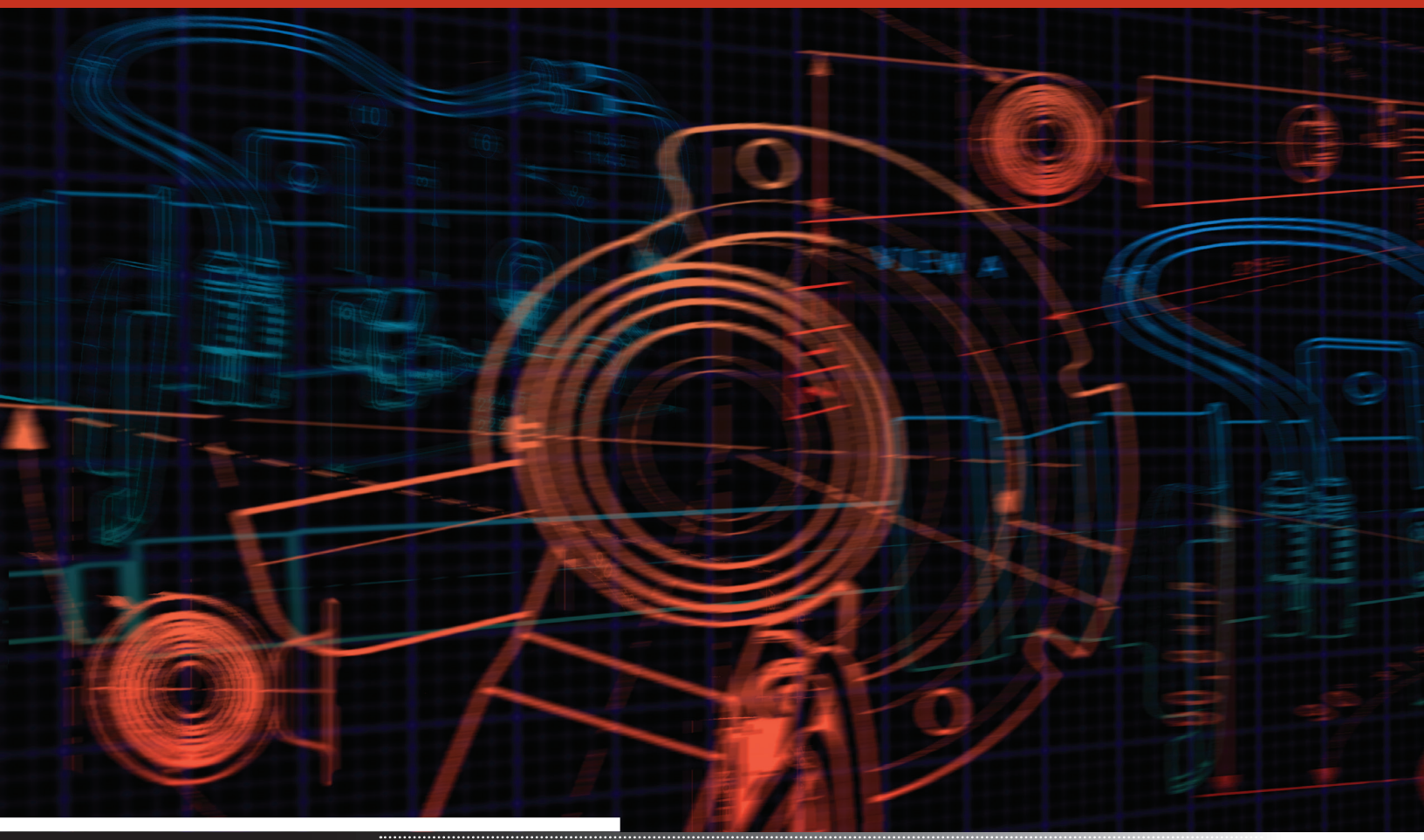
Electronic Damper Technologies



Ride Performance innovation, accelerated℠

TENNECO

Forward thinking. Forward moving.

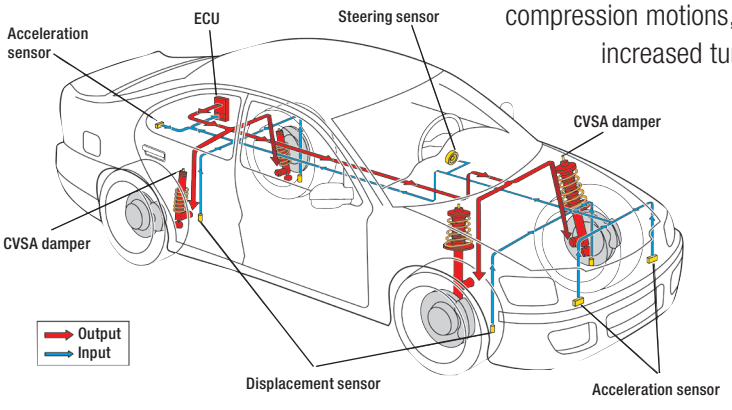
Where transportation goes for innovation

One thing that helps distinguish a vehicle from its competitors is its ride. Regardless of the application, Tenneco's electronic damper technologies help vehicles achieve a differentiated signature ride, tuned with the highest attention to detail.

Tenneco's electronic damper technologies target the entire spectrum of light vehicles, helping OEMs achieve the correct balance of comfort and control for each application.

Tenneco offers three different electronic damper technologies each designed for a specific market application – Continuously Variable Semi-Active systems (CVSA), Digital Ride Control Valve Technology (DRiV™) and Dual Mode Damper Technology.

Continuously Variable Semi-Active system (CVSA)



The CVSA system is a semi-active suspension system that continuously adjusts damping levels according to road conditions and vehicle dynamics, such as speed, turning and cornering, delivering comfort without sacrificing safety.

The company's first CVSA technology uses an external valve (CES) originally developed in conjunction with Öhlins Racing. Recently, Tenneco has developed a newer CVSA internal technology where the valve is completely inside the damper, attached to the piston rod.

For higher levels of performance and comfort, a two valve CVSA technology is available, with independent electro-hydraulic valves for the rebound and compression motions, providing an increased tuning range.

The CVSA system incorporates a powerful Electronic Control Unit (ECU), designed to leverage the full potential of the electro-hydraulic valving system. The ECU processes input data from sensors placed at key locations on the vehicle as well as signals provided from the in-car network (CAN).

The CVSA system control software processes sensor information including steering wheel angle, vehicle speed, brake pressure and other chassis control data and independently adjusts the damping level of each shock absorber. CVSA dampers allow a large separation between maximum and minimum damping levels and adjust instantaneously to ensure the optimum in ride comfort and firm, safe vehicle control.

Platforms equipped with the CVSA two valve electronic damping system can be easily upgraded with Tenneco's Kinetic® H2 CES or ACOCAR™ technologies.

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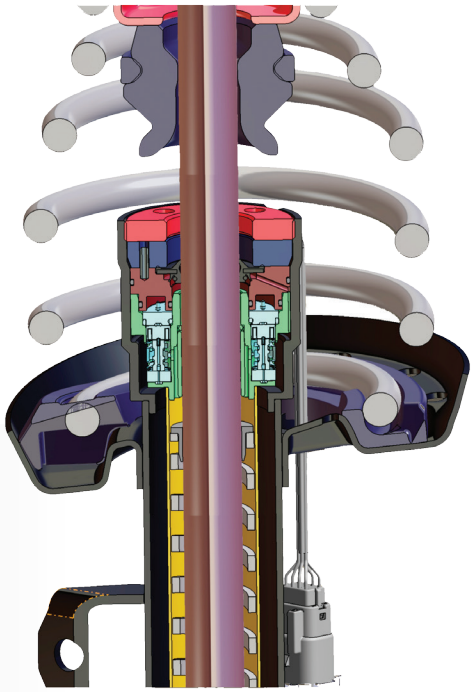

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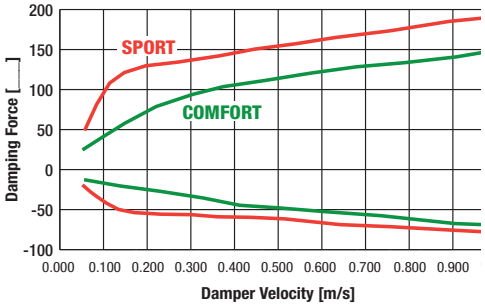
1 CVSA Shock

2 DRiV™ technology

3 Dual Mode Damper technology



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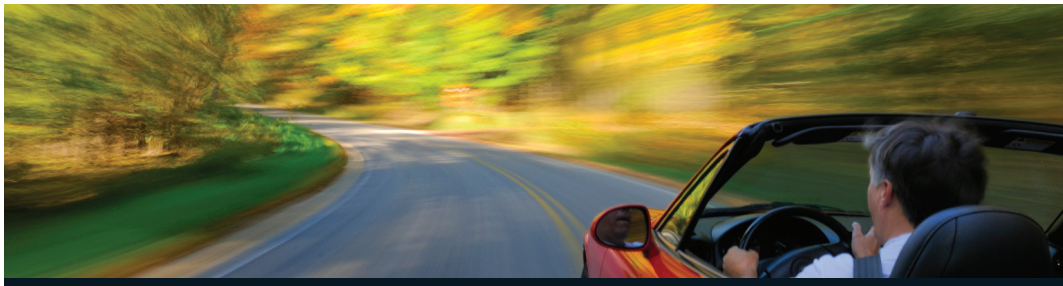
DRiV™ technology was developed from the CVSA model and features an affordable adjustable damper technology for the B/C vehicle segment. However, unlike CVSA, a dedicated ECU is not required, helping reduce the system cost. The system packaging features an internal valve with the electronics integrated in the damper, providing minimal deadlength.

Dual Mode Damper technology provides an enhanced ride experience at a minimal system cost for the small and midsized vehicle segment. A button on the dashboard allows drivers to choose the type of ride they wish to experience by selecting a comfort or sport damper setting.



FEATURES & BENEFITS

- **Improved primary ride motions through independent control of the vehicle body movements – heave, pitch and roll.**
- **Improved safety and security due to better road handling capabilities on rough, uneven road surfaces as tire force variation is reduced.**
- **Enhanced handling through control of load transfer characteristics of the suspension during transient movements.**
- **Improved secondary ride characteristics such as rolling plushness, impact harshness and shake reduction when driving conditions allow very soft damping levels.**
- **Improved comfort due to demand-specific damping and variable low-velocity bleed slope.**
- **Opportunity for vehicle manufacturers to further improve vehicle stability control systems through integration with the damping system.**

TENNECO

Partnership Built on Performance

At Tenneco, we don't simply provide a product. We provide a partnership – taking into account customers' entire systems, their unique needs and applications, technology requirements, market challenges and goals. With our electronic damper technologies and our complete line of ride performance solutions, we offer the partnership that drives the innovation that maximizes performance and enables true ride control.

PIONEERS IN RIDE PERFORMANCE

At Tenneco, innovation is a hallmark of everything we do. In our advanced ride performance technologies and solutions. In our unique, total-system integration expertise and approach. In our commitment to partnership and collaboration. We're always looking beyond the technology horizon to foresee and develop the next-generation ride performance solutions that accelerate our customers' success and keep them moving toward the future.

From development through delivery and beyond – we help our partners drive transportation innovation, full speed ahead.

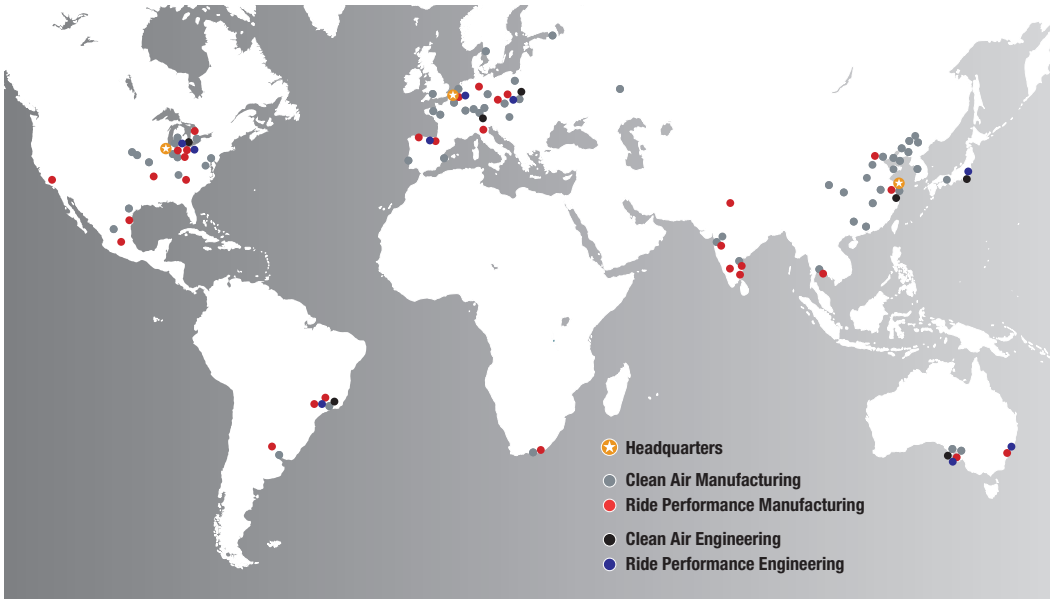
TENNECO IS EVERYWHERE OUR CUSTOMERS NEED US

Our reach is global, but our focus is local, helping customers in each region adapt our global capabilities and technologies for local applications.

- Nearly 25,000 employees worldwide
- 89 manufacturing facilities
- 14 state-of-the-art research and development centers
- 3 dedicated research and development centers for ride performance engineering

Markets served:

- Light vehicle
- Motorcycle
- Bus and truck
  - Axle suspension
  - Cabin suspension
  - Seat suspension



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