BRAKE SYSTEM, WHEELS AND TYRES

For the new Audi Q3, both the brake system and the wheel/tyre programme were matched to the specific needs of a Sports Utility Vehicle (SUV). A high-performance brake system ensures safety both on and off the road, extensive additional functions have enlarged the scope of the electronic stabilisation program (ESP), and the wheels and tyres combine excellent handling with comfort and low roll resistance.

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BRAKE SYSTEM

With its sporty positioning allied to first-class comfort, the new Audi Q3 imposes new demands on the brake system. These include short stopping distances with minimum body movement, optimal resistance to fading even when the vehicle is driven hard or enthusiastically, extremely convenient operation and safety functions that make the driver's task easier. With all engine options, the Audi Q3 is equipped with 16-inch floating-calliper brakes at the front and rear wheels, ❶, to ensure high braking performance on all engine versions.

The single-piston front brakes are of the proven Conti FN3 floating calliper type, with a piston diameter of 57 mm; they have 312 mm diameter, 25 mm thick ventilated discs with performance-oriented pads from the Jurid company that have a high friction value matched to the vehicle. The Colette CII41 HE brakes from TRW on the rear axle have a 41-mm diameter piston, Textar pads with the emphasis on refinement and 282 x 12 mm solid discs. These brakes ensure that ambitious braking performance and response requirements are maintained in all driving situations. Good performance in wet weather or when exposed to dirt helps to uphold these values even when the vehicle is not being driven on a hard road surface.

Integrated into the rear brake system, the electromechanical parking brake (EPB) – in addition to its main task of holding the vehicle securely when parked – operates together with the electronic stabilisation program (ESP) as a hold assist with no time restriction, and as a speed-dependent emergency brake. In this way it complements the hydraulic service brake system and adds significant emphasis to the premium character of the Audi Q3. Together with the Audi hold assist convenience feature, the EPB keeps the brakes applied to prevent the vehicle from moving without any action on the driver's part, and thus prevents it from rolling away accidentally. The switches for the EPB and the Audi hold assist are on the centre console. Since the space needed there in other vehicles for the mechanical handbrake lever is free, it can be used in the Audi Q3 for storage options.

Front-wheel brake	Rear-wheel brake
	
FN3 57/25/13.5 16" Brake disc: Ø 312 x 25 mm, ventilated Brake pad: Jurid 201-11	**CII41 HE 1612 16"** Brake disc: Ø 282 x 12 mm Brake pad: Textar 4402

❶ Overview of wheel brakes for the Audi Q3

BRAKE OPERATION

The left-hand-drive version of the Audi Q3 has a single 11-inch brake servo; for space reasons, a 7-/8-inch tandem brake servo is installed on right-hand-drive vehicles. There are two diagonally split brake circuits. The 23.8-mm diameter aluminium tandem master cylinder provides the necessary high performance and also short, dynamic brake pedal travel. With low pedal pressures needed, short initial response travel, a clearly sensed pressure point, spontaneous build-up of the necessary retardation and good control sensitivity, the Audi Q3 satisfies the demand for an optimal brake pedal operating characteristic with ease. The characteristic curves for the complete vehicle match the sporty performance typical of an Audi. The brake servo has a leverage ratio of i = 7. Operation of the brake pedal therefore satisfies the demand for a sports but nonetheless harmonious feeling on the road. The brake lights are energised by a Hall-effect sensor on the master cylinder.

PEDALS

In view of its function as a direct interface with the driver, the pedal assembly was required to comply with typical Audi standards of high quality and refinement; the version that has been developed ideally satisfies these requirements. For weight reasons, the pedal assembly is of modular construction. Each module consists of the pedal lever and the associated pivot mount. Components of the accelerator and clutch pedal are made from glass-fibre-reinforced polymer. For strength reasons the brake pedal pivot mount is of pressed-steel construction, but the steel brake pedal is of shell pattern and therefore of convincingly light weight. In addition to refinement and operating reliability, the pedal assembly is also of optimal crash-protection design. In the event of a collision, crash struts attached to the steering-column bracket prevent intrusion of the pedal assembly.

ELECTRONIC STABILISATION PROGRAM

The new Q3 is the first Audi model to be fitted with a traction control system from the TRW company. It is based on the proven Type EBC 450 ESP, which was adopted as a module and developed further to satisfy the needs of a sporty SUV. The requirement specification called for short stopping distances and a high level of driving safety as well as a series of safety functions. In addition to yaw-moment regulation the ESP incorporates a number of functions that have either been modified or are new to the Audi Q segment. There are also the well-established modules such as:

: anti-lock brake system (ABS)
: traction control (ASR)
: electronic differential lock (EDL)
: electronic limited slip differential (XDS)
: engine drag torque control (MSR)
: cornering brake control (CBC)
: electronic brake-force distribution (EBD)
: full brake application at rear axle (HVV)
: hydraulic brake assistant (HBA)
: additional hydraulic overboost
: hydraulic brake booster servo (HBV)
: brake disc wiper
: trailer stabilisation system.

This is the first Q model with sporty lateral dynamic road behaviour to be equipped with an electronic differential lock (EDL) to which the dynamic XDS function has been added. On vehicles with the quattro driveline it has the function of a limited slip differential at both axles; on front-wheel-drive vehicles the function is performed at the front axle. The braking torque is modified before increased wheelslip occurs. The correct torque value is determined from various input signals and their features such as wheel rotating speed, lateral acceleration and steering angle or the gradient of steering angle change. By controlled application of the brakes on the inner wheels of a curve, the braking torque at the outer wheels is increased. Even the electronic slip differential alone improves decoupling of the vehicle's lateral dynamic behaviour from the driver's call for acceleration, and therefore permits more agile road behaviour and improved traction on corners. The XDS function goes beyond this by permitting even higher road and cornering speeds. XDS optimises both the longitudinal and lateral dynamic road-behaviour characteristics and is standard equipment with all drivetrains. It emphasises the sporty positioning of the Audi A3 to an even greater extent. XDS is integrated into the ESP software and uses synergy effects for functional and safety monitoring, so that no further hardware components are needed and no disadvantages in the form of increased weight or reduced refinement can occur.

Roll-over prevention (ROP), a special ESP function for vehicles with a higher centre of gravity, is proof of Audi's awareness of safety requirements. It prevents wheels on the inside of a curve from leaving the road surface. The driving situation is identified by means of the usual ESP sensors such as yaw rate, lateral acceleration, steering angle or wheel rotating speeds, and critical vehicle movements reduced in severity by a special ESP-ROP corrective action. Engine torque is reduced and the Haldex all-wheel-drive clutch disengaged. The ROP brake application takes place at a high dynamic rate

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of pressure build-up and very high wheel retardation, especially at the front wheel on the outside of the curve. Engine intervention and brake applications reduce road speed and increase the curve radius moderately. The reduction in lateral acceleration and the reduced yaw tendency stabilise the vehicle.

TRAILER STABILISATION SYSTEM

Trailer oscillation is also evaluated by the ESP control unit with the aid of the available sensors. An outfit consisting of the vehicle and a trailer tends to oscillate when a speed that is critical for the trailer is exceeded and its damping action drops close to zero. However, a variety of factors influence the critical speed. In ideal conditions they include the size of the trailer and the loads carried by the trailer and the towing vehicle, with the resulting nose weight at the towbar. But other influences too, such as rough roads, cross-wind or interference with regular forward movement by the driver can also have an effect on the critical speed. The trailer stabilisation function is activated when three successive oscillation amplitudes corresponding with the outfit's typical frequency range exceed a regulating threshold formed from sensor and model data. The system is only activated if the trailer is attached to the towing vehicle and the trailer control unit has identified an electrical consumer.

In order to bring road speed down below the critical value and increase the damping applied to the towing vehicle and trailer, the system reduces engine torque and makes controlled brake applications: it brakes all wheels if the oscillation amplitudes have risen sharply during the detection period, or transmits symmetrical, frequency-dependent braking pulses to the front axle as a means of increasing damping steadily and causing the oscillations to decrease. The EPS steering also transmits a steering recommendation to the driver as a means of ensuring stable road behaviour. Like all traction-promoting and stabilising brake applications, neither trailer stabilisation nor roll-over prevention can be de-activated by the driver. Safety and dynamics are therefore maintained in all driving situations.

WHEELS AND TYRES

Requirements for wheel and tyre combinations are in accordance with the objectives laid down for the Audi Q3: superior handling compared with other vehicles in this category and excellent comfort and refinement, taking ambitious roll-resistance values into account. Wheel diameter and tyre width promote excellent stability on the move while retaining a level of comfort expected in this class. Q3 versions with all engines have 6.5 J x 16" aluminium wheels as standard equipment, with an offset (ET) of 33 mm, ❷; the summer tyre size for these wheels is 215/65 R16 98V, the winter tyre size is 215/65 R16 98H M + S. With both tyres a standard forged lightweight wheel design of optimised weight is used. Approximately 1.7 kg is saved per wheel compared with a conventional cast aluminium wheel.

As an alternative, wheels from an extensive program of optional extras can be chosen. There are two attractive 17- and 18-inch designs for summer tyres. The 17-inch wheel has the dimensions 7.0 J x 17" ET 43 and a sporty tyre of size: 235/55 R17 99V. These wheels are either of five-arm "Trias" or ten-spoke design. The 7.0 J x 18" ET 43 wheel is for a high-performance size 235/50 R18 97V tyre. In this case there is a choice between wheels of five twin-spoke design or a partly polished five-arm bicolour cast aluminium wheel with a machine-polished finish. In future, the program will be extended to 20-inch wheels. Last but not least there is a wheel for winter tyres, to which snow chains can be fitted, in addition to the 16-inch basic version. It is of size 6.5J x 17" ET 33 with a 215/60 R17 96H M + S tyre. The alloy wheels offered as optional extras emphasise both the sporty, dynamic character of the Audi Q3 and its positioning in the premium SUV segment. Their lower weight, together with the tyres' lower roll resistance, is largely responsible for the complete vehicle's good CO_2 emission values.

The tyres' cross-section, sidewalls and tread pattern round off the vehicle's overall appearance and also enhance its aerodynamic properties. The wheel offsets vary according to the width of the wheel rim and are therefore all flush with the outer panels of the body.

Standard equipment on the Audi Q3 is a tyre mobility system (TMS). In the event of a flat tyre the driver can reach the next service station before changing the wheel, and also benefits from the weight saving. As an optional extra a "minispare" wheel of size 4.0 J x 18" ET 27.5 with a 145/80 R18 tyre is available.

Standard wheel, 16"	Optional-extra wheels, 17"	Optional-extra wheels, 18"	Wheels for winter tyres
6.5J x 16 offset 33 mm 1 Forged aluminium wheel Brilliant silver paint finish 215/65 R 16 (Basic wheel with all engines)	**7J x 17 offset 43 mm** 2 Aluminium wheel Brilliant silver paint finish 235/55 R 17	**7J x 18 offset 43 mm** 4 Aluminium wheel Brilliant silver paint finish 235/50 R 18	**6.5J x 16 offset 33 mm** 6 Forged aluminium wheel Brilliant silver paint finish 215/65 R 16 M&S
	7J x 17 offset 43 mm 3 Aluminium wheel Brilliant silver paint finish 235/55 R 17	**7J x 18 offset 43 mm** 5 Aluminium wheel Bright lathe-turned finish 235/50 R 18	**6.5J x 17 offset 33 mm** 7 Aluminium wheel Brilliant silver paint finish 215/60 R 17 M&S

❷ Wheel and tyre combinations for the Audi Q3