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How the ŠKODA all-wheel-drive technology works

- › **Fifth generation of the electronically controlled multi-plate clutch with important innovations**
- › **Weight and space savings thanks to the latest technology**
- › **All-in-one solution: all-wheel drive interacts with electronic assistance systems for maximum traction and safety**

Mladá Boleslav/Rovaniemi, 15 February 2018 – All current all-wheel-drive models from ŠKODA are equipped with a fifth-generation electronically controlled multi-plate clutch. The main benefits are that it weighs less and requires less space. In addition, the all-wheel drive in the ŠKODA 4×4 models is fully connected to the electronics and assistance systems.

The centrepiece of the ŠKODA all-wheel drive is a fifth-generation electronically controlled multi-plate clutch. It is the latest evolution of the all-wheel-drive technology that was first used at ŠKODA nineteen years ago. The all-wheel drive is fully automated and ensures optimum traction in any driving situation. A series of sensors (e.g. for wheel speed, steering angle, longitudinal and lateral acceleration, accelerator pedal position, engine speed) continuously evaluates the current driving situation, while the all-wheel-drive electronics take all of the incoming parameters into account. Within milliseconds, the electronics can alter the distribution of torque between the individual wheels, thereby ensuring the optimum distribution of power.

All-wheel-drive technology offers many benefits. The all-wheel drive only intervenes when the driving situation requires it. At the same time, the system's electronics proactively precondition the all-wheel drive for anticipated driving situations. In normal driving conditions, only the front axle is driven – which keeps fuel consumption low.

From a technical point of view, the multi-plate clutch has barely changed compared to the previous fourth generation, though there are some important new features and improvements. One of the most important is the system's new design: it means that the fifth-generation multi-plate clutch no longer requires a pressure tank or control valve. Due to the lower minimum amount of oil, the clutch is altogether more compact and 1.4 kg lighter than the previous generation. The 4×4 drive control unit controls the rotational speed of the drive pump, which consists of an electric motor, a piston pump and a control valve. Thanks to the control valve, the rotational speed of the pump controls the oil pressure in the main piston. The higher the rotational speed of the pump, the greater the torque which the multi-plate clutch can transfer to the rear wheels. At a low pump speed, the forces are primarily transferred to the front axle. With the aid of the fully electronically controlled multi-plate clutch, the 4×4 drive control unit detects the wheels on the rear axle even when the vehicle is at a standstill.

The multi-plate clutch is positioned on the rear axle, together with the fixed gear and the rear axle differential. The system reacts within milliseconds, virtually unnoticed by the occupants, meaning that its reactions are just as fast as the transmissions in the previous generation of the system, despite the simplified design.





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The HISTORY of the ŠKODA 4x4 drive

... All-wheel drive was first used in 1999 in the first generation of the ŠKODA OCTAVIA COMBI 4x4 and used a mechanical pump. Its drive was dictated by the difference between the speeds of the front and rear axles. In order to bring the mechanical pump into its working position, an additional electric pump was required. The clutch could be adjusted via a control valve, which was also regulated by an electric motor.

The second generation of the ŠKODA OCTAVIA was equipped with a multi-plate clutch in a new design. To fully close the clutch, here it was enough to spin the wheels on the front axle slightly, by around 20°, in relation to the rear axle. A slight spin of the wheels on one axle was sufficient to activate the system.

Thus, these systems differed significantly from the current fifth-generation multi-plate clutch. Compared to the current state-of-the-art technology, the dynamic performance of the systems was considerably inferior.

As a central component of the overall all-wheel-drive system, the electronically controlled multi-plate clutch interacts with the vehicle's electronics and assistance systems perfectly and reacts to every change in the driving situation immediately. Just as in its sibling with front-wheel drive, under normal conditions, engine torque in all-wheel-drive models is transferred to the front wheels. As soon as sensors and control units engage the rear axle due to the driving conditions – because the front wheels are losing traction, for example – the control unit alters the pressure on the plates. The torque is then transferred in the ideal ratio to the rear wheels, too. At the same time, the Electronic Differential Lock (EDL), which is active on both axles on ŠKODA 4x4 models, also prevents individual wheels on the same axle from spinning. The spinning wheel is slowed down and more torque transmitted to the wheel with better traction. The XDS+ system is an extension of the EDL. It reacts when the load on the inner wheel is reduced when cornering, automatically applying the brakes to prevent the wheel from spinning. As a result, the vehicle holds its line noticeably better on bends.

QUESTION:

HOW DOES THE CURRENT FIFTH-GENERATION MULTI-PLATE CLUTCH DIFFER FROM ITS PREDECESSOR?

The main difference is the simplified system design. It no longer requires a pressure tank or control valve. The fifth generation has a new six-piston axial pump, which is driven by an electric motor and can react to instructions from the control unit within milliseconds. Moreover, the entire component is 1.4 kg lighter.

All of the ŠKODA 4x4 system's outlined interventions take place automatically, the redistribution of the driving forces between the individual wheels is imperceptible to the driver. In this way, the system ensures maximum traction and outstanding driving stability, even when cornering and performing difficult manoeuvres on rough terrain.

Electronic systems and useful assistance systems combined with all-wheel drive

In all ŠKODA models, all-wheel drive is combined with various assistance systems which improve the day-to-day driving experience and significantly increase the safety of the occupants. Here is





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an overview of the most important components and assistance systems. Their availability varies depending on the model and equipment selected.

Electronic Differential Lock (EDL)

EDL is an essential part of the ŠKODA 4x4 system and works on the front and rear axles. It intervenes at lower speeds when a wheel on the respective axle spins. The system slows the spinning wheel down and transfers more torque to the wheel with better traction.

XDS+ system

The XDS+ system simulates a limited slip differential. In combination with the EDL system, it reacts when the load on the inside wheel is reduced when cornering. The system slows down the wheel under the reduced load and prevents it from spinning. As a result, the vehicle holds its line better on bends.

Off-Road mode

For more difficult driving situations on rough terrain, the ŠKODA KAROQ 4x4, ŠKODA KODIAQ 4x4 and ŠKODA OCTAVIA SCOUT models are optionally available with Off-Road mode. When it is activated, the characteristic curves for all relevant assistance systems are altered and the settings are optimised for off-road driving. Off-Road mode is active up to speeds of 30 km/h and provides assistance when pulling away and managing steep descents as well as supporting traction and braking. When Off-Road mode is active, the infotainment screen also displays information pertaining to the terrain, including a compass, altimeter and the steering angle.

Hill-Hold Control

Hill-Hold Control prevents the vehicle from rolling backwards and the engine from stalling when pulling away on inclines of more than five degrees. This allows the driver to pull away on a gradient safely and easily, without using the handbrake. In vehicles with manual gearboxes, the system significantly reduces wear and tear on the clutch. The assistance system takes the direction of the slope as well as the selected gear into account and therefore also provides support when reversing uphill.

Hill-Descent Control

On steep off-road descents, this function regulates the vehicle's speed – depending on the situation – using the braking system and the engine braking torque, thereby ensuring that the vehicle does not begin to skid in an uncontrolled manner.

Drive-Off Assist

In models with a manual gearbox, Drive-Off Assist limits the engine speed when driving uphill. It not only allows smoother hill starts, but is also kinder to the clutch.

Snow mode

Snow mode can be selected when driving on slippery surfaces. Electronic assistance systems adapt to this situation straight away. The Anti-Lock Braking System (ABS) allows slightly more wheelspin. As a result, snow accumulates in front of the tyres and the braking effect is increased. Traction control (TCS) allows more wheelspin so that the tyre tread grips more effectively and the gearbox selects higher gears than it normally would in the lower speed range. The accelerator





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reacts more smoothly and thereby prevents an undesirable increase in the amount of torque. This prevents the wheels from spinning.

Area View

Using four wide-angle cameras, the Area-View system monitors the area surrounding the vehicle so that the driver has a bird's eye view of the current situation. Here, the driver can choose between a front or rear view.

Trailer Stability Assist – providing stability when towing a trailer

The Trailer Stability Assist function is a component of Electronic Stability Control (ESC). It detects swaying motions at an early stage, meaning that the vehicle and trailer can be stabilised before they start to swerve. Braking of the individual wheels and limiting engine torque safely stabilises the trailer.

Trailer Assist

Thanks to the Trailer Assist function, ŠKODA 4×4 models can even tow larger trailers without any problems. This assistance function makes reversing with the trailer easier for the driver and supports them whilst manoeuvring.

QUESTION:

DOES THE ALL-WHEEL DRIVE IN ŠKODA 4×4 MODELS OFFER AN ADVANTAGE OVER SIMILAR DRIVE SYSTEMS FROM THE COMPETITION?

Yes, 4×4 drive systems in ŠKODA vehicles can transfer a driving torque of up to 3,200 Nm to the rear axle. A large amount of torque is required at the rear axle when the load on the front axle is reduced and the rear axle transfers the power to the road. Drivers of ŠKODA 4×4 models benefit from that, especially when pulling away on steep slopes with trailers or when the front wheels offer inadequate grip. ŠKODA 4×4 vehicles are therefore among the best towing vehicles in their respective segments.

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- › currently offers the following model range: CITIGO, FABIA, RAPID, OCTAVIA, KAROQ, KODIAQ and SUPERB.
- › delivered more than 1 million vehicles to customers worldwide in 2017.
- › has been part of Volkswagen Group since 1991, one of the most successful vehicle manufacturers in the world. ŠKODA, in association with the Group, independently manufactures and develops vehicles as well as components such as engines and gear transmissions.
- › operates at three locations in the Czech Republic; produces in China, Russia, Slovakia, Algeria and India mainly through Group partnerships, as well as in Ukraine and Kazakhstan with local partners.
- › employs over 30,000 people globally and is active in more than 100 markets.

