

Delphi MagneRide™

► Description

Delphi MagneRide™ is a high-performance, semi-active suspension control system that responds in real time to road and driving conditions based on input from sensors that monitor body and wheel motion. This production-proven system provides fast, smooth continuously variable damping in a cost effective and reliable package. It provides great body motion control and helps increase tire-to-road contact.

Delphi MagneRide is the industry's first semi-active suspension technology with no electro-mechanical valves and no small moving parts. The system consists of four magneto-rheological (MR) fluid-based monotube dampers (struts and/or shock absorbers), a sensor set, and an on-board Electronic Control Unit (ECU).

MR fluid is a suspension of magnetically soft particles in a synthetic hydrocarbon base fluid. When the coil in the damper piston, through which the MR fluid flows, is not energized ("off" state), the MR fluid is not magnetized. The magnetically soft particles within the fluid exhibit a random pattern and the fluid behaves like conventional damper fluid. When the coil is energized ("on" state), the magnetic field causes the particles to align into fibrous structures in the direction of the magnetic flux. The strength of the bond between the particles in the structures is proportional to the strength of the magnetic field. The result is a variable resistance to fluid flow within the damper piston, which provides a variable damping capability in the damper. Fine-tuning the current supplied to the coil in the damper piston allows the generation of a wide range of damping force. Changes in the damping force occur nearly instantaneously; the result is continuously variable real-time damping.



Cutaway of a Delphi MagneRide rear shock absorber with supplementary air spring and a cutaway of a Delphi MagneRide suspension strut.

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Delphi MagneRide provides improved performance compared with conventional systems. Full software tunable damping characteristics provide excellent low-frequency body motion control without excessive impact harshness at high damper velocities. It also has a wide range of damping force control and high bandwidth for fast response and low power requirements (20 W per damper maximum).

Features	Benefits
Production-proven system	High reliability and maintenance free
Automatic, continuous control of body modes	Increased maximum damping forces for high levels of body and wheel control
Full-car modal control (heave/pitch/roll)	Reduced minimum damping forces for improved isolation and smoothness
Wide range of rebound and jounce damping capability	Tailors ride and handling for multipurpose vehicles
Standard monotube damper configuration: 36 mm piston for suspension struts 46 mm piston for shock absorbers Internal piston coil Optional hydraulic rebound cutoff Airlift configuration available Dead-length minimization Air/oil separation Ring mount or bayonet electrical connection capability	Provides ease of packaging: packages in place of most conventional passive shock absorbers Compatible with leveling control systems Offers high reliability and durability with simplified design
Independent damping at each corner	Increases damping at a corner when needed to control body and/or wheel motions Enhances vehicle handling and stability
Extensive error detection and diagnostic capability	Reduces warranty impact

► Typical Applications

Delphi MagneRide is suitable for a broad range of passenger vehicles in which premium ride and handling characteristics are desired, including: luxury automobiles, sports cars, light trucks, and sport utility vehicles. Delphi can provide vehicle manufacturers with complete MagneRide systems or individual dampers to meet specific customer performance objectives.

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► Performance Advantages

Delphi MagneRide helps provide exceptional body motion control to keep the vehicle flat and stable while the road below heaves, pitches, and rolls. It isolates and smoothes out the action of each wheel. Anticipatory control strategies provide the means to affect steering feel and transient roll motion. MagneRide may be integrated with the vehicle's stability control to enhance stability on gravel, and slippery road surfaces. MagneRide may enhance the vehicle's anti-lock braking system (ABS) to help keep the vehicle poised and balanced for optimal stopping capability.

With Delphi MagneRide as an integral part of the vehicle's ride and handling system, the result is enhanced vehicle performance, safety, comfort, and reliability.

Operating Conditions

- Dampers: -40°C to 110°C
- Sensors and optional compressor module: -40°C to 105°C
- Electronic Controller Unit: -40°C to 85°C

Specifications	
Wheel-to-body position sensing	Driven by system ECU Ratiometric analog output signal Supports ride control and leveling systems Underbody and wheel well packaging capability
Electronic Control Unit	In-vehicle or underbody packaging potential Stand-alone ECU with ability for integration of other chassis control functions
Monotube damper	Standard package: Shock: 46 mm bore, 50 mm reservoir, driven by system ECU and packages in existing suspension system Strut: 36 mm bore, 54 mm reservoir, driven by system ECU and packages in existing suspension system Driven by system ECU Ring mount or bayonet electrical connection capability
Optional leveling compressor module	Underbody and engine compartment packaging capability High-pressure capability available Integrates with existing sensors and ECU Requires vehicle power and relay/fusing
Control system loop time	Approximately 1 msec