

Three specific variants: Active anti-roll stabilisation (PDCC)

Anti-roll bars are the third fundamental chassis component to influence driving properties after suspension and damping. Typically designed as elastic torsion bars, they connect the wheel carriers of an axle and restrict lateral inclination of the vehicle when cornering. The hardness of the anti-roll bars on the front and rear axle can be adjusted to influence the wheel-load distribution during cornering and therefore the steering behaviour. Anti-roll bars primarily influence suspension behaviour when driving over bumps in the road surface affecting only one side of the vehicle, as they transfer the forces to the other side. This adjustment is therefore always a compromise between the lowest possible degree of lateral inclination and a high level of suspension comfort with alternating springs. Unlike passive spring bars, active anti-roll stabilisation (Porsche Dynamic Chassis Control, PDCC) can remove this conflict of objectives and even almost completely compensate for lateral inclination. The anti-roll bars also actively influence self-steering properties. Porsche uses three different designs of anti-roll bars depending on the model line. In all three designs, actuators are used to actively generate forces on the anti-roll bars.

In the Panamera, the new Porsche Dynamic Chassis Control Sport (PDCC Sport) system optimises driving dynamics through the integration of electromechanical anti-roll bars. One electromechanical actuator – consisting of a direct current motor and a three-stage planetary gear set – on each axle connects the two halves of the centrally divided anti-roll bars. Depending on the lateral acceleration, the actuator turns the two anti-roll bar halves in opposing directions, with the result that lateral inclination of the body is almost completely compensated for. The electromechanical system responds considerably faster than systems with hydraulic actuators, but requires a 48-volt power supply due to the high actuator dynamics and forces.

In contrast, the PDCC in the Cayenne is based on hydraulic actuators. Depending on the steering and level of lateral acceleration, the hydraulic pivot motors on the active front and rear axle anti-roll bars build up forces that counter the lateral inclination of the vehicle. The PDCC off-road mode can be activated by pressing the rocker switch in the centre console. On uneven surfaces, the anti-roll bar halves are disengaged, allowing them to turn more easily to provide improved traction and greater axle articulation. The wheels remain on the ground for a longer period of time, which means that they can transfer a greater degree of force.

The third variant of the PDCC is used in the 911. Instead of using a pivot motor and divided anti-roll bars, in this variant, a system specifically developed for the sportscar concept with actively adjustable hydraulic cylinders is positioned directly on the wheel suspensions. This system saves weight and is designed with the space constraints in mind. The hydraulic cylinders replace the rigid coupling rods normally used to connect the anti-roll bars. The lower section of the hydraulic cylinders is connected to the outer fastening point on the anti-roll bars, while the upper section is connected to the respective wheel carrier. The electronically controlled filling of the hydraulic cylinders with oil changes the stroke of the cylinders and causes the respective anti-roll bar to be preloaded to a greater or lesser degree. In addition, depending on the driving situation, the PDCC's intelligent control system is capable of triggering the hydraulic actuators individually, thereby influencing the self-steering properties and in turn improving vehicle stability.