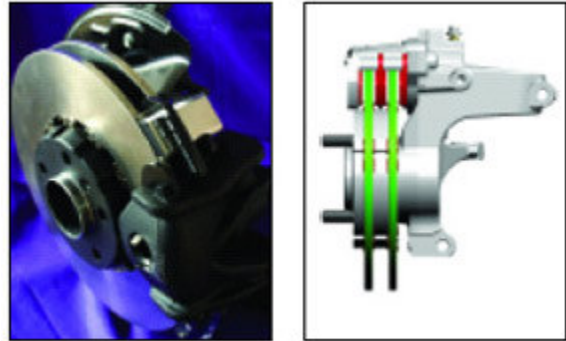


### Delphi Maximum Torque Brake

Delphi knows vehicles inside and out. By leveraging decades of its automotive experience and expertise, Delphi continues to design, develop, test, and manufacture automotive vehicle innovations that meet or exceed customer expectations. This vast knowledge of the total vehicle, combined with Delphi's resources and global locations, contributes to the production of more than 2 million brake systems each year. Delphi supplies a full range of braking components, modules, and systems that can be tailored to the manufacturers' specific requirements. With technical centers and manufacturing sites located throughout the world, Delphi provides personalized customer service and on-time, cost-effective deliveries to multiple programs for vehicle manufacturers and other Tier 1 suppliers.



#### ► Description

With the Delphi maximum torque brake system, two discs float on the outside diameter of the hub. A hydraulically actuated piston applies braking force, with pads operating on the inboard and outboard faces of each disc—providing four friction surfaces at each wheel. Maximum torque brake can provide up to 1.7 times the torque output of a conventional single-disc system of the same diameter—or it can provide similar torque from a reduced diameter.

The twin-disc design provides four cooling surfaces, without the need for vanes or cooling channels. This substantially reduces thermal stress on the brake and hub-mounted components. This improved thermal management provides engineers with many options for enhancing other aspects of the braking system.

#### ► Features and Benefits

- Twin, fully floating rotors (discs) with four friction surfaces
  - 1.7 times specific torque for same size rotor
  - Faster cooling for improved thermal management
  - Eliminates need for vanes/cooling channels
  - Reduced fade
  - Greatly reduced disc thickness variation (DTV)
  - Improved pedal feel
  - Improved noise, vibration, and harshness (NVH)
  - Potential to reduce rotor diameter, allowing smaller wheels
  - Longer rotor life
- Integrated knuckle and caliper

# Delphi Maximum Torque Brake

- Mass savings of up to 2 kg per corner
- Improved ride and handling through reduction in unsprung mass
- Reduced apply pressure
  - Potential to downsize vacuum booster
  - Reduced pedal travel and effort
  - Shorter, no-vacuum stopping distance

### ▶ Typical Applications

The maximum torque brake applies to a wide range of vehicles from passenger cars (B segment and up) to light-duty SUVs and trucks. For example, in a typical high-performance SUV application, Delphi's testing indicates that the maximum torque brake could provide the following benefits:

- Minimize the need for multiple brake system specifications
- Help reduce the maximum operating temperature by 212°F (100°C)
- Help improve NVH performance
- Offer reduced pedal travel by up to 25 mm, due to the reduced volume of fluid required for actuation
- Potential to downsize the booster
- Help provide a total vehicle weight savings of 0.5 kg up to 7 kg, depending on architecture

Delphi can supply the maximum torque brake using the latest supply-in-line-sequence techniques. The maximum torque brake can also be integrated with other systems from Delphi's portfolio of electronically controlled brake systems, including Delphi Electronic Stability Control 2.0.

### ▶ Performance Advantages

The high specific torque capability and substantial improvements in thermal management can lead to reduced weight and enhanced packaging flexibility.

By greatly increasing opportunities to optimize the combination of disc size, pedal travel, vacuum booster size, and friction material, the maximum torque brake allows the feel, cost, and performance of the system to be precisely matched to market requirements.

For example, with four pad surfaces, the brake requires approximately half of the apply pressure of a conventional disc brake. This advantage could be used to:

- Downsize the booster—helping reduce weight by up to 1 kg and freeing up more premium engine compartment space

### Delphi Maximum Torque Brake

- Reduce pedal effort and travel
- Reduce disc diameter by up to 25 mm—allowing smaller, lower-cost wheels; higher-aspect-ratio tires that are important for off-road vehicles; and a significant reduction in unsprung weight
- Shorten stopping distances in the unlikely event of a loss of brake apply system vacuum
- Incorporate low friction linings to improve brake noise, vibration, and harshness without loss of torque performance