



## MediaInfo

### 2007 Audi Q7

#### The performance SUV

#### Power and presence

**The new Audi Q7 sets new standards in the sport utility vehicle (SUV) segment. It ingeniously combines sportiness and versatility, sophisticated technology and the luxury of a premium-class vehicle.**

#### Highlights

- **Design**
  - Powerful yet elegant exterior and interior design
  - Single-frame grille – a clear indication of the powerful engine
  - Sporty coupé-like roofline contrasts with high side panels that create muscular stance
  - Dynamic shoulder line lends an athletic character
  - Driver cockpit based on A6 and A8 interior designs
  - Premium interior materials including available Cricket leather for seats, Alcantara for headliner, fine wood inlays, and aluminum trim
  
- **Body**
  - Dimensions: L 200.2”, W 78.1”, H 68.4”, wheelbase 118.2”
  - Five, six or seven passenger seating configuration available
  - 28 seating configurations possible
  - Luggage capacity up to 88 cu. ft., double load-area floor
  
- **Equipment**
  - Standard: Multi Media Interface (MMI)
  - Standard: Deluxe automatic air conditioning
  - Option: Bi-Xenon headlights with Adaptive front lighting system
  - Option: Panorama glass sunroof
  - Option: Advanced key
  - Option: Warning system for lane-changing manoeuvres Audi side assist
  - Option: Radar-based distance control system adaptive cruise control (delayed introduction date)

## **Exterior design**

The Audi Q7 brings the new design language of the Audi brand to the premium SUV segment. Its elegant styling represents power and presence and relays its dynamism and sportiness. Flowing forms create a body of moving surfaces, which appears sculpture-like even when standing still.

The Audi Q7 is a new breed of SUV. The first representatives of this vehicle category were angular beasts with a strictly off-road character. These were followed by the first premium SUVs, with a design clearly oriented towards on-road capabilities. In contrast, the Audi Q7 is a third-generation performance SUV. It combines the best features from both worlds and reflects this in its design. Its exterior is as much a reflection of superior sportiness as it is of the robustness required of a powerful off-roader.

A strong personality such as the Audi Q7 convinces with its attention to detail. The front is dominated by the striking, practically vertical single-frame grille – a clear indication of the powerful engine installed behind. With its slim chrome frame and rib structure, the grille has a marked three-dimensional effect – the horizontal ribs protrude slightly to emphasize the horizontal lines, the vertical lines are set back slightly. On either side of the grille, wide headlights reach far into the fender, their light tubes visible behind clear-glass covers. In addition to the standard halogen lights, Bi-Xenon headlights and the dynamic cornering adaptive light are available.

### **Sporty and robust**

The engine compartment lid has a distinctive V-shape to underline the sporty character of the Audi Q7, whereas the dominant shape of the bumper emphasises its robustness and stability. The lower section is color-contrasted. This visual differentiation – further accentuated by the contrasting paintwork option – clearly highlights the versatility of the vehicle.

The Audi Q7 looks powerful and long: with regard to its ratio of length to width to height it boasts the sportiest proportions in its class. These proportions are harmonious and at the same

time striking. High side panels lend the vehicle body a muscular appearance, contrasting with the flat sporty window area.

The free-flowing surfaces create the impression of a sculpture. Broad curves and seams intensify this effect as does the play of light and shade on the concave and convex surfaces. The elegant dynamic line running above the wheel arches and the strong high shoulder section lend the design an athletic character.

### **Bullish front end**

The Audi Q7 seems to forge ahead even when standing still. Its overhang at the front is markedly short and the sill line rises dynamically towards the rear, passing round the distinctly contoured wheel arches. The A-pillar, optically accelerated by its flat angle of projection, forms a harmonious transition area from the engine compartment lid to the roof. The roofline starts to drop again just in front of the B-pillar and finally ends in a coupé-like curve at the sporty flat, sturdy D-pillar. A spoiler carrying the third brake light lends a final touch.

The rear of the Audi Q7 has an unusually dynamic and innovative design. The sweeping wrap-around tailgate with the S-shaped shut line has an optically stabilising effect while at the same time expressing the urge to push forward. The tailgate does not interrupt the bumper with the embedded light strip and itself carries single-piece lights with an expressive design, extending to the body flanks and accentuating the horizontal lines at the rear. The shoulder line of the body ends at the top edge of the lights. Both exhaust tailpipes are arranged symmetrically. On vehicles with the V6 3.6 FSI engine they are 3.15 inches in diameter, 4 inches with the V8 4.2 FSI .

A number of impressive details round off the sporty appearance of the Audi Q7, starting with the large wheels of up to 20 inches in diameter symbolizing maximum performance and safety on and off-road.

The exterior mirrors have been optimised to achieve minimum air resistance, low noise levels, dirt-resistance and good drainage in wet weather. Horizontal turn signals featuring LED fiber-optic technology are harmoniously integrated.

The drag coefficient of the Audi Q7 on models with steel suspension is 0.37. If air suspension is fitted, it is even lower due to the lowered body at higher speeds, reaching 0.34 on the V6 FSI, for example. These figures are the best in the SUV segment.

### **A range of ten exterior colors**

All ten exterior colors are perfectly matched with the sporty yet elegant character of the design. The colors are Silver Metallic, Quartz Grey Metallic, Condor Grey Metallic, Lava Grey Pearl Effect, Phantom Black Pearl Effect, Cobalt Blue Metallic, Garnet Red Pearl Effect, Calla White, Bahia Beige Metallic and Sycamore Green Metallic.

The lower sections of the bumper and door cover strips, coordinated with these paint colors as standard by Audi, are available in Black and Dark Grey. The contrasting colors Platinum Grey matte and Silver matte are standard on the 4.2 model (optional on 3.6).

## **Body**

### **Strong and safe**

The dimensions of the Audi Q7 are not its only impressive feature – its spacious body is extremely rigid, robust and safe. State-of-the-art restraint systems help protect passengers in the event of an accident.

The Audi Q7 is a vehicle of prestigious proportions even in the premium SUV category. It is 200.2 inches long and has a wheelbase of 118.2 in. – figures that put it ahead of the competition. The width of 78.1 in. and the height of 68.4 in. (with steel chassis) are an indication of the superb spaciousness offered by the interior.

A primary development goal was to achieve maximum static and dynamic rigidity for the unitized body. Audi engineers have accomplished this with an elaborate lightweight steel construction. 26% of all components are of high-strength steel and 32% are even made of the

very high and ultra-high-strength varieties. In some areas such as the floor cover, ultra-modern tailored blanks are used, the various strengths of which are created in the rolling process. Six percent of the body components are made of aluminum – these are the fenders, the engine compartment lid and the tailgate. Compared with conventional components made of steel panels, Audi has achieved a weight saving of 48.4 lbs. In order to produce this unusually flowing design for the tailgate the expertise in lightweight aluminum construction – developed by the brand over many years – was required. The aluminum tailgate alone reduced the weight by around 16.5 lbs., another advantage of this being that the customer requires less force to open and close it. With the V8 engine the Audi Q7 weighs in at 5,269 lbs.

### **Bonding, laser welding and laser soldering**

During assembly of the performance SUV, cutting edge procedures and joining techniques – such as laser welding and laser soldering – are applied. Evidence of this high standard of quality can be seen from the body surface and its precise and narrow seams.

Areas subject to the greatest load were joined over a length of almost 262.5 ft. using spot-welding technology; laser welds of 7.2 ft. in length will be found on the roof frame.

High body rigidity is a prerequisite for dynamic on-road handling and diverse off-road qualities. At the same time it ensures good vibrational behavior, making the Audi Q7 an exceptionally quiet and comfortable vehicle.

### **Crash protection of the highest standard**

With regard to occupant safety, the body of the Audi Q7 offers a standard equal to the high claim expected of the brand. Crash zones with precisely defined deformation behavior in all sections help reduce the impact energy in a controlled way so that the high-strength occupant cell can provide maximum survival space.

In the event of a frontal collision, front sensors located near the headlights, working in conjunction with other sensors on the B- and C-pillars, register a crash within the space of a few thousandths of a second. A few milliseconds later, the control unit triggers the belt tensioners to minimize any possible belt slack. A belt-force limiter yields at a particular load threshold to

allow occupants to sink into the inflated airbag. Belt-force limiters are also standard on the outer seats of the second row. The full-size front airbags function in two stages of inflation.

### **Padding absorbs energy**

To a large extent, the steering wheel and the driver's airbag retain their position during a collision thanks to a sliding mechanism incorporating a damping function which is connected to the steering column. Energy-absorbing padding under the instrument panel, in the footwell and carpet protects the legs and feet; a device in the foot controls decouples the pedals.

With regard to the vehicle body, a system of supports in the front section, some of which are made of ultra-high-strength steel, help absorb the impact impulse.

The bumper beam distributes the forces evenly and directs them specifically to the side members, which are matched in terms of behavior to the bulkhead and the vehicle floor. The sills including inner reinforcement tubes, the columns of high-strength steel and the roof frame profile extending from the A- to the D-pillar distribute the remaining forces in such a way that the load to which the passenger cell is subjected is kept as low as possible.

In the event of a side collision other protective components in the body come into play. The doors overlap with the sidewall frame, their panels are extremely deformable in particular areas. The front seat frames remain rigid thanks to particularly stiff cross braces.

### **Sideguard head airbags for all three seat rows**

The occupant cell of the Audi Q7 is naturally equipped as standard with side airbags at the front, which protect the chest and pelvis of the occupants. As an option, these airbags are also available for the outer seats in the second row. Standard on the other hand is the head-protection sideguard airbag system which completely covers the entire side window area up to the third seat row. The airbags are filled by a hybrid gas generator. Once triggered, the side airbags do not deflate immediately therefore offering protection in the event of a secondary collision.

The new Audi Q7 also affords its passengers excellent protection against the consequences of a rear-end collision. It already meets the requirements of future standards, i.e. it withstands an impact against a deformable barrier at 50 m.p.h. and with 70 percent overlap.

The compact assemblies with the resulting deformation area under the Q7's high engine compartment lid have a beneficial effect in terms of pedestrian protection.

## **Interior**

### **Elegant and extremely versatile**

The interior of the Audi Q7 is sporty and at the same time elegantly functional. The uncompromising quality standards of the brand are to be found once again in the Audi Q7 performance SUV, combined with a level of practicality and versatility that sets standards.

Clear architecture and the finest materials and craftsmanship throughout: these are the lasting impressions conveyed by the interior of the Audi Q7. The elegant forms and the high-quality surfaces are both robust and luxurious. The instrument panel is covered as standard in a soft skin, pleasing to the eye and to the touch. Typical for an Audi, the gaps are exceptionally even and narrow.

In respect of the visual impression, calm surfaces in the same material and color dominate, accommodating the functional units which are embedded like islands.

The cockpit is color-contrasted with the instrument panel; the top is in black or beige and the armrests in the doors are trimmed in Cricket leather (optional).

### **Inlays in three fine woods combined with aluminum**

The standard decorative inlays are made from fine wood, including burr walnut, olive ash or tamo – a dark wood from Japan. Air outlets, optionally in aluminum look, aluminum inlays in the wood trims, discreet decorative rings and strips on covers and switches, as well as an

exquisitely designed lighting package including footwell lights using LED technology, can be ordered if desired to add yet more finesse to the ambience.

Additional options including Alcantara trim for the headlining and roof pillars as well as various leather trims complete the overall impression of elegance and style.

The heavily grained Cricket leather, is optional, whereas leather seating surfaces are standard in the 4.2.

### **Cockpit based on the Audi A6**

The interior architecture reveals the Audi Q7's kinship with the Audi A6 and A8. Powerful taut lines lend the door trims a dynamic look. The styling of the controls and cockpit, with its generous layout and sleek design, was inspired by the Audi A6. The center console is organically integrated into the cockpit; the main instruments – speedometer and tachometer – feature dropped-shaped surrounds.

The broad and high center tunnel is also a perfectly uncluttered and functional operating area, undisturbed by the presence of a handbrake – instead there is a foot-operated parking brake. The Multi Media Interface (MMI) located on the tunnel is highly impressive for its ergonomic qualities. Independent comparative tests have once again underscored the superiority of this Audi technology, even compared with new designs from the competition.

### **Bose sound system with 14 speakers**

Other modules include a Bose surround sound system with a digital sound processor and 14 speakers together with a large subwoofer and a DVD-based navigation system. Mobile phone preparation with Bluetooth interface and a speech dialogue system to simplify system operation are further technologies that ensure luxurious and relaxed travel.

Even the standard operating system, as found in the 3.6, comes with an audio system featuring eight speakers and a single CD drive. The standard specification for the Audi Q7 also includes a sensor package with light/rain sensor, automatic headlight activation and a coming/leaving home

lighting function. In addition, the Audi Q7 4.2 FSI has a number of top-class features on board: the driver information system, cruise control and a leather-covered multifunction steering wheel, which the driver can use to operate the audio system, the MMI and optionally the speech input system and phone.

### **Indirect air supply for automatic air conditioning**

The deluxe automatic air conditioning, which comes as standard, is exceptionally quiet and almost completely draft-free. Its special feature is an air outlet grille in the center of the instrument panel that ensures indirect ventilation. The air flow and temperature can be adjusted separately for the driver's and front passenger's sides. The automatic control operates based on the angle of the sun; an air purity sensor activates the air recirculation function if necessary.

As an option, Audi supplies the Q7 with a four-zone automatic air conditioning system, which provides even more cooling and heating power and even more precise air-flow regulation. The four-zone system has a separate air conditioner unit in the left side panel of the luggage compartment and a separate operating panel for the rear passengers. This air conditioning system comprises ten sensors, which register the temperature in the passenger compartment, additional air outlets in the C-pillars and a total of 19 electric motors.

All Audi Q7 models are equipped with an electric auxiliary water pump, which at the push of a button utilizes the residual heat from the coolant to adjust the temperature of the interior.

### **Open sky system panorama sunroof over 5.6 ft. long**

The large-area panorama sunroof, known as the open sky system, is a very special extra for the performance SUV. It creates a light-flooded sense of spaciousness and a fresh and airy interior for a rewarding driving experience. The open sky system is around 5.6 ft. long and comprises three glass elements. The front section can be tilted electrically by means of a rotary switch or opened by 19.3 in.; the rear section is tilted. Two slightly transparent roller blinds – the front blind electric, the rear operated by hand – prevent the interior from overheating.

The Audi Q7's panorama sunroof generates very little noise when open. A mesh wind deflector reduces noise levels and drafts.

### **Heated wipers**

The wiper motors are further evidence of how well thought-out the controls in the Audi Q7 really are: they reverse electronically the wipers' direction of rotation. The right arm also executes an additional lifting movement to provide the widest possible field of clear vision. In the rest position both wiper arms are invisible to the driver, lying in the slipstream of the engine compartment lid where they cannot produce any unpleasant air flow noise. To prevent the rubber lips from deteriorating, the wiper blades are placed in a different direction after each use. At temperatures of below 4 degrees the motor lifts the wipers slightly – in this way they are heated by the air vents in the interior and do not become frozen to the windscreen.

Numerous storage compartments enhance travelling comfort for every passenger. Brackets suitable for 1.5-liter bottles will be found in all four door pockets; there are also six cup holders. Additional stowage areas are incorporated in the center console and the center armrest. Nets are to be found in the footwell on the front passenger side, on the luggage compartment trim and on the back of the front seats; a compartment for glasses, for example, is integrated in the roof module. Audi Q7 customers also receive a center armrest with separate sections for the driver and front passenger.

### **Completely new seating system**

The seats in the Audi Q7 have been redesigned from scratch and provide excellent comfort on long journeys and a relaxed seated position throughout. The driver's seat is height-adjustable and the steering column can be adjusted for height and angle. The prospective customer can generally choose between three seat configurations: the performance SUV is available as a 5-seater, 7-seater or 6-seater.

The standard Audi Q7 will leave the assembly line as a 5-seater 3.6. In this case the seat bench in the second row is divided 60:40; as an option both elements can be moved back by 4 inches – in this way passengers can enjoy the most generous legroom in this vehicle category. The rear seat

split is 40:20:40; an armrest with pop-up cup holders is incorporated into the center section. This element can be folded down completely to create a through-loading width of 11.8-inches (30 cm).

If all three backrests are folded down – it is not necessary to remove the head restraints – a flat loading area is created, flush with the level of the luggage compartment. For even greater seating comfort, all backrests in the second row of seats can be reclined by 10 degrees.

The 7-seat version, standard on the 4.2, has two seats in the third row suitable for persons of up to 5-ft. 4-in. tall. They can be folded flat on the loading floor if necessary.

The mechanism for this is particularly user-friendly – by pushing the backrests (divided 50:50) slightly, the head restraints are retracted automatically. Cup holders are integrated in the luggage compartment side trim panels.

### **Convenient access thanks to easy entry**

The seats in the second row of a 7-seater Audi Q7 are adjustable for fore/aft movement as standard. They are equipped with a new and convenient adjustment mechanism for carefree access to the rear: if the backrests are folded forward by an angle of around 50 degrees, the entire seat slides forward by around 8.3 inches from the rearmost position.

On the 6-seater Audi Q7, the standard configuration on the 4.2 Premium, the individual fore/aft adjustable seats in the second row have a particularly comfortable design, based on the sports seats. The thigh support has more padding, is broader and longer, and has slightly higher side sections. At shoulder level the backrests are wider and softer. Between the comfort seats there is a separate center console with two cup holders and a large storage compartment as well as a folding armrest.

### **Up to 28 configurations**

The functional seating concept of the Audi Q7 allows up to 28 different loading configurations. The maximum load volume is an ample 88 cu. ft., without the seats having to be removed.

Even if all three seat rows are used, a very respectable luggage capacity of 10.8 cu. ft. remains. The innovative styling of the tailgate – its handle released electrically – provides exceptionally large access to the load area: it is no less than 45.7 inches wide.

As an option – and standard on the Audi Q7 4.2 FSI – the tailgate can be fitted with electric motors, which are activated by a switch in the driver's door, the remote control and via buttons on the tailgate itself. Two transversally mounted motors in the vehicle operate via a bracket directly at the hinges. A programming function allows the driver to determine the upper end position of the tailgate according to his preference. With the adaptive air suspension option, loading is even more convenient: the rear is lowered by 2.8 inches at the touch of a button, lowering the loading sill to 30.1 inches.

#### **45.7 inch -wide through-loading facility**

Standard on the Audi Q7 is a robust loading sill made of high-grade steel, which seamlessly joins the loading floor. The through-loading facility is an impressive 45.7 in. wide, sufficient for large golf bags. A luggage compartment cover, which can be conveniently operated with one hand, is also part of the standard package; with two additional roller covers, it compensates for the various positions of the backrests in the second seat row. Standard lashing eyes hold retaining straps or ropes. A load guard and roof rails are also provided as standard.

Sufficient space remains above in the double load-area floor to accommodate a removable, waterproof dirt-resistant tray. This can be used for soiled or wet items such as ski boots and for all types of small utensils. On the 5-seater there is an additional large storage compartment behind the second seat row.

## **Assistance systems**

The Audi Q7 is a technology demonstrator in the SUV segment – not only with regard to its drivetrain and suspension. A number of optional innovative assistance systems are available to make the driver's task even easier and more convenient.

### **Adaptive cruise control**

A new stage in the development of the radar-assisted cruise control system including automatic distance control – named adaptive cruise control – is to make its debut on the Audi Q7. The new system controls distance and speed from 0 to 90 mph. It is therefore able to brake the vehicle to a standstill behind the vehicle ahead. The Audi Q7 is the first Audi and the first SUV worldwide to feature this technology, which takes a lot of the unpleasantness out of driving on congested roads.

The new system offers substantially more comfort particularly in slow-moving traffic, jams and bumper-to-bumper urban traffic, as extensive tests in major cities and on very busy main routes have shown. Often the driver does not need to stop entirely and can keep moving at a crawling speed. If he should have to stop, however, he only needs to release the brake and tap the cruise control lever on the steering column to drive off again.

### **Four driving programs available**

The Audi Q7 driver enters his desired speed on the left steering column lever. Via the MMI terminal he can select one of four driving programs which determine the time interval from the vehicle in front – between 1.0 and 2.3 seconds – and the dynamics of the control function – from sporty to comfortable. The distances are shown on the screen of the driver information system.

The radar sensor for the system is discreetly mounted in the area of the licence plate trim. Compared with the first generation, it has several new features. During the journey it transmits waves at a frequency of 76.5 gigahertz – they cover a distance of 600 ft. and an angle of 8 degrees (previously four degrees). From the differences between the consecutive measurements

the system can determine whether and how much the distance from the car in front changes; it registers the angle of the vehicle ahead in relation to the vehicle's own direction of travel.

The radar system is integrated in the CAN network, which covers the entire vehicle, and communicates within a few thousandths of a second with the control units for engine, transmission and brakes. The system adapts the speed of the Audi Q7 by manipulating the accelerator or brakes, whereby in both cases the main emphasis is on comfort and convenience. The braking action initiated by the system has also been deliberately limited to  $4 \text{ m/s}^2$  – adaptive cruise control is designed as a convenience system.

### **Warning in two stages**

In hazardous situations, for example if the driver in front suddenly brakes hard, a new technology takes intervening action. If the Audi Q7 driver does not react within a specified time, a two-stage warning is issued. Stage one consists of an acoustic signal accompanied by a prominent red flashing signal on the instrument panel.

In the second stage, if there is still no response from the driver, the system triggers a short but clearly noticeable jolt, generated by a fast build-up of pressure in the brake system. At this point there is no permanent deceleration but the system shakes the driver awake with this jolt and urges him to brake hard. At the same time the brake system is automatically supplied with pressure so that full braking performance can be attained without delay when the driver applies the brake pedal.

Audi engineers have identified this as the most effective solution – after evaluating numerous road tests in which test persons were confronted with the most diverse warning messages. There is a very serious side to this new technology. According to a study conducted by the German Insurance Association, not paying due attention and delayed reactions – even falling asleep at the wheel for a few fractions of a second – are the cause of 25 per cent of all road accidents.

### **Audi side assist**

Even with all the sophisticated active driver assistance systems such as ESP, the primary objective of Audi research work is to prevent dangerous situations from arising in the first place. For this reason a designated department, the “Audi Accident Research Unit” analyses accidents. Their aim is to analyse those areas in which people often make mistakes and to lessen the impact of these by providing high-tech solutions in the vehicle. The new Audi side assist is one of them.

Similarly to adaptive cruise control, the latest generation of Audi side assist utilises intelligent radar technology. The side assist, a world first, has been specifically designed for lane changes, as it monitors the critical blind spot. Two 24-gigahertz radar sensors in the rear bumper monitor the area next to and behind the Audi Q7 to warn the driver – additionally to the image in the rear-view mirror – of any approaching vehicles. The sensors have a range of up to 16.5 ft.

If another vehicle is moving in the critical zone at more or less the same speed or is approaching fast from the rear, yellow LEDs in the housing of the exterior mirror light up permanently. The driver sees the LEDs only when looking in the mirror. As long as he is only looking ahead he will not notice them – they are not meant to distract him. If, despite the warning, he presses the indicator lever to change lanes, the LEDs become brighter and start to flash.

For licensing reasons the display on the inside of the mirror housing is directed so that practically only the driver can see it. The system adapts the brightness to the ambient lighting; in addition it can be adjusted via the MMI. It is active from a speed of 35 mph and can also be switched off. Audi side assist does not intervene in the driving and control functions.

### **Audi Rearview Camera and Parking System**

The Audi parking system is new and incorporates a rear-view camera and rear acoustic parking assistance. The extremely light-sensitive camera is integrated, together with its control board, in the handle of the tailgate and covers a wide area behind the vehicle with

its viewing angle of 130 degrees. The images captured appear – slightly distorted – on the MMI screen. It withstands acceleration of up to 100 g – 150 percent more than is normally achieved when closing the tailgate.

When reversing the system shows the driver the way with the help of various lines and boxes. With parallel parking, for example, blue areas show how much space is required by the Audi Q7 – they clearly indicate whether the parking space is large enough. Blue lines assist when steering and countersteering. With angle parking, orange-colored lines mark out the course. The camera image also shows the rear bumper and the extended tow hitch – in this way the performance SUV can be maneuvered with precision onto the drawbar of a boat or horse trailer.

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## MediaInfo

### 2007 Audi Q7

#### **The performance SUV** **Sportiness and power**

**On the road, the Audi Q7 excels with sporty driving performance and dynamism; off-road its uncompromising propulsion is dazzling. The Audi Q7 is the performance SUV from the creator of quattro.**

#### Highlights

- **Engines**
  - 4.2 V8 FSI developing 350 bhp, 325 lbs.-ft. (440 Nm) at 3,500 rpm
  - 3.6 V6 FSI developing 280 bhp, 265 lbs.-ft. (360 Nm) from 2,500 to 5,000 rpm
    - (V6 model available in September)
  
- **Drivetrain**
  - 6-speed Tiptronic transmission
  - quattro permanent all-wheel drive with 42:58 front/rear torque split
  
- **Suspension**
  - Audi dynamic chassis with double wishbone suspension featuring aluminum and 18 to 20-inch aluminum wheels
  - Optional adaptive air suspension with adjustable ride height and dynamic roll stabilization
  - Speed-dependent Servotronic steering

## **Drivetrain**

### **Powerful and cultivated**

The Audi Q7 is available on its debut with a 4.2-liter V8 FSI engine. A 3.6-liter V6 FSI engine will follow in the second half of 2006. Typically for Audi, both power plants work with performance-enhancing, efficient direct-injection technologies.

The engines of the new Audi Q7 deliver a level of performance promised by the vehicle's powerful outward appearance. Torques of up to 325 ft.-lbs. delivers superior tractive power in all speed ranges.

With a displacement of 4,163 cc, the V8 is a close relative of the engine used in the new Audi RS 4. In the Audi Q7, in line with the character of the performance SUV, it develops 350 bhp at 6,800 rpm. But its torque curve is even beefier than in the RS 4: it achieves 325 lbs.-ft. (440 Nm). This power output is the best in its class and is available at 3,500 rpm – 85 percent is unleashed from as low as 2000 rpm. The engine has a sonorous tone and is highly cultivated throughout the entire speed range.

### **Three chains for the four camshafts**

The powerful V8 belongs to the present V engine family of the brand, notable for a 90° cylinder angle and a distance of 3.5 in. between cylinders. A maintenance-friendly two-stage chain drive system, comprising three single roller chains, activates the four camshafts; it is located at the rear of the engine to save space. A fourth chain drives the ancillaries.

The cylinder housing of the V8 engine is cast from an aluminum-silicon alloy; the pistons and rings glide in the liners on the hard silicon crystals. Separate liner inserts are not necessary: this permits a narrow bridge width of only 5.5 millimetres and saves weight accordingly. Modifications to the sump and the oil pump ensure adequate lubrication even on challenging terrain – in a similar form, these measures will also benefit other engines in the Audi Q7.

The V8 draws its fuel through a newly designed two-stage variable intake manifold made of magnesium. Electric motors control the manifold length and tumble, and therefore the charge movement, by means of flaps. Two high-pressure pumps, driven by the intake camshafts, deliver the fuel to two interconnected chambers made of stainless steel. One of the most modern engine management systems on the world market controls the whole process – the Motronic

MED 9.1.1.

### **Direct injection with a lambda value of 1**

Like the engine in the RS 4, the V8 in the Audi Q7 uses FSI direct gasoline injection technology. Here the fuel is not delivered to the intake manifold but injected directly into the combustion chamber, where an even air/fuel mixture to the value of lambda 1 is produced. Thanks to the cooling effect of the directly injected fuel, Audi's development engineers have at the same time been able to increase the engine's compression ratio.

The result is a more efficient combustion process and consequently greater power output – this is demonstrated most effectively by the spontaneous response. FSI engines deliver more power than the conventional power plant with manifold injection – and they do so with outstanding fuel economy. A significant strong point of the V8 FSI is demonstrated in the frequently used part-load range, where it uses five to seven percent less fuel than an engine with manifold injection.

### **A sprint in 7.0 seconds**

The figures confirm the impressive power potential of the eight-cylinder engine. The performance SUV with the V8 sprints from zero to 62 mph (100 km/h) in just 7.0 seconds. Top speed is limited to 130 mph.

### **The V6 develops 280 bhp**

The V6 engine available in the second half of 2006 will have a displacement of 3.6 liters. It is derived from the six-cylinder engine that powers the top versions of the Audi A3 and the TT. By enlarging the bore, displacement has increased from 3,189 cc to 3,597 cc. Its torque is available across a wide range: 265 lbs.-ft. (360 Nm) from 2,500 to 5,000 rpm. With a power output of 280 bhp at 6,200 rpm, the V6 represents yet another impressive power pack for the performance SUV.

With an included angle between cylinder banks of 10.6 degrees the V6 is unusually compact. Its engine block is fashioned from grey cast iron; the valves are actuated by low-friction roller cam followers with hydraulic clearance adjustment. Intake and exhaust camshafts, which are chain-driven, are continuously adjustable to reduce emissions and further improve fuel economy. The variable intake manifold also contributes towards an improvement in cylinder charging. Like the V8, the V6 uses FSI, the direct injection technology developed by Audi engineers, which enhances performance and efficiency.

The performance figures are correspondingly impressive: the Audi Q7 3.6 FSI accelerates from zero to 62 mph (100 km/h) in 8.2 seconds; its top speed is limited to 130 mph.

### **Six-speed automatic transmission**

To optimally convert the high performance of the engines into forward propulsion, the Audi Q7 4.2 FSI and 3.6 FSI have the tiptronic automatic transmission on board as standard. Depending on the engine version, two technically different versions are employed, both of which have the same dynamic character.

The six gears of the tiptronic are wide-spaced and ideally exploit the torque potential of the engines – on the road and on difficult terrain, where the torque converter with its damping action and torque multiplication is particularly well suited for driving off; it also replaces a reduction gear.

Thanks to its enormous efficiency and ability to transmit up to 553 lbs.-ft. (750 Nm) of torque, the tiptronic is perfectly equipped for any situation. Typically for Audi, it is compact and light – the version for the V6 3.6 FSI weighs only 176 lbs.

Transmission management is taken care of by the dynamic shift program DSP. It adapts to suit the individual style of the driver and the prevailing road conditions and responds to any changes. DSP controls a wide range; the shifts are precise, spontaneous, fast and smooth.

### **Faster shifts with the sports program**

A special sports program – the S position – promotes a particularly dynamic driving style: in this mode, gear changes are delayed and performed faster. The Motronic double-declutches during downshifts in overrun. The driver can intervene in the process at any time, either via the special shift gate on the selector lever or via optional paddles on the steering wheel. Manual shifts too are particularly fast and sporty.

A number of changes were made to the tiptronic for off-road use. The transmission shafts, their mountings and the parking mechanism were reinforced; modifications to the oil sump and intake filter guarantee oil supply even under extreme conditions.

### **quattro: 25 years of all-wheel drive experience**

The classic technology for all high-performance Audi vehicles is quattro permanent four-wheel drive – a concept that has been celebrating victories in motorsport and in standard production vehicles for 25 years now. More than two million Audi quattro vehicles have come off the assembly line to date. quattro technology ensures excellent traction and lateral stability and minimises the effect of propulsive power on the vehicle's self-steering properties. This provides the basis for dynamic handling and driving stability – on and off-road.

A self-locking center differential in the drivetrain of the new Audi Q7 – with its longitudinally installed engines – automatically ensures optimum power distribution to all

four wheels. The center differential is a self-locking worm gear that is purely mechanical and so reacts instantly. Its locking action only takes effect under power, while allowing speed differences when the brakes are applied or when cornering.

Like the RS 4 and the S8, the Audi Q7 features the latest-generation self-locking center differential. It has an asymmetric/dynamic torque split of 42:58 between front and rear wheels. In particular off-road situations or if the prevailing road conditions change, the differential can direct up to 65 per cent of the power to the front or up to 85 per cent to the rear. If a wheel at one axle starts to spin, the electronic differential lock (EDL) takes control by means of appropriate brake intervention.

### **Superior agility and steering precision**

The slightly tail-heavy basic characteristics of the quattro drive in the Audi Q7 signify even more agility. This is mainly noticeable when driving into bends – when the steering is virtually free of any noticeable torque steer. Thanks to direct servotronic control, which is standard on all Audi Q7 models, the driver enjoys a level of steering precision and clearly defined handling that up to now has been unimaginable in an SUV and which has only rarely been experienced in a sports car.

The transfer box on the Audi Q7 is installed directly next to the automatic transmission. A hollow shaft in the case delivers torque to the self-locking center differential. It is then distributed – the somewhat larger proportion flows via the ring gear and the coaxial output shaft to the driveshaft and from there to the rear. The smaller share is supplied to the center differential, from where it travels by chain to a second driveshaft, which leads past the transmission to the front axle.

## **Suspension**

### **Dynamic and safe**

The dynamic suspension of the Audi Q7 uses sports technologies such as double wishbone suspension all round. At the same time, long spring travel, a ground clearance of 8.1-in. and robust components take into account the demands of off-road driving. In respect of dynamism, the driving performance of the Audi Q7 bears any comparison; and in terms of driving safety, it also sets the benchmark – on the road and on rough terrain. In addition to the standard steel chassis, adaptive air suspension is available.

The Audi Q7 is a classic illustration of Audi's claim to offer optimum technical solutions in every model. As a performance SUV it harmoniously combines excellent driving comfort with a level of dynamism that is quite new for this category of vehicle. Even the slightly tail-heavy axle load distribution of 42:58 percent between front and rear is a clear sign of its agile nature.

Audi supplies the Q7 with a conventional steel-spring suspension and hydraulic twin-tube shock absorbers as standard. Ground clearance here is around 8.1-in. to ensure good off-road handling. Spring travel is correspondingly long and comfortable. The long wheelbase of 118.2 in. guarantees straight-line stability at high speeds.

### **Wishbones of aluminum**

To enhance ride comfort and driving dynamics, the double wishbones at the front of the Audi Q7 are made of aluminum. The upper triangular wishbone is a cast part, the lower is forged. The large gap between both wishbones guarantees precise wheel control. The mounting for the spring strut and upper wishbone is also made of aluminum.

The lower wishbone and anti-roll bar, made of high-strength steel tubing, are attached to a subframe of high-strength steel, on which the steering is mounted. The mounts are hydraulically damped – this minimizes rolling noise and improves comfort even more.

### **Servotronic with variable assistance**

All Audi Q7 models are equipped as standard with speed-dependent servotronic steering. The purely hydraulic rack-and-pinion steering helps the driver to maneuver in or out of a parking space, and its directness and precision ensure good road contact and clear feedback at high speeds.

The servotronic is generally tuned for direct sporty response: depending on steering wheel angle, its ratio varies from around 10.0:1 to 16.5:1. When steering out of the central position, the steering responds more indirectly – this guards against nervous vehicle reactions at high speeds and makes minor corrections to maintain straight-line stability. If the steering wheel is at a greater angle, the control action is more direct and agile with a view to an active driving feel.

At the rear axle, the upper wishbone and the spring strut cross bar are made of forged aluminum. The tie bar is made of weight-optimized tailored rolled blanks, which thanks to steel plates of varying thicknesses, combine low weight with high rigidity for sections under particular load and strain.

All control arms are attached to a subframe which also supports the final drive. The spring struts are cardan-mounted on a separate wishbone of cast aluminum, which is attached to the body. Their marked inwardly tilted position reduces overall height and creates more room in the vehicle interior to accommodate the third row of seats.

The rubber-bonded metal mounts at the rear axle have been specially optimised to perform their respective purpose. Where loads occur in a longitudinal direction, their torsional rigidity is low to enhance ride comfort. Lateral forces on the other hand are firmly absorbed in the interests of driving stability.

### **Large wheels but extremely light**

The Audi Q7 is fitted with 18-inch aluminum wheels as standard, with 235/60 tires – on the eight-cylinder version with 255/55 tires. The rims underneath are 7.5 inches wide (for the V6 engines) and 8 inches (for the V8).

Each can bear a wheel load of 1980 lbs. while weighing only 24.2 and 26.4 lbs. respectively.

Wheels in other sizes (19 and 20-inch) can be ordered as options. An optical highlight is the new 20-inch 5 twin-spoke cast aluminum wheel of two-color design – with spoke flanks in anthracite and polished design elements.

### **Driving on air**

The latest-generation adaptive air suspension is available as an option on the Audi Q7. The combination of air suspension and an electronically controlled damping system produces the perfect synthesis of sporty handling and supreme ride comfort.

The air suspension essentially comprises a compressor, two accumulators each with a capacity of around 10 liters and four electronically controlled dampers, integrated into the suspension struts. To ensure sensitive response the externally-guided bellows are made of a particularly thin material.

For normal driving, a choice of three different characteristics can be selected via the Multi Media Interface (MMI) operating system, ranging from very sporty to comfortable, namely Dynamic, Automatic and Comfort. The system control unit varies the air-spring and damping characteristics at the compression and rebound stage according to the mode selected and vehicle speed. The driving modes and height levels can be read off the MMI screen. The ride height also appears in the central driver information display.

### **More sportiness in dynamic mode**

The Automatic mode is designed to offer the best handling performance in every situation. Alternatively, drivers requiring more comfort can select the Comfort mode, which has a particularly soft damping action. In both cases the body is at normal ride height up to 75 mph, offering 7.1-in. ground clearance. In the Dynamic mode the suspension is lowered by 0.6-in. from the start – the lower center of gravity ensures a more dynamic driving experience.

Irrespective of the mode selected, the body is automatically lowered on motorways to a ground clearance of 6.5-in. if the Audi Q7 travels for longer than 30 seconds at a speed of at least 75 mph. From a speed of 100 mph – maintained constantly for over 20 seconds – the body is lowered by another 0.6-in. to further optimize stability and aerodynamic drag. If the vehicle slows down, the air suspension lifts the body in two stages to restore the normal ride height – the thresholds for this being 81 and 44 mph.

Particularly on country roads, the dynamics also benefit from an important innovative feature of adaptive air suspension – the dynamic roll stabilization function. The system, using information provided by four sensors at the wheels and three additional sensors on the body, actively responds to steering input and body roll. By deliberately increasing the damping forces, it counteracts the rolling motion of the vehicle. In fast cornering maneuvers, for example, the body remains horizontally stable.

### **Off-road mode up to 60 mph**

Off-road, the Audi Q7 driver can activate two additional modes: the off-road mode is one inch above normal ride height and can be used up to a speed of 60 mph. The lift mode is even higher – with 1.4-in. of extra ground clearance, even major obstacles can be negotiated at moderate speeds.

Finally, two functions round off the range of options: via a button in the luggage compartment the driver can lower the loading lip by 2.8-in., making it much easier to

load heavy objects into the vehicle. There is even a special suspension mode for driving with a trailer.

The air suspension of the Audi Q7 also functions as a high-tech self-levelling suspension – it keeps the body at the ideal height, regardless of the load situation. Passengers benefit from a very smooth ride at all times.

### **New ESP with off-road expertise**

The Audi Q7 is equipped with latest-generation stabilisation control technologies. The ESP incorporates a number of components – the anti-lock brake system ABS with electronic brake-force distribution EBD and hydraulic brake assist, the traction control system ASR and the electronic differential lock EDL.

To allow for the far-reaching scope of the performance SUV, the ESP has new features such as an off-road mode that can be activated by a switch. In this mode the system tolerates a certain amount of slip when braking or accelerating, which can often be of help on loose surfaces. Fluid control thresholds apply at lower speeds, whereas more and more priority is attached to driving stability as the speed increases.

For downhill driving there is a special assist function. Below 12 mph it keeps the speed constant on steep downhill stretches, allowing the driver to fully concentrate on steering the vehicle. In addition to this, the rollover stabilization program intervenes in the event of critical driving situations that might cause the vehicle to overturn and takes the necessary corrective braking action.

### **Fording depth of over 20 inches**

With all these technologies – quattro permanent four-wheel drive, high-torque engines, long spring travel and high ground clearance – the Audi Q7 offers superior off-road capability. Its maximum possible climbing capacity is 31 degrees.

The ramp angle measures 21 degrees for vehicles with steel-spring suspension, 24 degrees for the Audi Q7 with air suspension. There is a similar difference in the angle of slope (23/25 degrees). If driving through water the Audi performance SUV can plunge in up to a depth of 20-in.

An off-road package for fans of a more cross-country look will be available at a later date. This includes painted front guards, underside protection plates of brushed stainless steel at front and rear, flared wheel arches and rocker panels.

The ESP is not the only system on the Audi Q7 to feature state-of-the-art technology – the hydraulic brake system also gives a strong performance. Even under extreme load it has exceptional deceleration capabilities. The four discs are internally ventilated and generous in size – those at the front axle are 13.8-inches in diameter and 1.3-in. thick; rear disks are 13.0-in. in diameter. The front brake calipers are cast from black anodized aluminum and feature a six-piston design.

Air ducts in the vehicle floor help to improve brake cooling. The smooth-finished discs are dirt-resistant – important for off-road driving. Here deflector shields protect the brake lines from damage caused by gravel impact.

The standard tire pressure monitoring system makes another important contribution to driving safety. It constantly monitors the temperature and pressure of all four tires. In the event of pressure loss it sends warning messages, varying in priority according to pressure levels.

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## MediaInfo

Ingolstadt, February 2006

### Developing the Audi Q7:

#### Virtual worlds and a car for the senses

- **From “Pikes Peak” show car to start of Audi Q7 production in less than three years**
- **More intensive use of simulation technologies than ever before**
- **“Soft factors” such as sound, feel or odor played an important part**

In the words of Prof. Dr. Martin Winterkorn, Chairman of the AUDI AG Board of Management: “The Audi Q7 represented uncharted territory for Audi – both in its own product range and on the competitive scene. The market had no similarly sporty and dynamic, but also spacious, multifunctional vehicle with off-road capability to offer. To achieve this position was the special challenge our development teams had to face.”

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Almost 5,000 people work in Technical Development at AUDI AG. Since 2002, many of them will have been engaged to a greater or lesser degree on the project bearing the internal Audi number AU 716: the development of the Audi Q7. But in addition to the many technical departments, experts from Production, Tool making, Quality Assurance and Marketing were brought in from the first concept and design sketches onwards. There can be no doubt that creating a vehicle such as the Audi Q7 is one of the most complex tasks encountered anywhere in industry. So many of the tasks it involves can only be hinted at or described in brief here.

At Audi, the engineers, designers, mathematicians, physicists, industrial chemists, mechanics, shop-floor personnel, electronics and IT experts work in virtual computer worlds, on crash circuits, test rigs and other test equipment, in wind tunnels – or in worlds of the senses. But they have all contributed to a fine result: a third-generation sport utility vehicle (SUV).

## **Design**

One of the most important reasons for buying a car has always been its appearance – in other words, its design. The designers are the first people to concern themselves with a new vehicle project: they give the idea its actual shape. Even for the Audi Q7, the process starts in a ‘classic’ way, with pencil and sketch pad. Audi Q7 design project manager is Canadian Dany Garand, who recalls: “The Audi Q7 design process was a special challenge for our team. We had to create a product that was totally new for Audi, and bring the normally rather crude design of an SUV into harmony with Audi’s formal idiom. The kind of SUV on the market today would not have suited us.”

There were a variety of demands put on this vehicle due to it needing to satisfy the European, American and Asian markets. Garand comments: “Consumer profiles in Europe and overseas are distinctly different, and during the design process we had to bear these regional patterns of life in mind. This included the Audi Q7’s overall size, its maximum capacity of seven seats, specific storage facilities and even new color concepts both inside and out.”

Audi’s large SUV project acquired concrete form midway through 2002.

Garand explains: “After the concept had been largely finalized, we succeeded in developing and building the fully functional Audi Pikes Peak quattro show car in only six months, so that it could be shown to an international public at the Detroit Motor Show. We wanted to establish how the public would react to our vision for this vehicle segment.”

The response was overwhelmingly positive – an ideal brief for the designers, who were then able to base their styling work on the “Pikes Peak” rather than having to start again from scratch. Garand: “We saved a considerable amount of time when it became clear that many of the show car’s basic features could be adopted on the production model.”

Some 150 members of Audi Design at the Group’s head offices in Ingolstadt, led by Gerhard Pfefferle, began intensive creative work on the Audi Q7’s interior, exterior, color schemes, equipment and trim. The aim, in Garand’s words, was to “unite the best of four worlds” in the new SUV: the dynamic,

sporty lines and road behavior of a sports coupe, the comfort of a luxury sedan, the technology and strength of an off-roader and the space and versatility of a van. The designers produced three different concepts, one of which was chosen for further work.

Body designer Satoshi Wada explains the exterior features of the chosen concept in the following terms: “The Audi Q7 is homogeneous in the ratio of overall height, length and width, with a short front overhang and a rather longer one at the rear. Like the A6, the body tapers considerably in plan view, and divides visually into volumes above and below the dynamic boundary line. The Audi Q7 therefore looks sporty and elegant above this line, but sporty and robust below it.” For its Japanese designer, the Audi Q7’s outward values are emphasized by its coupe-style roof line, the close-to-vertical angle of the Audi single-frame grille, the innovative rear-end styling with single-unit rear lights and the boldly flared wheel arches and large wheels.

Inside this SUV, the creative minds have adopted an “island design” principle. Interior designer Uli Beierlein and his Dutch colleague Mattijs van Tuijl describe this as “closed, single-color surfaces, entirely made from one material, interrupted by islands containing the functional units.”

Beierlein: “The three easily identifiable islands are the door island (the inside door trim), the seat island (the seat locations) and the driving-area island (the cockpit and center console unit). These islands are distinguished by their functions and differ both visually and in terms of touch from all the other surfaces.”

Van Tuijl adds: “The interior makes a lasting impression because of its clear architecture, perfect ergonomics and top-quality materials and craftsmanship.”

This is the point at which color and trim designer Ute Grönheim took over. Together with her colleagues, she selected suitable fabrics, materials and paint finishes for the Audi Q7. She comments: “Color and the nature of the materials tell us a lot about a car and its owner. The color of a car is the first thing you notice about it, and is therefore an excellent way of stimulating the emotions.”

To create this initial emotive response, ten standard paint finishes are available, some in metallic and others in pearl effect, from Calla White to Garnet Red and from Condor Grey to Phantom Black. Customers can also have the sill areas of the Audi Q7 finished in Silver or Grey as a contrasting color. New colors with a specific SUV affinity are Sycamore Green and Bahia Beige, metallic. Ute Grönheim explains that each color is applied to an actual vehicle before being approved: “They simply can’t be shown realistically enough as a virtual display.”

The forceful but at the same time luxurious feeling that prevails inside the Audi SUV is emphasized by various high-grade materials and fabrics. The designers created fine (“Verano”) and coarser-grained (“Cricket”) leather upholstery and trim, and developed a new type of carpet known as “Fresco” and the “Cosmo” seat upholstery fabric. Three kinds of wood inlays from three different continents are available: American burr walnut, European burr olive ash and Tamo, from a tree that grows in Japan.

Ute Grönheim illustrates the difficult task that the designer has to perform when identifying trends: “Our own tastes have to take second place when choosing materials and colors. On the contrary, we have to work out what will appeal as strongly as possible to customers in various markets in a few years’ time.” A car is a long-lasting product, but can be confronted with fashionable preferences and trends in taste that prove to be relatively short-lived.”

### **Development of the concept**

Not everything that seems ideal from a design standpoint can be implemented as a practical technical concept. When the designers start their work, therefore, their colleagues in Concept Development begin to realize the vehicle project at the same time. As Ralf-Gerhard Willner, Head of Vehicle Concepts at Audi, puts it: “We are to some extent the mediators between the various worlds.” He defines his task as tracking down the best possible compromise between emotive styling, customer-relevant and legally permissible demands and the concept’s technical feasibility.

One of the main tasks of Concept Development is to lay down the vehicle's principal dimensions and its architecture. The engineer Felix Biffar undertook this work for the Audi Q7 project: "From the very outset, the emphasis when the package was drafted out for the Audi Q7 was on typical Audi qualities: design, driving dynamics, safety, the operating concept, comfort and convenience." One of the first assumptions for the AU 716 project, he goes on to explain, was for a third row of seats to be an option. "Market surveys have confirmed that customers want this kind of flexible, purpose-orientated seat arrangement in a vehicle of this size," explained Biffar.

A wheelbase of three meters was therefore chosen. The high seat position characteristic of an SUV was also included in the requirement specification from the very start, as were sporty handling, an above-average level of comfort on long journeys, off-road capability, ample room for the occupants and the largest load area in its class.

Another requirement was that despite its imposing dimensions, with an overall length of more than five meters and a width of almost two meters, the Audi Q7 should have a sporty visual character. Also finalized by Concept Development at a very early stage: the size of the wheels, the range of engines and transmissions to be offered, the use of air suspension, the MMI operating concept and the capacity of the fuel tank. Biffar comments: "We wanted to create a "performance SUV" from the outset, with a combination of emotive design, comfort, agile handling, luxury, flexibility and space – something that no model in the SUV segment had so far succeeded in achieving."

By the end of 2003, the technical aspects of the Audi Q7's specification had been largely finalized. As far as the main dimensions were concerned, the concept development team was able to make rapid progress by using the show car as a basis. Biffar and Willner describe the procedure as "lean", and even as "relaxed" in comparison to other projects. Willner explains why: "Our advantage was that the Audi Q7 was an entirely new product for us. There were no preconceived opinions, and we didn't have to base our work on a previous model."

When development work began, the core team consisted of just 20 people, but the total number went up steadily as the project continued, until in the end about 500 men and women were working exclusively on Audi Q7 development.

### **Virtual worlds: simulation and computing**

Among these employees were many who were closely involved in the car's progress, its appearance and its design long before they were able to handle a single component "in the flesh". Never before had there been such intensive use of computer-aided simulation tools from the virtual world. Never before had so many of an Audi model's characteristics been developed and evaluated digitally, and never before had so few actual prototypes been built and, at the same time, such a high level of production maturity attained.

The advantages are obvious: everything that can be designed, destroyed, tested, modified and displayed on a screen in the virtual world of the computer only needs to be confirmed when actual hardware becomes available. This not only cuts development time and cost but also boosts quality, since any conflicts of objective affecting the car can be eliminated even more accurately and efficiently.

This is the world in which terms such as Computer Aided Design (CAD), Computer Aided Engineering (CAE), Digital Mock-Up (DMU), Finite Element Method (FEM) or Virtual Reality (VR) are bandied about all the time in conversation among the technical specialists. They work with super-computers, microprocessors, power walls, gigantic volumes of data and the very latest software technologies. This is where the classic skills of mechanical engineering and vehicle design come together with advanced mathematics, lattice structures suitable for input to the computer and complex differential equations. There is very little that the computer cannot calculate and simulate.

The list of areas in which simulation technology is used in motor-vehicle manufacturing is a long one: body rigidity, strength and operating life, avoidance of unpleasant vibration, doors, lids, occupant protection, interior components, joining techniques and crash performance can all be displayed by these methods, as can driving dynamics, ride comfort, fuel consumption, sensor

operation, aerodynamics and aero-acoustics, heating, ventilation and air conditioning, headlights, suspension characteristics or the actual combustion process in the engine. Many others could be mentioned too: Audi Technical Development currently uses some 250 simulation methods in production areas.

Even in the early vehicle development phase, colleagues from the Tool making, Production or Test Construction departments participate actively: as elements in the “digital factory”, they can simulate how certain sheet-metal parts can best be made (or if they are suitable for production in their initial form).

In an imaginary production shop, the spot welds to be produced by the robots are decided upon, and the robots’ own positions determined so that they keep clear of each other while performing the necessary movements.

In the “Cave”, as it is called, an engineer from Test Construction wearing 3D goggles extends a fully movable “virtual hand” into the Audi Q7’s body. He is using this authentic three-dimensional environment to check whether an employee on the assembly line will later be able to install, for example, a seat designed on the computer or the vehicle’s roof lining easily without any collisions with other components occurring. Nor should we forget that all this happens at a time when neither the car itself nor any of its components have been built.

At the power wall, a back-projection screen about 6 meters wide and 2.5 meters high, everyone involved in the development process, from technicians to members of the Board of Management, can view a virtual picture of the Audi Q7. Almost every detail can be displayed, even the surface texture of materials used inside the car.

With a single mouse-click, the car can be turned for viewing from every possible perspective, or the observer can make a circular flight all around it or through the interior. Various paint finishes and equipment specifications, as well as left- or right-hand-drive versions, can all be conjured up within a matter of seconds. The development engineers can even blend the real and virtual worlds together on the power wall, for example by displaying the virtual

Audi Q7 in a real setting to see what effect is created when it is seen on the road.

Dr. Ulrich Widmann is Head of Functional Design at Audi. He knows the reasons why simulation technologies have now become indispensable: “A model such as the Audi Q7 is a highly complex combination of many different components and assemblies, with any number of different characteristics. To develop it and determine its performance by means of genuine tests would be totally impracticable. Such a mammoth task can only be tackled successfully by means of a vast number of virtual-world simulations.”

Even in the Audi Q7 concept phase, computing and optimizing the design ratings of the vehicle package is a particularly important task. There are tools that permit the modular vehicle concept to be described by just a few different parameters – about 1,000 in all, each of which can be changed interactively. Adjacent design areas that are influenced by these changes are then modified automatically. For example, the complete B-post can be moved rearwards by five centimeters within a matter of minutes.

The volume of data necessitated by such a change is immense: for a crash analysis on a modern car, up to a million elements are now involved when calculating the results within a period of 150 milliseconds. To calculate the effects of a frontal collision, the super-computer with its eight processors needs about 22 hours.

When Audi Q7 development is complete, some 2,000 virtual frontal crash tests will have been carried out, compared with just over 40 on actual vehicles. Dr. Widmann: “Our forecast accuracy from these simulations is already 90 % or higher!” An important aspect of such processes is for all the departments taking part to be networked together at an early stage, so that all of them have access to the latest design data.

Widmann: “For the Audi Q7, we used an “Engineering Portal” for the first time that our suppliers were able to access directly as well.”

The experts' term for this kind of closely interlocked development work that takes place in parallel is "Simultaneous Engineering" (SE).

"We never worked as intensively as this before in the virtual world. Together with an actual concept car to act as a basis for package decisions and convey a sense of space, we were able to reach the series-production development phase more rapidly", says Dr. Widmann.

### **Wind tunnel**

A great many specialist areas were – and are – directly involved in development of the Audi Q7 to series production readiness. The project acquired much of its dynamic character from the engineers concerned with aerodynamics and aero-acoustics. Audi Q7 prototypes and pre-production vehicles spent more than a thousand hours in the Audi wind tunnel center in Ingolstadt, which is one of the most modern anywhere in the world. The results are a drag coefficient of 0.34, the best value in the large SUV segment, and extremely low wind noise levels.

For Dr. Michael Jaroch, who with his team was responsible for Audi Q7 aerodynamic, aero-acoustic and water management development work, achieving such good results was far from easy. As he says: "Optimum design of a vehicle of this size, without any adverse effects on its styling, is a difficult balancing act for us."

The Audi development engineers studied the airflow acting on the Audi Q7 in a vehicle wind tunnel that is both quieter and faster than those currently in use anywhere in the world. A turbine approximately four meters in diameter, with a drive rating of 2.6 Megawatts, delivers air to the wind tunnel at up to 300 kph.

The thermal wind tunnel is used to optimize the flow of air to the Audi Q7's cooling systems. On this hi-tech test rig, the temperature can be varied anywhere between 20 and 50 degrees Celsius, and the airflow accelerated up to 275 kph. Even the floor of the measurement zone can be heated, to simulate hot road surfaces. Set into the floor is an additional roller for Audi models with quattro four-wheel drive.

A further development priority is water management. The aim here is to minimize interference with the driver's view of the road as a result of dirt and water on the windows.

Dr. Jaroch illustrates this as follows: "Critical situations can for example arise if the car is following a truck along a wet road, and water spray from its wheels obscures the driver's view. This can typically occur at speeds of between 70 and 90 kilometers per hour. Our aim in the case of the Audi Q7 was to optimize the airflow round the A-posts and exterior mirrors so that the side windows and mirror glass remain clean."

How is this achieved? The vehicle is sprayed with a fluorescent liquid in a special wind tunnel devoted to surface contamination. Under black light, the paths taken by rain and spray and the areas where the water collects can be clearly seen.

### **Electronics**

Audi naturally keeps pace with the rapidly increasing importance of automotive electronics – in the Audi Q7 as in all other Audi models. For this purpose, an ultra-modern Electronics Center has been specially built on the Technical Development site in Ingolstadt.

All Audi's competence in electronics is concentrated in this seven-storey building, which includes space for future extensions. Some 750 employees from the Development, Purchasing, Quality Assurance, Production Planning, After Sales and Controlling departments work there.

Peter Dlab, in charge of Electrics/Electronics Project Steering for the Audi Q7, sees the significance of electronics in this way:

"Automotive electronics are a key technology, and have therefore been made into a core competence area at Audi." In the cars of tomorrow, up to 90 % of all innovations will be based on electronics.

The volume of electronics is increasing all the time: navigation systems, on-board computers, infotainment, electronic engine and transmission management, airbags, ABS, ESP, electric windows and central locking – without electronics, none of these would function as they do in the modern car. A large number of electronic control units in the vehicle communicate with each other; Audi models have long since taken to the “data highway”.

An example will serve to show the unstoppable progress of in-car software integration: an Audi Q7 with top-level specification contains as many as 50 electronic control units and has a memory capacity of up to 90 Megabytes. Peter Dlab: “That’s precisely where the major challenge lies. We have to make these increasingly complex in-car electronic networks easy for the customer to operate, and also ensure that they process data reliably.” Another important aspect involves bringing the remarkable development progress that is being made in electronics into harmony with the comparatively lengthy life-cycle of the average car.

The Electronics Center plays a decisive part in this strategy, by grouping all Audi’s competence in the electronics area under one roof. The terraced building complex provides workplaces for 400 electronics development experts, 80 employees from a variety of Purchasing departments and 50 specialists from Quality Assurance and Production Preparation.

Each of the project teams includes members from various company work areas, with efficient “cross-desk” communication between them.

Innovative electronics development naturally includes organizational changes, a minimum number of hierarchy levels, efficient processes and a young, highly motivated team. Project teams can be brought together at one point for various activities in a number of different areas, without major modifications to the room layout.

This is particularly important in the electronics field, since experts in widely varying disciplines often have to work together for limited periods on specific projects.

The Electronics Center is not only impressive in its architecture: it is also equipped with the very latest measuring and testing apparatus, for instance a climatic roller test rig that is used to test operation and reliability of electronic components for the Audi Q7 at the most extreme temperatures and over a variety of road surfaces. This combined test rig can simulate arctic temperatures just as effectively as humid, tropical weather or the extreme heat of the desert.

The complete electronics for the Audi Q7 are tested on a board assembly, and the reliability and fault-free interaction of the components – up to 4,000 in all – checked in detail.

The MMI laboratory is entirely devoted to checking and developing all the functions to be performed by Audi's innovative Multi Media Interface (MMI) concept in authentic operating conditions. MMI is standard equipment in the Audi Q7. There is also an ultra-modern acoustic laboratory in which the engineers perfect the sound system for the new SUV. Yet another impressive facility is the lighting test area, 50 meters long and 10 meters wide, which is used to develop new vehicle lighting systems.

Audi is already one of the leading car manufacturers in the electronics area, in which it has achieved a high standard of reliability.

The Audi Q7 also sets new standards in “chips, bits and bytes”. Not one but several innovative driver assistance systems have reached series production for the first time on this model. For example the “Audi side assist” radar-supported lane-change assistant and “parking system advanced” with its visual and audible signals and rear-view camera.

The ESP includes several new functions, such as the hill descent assistant. A special off-road mode optimizes brake-system performance and traction on

loose surfaces. None of these features would be practicable without electronics. The Electronics Center will enable Audi to consolidate and extend the leading position it already occupies in this area.

As electronics are used to an ever-greater extent in modern cars, electromagnetic compatibility (EMC) is becoming an increasingly important topic. This term refers to a vehicle's ability to operate correctly in an environment in which electromagnetic interference signals may occur, and also to avoid transmitting such signals if they could prevent other equipment from operating safely. Audi operates an extremely modern EMC center in which the Audi Q7 too was exposed to a torrent of external radio signals.

The central element in this EMC testing center is the big absorber room. It has metal screening and is lined with pyramid-shaped absorbers to reduce reflection of radio waves. In this futuristic setting, large aerials bombard the Audi Q7 with electromagnetic fields in the frequency range from one Megahertz to three Gigahertz.

### **Test-driving**

To make sure that the Audi Q7's features remain fully operational, even in extreme conditions, when the vehicle is in the hands of the customer, a test driving program is carried out. Never before has a model been exposed to tests representing such an extensive range of potential tasks and applications as those to which the Audi Q7 was subjected. Before the first production vehicles are delivered to customers next spring, Audi Q7 prototypes and pre-production vehicles will have covered several million test kilometers.

Testing takes place at a variety of locations: on various test rigs, at the Volkswagen Group's proving ground, on the Arctic Circle at minus 35 degrees Celsius, in the scorching heat of South African desert, sand and loose stones, on highways in Florida, on dusty tracks surfaced with gravel chippings in Europe, Asia, Brazil and Central America, and on the North Loop of the Nürburgring motor racing circuit. Every other kind of road is featured in the program too:

isolated, twisting country roads, German motorways and dense city-center traffic.

Although still disguised, the Audi Q7 is on the road constantly, often in the farthest corners of the earth and in the most severe dynamic, climatic and topographical conditions (*see MediaInfo "A tough test for cars – from South Africa to the North Loop"; 2 August, 2005*).

### **Suspension and driving dynamics**

The Audi Q7 is designed to master a variety of different driving tasks equally well: long-distance road travel, leisure activities and off-road driving. This calls for a combination of widely differing chassis and suspension characteristics. Audi's development engineers have tuned the Audi Q7's suspension systematically to achieve a standard of road dynamics previously considered impossible.

Front-to-rear axle load distribution of 52:48 when unladen (V8 FSI) and quattro permanent four-wheel drive with dynamic load-dependent torque distribution are the keys to optimal road behavior right up to the handling limits.

In the words of Thomas Kriegel, Head of Driving Characteristics Simulation at Audi: "We used DOE (Design of Experiments) methods to determine details of the suspension components at a very early stage in our development work. We chose the settings for the springs, shock absorbers, anti-roll bars and tires to ensure harmonious, easily controlled handling in all operating situations."

For example, to achieve the ideal combination of firmness values in various directions for the rubber-to-metal bushings, the Suspension Computing staff investigated several thousand versions in various load situations and for each axle. To make it easier to filter out the most suitable combinations of values, they established target ranges for all the main suspension performance areas. These were subsequently investigated in more detail. It was found for example that the firmness of the steering box mountings, together with the front wishbone pivot bushings, determines the lower levels of acceptable agility and dynamic stability.

By means of thorough road testing, the engineers arrived at a typical Audi combination of sportiness and ride comfort, whether the vehicle was fitted with steel springs and conventional shock absorbers or air suspension with controlled damping. Thomas Kriegel sums up: “Air suspension offered us additional scope for optimizing high-speed dynamics. Firmer shock-absorber settings and step-by-step lowering of the body for aerodynamic reasons have the effect of stabilizing the Audi Q7’s handling still further. Compared with competitors, it has the best dynamic driving characteristics.”

To achieve this, the development team had to take a number of different aspects into consideration: a premium-class SUV, for instance, is a popular choice for long journeys on account of its high seat position and its attractive interior trim. The occupants naturally expect ride comfort to reach an equally high standard. Thomas Kriegel explains how this was achieved: “An initial aid to determining the ride-comfort settings was an operating-point analysis, using details of the forces measured in the rubber bushings.” For this purpose, the computing engineers simulated excitation from the road surface (for example rough asphalt, cobblestones and lateral joint lines) using a high-resolution multi-body model of the Audi Q7. In this way, the bushings could be ideally matched to the forces that occur when the vehicle performs movements relevant to occupant comfort.

Kriegel concludes: “Finally, these and other changes to suspension components were assessed repeatedly for acceleration values at the ‘comfort points’ such as the steering wheel and seat, using a complete-vehicle model, so that we obtained an excellent starting situation for fine tuning on the road.”

### **A car for the senses**

When a new Audi model is being developed, what are known as the “soft factors” are also becoming increasingly important. Apart from the visual satisfaction of a well-styled vehicle, the senses of hearing, smell and feel also played a significant role in Audi Q7 development. Audi was one of the first car manufacturers to recognize the importance of these factors and set up special teams to work on them.

One of these teams deals with haptics. Gerhard Mauter, Head of the Control Haptics team, is an engineer “with feeling”, so to speak, though this scarcely hints at the full extent of his work. Haptics are the science of touch, but here again the task is not limited to making an Audi feel pleasant wherever the occupant comes into contact with one of its surfaces.

Ergonomics, control logic, smooth movement and attractive appearance also play their part whenever controls and switches are pulled, pushed, pressed, slid, turned or simply touched inside the car.

How does one find oneself working in such an esoteric area? Gerhard Mauter explains: “It’s important for haptics to be taken seriously, and also for one to approach the subject with a certain degree of sensitivity. This of course starts quite literally at the fingertips, but it goes beyond such physical characteristics and largely takes place in the mind.” Mauter has been in charge of the haptics team for more than five years now; it was first formed back in 1995 – a sign that Audi has always taken this topic very seriously indeed.

There are good reasons for this: haptics are of considerable importance in the car. The impressions gained by touching and handling the controls and surfaces exert a strong influence on the potential customer’s purchase decision. Whoever sits in an Audi should feel good from the start. To make sure that this applies to all Audi models, the haptics team was set up.

Then there is the Audi “Nose Team”: its job is to “poke its nose” into every possible part of the car, to track down objectionable smells and to ensure that the inside of an Audi, is always consistently agreeable. Plasticizers exuded by synthetic materials, leather with an odor of fish oil, floor mats that smell as if they had been in contact with onions – none of these have a chance to spoil the quality of an Audi car. Nor, of course, have materials that could produce emissions that represent a health risk.

As many as 500 parts used inside each model are analyzed by the “artificial nose”. Audi sets benchmark standards for the industry in odor avoidance. The

aim is not so much the avoidance of all odors as the production of an “odor-neutral” car in which the customer always encounters a pleasant atmosphere. Heinz Stahl, who heads Audi’s team of odor detectives, says: “Eliminating all smells would be more or less impossible, and not particularly desirable either. It would be comparable to traveling in an acoustically dead vehicle.” Every car is now a sensory pleasure.

How should this be understood? Stahl explains: “We spend quite a lot of time in our cars, so that our sensory perceptions are becoming more and more important.” A new car should always have a typical odor, but of course not an objectionable one. This is the task tackled by the “olfactory experts” (olfactology is the scientific study of odors). What may seem only of secondary importance compared with other aspects of the car can subconsciously play a fundamental role for the customer.

The leader of the “Nose team” explains this by reference to the comfort hierarchy, which has been confirmed by scientific investigations: “Imagine this in the form of a pyramid. The customer’s well-being is right at the top, the car’s odor is down at the bottom. If an unpleasant smell comes to the customer’s attention, he or she no longer senses the car’s other comfort and convenience aspects in a positive way, but is totally irritated by the objectionable smell.”

In the sound design area, the important thing is to strike the right note – something that Audi achieves with particular success in its cars. Acoustic development work has become an important element in car development at the Ingolstadt-based manufacturer, and one of the calling cards of the brand with the four-ring badge. How should an Audi sound? That depends on the type of vehicle, and also on what the customer expects. For the Audi Q7, the sonic image can be described as “powerful and sporty”.

Dr. Ralf Kunkel, Head of Audi Acoustics, is the conductor of the “Audi orchestra”. As an engineer, his choice of words is perhaps unusual: as well as using this term, he speaks of “composing” and “directing”, of “good musicians”, of “out-of-tune players” and of the “Symphony of the Four Rings”. His guiding

principle: “The sound must be what the listener expects to hear. Sound stimulates emotion.” He has a very convincing example to illustrate this: a photo of a glass of lager appears on the screen, but the sound track is of tap water being poured into the glass. The listener automatically registers the fact the picture and the sound don’t fit together. In other words, “we expect something and are then disappointed.”

One can apply the same logic to a car. Dr. Kunkel explains that the sound it makes must tie up with the expectations that the model positioning arouses in the customer. To put this another way: anyone who buys a Audi Q7, sits behind the wheel and presses the accelerator expects to hear a strong, sporty sound. Too much acoustic restraint would disappoint the customer in this case.

Yet at the same time, the sound must not be too obtrusive or begin to cause irritation as the journey continues. The Audi Q7’s acoustic image has therefore been slanted towards comfort in a way that also emphasizes the vehicle’s supreme character in a fairly restrained manner. Dr. Kunkel: “For a model like the Audi Q7, everything has to blend together perfectly: design, performance, objective size – and sound!”

The “Squeak and Rattle” team is on the track of quite different sounds. Eckhard Peithmann, the leader of this group of “good listeners”, and his colleagues have located and suppressed just about every form of minor noise – from rattling to far more subtle sources of aural irritation – in the latest model families. During Audi Q7 development too, they conducted innumerable tests both on the road and on the company’s test rigs with the aim of driving any squeaks and rattles out into the open and eliminating the causes.

Some people at Audi call him simply “The Ear”. Peithmann himself smiles when he hears this nickname: “This is certainly a job that calls for good hearing – but also for plenty of patience! There are some sounds you simply can’t hear until you’ve run the test over and over again.” Those who not only hear them but somehow sense them too – these are Eckhard Peithmann’s most sought-after colleagues.

The listening team is made up of development engineers and staff from Quality Assurance, Production and Customer Care. Peithmann's verdict: "You don't learn our job at school or in training sessions. And not everyone has the patience it needs." Peithmann, a blues fan, has a strong dislike of rattling, unmusical glove box lids, squeaking seat frames or creaking plastic trim. But as he readily admits, suppressing obvious noise is not the real problem: his remedies have to work on a variety of road surfaces, at specific temperatures, speeds or after the car has covered a certain distance. Otherwise they may reappear to plague an otherwise contented customer.

Locating the origins of all these noise sources is an extremely complex, time-consuming task. Audi Q7 noise analysis took at least a year to complete. Every four to six weeks, the noise detectives take a test run, sometimes in icy-cold Scandinavia, sometimes on desert trails in North Africa.

Between these excursions, noise elimination continues intensively on the roller and vibration test rigs, climatic chambers, dummy-head microphones and hydropulsers in the Ingolstadt plant's Technical Development and Quality Assurance departments. Peithmann: "Over the years, the number of trial runs and noise analyses has steadily increased, the reason being that the Audi model range has grown all the time and so new product launches naturally occur at more frequent intervals."

But why do Audi's acoustics experts have to go as far as the Arctic Circle in their hunt for noise sources? This is explained by Franz Lang from the Design Check and Test Run department, who is also a member of the "Squeak and Rattle Management Circle": "We can find winter temperatures there down to minus 40 degrees Celsius. In a climate such as that, plastics lose their flexibility, their friction coefficients change and they are more likely to generate noise." Exposure to extreme heat can have different but equally serious consequences, so that here too certain types of plastics in the car begin to creak or chatter.

At first glance, there's something exotic about the way the noise eliminating team goes about its work. An acoustics engineer is quite likely to be found huddled up in the boot of the car during the test run, "just to hear what's going on" – no matter how bumpy the road or how low the outside temperature.

The tester occupying the passenger seat may have his head down in the footwell and his feet on the head restraint during the test run, and be listening hard for a noise that's difficult to locate.

Eckhard Peithmann sums up: "It's true, we crawl into every nook and cranny on the car!" But since road safety risks have to be allowed for, these test runs take place on cordoned-off test tracks rather than on the public highway.

### **Quality assurance**

All these efforts culminate in the high quality that has been achieved on the Audi Q7. Quality assurance personnel take part in development meetings from a very early stage. Marcus Hoffmann, who is responsible for Audi Q7 Quality Planning and Steering, says: "At the start, we were less concerned with detailed quality matters than with the task of determining what demands the customer makes of a vehicle such as the Audi Q7."

In the next phase, the experts monitor the quality by means of design and data control models or prototypes. Hoffmann: "Quality has to be part of development work from the very start. It can't be applied to the vehicle at a later stage."

The quality assurance teams have borne the needs of American customers in mind throughout their work. As a model in the SUV segment, the Audi Q7 is closely geared to North American market requirements.

During development, the new model was therefore driven regularly from an early stage by staff from Audi of America and assessed in accordance with US customers' preferences. Hoffmann: "In most cases, those who drove the car have day-to-day contact with customers and are extremely familiar with their wishes."

In addition, experts from the American market research company J.D. Power and Associates were invited to Ingolstadt and their suggestions incorporated into the Audi Q7 development process. In the USA, J.D. Power is one of the most respected arbiters of consumer satisfaction: it issues a regular bulletin on this topic and assesses the quality of cars from the customers' standpoint.

Hoffmann: "In this way we are able to gain a picture at an early stage of how the US customer would react to the Audi Q7 and what he would expect of it." Some of the results of this exchange of views are the large cup holders in the center console, the bottle holders in all four doors, the way the air conditioning operates, which is somewhat different from European practice, and the folding mechanism for the third row of seats, which is child's play to operate. But Hoffmann is nonetheless confident: "We have by no means neglected the wishes of other customers from around the world. We have simply combined these often very different requirements in the most effective possible way."

Fine-tuning of technical, visible and haptic quality takes place at the pre-production stage. At Audi, one of the measuring instruments used for this is referred to as the "master gauge". Versions for both inside and outside the car are used.

Even for Josef Junker, the Measuring Technology and Master Gauge Manager in the Quality Assurance department, the name is something of a mystery. But as he explains, "The master gauge is far more than just a measuring instrument; at Audi it's an integral element in quality assurance policy."

The master gauge is a ladder-type frame made of aluminum, on which the vehicle, including all the currently available parts, is built up, measured and assessed. These assessments take place once a week. A large group including suppliers' representatives gathers round the master gauge and presents its components in the latest optimized versions to members of the Quality Assurance, Development and Production departments. Are the joint gaps ok? Is the "feel" of the surface acceptable? What impression does the part make when seen in or on the complete vehicle? Can the pushbuttons and switches be easily

reached and operated without difficulty? Will it be possible to install the part later without problems arising on the assembly line?

Many questions of this kind are discussed and the solutions arrived at during the master gauge meetings.

In this way, some three hundred parts relevant to the Audi Q7 are subjected to close examination. At two- to four-week intervals, the Board of Management visits the master gauge department to obtain a picture of the quality level that has so far been achieved. Junker: “The procedure is repeated until we know that we can maintain the high build quality that Audi is famous for.”

### **Coordination by model line management**

But who controls the entire process? Audi has organized it according to model lines. Gerhard Hametner, the Audi Q7 and A8 Model Line Manager, explains: “The demand for an ever-greater variety of models increases pressure on the production process. This is a situation that applies to all car manufacturers. One of the most crucial challenges for AUDI AG is to keep control of this constantly expanding multi-project scene. Despite increasing complexity, new models such as the Audi Q7 must be developed successfully, launched punctually and be in accordance with customers’ wishes.”

Model line management is responsible for every aspect of the vehicle project: it controls project-related activities, monitors progress and, if there are signs of significant deviations from the targets steps in and takes remedial action. Hametner sums up: “Model line management controls the Audi Q7 product process at cross-department level, almost as if it were a business within a business, from the decision to go ahead with the project to the market launch of the vehicle and its entire subsequent life-cycle.”

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