The chassis of the new Porsche Cayenne

Optimum balance between performance and comfort

In the new Cayenne, Porsche has developed a chassis with a versatility that is unrivalled in the SUV segment. The chassis – designed completely from scratch – pushes the boundaries of sportiness and comfort to new levels. On the one hand, the car offers the driver a level of driving dynamics rivalled only by sports cars. On the other, the driver can also enjoy the driving comfort typically associated only with top-segment saloons. New active systems such as rear-axle steering, Porsche Dynamic Chassis Control (PDCC) electromechanical rolling-motion compensation and three-chamber air suspension are key to this heightened versatility. All of these systems are managed by the new 4D Chassis Control. Sporty drivers will also appreciate the new mixed tyres and the Porsche Surface Coated Brake (PSCB), which makes its global début in this car.

New axle concept with sports car genes

The design of the new lightweight Cayenne chassis draws on many years of sports car expertise. The traditional double wishbone axle seen in the predecessor model has been replaced by an aluminium front axle featuring a separated link design. The old chassis subframe, which was constructed of steel and attached to the body using rubber bearings, is no longer needed. In its place, an aluminium auxiliary frame now stiffens the axle construction and supports the engine via its integrated bearings. There are two major benefits to the new axle concept. Firstly, it contributes to the total vehicle weight reduction of up to 65 kilograms – achieved in spite of the significantly expanded range of standard equipment – bringing the new Cayenne to a total weight of under two tonnes. Secondly, it helps to optimise driving dynamic properties such as steering response, steering precision and straight line driving. The new axle layout virtually eliminates vibrations caused by wheel imbalance and powertrain influences.

On the rear axle of the Cayenne and Cayenne S, Porsche is continuing to fit a multi-link suspension with lightweight steel links and steel springs as standard. In combination with the adaptive air suspension, aluminium forged links are used at the rear. The responsiveness of the dampers and thus also the spring comfort have been improved thanks to the separated spring-damper arrangement on the spring links and the almost perpendicular damper arrangement. The optimised elastokinematics enhance agility, precision and comfort. The use of a rear axle steering system in this car for the first time was one of the key factors in the redesign of the rear axle.

World premiere of the Porsche Surface Coated Brake

In the new Cayenne, Porsche is launching an innovative new braking technology: the Porsche Surface Coated Brake (PSCB). At the core of this new technology are discs with an exceptionally hard tungsten-carbide coating, combined with specially developed brake pads. Compared to conventional grey cast iron brakes, the new system boasts far superior properties – including an up to 30 per cent longer service life. The discs not only wear at a significantly slower rate, but also generate less brake dust accumulation on the rims. The increased friction values of the brakes also ensure improved responsiveness. The PSCB delivers stable braking even under extreme stress. As with the Porsche Ceramic Composite Brake (PCCB), which is still available as an option, the PSCB uses ten-piston callipers at the front and four-piston callipers at the rear.
A side effect of the new technology is the unique appearance of the coated discs. After around 600 kilometres of day-to-day driving, the pads will have polished the surface to a gleaming shine, creating a mirror-like finish. The aesthetic effect is enhanced by the white brake callipers. The PSCB is included as standard on the Cayenne Turbo, and is available as an option for all other Cayenne models. The PSCB is available in combination with 20 or 21-inch wheels.

**Larger wheels – now available with mixed tyres for the first time**

The new Cayenne is more of a sports car than ever before. The stronger focus on performance is evident not only in the mixed tyres – fitted on this car for the first time – but also in the introduction of a new and larger generation of tyres in dimensions ranging from 19 to 21 inches. The external diameter has increased by 25 millimetres to 775 millimetres across the model line, ensuring that the larger standard wheels have no negative impact on comfort. The options now range from sizes 255/55 (front) and 275/50 (rear) on 19-inch wheels to 285/40 (front) and 315/35 (rear) on wheels with a 21-inch diameter. The combination of lower-profile tyres on the front axle and wider tyres on the rear main drive axle has been tried and tested in Porsche sports cars for decades. Mixed tyres enhance agility, stability and driving dynamics, while the larger tyre size and adjusted air pressures also boost comfort.

**New generation of active control systems boosts versatility**

Based on the new basic chassis design, Porsche has developed a virtually brand-new generation of active chassis systems for the Cayenne. The only exception is the Porsche Active Suspension Management (PASM) damper system; here, the control strategy was adjusted to suit the new concept. Depending on the road conditions and driving style, the PASM actively and continuously regulates the damping force for each wheel individually. Alternatively, three different programmes can be selected via the PCM, the PASM button or the Sport button: Normal, Sport or Sport Plus.

**The first Cayenne with rear axle steering**

For the first time, the Cayenne is available with rear-axle steering as an option. With this system on board, the Cayenne takes on the driving dynamics of a premium sports car. Thanks to this system, the new Cayenne steers without delay and builds up lateral acceleration at the rear-axle significantly sooner. The new steering precision achieved by the Cayenne is unique for a vehicle in this segment. Rear-axle steering also boosts comfort and safety in day-to-day driving. The car’s turning circle is reduced from 12.1 metres to 11.5 metres.

At speeds of up to approximately 80 km/h, the axles steer in opposite directions. This feature not only ensures significantly higher agility and steering precision, but also makes manoeuvring easier. At higher speeds, both axles steer in the same direction, resulting in even greater driving stability, for example when changing lanes on the motorway at high speeds. The maximum steering angle used on the rear axle is three degrees.

**More responsive: Electromechanical roll stabilisation**

The Porsche Dynamic Chassis Control (PDCC) active roll stabilisation system is a tried-and-tested solution from the predecessor model that delivers enhanced driving dynamics
and comfort. Now, by switching electro-hydraulic actuation for electromechanical actuation, the system has been improved even further. The new, 48-volt system is capable of adjusting the torsional rigidity of the anti-roll bars on the front and rear axles in milliseconds, actively stabilising the vehicle body. At lateral accelerations of up to 0.8 g, any lateral inclination in a Cayenne with two occupants is suppressed. The design features an anti-roll bar divided in two, with the halves joined together by a pivot motor. Depending on the car’s roll angle, the motor rotates the two halves in opposite directions, keeping the vehicle upright. The electromechanical system not only boasts a faster response, but is also more compact and requires less energy, which reduces fuel consumption.

In the Cayenne’s offroad modes, the PDCC largely disengages the anti-roll bar halves, or even actively rotates them. This enables greater axle articulation, and helps maintain contact with the ground to ensure optimal traction offroad. On fast roads, this function also means that the replication effects of the anti-roll bar are reduced to zero, and the spring and wheel movements can be damped completely independently of one another.

**Adaptive three-chamber air suspension for greater comfort and sporty performance**

For the air suspension in the Cayenne, Porsche has developed a three-chamber system. For drivers and passengers, this means greater comfort when travelling, enhanced dynamics on sporty drives and more ground clearance offroad. The new adaptive air suspension uses three air chambers for each spring strut rather than a single one. This enables the air suspension system to work at an exceptionally wide range of spring rates. For maximum comfort, the chassis is set to a very low basic spring rate. If strong pitching or rolling motion occurs, the system immediately switches to a higher spring rate for additional stabilisation.

In addition to the normal level, five further vehicle levels are available. With the exception of the loading level, these are set automatically depending on the driving situation and the selected driving mode. Regardless of the automatic setting, the driver can manually set the desired level via the PCM at any time, with the exception of the “Deep” setting, which is exclusively controlled by the system at speeds above 210 km/h. This setting improves stability and reduces drag at high speeds. Depending on the mode, ground clearance while driving varies between 245 and 162 millimetres. An exceptionally deep loading level can be selected by pressing a button in the luggage compartment. This mode is available only when the vehicle is stationary. The new three-chamber air suspension is standard equipment in the Cayenne Turbo and is available as an option in the other models.

**Porsche 4D Chassis Control connects and manages all active chassis systems**

With Porsche 4D Chassis Control, the new Cayenne is the first model to deploy a central control system capable of networking all the systems within the vehicle. Previously, the Cayenne’s chassis systems worked largely independently of each other. They primarily used their own sensors and responded to the behaviour of the other chassis systems. This has fundamentally changed with the introduction of Porsche 4D Chassis Control. The system centrally analyses the driving situation in all three dimensions (longitudinal, transverse and vertical acceleration). The optimum vehicle condition information is calculated from the results and provided to all relevant systems. The fourth dimension is the provision of information in real time. Porsche 4D Chassis Control provides an integrated approach that enables the chassis systems to respond proactively to the
upcoming driving situation.