

Delphi Multec® Multi-Port Fuel Injection Fuel Rail Assemblies

Delphi Multec® Multi-Port Fuel Injection (MPFI) Fuel Rail Assemblies are integrated, pre-assembled conduits that transfer fuel from a vehicle's chassis fuel line and distribute it to each fuel injector location at the engine. Delphi offers a variety of MPFI Fuel Rails in both stainless steel and composite material designs to provide manufacturers with a choice of efficient packaging, superior performance and durability, low cost, and aesthetics. Delphi Multec MPFI Fuel Rails are sold in conjunction with Delphi Multec® Fuel Injectors. Pressure damping options include:

- **Undamped ("Tech 0") Fuel Rails** in both stainless steel and composite material designs that provide a low cost option for applications without fuel distribution issues.
- **Internally Damped ("Tech 1") Fuel Rails**, also available in both stainless steel and composite material designs, feature a stainless steel damper positioned inside the fuel rail conduit directly over the injectors. The damper is robust to thermal and flexible fuel environments. Pulsations are dampened at the injector source.
- **Integrally Damped ("Tech 2") Fuel Rails** are made of stainless steel. The conduit walls act as the damping surface to eliminate the internal damper.



Delphi Multec® Multi-Port Fuel Injection Fuel Rail Assemblies are available in stainless steel (top) and composite material designs (bottom).

Delphi MPFI Fuel Rails are supplied preassembled with Delphi Multec Fuel Injectors and a pressure regulator (if applicable). They are leak tested for elimination of engine-level leak testing. They provide low gain and filtered pressure regulation with a provision for reference manifold pressure to help provide consistent operation over the life of the vehicle. A range of pressure regulation is available.

Delphi Stainless Steel MPFI Fuel Rails provide high resistance to impacts and prevent corrosion with all market fuels. The stainless steel construction and use of a single O-ring at the injector interface contribute to reduced evaporative emissions.

Delphi Composite Material MPFI Fuel Rails offer enhanced packaging flexibility because of advanced composite molding technology. Their composite material construction also provides reduced heat transfer. Composite fuel rails typically offer 50% lower cost and 50% lower mass than comparable steel fuel rails. No failures due to composite material degradation have been experienced.

► Benefits

- Delphi MPFI Fuel Rails are robust to ethanol fuel blends (0 to E100) and methanol fuel blends (including M15) for 15 years/150,000 miles, based on severe temperature and vibration schedules.
- Excellent warranty performance. Excellent first-time quality. Delphi has never experienced a fuel rail failure due to material degradation.
- Delphi's Internal Damping and Integral Damping designs minimize pulsations. (Low pressure pulsations.)

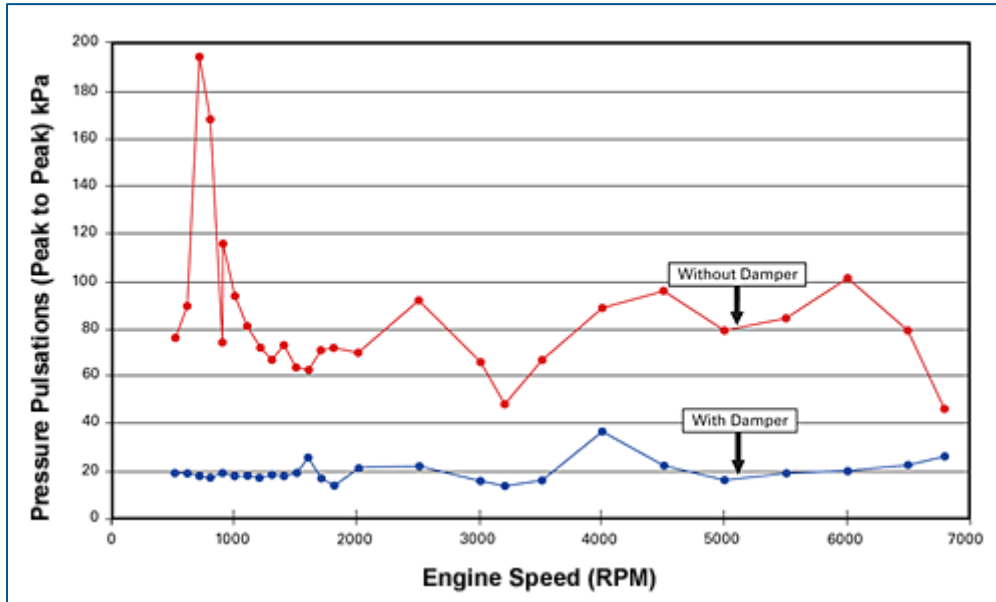
► **Typical Applications**

Delphi Multec Multi-Port Fuel Injection (MPFI) Fuel Rail Assemblies are suitable for use on one- to 12-cylinder port fuel injection gasoline and flexible fuel engines. Each MPFI Fuel Rail is unique and optimized to meet the customer's specific application requirements.



Delphi offers a variety of Multi-Port Fuel Injection Fuel Rails suitable for one- to 12-cylinder gasoline and flexible fuel engine applications.

► **Fuel Pressure Pulsations at Fuel Rail Inlet Connection**



Delphi's MPFI Fuel Rail damping technology can significantly reduce pressure pulsation levels versus undamped fuel rail designs as demonstrated by this graph.

► **Performance Advantages**

Delphi's Multec Multi-Port Fuel Injection (MPFI) Fuel Rail Assemblies damping technology can significantly reduce pressure pulsation levels. As a pressure wave travels in a conduit, it locally deflects the Delphi-designed damping surfaces, decreasing pressure pulsations. The reduction of pressure pulsations improves cylinder-to-cylinder fuel distribution, improves pulse-to-pulse fueling control and reduces chassis line vibrations. This technology helps improve drivability, reduce emissions and minimize fuel line noise.

Delphi's high volume business and global presence (North America, Europe, Asia and South America) provide manufacturers with the benefits of a varied customer base and diverse operating environments.

With its extensive experience in fuel rail design and manufacturing, Delphi understands the fuel rail environment and validation requirements. Delphi investigates fuels worldwide and has developed aggressive formulations for ethanol and methanol, and worst case fuel scenarios as required for validation testing. Delphi conducts all testing in-house using our own laboratories and state-of-the-art tools for fuel rail design (simulation and calculation), testing and validation.

► **The Delphi Advantage**

Delphi offers the benefits of more than 25 years' experience with stainless steel gasoline fuel rails, and more than 20 years' experience with composite gasoline fuel rails. Delphi Multi-Port Fuel Injection Fuel Rails have provided customers with excellent first-time quality and excellent warranty performance. Delphi engineers also focus on the development of cost competitive technologies and efficient manufacturing processes to provide manufacturers with gasoline fuel rails that deliver good value.

As a global leader in engine management systems technology, Delphi can help manufacturers meet emissions requirements, improve fuel economy and enhance performance. Delphi is a source for high value solutions and our systems approach is built into every product. Delphi's flexible engineering approach encourages collaboration. And, Delphi has a thorough understanding of automotive markets around the world and a global network of resources.