Chassis

Adaptive Chassis Enhances Driving Dynamics

- FlexRide: New generation allows personalized settings
- Fine-tuning: Advanced chassis for more comfort and control
- Adaptive 4x4: Class-leading all-wheel-drive provides optimal traction

London. Together with the option of tailoring the riding experience for added fun, the new Opel Insignia’s chassis concept offers more comfort for all. Drivers can individualize their chassis and suspension setup in one of two ways: Either with a generally stiffer suspension available in combination with the sport equipment package or with the new generation fully-integrated adaptive suspension control, FlexRide.

At the press of a button, FlexRide, developed by GM Europe engineers in Rüsselsheim, Germany, allows the driver to choose a dynamic and sporty ride or a relaxed and soft setup in addition to the standard mode, which adapts itself to all driving styles. This provides optimal stability in all driving conditions. The FlexRide alters the characteristics of the dampers, gas pedal, ESP and steering, and, if applicable, also changes set up of the all-wheel drive set up, the curve light function of the AFL and automatic transmission, adding emotion to the driving experience.

An all-new chassis serves as a platform for this more advanced customization option. The McPherson strut front suspension has dual path top mountings in the body structure turrets, separating the transfer of spring and damper loadings. To reduce unsprung weight, the combined steering knuckle and strut carrier is made from aluminum, and the stabilizer bar in hollow section steel.

Steering and lower suspension A-arms are attached through two mountings to a substantial front sub-frame, which is bolted via four bushings to the front structure’s longitudinal members. This isolated mounting technique helps reduce the transfer of road shocks and noise to the cabin. The hydraulic damping of the rear A-arm mounting also adds to ride comfort. The rear suspension consists of an independent, four-link layout, with the second lower link in aluminum. For all-wheel-drive applications, a lower H-arm is used.
To enhance handling characteristics and ride comfort, the suspension geometry and the tuning of the bushings strategically is designed to optimize the different levels of lateral and longitudinal compliance required. The rearmost bushings of the A-arms also are hydraulically damped to help prevent road shocks and vibrations from being transmitted to the steering wheel.

**FlexRide: Customizable mechatronic chassis**

The new FlexRide system enables drivers to choose a chassis setup that matches their own particular driving style. In addition to the comfortable Standard ride setting, FlexRide enables the driver to select a relaxed (Tour) or a firmer, more crisp suspension set-up (Sport) by pressing two buttons on the instrument panel. Deactivating the Sport or Tour mode returns the ride setting to the Standard mode. In all modes, the chassis management system automatically adapts damping in real time to the driving and road conditions.

In Sport mode, FlexRide provides a spirited driving experience. With the push of a button, the dampers stiffen and the accelerator offers a swifter pedal response. Moreover, it increases Variable Effort Steering (VES), raises the shift-points of the automatic transmission to a higher rpm and adjusts the Adaptive 4X4 system for more rear-wheel drive. In sport mode, the AFL system reacts more quickly. In addition, the lighting on the instrument panel changes from white to red to add to the driving experience.

In the customization menu, accessible via the infotainment display, the driver can personalize the Sport mode by specifying which functions are activated when the Sport button is pushed. For instance, the electronically controlled dampers, VES, and all-wheel drive can be added or switched off.

The core of the new chassis is the Driving Mode Control (DMC). This unit oversees and executes FlexRide selections allowing the car to react to sudden changes in driving style or emergency situations. For example, if an obstacle must be avoided when the car is in ‘Tour’ mode, various chassis sensors convey this to the DMC and the dampers are adjusted within a split second. The mode requests are not only based on the driver’s selection via the buttons and the customization menu; they can also be automatically optimized
according to vehicle state --including accelerating, braking, or cornering -- and driving style which DMC determines from vehicle dynamics information.

With the exception of the entry level gasoline and diesel variants, all Insignia models can be ordered with the new FlexRide system, which comes as standard with the Sport equipment package and the V6 gasoline engine.

**Adaptive 4X4: More traction, exciting driving dynamics**

Both of the Insignia’s turbocharged gasoline engines are available with the newest-generation advanced all-wheel-drive system. The all-wheel drive system also will be available on future, more powerful diesel versions. Called Adaptive 4X4, it is designed to optimize handling and driving stability in all conditions, as well as increase traction at take-off and on slippery surfaces. Under electronic control, the Haldex hydraulic rear clutch unit continuously adjusts and optimizes drive torque distribution between the front and rear axles.

The Adaptive 4X4 control unit is fully networked with the Insignia’s other control systems. It consists of a Power Take-off Unit (PTU) in the front final-drive that transmits engine torque through a prop-shaft to the Rear Drive Module (RDM), which includes a Torque Transfer Device (TTD) and the optional rear Limited Slip Differential (eLSD).

Adaptive 4X4 processes signals from the ESP sensors, the steering angle sensor and accelerator pedal position to adapt power distribution to the prevailing driving situation. While offering better traction in low friction conditions, the sophisticated operation of the Adaptive 4X4 improves stability in all situations. In this way, it adds a further dynamic dimension to the driving experience by increasing the scope for closer driver involvement.

In the Sport variant, Adaptive 4X4 is coupled with an electronically-controlled eLSD. Chassis control is taken a step further with the optional rear eLSD. It is installed alongside the RDM and operates via pressurized clutch plates on a principle similar to the larger TTD. In icy or wet split-friction conditions, for example, it uses input from the rear wheel speed sensors and can transfer up to 50% of torque between the drive shafts, to whichever wheel has more grip.
The eLSD also gives the driver enhanced control when cornering hard or completing a high speed maneuver, such as a lane change, by momentarily applying more or less torque to either of the wheels to help the rear of the car more closely follow the direction of the front wheels. That way, the eLSD can keep the Insignia better balanced and more tightly controlled without requiring ‘outside’ intervention from ESP.