above it. This makes the front end look even more poised and focused on the road.

Unmistakable character

The flat strips of the headlights lie flush with the upper edge of the air inlets. The headlight covers enclose a microcosm of intelligent technology and innovative design. The xenon plus headlights with their 70 millimetre diameter glass lenses lend the R8's face a clear, demanding gaze – framed by the unique daytime running lights comprising twelve light-emitting diodes that infuse the R8 with an added, unmistakable character. The small lens in front of the turn indicator lights exemplifies the designers' attention to detail: it sports a finely engraved R8 logo that is only perceptible upon closer inspection.

The optional LED headlights are the sheer epitome of innovation. That is because from the end of 2007, the Audi R8 will be the first vehicle in the world to be equipped with light-emitting diodes for all lighting functions – a fact that of course demands a correspondingly progressive design approach. Bionics, in other words design inspired by nature, has provided the key idea: the unit for the low-beam headlights is reminiscent of an opened pine cone. Reflector shells arranged in concentric circles surround the high-performance LED projection system. The internal reflectors for distributing the high-beam light, on the other hand, are architectural in inspiration, recalling the design of the Sydney Opera House.

Passion for lighting design

The tail end is defined by the horizontal spoiler edge. The area beneath it gives the R8 a wide, dominant effect. As at the front end, the tail is dominated by two large air apertures with their substantial transverse struts. And as at the front, the light units are embedded flush with the body panels at their upper edge. These light units are, in turn, shining examples of Ingolstadt's passion for lighting design. Because here for the first time, it has been possible to give all-LED rear lights a three-dimensional character with a pronounced three-dimensional effect irrespective of the angle from which they are viewed.

Elegant showcase for the sports car's beating heart

The roof is delimited by the third brake light, forming the upper edge of the transparent engine compartment lid. This is another visual highlight. The engine is exhibited as the beating heart of this sports car, like a work of art inside a voluminous showcase. The engine can even be seen after dark, when the two sets of three white light-emitting diodes linked to the coming home / leaving home function illuminate the engine compartment. This "showroom" can be fully lined in genuine carbon fibre as an option, for a particularly exclusive look.

Two large-format diffuser apertures in the rear bumper demonstrate the extent to which aerodynamics dictate the shape of the R8. The four round tailpipes of the exhaust system are located in pairs on the right and left above the diffuser apertures. The automatically extended rear spoiler also interacts with the air as it flows around the car. The added downforce it provides boosts the efficiency of the air intake that is generated by the aerodynamic design of the underbody and diffusers. At low speeds, the rear spoiler is retracted flush with the body again. Thanks to the car's aerodynamically effective basic shape and extensive fine-tuning, no demonstratively large spoilers are needed.

The interior

A sports car with unique personality

Sheer sports racing atmosphere in the cockpit, with perfect command over the vehicle – but coupled with spontaneous well-being and ease of operation.

Also spacious and comfortable enough for a lengthy journey – allying sophistication with an impression of sheer quality. In the case of the Audi R8 these are not opposites, but different facets of a unique, unbeatably personable sports car.

The Audi R8 reveals one of its most surprising aspects the moment the door is opened, because a mere glance suffices to identify an interior that differs fundamentally from all other sports cars by virtue of its dynamic design.

The central element of the cockpit's design is the monoposto, providing a visual echo of the world of motor racing. The monoposto is a vast arc that envelops the driver, frames the steering wheel and visually connects all displays and controls. It provides the driver with a tailor-made command centre, as in a racing car. Never before has driver-oriented architecture been applied as systematically.

Diverse customisation options

The instruments together with their cowl are embedded in the monoposto; the monitor of the radio and navigation system with the MMI operating system and the controls for the automatic air conditioning are located to one side. This marks the transition between the monoposto and the high centre tunnel with the gear lever. The latter is extremely short, but is guided precisely through its stainless steel gate. Alternatively there is the selector lever of the R tronic sequential sports transmission. On the opposite side, the monoposto continues into the door, with the door handle an extension of the frame.

The monoposto forms part of the diverse range of customisation options for the R8: as the basis it – together with the door handle and sections of the centre tunnel – can be supplied as an exclusive version in genuine Piano finish black.

Carbon fibre is the alternative for that authentic motor sport look: in this instance, the components are made from genuine carbon fibre.

The steering wheel: Nappa leather over a magnesium core

The three-spoke sports steering wheel of course remains the focal point of the car's controls. With a diameter of 365 mm, it is both sportily compact and ergonomic in shape. The steering wheel rim has a flat lower edge. This is a further aspect of sports racing atmosphere in the Audi R8, but also brings major functional benefits, facilitating entry and exit for the driver. The steering wheel is trimmed in Fine Nappa leather, with a die-cast magnesium core providing strength. Other options include operation of the radio and telephone via the steering wheel and the R tronic shift paddles behind the steering wheel.

Concentrating on the essentials was the priority in the ergonomic arrangement of the R8. The most important criterion – particularly for high-speed driving – is short reach distances for all controls, to keep the time that there is only one hand on the steering wheel to an absolute minimum. In typical Audi fashion the monitor is well within the field of view, and the elements of the MMI operating system are located directly beneath it.

Lap timer for the laps on the racetrack

The instruments have an elegantly sporty design and can be read with precision. In addition to the analogue speedometer, the speed is displayed digitally in the driver information system display between the instrument dials. As well as the instructions from the navigation system and the cruise control settings, all comfort and convenience functions can be personalised here. Examples include the coming home function for the lighting – including the engine compartment lighting – and the brightness of the footwell illumination.

There is one particular function in the driver information system to assist the driver if they want to probe the true potential of the Audi R8 on the racetrack: the lap timer. The on-board computer then processes the readings and displays the fastest, slowest and average lap times.

A perfect fit for all

The basis for that feel-good experience on board the Audi R8 is the sports car's dimensional concept. Because from the very moment the designers put pen to paper, it was clear that the R8 had to provide an exceptional amount of space for a high-performance sports car. The long wheelbase of 2,650 mm serves as the starting point. It permits a good interior length, an optimum range of adjustment for the seats, space for luggage behind the seats and, finally, even a spacious footwell. The shoulder width of 1,390 mm is another measure of the R8's spaciousness.

Whether for a tour over Alpine passes, a longer business trip or just for a few small errands, with 100 litres of luggage capacity beneath the front lid and a further 90 litres behind the seats (60 when loaded up to window level) the R8 is well equipped even for the requirements of everyday use. The tailor-made luggage set from quattro GmbH, with cases and bags in leather and carbon fibre, is a particularly exclusive feature here.

Even golfers need not forgo their R8 as a means of getting to the course: the storage space behind the seats is large enough to accommodate two golf bags.

The body

New facet to lightweight construction quality

The outward body shape of a high-performance sports car is of course the aspect that initially matters most: its design must win the hearts of car enthusiasts. But in the technical domain, too, the metallic structure has to meet particular requirements: the body of a sports car must be light in weight, to maximise its dynamic performance. It also needs to be highly rigid as a condition of ultra-precise handling. And then, of course, good aerodynamics are called for – not simply in order to achieve an impressive top speed, but equally for stability and driving safety. And last but not least, passive safety is as important in a sports car as in any other model.

The perfect solution to all these requirements is the Audi Space Frame (ASF). Audi developed this trailblazing aluminium technology in the early 1990s for the first-generation A8 and has since perfected it over many stages. In ASF technology, the body's supporting structure is made of extruded aluminium sections and die-castings. Aluminium panels are incorporated into this skeleton such that they form a positive connection and perform a load-bearing role. Each individual component of the ASF space frame is optimised for its specific task by the use of widely differing shapes and cross-sections, thus combining maximum stability with minimal weight.

Audi is a world leader in aluminium lightweight construction of cars. The latest expertise in calculating and optimising every component was used in the development of the high-performance sports car. The structural components of the R8 are moreover made from innovative aluminium alloys; they exhibit superior strength and as such offer scope for further weight reduction.

Extremely rigid but low in weight

The entire bodyshell of the Audi R8 weighs just 210 kilograms. In terms of lightweight design quality, this is an absolute top figure compared with competitor sports cars: it is based on the ratio of body weight to torsional rigidity, as a function of the vehicle's size. It reveals the R8 to be particularly light and rigid, an outcome that can be felt in the ultra-precise driving feel.

The body comprises 70 percent extruded sections, 22 percent metal panels and eight percent vacuum-cast nodes. The profile and cross-section of each individual extruded section have been optimised for the specific application. The curved roof is a special case, because its shape is produced by hydroforming. This means that the profile is pressurised from inside by a liquid, pressing it into the desired shape. This allows a complex shape to be produced, avoiding the need for several different body components. This, too, contributes towards maximum precision as part of Audi's quality philosophy. The elaborate structure moreover keeps the A-post narrow, thus minimising the degree to which the view to the front is obstructed.

The cast nodes, too, are highly complex components. As well as connecting the profiles, they perform other tasks: the node on the A-post, for example, connects the A-post to the floor structure, serves as a mount for the shock absorber bracket and is even the point to which the windscreen wipers are attached. It has only been possible to realise such complex shapes with the aid of design and calculation programs.

A supporting component made from diecast magnesium is used for the first time in the R8's space frame. This is the engine frame, which reinforces the upper section of the rear structure. Magnesium has proven to be the ideal material for this component in terms of weight and rigidity.

The production shop: precision on a small scale

In keeping with the exclusive standards of the Audi R8, its body is assembled largely by hand. Highly qualified specialists produce weld seams measuring a total of 99 metres to connect the castings and profiles. The metal panels in the structure are connected by a total of 782 punch rivets and 308 automatically set, self-tapping screws. Instead of a hole first needing to be drilled for these specially developed flowdrill screws, they are set into the solid material under high force. The result is a particularly strong connection. A total of 38 welding machines, five sets of riveting tongs and just five robots are used in the body shop – the latter for processes where a particular level of force is required.

Working methods in the body production shop are characterised by superlative precision. The dimensional accuracy of every single component is examined to within one-tenth of a millimetre by a fully automatic measuring system. This scanner operates without making any contact; its 95 laser sensors check a total of 220 points on the structure in the space of just five seconds. Before that, all 52 connecting points for the running gear and steering are drilled and cut on the finished body structure in a single pass. This assures maximum precision in the axle geometry.

Computer tomograph: quality with micron precision

Another example of Audi's unstinting quest for quality is the new computer tomograph that thoroughly examines everything from minute components to whole vehicle bodies. Computer tomographs are better known in human medicine, where they provide a hitherto unprecedented view inside the body thanks to their fine-resolution representation and three-dimensional pictures.

Audi has now installed the only computer tomograph (CT) of its kind in the world in Neckarsulm, generating X-rays that are capable of detecting flaws of micron magnitude. That is about one-hundredth the breadth of a human hair. The CT examines primarily connecting points in aluminium lightweight construction to verify their high quality, and scans weld seams or punched joints slice by slice.

The whole process takes place non-destructively: the system is large enough to accommodate the entire aluminium space frame of the R8 in one piece. It is equally possible to check minute electronic components just three millimetres in size.

While the object is rotated in the X-ray, the computer tomograph compiles X-ray projection images for between 100 and 1,000 different angles. 3D reconstructions of the object being examined can be computed from these images: the observer can then "fly through" the weld seam or electronic component in order to obtain an impression of its physical properties from every perspective.

Aerodynamics: playing with the wind

With regard to aerodynamics, there are of course particularly close parallels between the roadgoing sports car, the Audi R8, and the car which earned its reputation on the racing circuit at Le Mans. In both cases low drag is as important to a high top speed as it is to modest fuel consumption. Equally, in both cases downforce promotes good handling and optimum driving safety, including at high speeds. Because on most roadgoing cars and even on many sports cars, the air that flows through and around it at high speeds can in some cases produce considerable lift. This reduces the weight applied to the wheels and thus impairs directional stability.

Racing cars, on the other hand, produce downforce: the faster they drive, the greater the pressure their wheels exert on the road surface. Although this increases drag, it provides stability when braking from high speeds and allows higher cornering speeds. To this end, however, racing cars have giant wing structures and the front ramp angles are not exactly compatible with everyday driving as a result of the very low front aprons – features that are unacceptable on an elegant road version of a sports car.

As on the sports racing car for Le Mans, downforce was more important than low drag in the development of the production R8.

A glance at the competitors reveals how successfully Audi's aerodynamics specialists accomplished their task: with a drag coefficient of 0.345, the R8 has the lowest drag of any sports car producing downforce. The drag consequently does not cancel out the engine's propulsive power until a top speed of 301 km/h.

Diffuser principle from motor racing

The downforce is achieved by means of the extending rear spoiler and the diffuser underbody. The rear spoiler intervenes in the airflow from a speed of 100 km/h, and below 35 km/h the spoiler is retracted back in until it lies flush with the body. It can of course also be extended and locked at the push of a button, for example for use on the racetrack. The rear spoiler's core is filled with a special lattice structure. When in the extended position it does not impact the aerodynamic effect, but when retracted it serves as an additional means of dissipating heat from the exhaust zone.

Even more important in terms of its effect is the fully clad underbody with moulded-in diffusers at the front, ahead of the rear wheel arches and above all at the rear. These generate a low-pressure zone between the vehicle and the road surface, helping to keep the car firmly on the road in effect by suction. The diffuser underbody brings the car full circle, back to the racing car that shares the same aerodynamic principle. The calculation and testing methods, for instance in the wind tunnel with a moving floor, are again the same as for the racing car.

The fully clad underbody also covers the engine and transmission, the only small openings being those for the lubricating system's dry sump and for engine compartment ventilation. Here too, considerable fine-tuning involving computer models of the airflow through the engine compartment was needed to ensure for instance that the air emerging from the car's upper surface did not adversely affect its aerodynamics.

Although seemingly only a marginal issue on sports cars, aeroacoustics plays a very important part in determining long-distance comfort and everyday suitability. Audi was able to call on its wealth of experience as a manufacturer of premium saloon cars in making the R8 the sports car with the lowest level of wind noise.

The aim is ultimately to keep the driver and passenger in top shape over long distances, not unduly distracted by the fascinating sound of the V8 or the high fidelity of the Bang & Olufsen sound system.

Passive safety: sturdy cage

Thanks to its high rigidity and a structure resembling the safety cages encountered in motor sport, the ASF construction principle provides the basis for an excellent level of passive safety. The two longitudinal member planes in the forward structure absorb the forces arising in a collision, reduce them through targeted deformation and channel them into the tunnel and sill structure of the centre structure. The body is likewise very well equipped to withstand the consequences of a side impact thanks to its precisely calculated profiles and nodes down the sides and on the underbody. The fuel tank is located well away from impact zones in the centre of the vehicle, ahead of the engine.

The safety equipment is perfectly matched to this arrangement: the two front airbags have two-stage activation, unfurling their life-saving effect in conjunction with the belt tensioners and the belt force limiters. The seat backs conceal the combined head and thorax side airbags which protect the entire upper body of the driver and passenger if need be. The backguard system incorporated into the head restraints reduces the risk of whiplash injuries in the event of a rear-end collision.

The R8's designers have of course also taken precautions to protect other road users: thanks to the favourable contours of the nose and its extensively optimised design, pedestrian protection is of a high standard. The sports car's front end has a specially matched layer of backing foam six centimetres thick.

It should be emphasised that the overwhelming proportion of road accidents are comparatively minor affairs. The R8 is equally well equipped to take these in its stride: the body structure at the front and rear is bolted together in such a way that any crash damage sustained at an impact speed of up to 15 km/h – and that covers most bodywork damage – can be repaired without the need for welding work.

And with the exception of the roof, all metal panels on the outer skin are bolted to the structure and can likewise easily be changed. If a major repair should nevertheless be necessary, Audi's workshops are perfectly equipped to rectify the damage thanks to their many years of experience in working with ASF bodies.

Engine and drivetrain

From the racetrack to the road

Even more so than for any other vehicle concept, the engine is the nerve centre of a sports car. As well as being a source of dynamism, performance and sprinting ability, it must be capable of generating excitement through its spontaneous response and free-revving character. Finally, its sound is sheer music to the ears of every true sports car enthusiast.

Audi initially demonstrated the performance of V8 engines with FSI petrol direct injection on the racetrack: Audi R8 sports racing cars first appeared with the FSI concept in the 2001 Le Mans 24 Hours – and captured a superb double triumph, marking the start of an unprecedented string of achievements. The year after that, the combination of a superior power characteristic and reduced fuel consumption even paved the way for a one-two-three victory. There was not a single instance of the R8 failing to complete any of its 79 races due to engine failure.

The new Audi R8 now transfers this superiority from the racetrack to the road: like its role-model from Le Mans, it derives its power from a high-revving V8, located ahead of the rear wheels as a mid-engine. The 4.2-litre engine is a new development that features a full array of motor racing technology in the guise of dry-sump lubrication, straight intake ports and an exhaust manifold with equal-length pipes for all cylinders.

Impressive performance figures

This engineering achievement is suitably reflected by a host of impressive figures: the engine's top speed is a notable 8,250 rpm. The engine delivers its peak output of 420 bhp at 7,800 rpm. With its displacement of 4,163 cm³, this outstanding engine breaks through the magic barrier for a production vehicle of 100 bhp per litre.

The high-revving concept also means that the maximum piston speed is 24.1 metres per second at the engine's rated speed. Every piston thus changes direction around 275 times per second.

The torque is equally impressive: the peak value of 430 Newton-metres is achieved between engine speeds of 4,500 and 6,000 rpm. Better still, at least 90 percent of this figure is achieved across the impressively wide speed range from 3,500 to 7,500 rpm. This assures thrust across an extensive range of engine speeds and therefore superb pulling power, enabling the driver to drive in a relaxed style without frequent gear changes.

The road performance is correspondingly impressive: the R8 dashes to 100 km/h from a standstill in just 4.6 seconds, whether with manual gearbox or with R tronic sequential gearshifting. Thanks to its quattro drive and perfect weight distribution, problems of traction are an alien concept to it. It touches the 200 km/h mark after 14.9 seconds. Thanks to its refined aerodynamics, the engine's propulsive power is only finally harnessed by drag at a top speed of 301 km/h.

Compact sports engine

The V8 is very compact in design. This keeps its weight low, improves the vibrational behaviour and is beneficial in terms of installed position and weight distribution. The crankcase, with its angle of 90 degrees between cylinder banks, is only 43 cm long and 52 cm wide. The cylinder bore is 84.5 mm, with a stroke of 92.8 mm. The engine block is made from a high-strength aluminium alloy by low-pressure die-casting. The camshaft and auxiliaries such as oil pump and air conditioning compressor have a reliable, space-efficient chain drive.

In the interests of achieving a low centre of gravity, a sports car's drivetrain should be as low down as possible. Thanks to its dry-sump lubrication, the R8's eight-cylinder engine is much flatter than a conventional engine. This has allowed it to be positioned well down, close to the road surface. Dry-sump lubrication means that instead of being collected in a large oil sump beneath the crankshaft, the engine oil is delivered to a separate tank by a scavenge pump via an oil cooler, and from there pumped back to the bearing points via the oil filter. The oil cooler is another example of precision measures at the vehicle's centre of gravity. It has been positioned very low down in the space frame, behind the left-hand sideblade. The radiators are located in the forward structure: two behind the large air guides at the sides, and a third in the centre, behind the single-frame grille.

The dry-sump lubrication with its oil tank moreover assures a reliable supply of lubricant even under extreme loads: the oil supply of the V8 sports engine is designed to cope with the lateral acceleration that occurs in the rough-and-tumble of motor racing. What is more, the fuel pump in the tank is also designed to ensure that the fuel supply to the engine is never interrupted by lateral acceleration, however extreme it is.

The computer is fast, too

Who does not recall those breathtakingly beautiful, high intake trumpets that Formula 1 cars used to have? The V8 engine of the Audi R8 likewise draws its breath through straight, cast aluminium intake trumpets measuring 23 cm in length. They are integrated into the dual-branch intake system that starts on both sides of the R8 beneath the sideblades and directs the fresh air to the two throttle valves via a 27-litre filter box. At low engine speeds and loads, a tumble flap is activated in the lower section of the intake manifold, producing torque-boosting swirl in the mixture.

The engine speeds of up to 8,250 rpm call for high computing power and speed. That is why the fastest processor currently available for this purpose, the "Green Oak", is used for the engine management. Two Motronic 9.1 engine management systems complement each other according to the master-and-slave principle and supply their digital commands to the mapped ignition with solid-state high-voltage distribution.

Pressure where it is needed – in the cylinders, not the exhaust

On the V8 FSI engine, the fuel is injected directly into the combustion chamber via a single-hole swirl-type nozzle. This supports the very good full-load performance, cools the cylinder from inside, reduces susceptibility to knocking and paves the way for the compression ratio of 12.5. Both camshafts of the four-valve engine have fully variable adjustment, assuring a sports engine characteristic with a steady rise in torque across an extensive engine-speed band.

On a sports car, performance is the overriding objective likewise when configuring the exhaust system. The requirements include low exhaust back pressure and an exhaust manifold that is performance and torque-optimised by means of specific lengths for each cylinder. The two close-coupled preliminary catalytic converters are integrated into the manifold module and ensure that the exhaust emission control lights off rapidly. The two main catalytic converters are housed in the silencer. This is installed behind the engine and above the transmission, and made entirely of stainless steel. It has been possible to reduce its weight by around five kilograms by optimising the wall thicknesses. The large volume of the silencer, the systematic separation of the exhaust branches and the two exhaust flaps are instrumental in giving the R8 its unmistakably ample sound.

The sound sensation

The sound of a sports car's engine has to be electrifying. Every movement of the accelerator and every change in engine speed must be accompanied by a powerful change in sound that does not merely reflect the engine's performance and power flow, but also reinforces how these are perceived.

In contrast to the sound of the engine, other driving noises (wind, tyres) should keep a lower profile. After all, sports car drivers too want to arrive relaxed and refreshed after a long, high-speed stretch of motorway. Noise and vibrational comfort were therefore a particularly important aspect in the development of the R8.

Before the engineers can actively indulge in acoustic design, all undesirable frequencies need to be damped and eliminated by means of exhaustive fine-tuning. The extremely rigid space-frame construction aluminium body provides an excellent basis for low transmission of structure-borne sound. A key component of the mid-engine concept is the bulkhead between the passenger and engine compartments. The sheet metal surfaces of this firewall are insulated with special materials on both sides, and the glass pane too is made from special acoustic glass – a laminated dual pane with a thick soundproofing film.

Playing with the frequencies

That is of course merely a condition of how to play with the "right" frequencies. The engine sound, for instance, is dominated by the intake and exhaust system. If the exhaust flaps are closed, for example, the silencer is transformed into a sound-absorbing reflection silencer. Open exhaust flaps, on the other hand, create a sportily voluminous sound pattern. The air cleaner housing has likewise been intensively tuned: the intake sound now penetrates the engine compartment in carefully measured doses through special sound apertures, and is acoustically filtered by the firewall as it passes into the passenger compartment.

The frequency spectrum moreover has to be right: the V8 supplies a rich array of sounds without any one frequency being interferingly dominant. The extensive fine-tuning has unquestionably been worth while: the higher the engine speed, the higher the load and the sportier the sound produced by the R8.

More than a mere adjunct: the transmission

The dynamic character of a sports car stems not only from its performance and torque: the transmission ratios have to be right, too. The transmission in the R8 has six of these, which can be operated either by clutch and gear lever or, for even more sports racing flair, sequentially by the R tronic. Whichever option is used, the transmission ratios are always the same: short, and crisply engaged.

The manual gearbox is very compact in design. In conjunction with the small-diameter double-plate clutch, this allows it to be installed low down.

The manual gearbox features very short shift travel and utterly precise guiding of the gear lever into the open gear lever gate. It is made from stainless steel, is agreeable to the touch and enjoys exquisite sports-car looks.

Crisp gearshifts, by order

The R tronic sequential gearbox provides even better performance and swifter gear-changing. It adds another dimension to the R8 experience: with manual gearshifts via the steering-wheel paddles or the newly designed sequential gear lever, with an automatic mode comprising two levels, and not least with Launch Control for lightning-fast starts.

The R tronic's electro-hydraulic shifting unit has a separate oil pump with electric pump, permanently supplying the pressure of 40 to 50 bar required for the gear changes. The clutch is operated by the hydraulics, and a second valve block takes the place of the mechanical gearshift control. Other than this, the mechanical gearbox, with its optimum efficiency, remains unchanged. The shift commands from the steering wheel or gear lever are transferred by wire, in other words purely electrically.

Compared with similar competitor solutions, the newly developed, comprehensively optimised R tronic is notable on the one hand for the minimal interruption to the power flow, and on the other hand for the smooth gear changes. The operating speed varies according to engine speed and transmission program. The S mode achieves extremely short gearshift times: in this mode, the R tronic shifts significantly faster than even a well-routined driver. The S mode is available both for manual operation and the automatic program. The threshold engine speeds are then higher than in the standard program.

For pole position starts

With its superior traction, the R8 is an excellent sprinter: it reaches 100 km/h from a standstill in a mere 4.6 seconds – assuming of course a lightning-fast start and ultra-fast gearshifts at the optimum engine speed of 8,250 rpm.

But there is a far easier way to experience the same utterly overwhelming acceleration: with the R tronic's Launch Control. Here, the transmission control unit takes charge by optimally controlling the throttle angle and clutch travel.

The system is straightforward to use: the S mode needs to be activated and the ESP switched off. If the foot brake and accelerator are both pressed right down, the system automatically establishes the engine speed needed for optimum traction and power transmission. When the brake is now released, the R tronic engages the clutch with ultimate efficiency and accelerates the R8 at maximum speed.

Driving fun and safety, from the inventor of quattro

In unveiling the first quattro, now all of 27 years ago, Audi revolutionised the automotive scene and quattro permanent four-wheel drive rapidly became established as the superior drive system. From rally courses to circuits and hill-climb races such as the legendary Pikes Peak, Audi quattro racing cars have dominated almost every category of motor sport over the years, wherever the competition rules have not prohibited this principle due to its crushing superiority.

On ordinary roads, too, quattro makes the most of blending driving fun with safety. The demand-controlled distribution of the propulsive power to all four wheels improves both traction and directional stability in every driving situation. Then of course there is the safety gain in adverse weather conditions, such as rain, ice and snow.

Because of its mid-engine concept, the R8's drivetrain differs in design from all previous quattro models; the driveshaft runs from the transmission through the engine's oil sump, to the newly developed front differential. Here, a viscous coupling distributes the power between the rear and front wheels.

With an axle load distribution of 44:56 in favour of the rear axle, the weight balance of the mid-engine R8 is extremely good. The viscous coupling correspondingly diverts between 10 and 35 percent of the propulsive power to the front wheels. This assures maximum traction, but also preserves the typically agile handling of a mid-engine sports car.

The asymmetric limited-slip differential on the rear axle makes a further contribution towards maintaining balanced handling of the Audi R8. The locking ratio is 25 percent when accelerating and 45 percent when coasting. In conjunction with ingenious axle kinematics, this avoids abrupt load reversal reactions, for instance if the driver switches from accelerating to braking while cornering.

The suspension

The precision sports car

Sporty performance or everyday suitability? Dynamic or comfortable? Such issues are academic in the case of the Audi R8. It is equally capable of race-standard agility and pleasurably relaxed driving for lengthy journeys. Thanks to its elaborate suspension technology, Audi's new masterpiece provides an astonishing level of comfort as well as being supremely sporty.

But the most important term for describing the driving feel in the Audi R8 is precision – that thrilling spontaneity with which this sports car instantly acts upon every movement of the steering wheel and every request for acceleration or braking. The R8 may be responding to the steering wheel, but it almost appears to be responding to the driver's thoughts.

The Audi R8 is ultimately an excellently executed mid-engine sports car. Even in theory, this concept has compelling advantages: unlike a car with its engine at the front or rear, in this case the engine is located very close to the car's vertical axis. The weight is concentrated around the centre of the car and the mass moment of inertia when it spontaneously changes direction is much lower.

Exceptionally high driving safety

This responsiveness lends the R8 a high degree of active safety: a car that steers and brakes well can drive away from hazards faster than an unresponsive car. On the Audi R8, this agility above all goes hand in hand with exceptional driving safety: together with the neutral self-steering behaviour and the wheelbase of 2.65 metres, which is long for a sports car, the excellent quattro drive provides particularly good directional stability.

And before the extremely high limits of handling can be exceeded, the painstakingly optimised ESP stabilisation system intervenes. It offers two levels of protection: the standard mode, which fully preserves both the agility of the R8 and its reserve safety, and the sport mode, which permits greater transverse dynamics for very sporty driving. And those who wish to push their R8 to the limit on a racetrack can switch off ESP, complete with its traction control feature.

Precision with a crafted character

This precision of course stems from a whole raft of skilful engineering solutions. An essential basis for a precise driving feel is a high-rigidity body structure that does not exhibit any tolerances or waywardness even under extreme loads. The Audi Space Frame of high-strength aluminium, with its cage-like structure, is virtually without par at providing this rigidity.

The body production shop in Neckarsulm supplies sheer precision as the basis: after the structure has been welded and riveted, all 52 connecting points for the running gear and steering are machined in a single pass. An automatic station mills, drills and cuts threads precise to one-tenth of a millimetre. This ensures that the suspension geometry planned by the engineers is realised with precision on every production car. An automatic measuring system in the production shop scans 220 measuring points on every body with its 95 laser sensors to verify this.

High-tech in every suspension mount

The basic suspension layout, with double wishbones at both the front and rear, reflects the concept used by almost every racing car right up to Formula 1 level. To reduce the unsprung weight, virtually all suspension components are made from forged aluminium. Particular attention has been devoted to the comprehensively new rubber-metal mounts that connect all axle components to the space frame. These mounts look simple, but are in actual fact individually coordinated high-tech elements. They transfer the transverse forces with precision, while filtering out undesirable vibrations.

A new double wishbone structure with an additional track rod is used at the rear. It permits a defined toe characteristic under load. This makes a huge contribution towards the ease with which this high-performance car can be controlled – along with the grip-optimised damper settings that avoid wheel load fluctuations. By separating longitudinal and transverse forces, it has moreover proved possible to combine sporty precision with very comfortable suspension and acoustic comfort.

Ride comfort, magnetically controlled

A particularly innovative damping technology is available for the R8 as an alternative to the standard gas-filled shock absorbers: Audi magnetic ride adapts the damping characteristic to the profile of the road and the driver's style within milliseconds. This consequently resolves the conflict between driving dynamics and comfort without countenancing any compromises.

The pistons of these shock absorbers do not contain conventional oil, but a magneto-rheological fluid – a synthetic hydrocarbon oil in which microscopically small magnetic particles are enclosed. When an electrical voltage is applied to a coil, a magnetic field is created, causing the alignment of the particles to change. They arrange themselves transversely to the direction of flow of the oil, thus inhibiting its flow through the piston channels. The damper becomes instantaneously firmer.

The advantage of this technology is that damper adjustment responds much faster to the commands from the electronic control unit than previous systems with an adjustable valve. The control unit is supplied by complex sensing technology and constantly monitors the optimum values for each wheel. If the driver for instance enters a bend, the damping force for the wheel on the outer arc of the bend is increased. This reduces body roll even further and the car responds with even greater spontaneity.

Depending on the driving situation – and personal preferences – the driver can choose between the standard and sport modes: heightened ride comfort for long distances and poor roads, or overt dynamism for taking every bend in the road with relish.

Steering with sensitivity

The steering, operating precisely and supplying sensitive feedback, provides the driver with direct feedback from the road surface. With a steering ratio of 17.3:1, the hydraulically assisted rack-and-pinion steering operates very directly. An important aspect of the R8's everyday suitability is the turning circle of 11.8 metres, which is small for a sports car.

This makes the R8 astonishingly manoeuvrable, even though the tyres inside its wheel arches are of mammoth proportions. In the basic specification, 18-inch cast aluminium wheels fitted with 235 mm tyres at the front and 285 mm tyres at the rear provide the necessary grip. 19-inch wheels are available as an option, in which case they are equipped with 295 mm tyres at the rear. The R8 is naturally suitable for driving all the year round, not least thanks to its quattro drive: both 18-inch and 19-inch winter wheels are available.

Braked by 24 pistons

The requirements that the brake system needs to meet on a sports car are very varied: it must ultimately withstand the extreme loads of a racetrack, but also handle stop-and-go driving in urban traffic with ease. Two fixed-caliper brakes painted black, each with eight pistons, are fitted to the front wheels to provide the necessary braking performance, complemented by four pistons on each wheel brake at the rear.

There are particularly elaborate studded composite brake discs with the impressive diameters of 380 mm at the front and 356 mm at the rear. They comprise the friction ring and an aluminium central element connecting the stainless steel studs. This arrangement means on the one hand that thermal expansion of the disc when subjected to high loads does not affect the central element. On the other hand, the use of aluminium cuts the weight of each disc by about two kilograms. And weight-watching is always a key issue for a sports car.

Ceramic brakes with extreme reserves

For even better performance coupled with a further reduction in weight and longer service life, there are the optional ceramic brakes. In this instance the discs are made from carbon fibre reinforced ceramic, a material that has repeatedly proven its worth in the aviation and aerospace sectors. The basis is very hard, frictionally resistant silicon carbide, with its diamond-like crystalline structure. Embedded in it are high-strength carbon fibres that absorb the stresses that occur in the material. The intricate geometry of cooling ducts in the ventilated discs prevents extremely high temperatures. The ceramic brake disc ring is bolted via ten sprung elements to a stainless steel central element that acts as the connection with the wheel's hub.

The ceramic brakes are identifiable at a glance by the anthracite-coloured special six-piston monobloc aluminium calipers and the fixed calipers at the rear. The advantages of the ceramic brakes include a further reduction in weight of around 20 kilograms, which in this case improves the handling characteristics and comfort response. The high abrasion resistance permits an operating life of up to 300,000 kilometres. Their trump card however is their insusceptibility to very high loads.

Even when in operation on the racetrack, for example, the ceramic brakes always maintain their full reserve performance. The ceramic brakes are expected to become available for the R8 from the end of 2007.

When it comes to reliability and durability, the R8 must of course satisfy the renowned high standards of the Audi brand as effectively as any other product. And more: they were put through the ultimate trial of several endurance runs covering more than 10,000 kilometres on the racetrack, with DTM drivers behind the wheel. The circuits driven included the North Loop of the Nürburg Ring, where every single kilometre represents a multiple of the loads encountered on ordinary roads.

The equipment

Exclusivity as part of the deal

Driving a precision high-performance sports car need not involve spartan self-deprivation. Quite the opposite, in fact: the Audi R8 combines superior performance with both a surprising measure of everyday suitability and an exclusive equipment specification. In a nutshell, when it comes to quality and overall appearance, the R8 is one hundred percent an Audi.

The standard technology package is in itself already an exclusive affair: the R8 is the only car featuring an FSI mid-engine with quattro permanent four-wheel drive and Audi Space Frame construction. The sports car in addition comes with an equipment package that accentuates in equal measure its sports characteristics, its standard of comfort for long-distance driving and – naturally for an Audi – its sophisticated appearance.

Exceptional build quality

Even in the basic version, the materials and surfaces are of choice quality. The sports seats provide excellent support and can be adjusted in a wide range of ways (power-operated, as an option). They are upholstered in fine Pearl Nappa leather in the colours black or pale grey.

The seat centre sections are in colour-coordinated Alcantara. The precision-stitched seams arguably do even more to reinforce the visual and tactile impression than the material.

The upper side of the cockpit and the door panels illustrate this particularly vividly: even the basic version, with the technical structure of its surfaces, has a soft backing and stitched edges. The resulting finish is exquisitely elegant – especially when compared with some competitor products.

Another example is the polished stainless steel gear lever gate of the manual gearbox. It is one of several gleaming highlights in the interior, along with the clips in the three-spoke steering wheel, the gear lever and the controls for the air conditioning and audio system.

As distinctive as its owner

Every R8 can be customised to be a precise reflection of its future owner's preferences. It all starts with the body colours, ranging from Ibis White to Phantom Black. Those envisaging a very specific colour can order a custom paint finish from the quattro GmbH Audi exclusive range.

The sideblades behind the doors are definitely a striking visual highlight. They are colour-coordinated with the paintwork, or available optionally in high-gloss Oxygen Silver. The material Carbon Sigma possesses a special sporting flair: as a further option, the sideblades can be supplied in genuine carbon fibre with a clear-coat finish.

Carbon fibre for undiluted racing flair

As a means of customisation, Carbon Sigma is also used to adorn the interior and even the engine compartment. Though the conventional designation of engine compartment barely does justice to this spectacle. The eight-cylinder engine is displayed beneath a glass cover, as if in a showcase. Its recess can be lined virtually in entirety in carbon fibre if desired. Then there are the white light-emitting diodes to illuminate the engine compartment, in conjunction with the coming home / leaving home function.

After all, owners of an R8 are bound to want to cast a final, admiring glance at this jewel of a car after parking it in the garage at night.

A carbon fibre package is also available for the interior. It envelops the monoposto, the unit comprising the displays and controls, and embellishes the doors and centre console. If carbon fibre evokes the sheer excitement of motor racing, the black piano finish is the elegantly sporty alternative. The all-leather equipment specification definitely complements it in perfect style: virtually the entire interior of the R8 is then trimmed in Fine Nappa leather, with colour-contrasting seams if preferred. Here too, an almost inexhaustible choice of colours and variants is available in the Audi exclusive range from quattro GmbH if the standard versions are not quite what the customer is looking for.

The same is true of the optional bucket seats. They have been developed and designed specially for the R8 and are yet another example of the unique blend of uncompromising sportiness and unflinching everyday suitability. The bucket seats envelop the upper body in particular even more resolutely than the standard sports seats and provide perfect support even under the influence of high lateral acceleration. But above all they can be adjusted in a great many ways, are comfortable over long distances and above all permit an easy entry and exit, and do not get in the way when stowing luggage behind the seats.

Expressive night-time guise

The lighting is emphatically one of the highlights of the R8. Because with such an expressive design visible by day, it would be a shame if anyone were to miss beholding Audi's sports car at night. The standard xenon plus headlights with a diameter of 70 mm illuminate the road surface outstandingly well. But the daytime running lights, which trace the contours of the main headlights with 12 light-emitting diodes, provide a truly unique accent. With the low-beam headlights on, the LEDs are dimmed slightly but then assume the function of sidelights, giving the R8 its unique "night-time look"

Admittedly, this high-performance sports car is much more likely to be seen from behind.

And it is no less engaging when viewed from that angle at night, because for the first time three-dimensional illuminated bodies have been created using LED technology, instead of merely flat, two-dimensional lighting surfaces. The tail lights function is performed by 40 light-emitting diodes, which are installed in two tubular-shaped light units. The external structuring and internal optical-fibre effects reinforce the three-dimensional impact. The light output of the LEDs was increased for the brake lights, with a further eight diodes filling the inner surface of the tubes. 32 yellow light-emitting diodes on the bottom edge of the tail lights serve as indicator lights. The high-level brake light, comprising 26 LEDs, extends over almost the entire width of the roof. Its light intensity and the extremely short response time of the light-emitting diodes are genuinely necessary for warning traffic following on behind, because the R8 does of course have excellent brakes.

The world's first all-LED main headlights

But the all-LED main headlights are the absolute highlight: from the end of 2007, the R8 will be the first vehicle in the world to offer this innovative lighting technology as standard. Not only will it give the headlights a futuristic look; it also brings significant functional benefits: the light colour of the LED headlights of almost 6,000 Kelvin is close to that of daylight, and therefore makes driving at night less tiring. It differs markedly from the 4,100 Kelvin of xenon headlights or the relatively yellowish appearance of halogen headlights, at 3,200 Kelvin. The light quality and illumination of these lights are in no way inferior to Audi's outstanding bi-xenon headlights.

If the technical description of these lights sounds complex, it is because these engineering masterpieces of lighting technology are highly advanced creations. The task of providing light is tackled in an entirely different way to conventional headlights. A total of 22 ultra-high-performance light-emitting diodes are arranged in seven groups of two or four, performing the various tasks of the low-beam and high-beam headlights.

For the low-beam headlights, the light from the two groups of four LEDs is distributed by two free-form reflectors as a source of basic lighting. In combination with the projection system of the three groups of two LEDs, the design resembles that of an open pine cone.

They provide the range and the asymmetry. This is achieved first by concentrating their lumens via a primary optical device, then distributing it via a new type of plastic lens. The high beam is operated by the two internal reflector shells each with a group of four LEDs. In stylistic terms, the light is cast forward as if by turbine blades.

The daytime running lights, too, serve as a distinguishing feature of the all-LED headlights: while they have the same contours as the standard lights, the LEDs here form a continuous strip, whereas they appear as individual dots in the xenon version. Simply guaranteed to grab the attention of onlookers!

The energy consumption of the Audi R8 LED headlights totals 60 watts (50 watts for the LEDs, plus 7 watts for the actuating electronics and around 3 watts for the fan). Xenon headlights are even more efficient at 42 watts (35 watts for the xenon lamp and likewise 7 watts for the actuating electronics). Halogen headlights have the highest power consumption, at 68 watts. Compared with standard xenon headlights, the Audi R8 with LED headlights adds 0.008 litres per 100 km to the fuel consumption, a difference that is barely relevant in practice.

What is relevant is the reduction in consumption for LED daytime running lights compared with vehicles without daytime running lights, for daytime driving. The LED daytime running lights in the standard headlights of the Audi R8 use 14 watts per vehicle (6 watts for the LED light output and 1 watt for the actuating electronics, for each headlight). The lights of vehicles without daytime running lights use the same amount day or night, namely 300 watts for halogen headlights and 248 watts for xenon headlights. In other words, around twenty times more.

Tried-and-tested MMI operating system

Safety features such as the tyre pressure monitor and headlight cleaning system and comfort/convenience elements such as automatic air conditioning are all supplied as standard on the R8. An anti-theft alarm with tow-away protection is likewise a matter of course on such an attractive car. All the essentials are included, even down to the drinks holders.

The optional radio and navigation system, to keep drivers always on course, comes with a DVD that covers the entire road network of Western Europe. It is integrated into Audi's tried-and-tested MMI operating system, via which a large range of vehicle and comfort/convenience functions can be selected. The mobile phone preparation with Bluetooth link is available as an option.

Clear view to the rear

The optional Audi parking system advanced provides a clear view of things when manoeuvring into a parking space – another USP in the sports car segment. It combines ultrasonic sensor technology with a rearview camera and displays the space behind the car on the MMI system's monitor. The camera is located above the rear number plate.

Guidance lines are superimposed on the image on the monitor as an aid to manoeuvring. The zone coloured blue, for instance, depicts one vehicle's length to the rear, and orange lines mark the car's course at its current steering angle.

New standard of music pleasure

The R8 is already equipped with a high-quality sound system as standard, with seven speakers and a five-channel amplifier with an audio output of 140 watts. The radio unit incorporates two VHF tuners with diversity aerial for constantly optimum reception, an MP3-enabled CD player and two sockets for MMC/SD memory cards.

The quality standard of Audi's sound systems is reflected by the fact that the company has teamed up with the Danish high-end specialist Bang & Olufsen, which has created an optional system for the R8 that pioneers unprecedented standards of music enjoyment in a sports car. Twelve sound sources, surround sound and the very high audio output of 465 watts for a small interior compartment provide just an inkling – but barely more than that – of the experience that awaits the occupants.

The interior of a sports car presents a particular challenge to the sound designer because of so little space being available. This makes it a real challenge to integrate the 12 speakers to good effect. The doors accommodate the 200 mm woofers and also the 80 mm mid-range speakers, which are complemented by the 25 mm tweeters in the mirror triangles and the surround speakers on the upper side of the cockpit. Additional 168 mm woofers/mid-range speakers with their own tweeters are concealed in the rear side sections. The 150 watt subwoofer box for ample bass reproduction is installed behind the glove box.

Sound that envelops the driver

The amplifier, with a total output of 465 watts – together with the optional CD changer – is fitted behind the driver's seat. A conventional linear amplifier would produce a very large amount of power dissipation and therefore heat – as a rule of thumb, two watts of heat for every watt of audio output. The Bang & Olufsen system consequently has an amplifier using innovative ICE-Power technology that limits the power dissipation to no more than 50 watts.

The digital signal processor integrated into the amplifier can transform straightforward stereo music into surround sound that totally envelops the driver and passenger. This effect is achieved by a complex process of analysing music for components that sound rather "dry" and contain little echo, and components that the listener would experience as rather diffuse in a natural environment. The signals are distributed to the twelve speakers accordingly. A microphone in the roof of the R8 constantly measures the level of noise inside the car, the volume of the space and the resonance behaviour, and in effect corrects the sound pattern in real time.

However impressive it is, though, the R8 driver is bound to want to switch even this sound system off occasionally, in order to savour the splendid sound of the eight high-revving cylinders.

The market

The car market's most discerning segment

Audi is entering the most discerning segment of the car market with the R8. It is served by only few, highly prestigious manufacturers vying for the attention of affluent, highly sophisticated customers. The R8, with its characteristic design and technological expertise, coupled of course with the sports and commercial success of the Audi brand, is destined for pride of place in this field of competitors.

Sports cars are the most emotionally charged way of getting from A to B. More programmatically than any other type of vehicle, they elevate the driving experience to an end in itself and heighten awareness of the exhilarating side of mobility. And they are not afraid to display their credentials openly: with their sporty, expressive design, sports cars are also always a statement aimed at the world around them.

Purchases with the character of rewards

The reasons why someone buys a sports car are therefore always in the realm of the emotional. Acquiring such a car is often a person's means of rewarding themselves, or is the fulfilment of the dreams of their youth. The main age group for buyers of sports cars is accordingly those aged 40 to 49. The proportion of male customers is exceptionally high, at more than 95 percent – though women play a major part in the decision-making process. 90 percent of the target group own two or more vehicles.

The Audi R8 is positioned in the market segment of classic sports cars. Below it there are the small sports cars, of which the Audi TT is a very successful example, and above it the super sports cars. Sales in the Audi R8's segment have been slightly over 40,000 units in recent years, with a slight upward tendency. The sports car market is, however, driven to a very high degree by the supply end: new models stimulate the entire market.

Supreme performance plus practical utility

The market is moreover very heterogeneous. It ranges from uncompromising driving machines offering very limited everyday practicality to comfort-oriented Gran Turismo vehicles, and the demographics of their buyers are correspondingly disparate. The Audi R8, on the other hand, combines superlatively dynamic performance with high practical utility and appeals to both customer groups.

A portion of R8 buyers are expected to be loyal Audi customers who already drive a high-class model of the brand with the four rings. The majority will, however, be conquests, mainly from other makes of sports car.

With its basic price of EUR 104,400, the Audi R8 is positioned very competitively considering its technological standards, road performance, very high quality and specification. The production shop at Neckarsulm is geared up for building a total of 20 cars a day. The most important sales markets for the R8 will be Germany, the USA and Great Britain.