

**TORSEN**  
 TORQUE SENSING TRACTION

# TRACTION DIFFERENTIAL



TORQUE SENSING TRACTION

*All roads are not created equal. Unexpected conditions can be encountered without warning, leaving little or no time to manage the situation.*



## Managing Power and Traction

Optimum driving conditions are achieved when 100% of an engine's power can be utilized to propel a vehicle. Power alone, however, does not drive a vehicle. Friction between the driven tires and the road surface (traction), converts the engine's horsepower into forward motion. Since a vehicle is not always driven in a straight line and road surfaces are not always ideal, to achieve maximum traction at all times, power (torque) has to be managed from wheel to wheel. This balancing or juggling of power to maintain optimum traction is known as traction control.

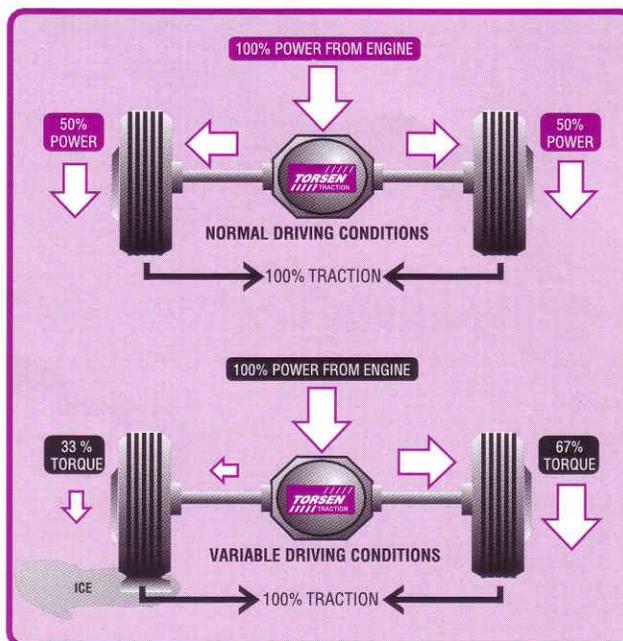
Many traction systems are reactive in nature, controlling traction by reducing power to the wheels. TORSEN, on the other hand, provides traction management with maximum available power, making it a more effective traction control system. And, unlike conventional limited-slip differential technologies, the TORSEN Traction Differential is a "live" continuous-duty system, there is no slip or lag time. Instead, direct power (torque) is instantly transferred to the wheel with the most traction. Furthermore, there are no clutches to wear out. Engineered to endure, TORSEN Traction Differential units will provide effective traction control for the life of the vehicle.

Maintaining the perfect balance of power and traction makes a substantial difference in the overall performance and safe handling of a vehicle.

## Better Traction for Safer Driving

Safety in the automotive industry continues to draw increased attention. During the first phase of the 90's, safety enhancements such as seat belts, air bags and ABS focused entirely on better passenger protection. Today, with the aid of advanced technology, the new generation of vehicles are taking safety to a higher level...accident prevention.

Most often, loss of control is compounded by a vehicle's inability to recover or to cope with a hazardous road surface. The TORSEN Traction Differential increases the margin of safety by improving a vehicle's capability to manage unexpected road conditions. In addition, TORSEN works continuously, providing a more stable and controllable driving platform, which could help to reduce the chance of a potential accident before it can occur.



### Normal Driving Conditions

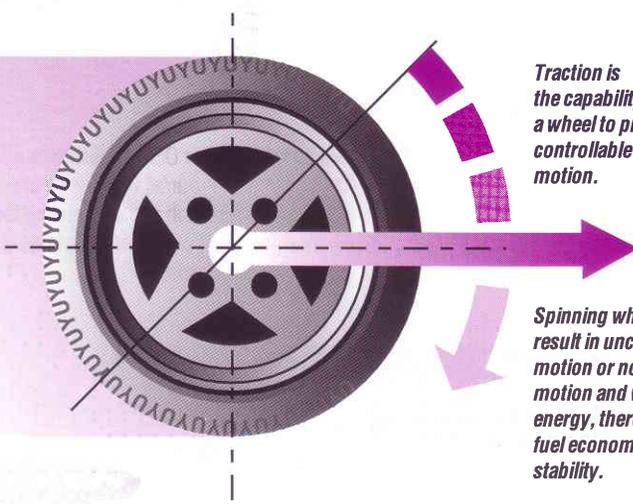
*In normal driving conditions, power from the engine is equally distributed to both axles resulting in equal traction from both wheels. While this configuration is ideal for normal straight line driving, it is unsuitable for variable road surfaces (snow, ice, mud).*

### Variable Driving Conditions

*Loss of traction causes wheel spin, a potentially dangerous condition on slippery roads. Unlike conventional speed sensing LSD's, TORSEN Traction Differentials respond instantly, shifting power to the wheel with the most traction. There is no wheel spin, lag time or momentary loss of traction.*

## TORSEN Provides Improved Lateral Traction and Stability.

TORSEN's unique ability to instantly manage power and traction results in excellent longitudinal traction and lateral stability. Not only does the vehicle benefit from full time traction management, TORSEN's efficient use of traction also enhances the vehicle's overall performance. Output from the engine is effectively managed throughout the power curve to continuously deliver the most horsepower to the road. This extra power improves acceleration and can make a remarkable difference in critical maneuvers such as high speed passing: a potentially dangerous moment when total traction control and maximum horsepower are an absolute necessity. It only takes a split second to lose control...TORSEN's instantaneous response helps to provide an extra measure of preventive safety.



*Traction is the capability of a wheel to provide controllable forward motion.*

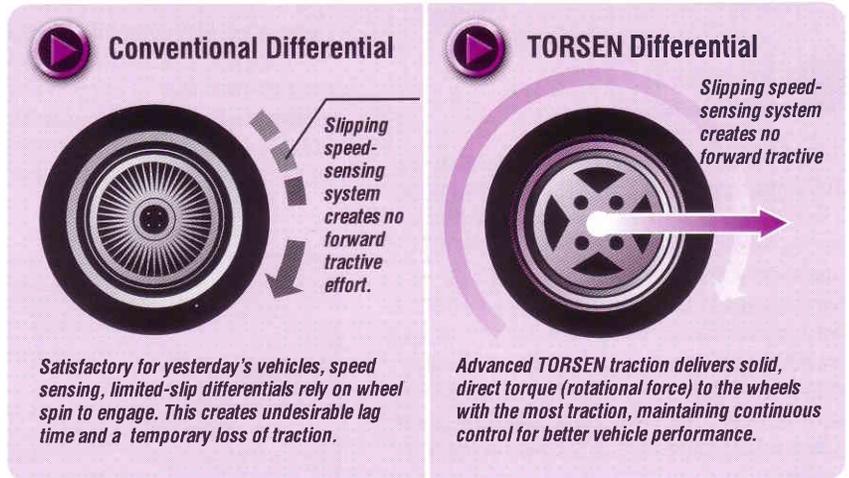
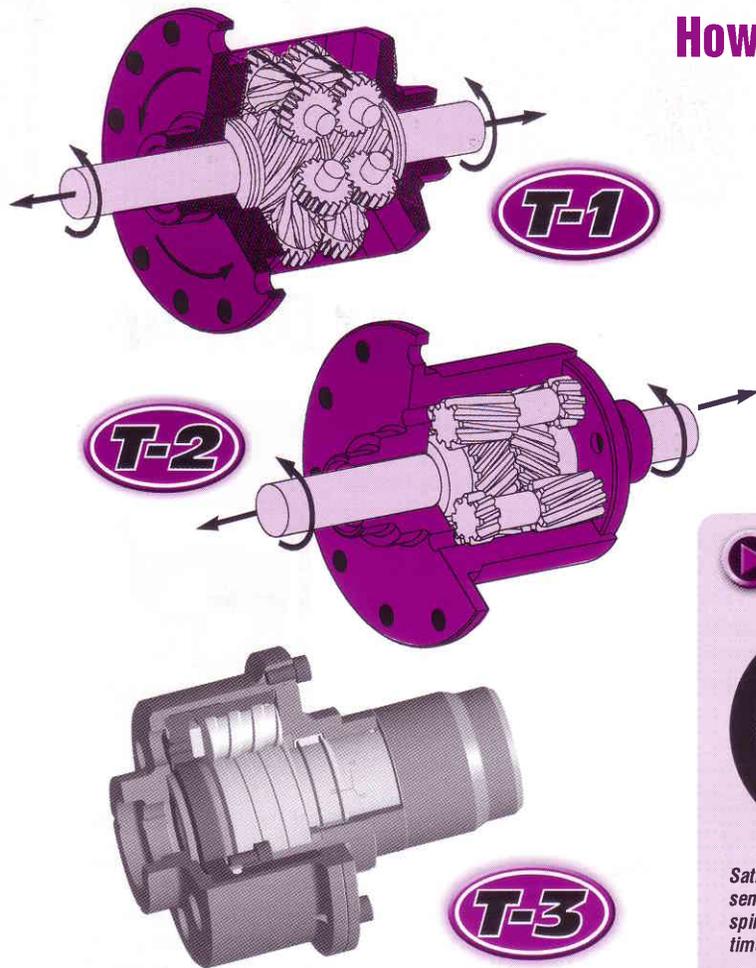
*Spinning wheels result in uncontrollable motion or no forward motion and wasted energy, thereby reducing fuel economy and stability.*

**HOW TORSEN WORKS**



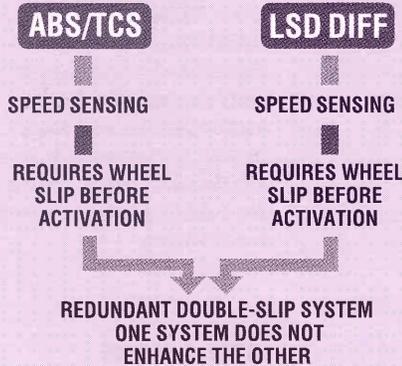
# How TORSEN Traction Differentials Work

The TORSEN Traction Differential is designed to outperform conventional differentials. It is an advanced and highly efficient traction control system engineered to effectively manage power (torque) distribution and traction management. Unlike limited-slip differentials, the TORSEN Traction Differential has no clutches to slip or wear out. Instead, it is an on-demand, torque-sensing, torque-biasing system. The driven axles are directly coupled through patented INVEX™ (T1), EQUVEX™ (T2) or Planetary Helical (T3) gears allowing multi-function capabilities in one integral unit. Torque transmission, torque-biasing and differentiation, essential functions for effective traction control, are performed simultaneously, all in one compact unit. For center applications, front or rear biased torque splits are also possible. Because it is a solid, no-slip geared system, the TORSEN differential will perform for the life of the vehicle.



## TORSEN Enhances ABS and Electronic Traction Control Systems

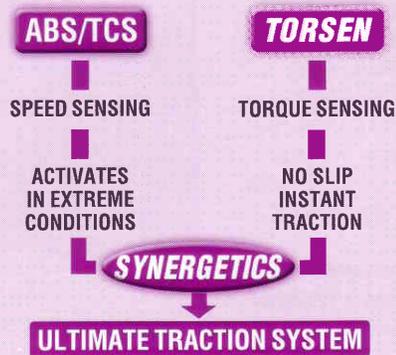
### All Speed Sensing System



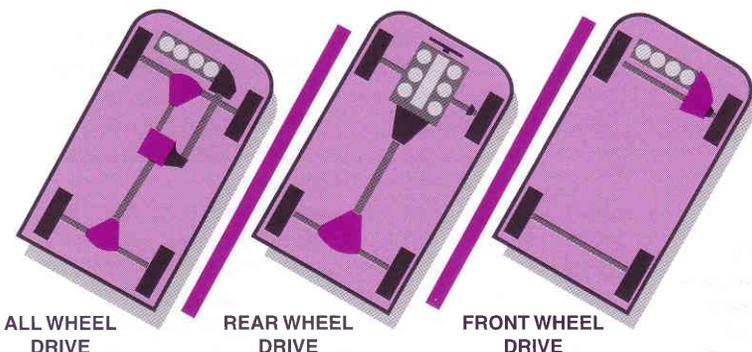
In a double speed sensing system (LSD used with ABS/TCS) both systems depend on speed sensing to activate, resulting in a temporary loss of traction. It's a less than desirable mix of old LSD technology with modern electronics: a redundant configuration where each system is independent of the other and does not enhance the other's traction control capabilities in any way.

TCS is a reference to Traction Control System

### TORSEN With ABS/TCS



The TORSEN Traction Differential is a rugged clutch-free system that works instantly. There is no lag time or wheel slip as in old LSD technology. In addition, it is a full-time, continuous-duty unit, bearing the brunt of the traction management work while ABS/TCS kick in only under extreme conditions. Each system enhances the other, providing increased longevity, assuring continuous and reliable long-term performance.



### Flexible OEM Applications

TORSEN Traction Differentials are available for OEM applications as front, rear or center drive systems for either two wheel or four/all wheel drive chassis. ZEXEL TORSEN has the expertise, and the research and engineering facilities to design, test and manufacture a custom unit that will conform to virtually any specific OEM application and torque bias requirements.



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