

Delphi Multec Medium Duty Diesel Common Rail

Delphi is an industry leader in diesel common rail fuel injection technology. Delphi is actively involved in the development of advanced diesel technology to help create fuel injection equipment that continues to meet stringent emission requirements while enhancing fuel economy and performance. Extensive experience in high-pressure fuel injection technology has helped Delphi develop several innovative design and control strategies. These strategies meet customer needs for cost-competitive, high-value fuel injection systems that provide accurate injection over the life of the engine, helping minimize emissions while providing robust performance and low noise.

Description – Delphi's Multec™ medium duty diesel common rail (MDCR) is a modular diesel fuel injection system, with models capable of 1800 bar system pressure. It uses a solenoid injector design to optimize fuel rate, spray shape, and accuracy. The highly innovative Multec common rail system provides small injection quantities in a small injector package, and along with closed-loop strategies, delivers precise fuel quantities over the life of the engine. That helps result in cost-effective, robust emissions and acoustics performance.

The Delphi Multec MDCR actually helps customers achieve or exceed the requirements of current and future emissions legislation through in-depth optimization of the nozzle and injector behavior. The system can deliver up to five injections per cycle, allowing high flexibility for combustion optimization.



In the Multec MDCR system, the pressure level of the rail is electronically regulated by a combination of inlet metering to the high-pressure pump and fuel discharge by bleeding the pressure off quickly via the injector solenoid return. Also, as an option, Delphi offers a rail-mounted actuator for discharge of highpressure fuel. The rail pressure operates independently of engine speed or load, so that high injection pressure can be produced at low speeds if required. A series of injectors is connected to the rail, and each is opened and closed by a solenoid driven by the electronic control unit (ECU). Delphi has further enhanced the multi-injection capability of its previous system by introducing a hydraulically optimized rail, which in combination with a software compensations strategy allows for unprecedented accuracy of each of the five injections delivered in one cylinder event.

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Features	Benefits
Injectors	<ul style="list-style-type: none"> - Driven by pressure-balanced 12 V solenoid valve - Flexible packaging, with 17mm, 19mm diameter axial-feed injectors (optional compact side-feed injector design is also available) - Multiple injection capable - Performance enhanced through individual injector characterization - Low fuel backflow design helps reduce parasitic losses and requirements for return fuel cooling
High-pressure pump	<ul style="list-style-type: none"> - Capable of 1800 bar pump pressure - Modular pump design 1.0 to 1.5 cm³/rev - Includes integrated inlet metering valve, pressure limiter, temperature sensor, and transfer pump
Rail with optional high-pressure valve	<ul style="list-style-type: none"> - Tubular rail design can be customized to individual customer requirements - Hydraulically optimized to dampen waves, allowing for precision of each of the five multiple injections per cycle
Filter	<ul style="list-style-type: none"> - Validated with Multec MDCR system - Customized to match application requirements
Electronic control unit (ECU)	<ul style="list-style-type: none"> - 32 bit processor - Robust design capable of engine mounting - Accelerometer pilot control "listens" to engine and corrects minimum drive pulse over life of the engine - Can convert 24 V to 12 V to drive the Delphi fuel injection system

- Inlet-metered high-pressure supply pump, with integrated lift pump
- Electronically actuated injectors (axial-feed or side-feed designs available)
- Electronic control unit
- Filtration unit



Typical Applications – The Multec MDCR system has been developed to meet the demanding requirements for medium-duty truck and off-highway engine applications. Because of the compact, modular design of the MDCR system, it can be applied to a wide range of engine applications from three to eight cylinders.

Performance Advantages – The Delphi Multec MDCR offers significant simplification of fuel and control systems. The injectors operate at a battery voltage (12V) with low energy requirements, allowing a less complex, more cost-effective electronics design. In addition, the injectors perform the pressure relief function in conjunction with the inlet metering system. As an option, Delphi offers a rail-mounted actuator for discharge of high-pressure fuel.

Product Design – The Delphi Multec MDCR is a compact modular system and can be easily adapted for different engines. The main components of the MDCR system are:

- Common pressure accumulator, or "rail" (designs can be customized to customer requirements)
- High-pressure regulator (optional)

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The enhanced performance of the Delphi Multec MDCR is a result of:

- 12 V pressure-balanced solenoid valve: With this pressure-balanced valve, the force required to move the solenoid remains constant regardless of the prevailing injection pressure. This helps eliminate the space and cost of larger solenoid valves or retention springs.
- Accelerometer pilot control (APC): In order to help keep the noise and emissions within small tolerances during engine life, the APC technique is used on all Multec MDCR systems. In this closed-loop system, an accelerometer attached to the engine block “listens” to the combustion, allowing the engine management system to automatically optimize its calibrations as conditions change. The result helps enable a consistently clean, quiet, and smooth-running engine.
- Individual injector characterization: This system records precise individual injector characteristics on the injector body using a bar code label. When the engine is installed, this information is read optically and programmed in the ECU to optimize performance. This feature provides superb accuracy for each injector while simultaneously helping reduce manufacturing costs and improving quality since the injectors do not need to be repaired or adjusted to achieve the desired accuracy.
- Compact design: The compact design of the injector outline enables the Multec MDCR system to be used on two or four valves per cylinder engines.
- Modular system: With one electronically driven injector per engine cylinder, the system is modular and can be used on three to eight cylinder engines.
- Low drive torque: Low peak drive torques help enable the design of simplified and flexible drive arrangements.
- Independent injection pressure: The injection pressure is independent of the engine speed and load, enabling high pressures at low speed if required.

- Multiple injections per firing cycle: Injection sequences that include pre, main, and post injections can be utilized to help reduce emissions, enabling the system to help meet the stringent emission levels required by Euro IV and US04 legislation and beyond. The inclusion of pilot injection also results in significant reduction in engine noise.
- Full electronic control: Multec MDCR offers all the benefits of full electronic control fuel metering and timing, as well as the option to interface with other vehicle functions. The ECU has the ability to convert 24 V to 12 V to drive the Delphi fuel injection system.

The Delphi Advantage - Delphi is the only fuel injection equipment supplier with in-house design and manufacturing capabilities in aftertreatment catalysts. Plus, we offer air subsystems, exhaust gas recirculation components, and sensors, offering vehicle manufacturers the widest portfolio of engine management systems and components. Delphi can integrate air and fuel management systems, exhaust aftertreatment, and the associated electronic controls and sensors, helping provide complete diesel engine control systems that meet emission requirements worldwide.

Delphi is developing Diesel NOx Particulate Traps (DNPT) and already produces Diesel Catalyzed Particulate Traps (DCPT) that together have the potential to help nearly eliminate NOx and particulate matter coming out of the tailpipe. Delphi’s research is focused on both perfecting design and manufacturing these components, along with the control strategy to best utilize the devices as part of the EMS. With its extensive aftertreatment knowledge, Delphi has the know-how to help achieve future emission standards set to come in the later half of the decade.

Delphi has two common rail development centers, five diesel applications facilities in Europe, Asia- Pacific, and the United States, and nearly 8,000 employees working to further advance diesel technologies. Delphi has 12 manufacturing facilities that produce diesel systems components in seven countries, enabling high on-time delivery performance.



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