

Delphi Multec[®] Gasoline Direct Injection Engine Management Systems

Delphi Multec[®] Gasoline Direct Injection (GDi) Engine Management Systems (EMS) are a cost-effective, family of fuel systems that provide a complete, easy-to-manage package and allow vehicle manufacturers to tailor content to their individual needs. The systems provide features that can assist vehicle manufacturers in meeting consumer demands for improved power, torque and, especially, better fuel economy.

Delphi Multec GDi EMS systems offer features such as:

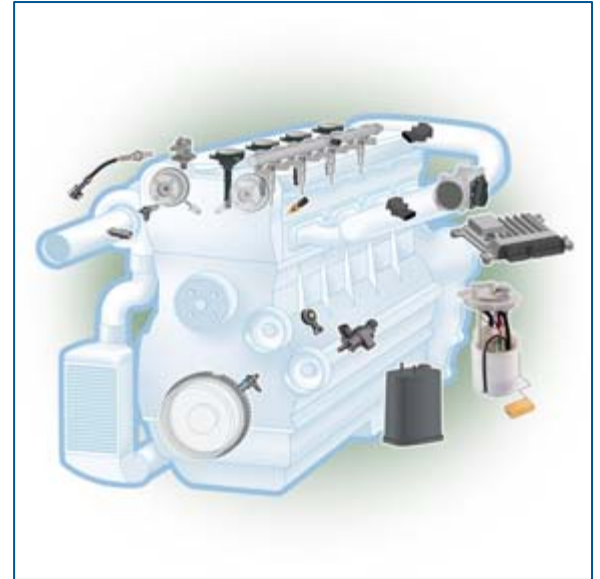
- High pressure pump flow control with variable rail pressure capability
- Low emissions cold starts
- Low particulate emissions
- Multi-pulse capability for precise spray formation and penetration control
- Enhanced turbo scavenging for low end torque improvement
- Active valve train components
- Gasoline/electric hybrid capabilities to help vehicle manufacturers meet fuel economy standards, such as U.S. Corporate Average Fuel Economy (CAFE), and greenhouse gas emissions requirements, such as European Automobile Manufacturers Association (ACEA) CO₂ fleet average

Delphi can provide all necessary algorithms, calibration services, as well as the required components and full on-board diagnostics.

Delphi's Multec GDi Engine Management Systems are designed to help vehicle manufacturers meet current and future vehicle emission standards around the world including Euro 5 and Euro 6, and U.S. Environmental Protection Agency (EPA) and California Air Resources Board (CARB) standards such as Tier 2, LEV, ULEV II, SULEV, and PZEV.

► Benefits

- System components are optimized to provide the vehicle manufacturer with the required performance objectives within a cost-effective, complete package
- Delphi can provide calibration and software or create custom software for the manufacturer
- Delphi provides a single point contact for the manufacturer to facilitate management and execution of the EMS program
- Delphi's experienced and knowledgeable local EMS teams, with their systems development, calibration, and validation capabilities, can provide fast response and help achieve fast time-to-market
- Scalable systems allow the manufacturer to use the same base engine and EMS to meet multiple local and export market requirements



Delphi's Multec[®] Gasoline Direct Injection Engine Management Systems provide manufacturers with a complete, easy-to-manage package tailored to customer requirements.

► **Typical Applications**

Delphi Multec Gasoline Direct Injection Engine Management Systems are designed to support most 4-, 6- and 8-cylinder gasoline direct injection engine programs, including spray stratified and homogeneous combustion systems. They can also support hybrid architecture and flexible fuel programs including E85, an important consideration for many markets.

Delphi Multec® Gasoline Direct Injection Engine Management System Applications and Features Summary

Applications	Delphi Multec GDi EMS
Engine	3, 4, 6, and 8 cylinders
Fuel Type	Gasoline, Ethanol Blends (up to E85)
Emissions Standard Support Capabilities	Euro IV, V and VI. U.S. LEV II, U.S. ULEV II, U.S. SULEV and U.S. PZEV. Other standards also supported.
Diagnostics	EOBD and OBD II (CAN and KW2000)
Features and Content	
Electronic Control Unit (ECU)	Delphi MT90 family
Microprocessor	32 bit
Torque Based Control	Standard
Fuel Injection	Direct Injection: Multec® 12 Homogeneous Combustion Systems Multec®20 Spray Stratified Combustion Systems
Ignition System (High Energy Coil)	Coil Per Plug High Energy Option Ion Sensing Option Multi-Charge Option
Throttle Control	Electronic (non-contacting sensor)
Exhaust Gas Recirculation (EGR) Valve	Available
Cam Phasing	Dual Independent Intake and Exhaust
Discrete Valve Lift Control	Cylinder Deactivation Option Two-Step Valve Lift Option
Continuous Valve Lift	Available for development.
Knock Control	1.) Electronic Vibration Based with Enhanced Digital Signal Processing 2.) Electronic Ion Sensing Knock Control (Available)
Turbo Charging Control	Mechanical and Electronic Wastegate Control
Active Intake Tuning Control	Intake Runner, Plenum, and/or Mixture Motion Control (Also available as part of Delphi Integrated Air/Fuel Module.)
Engine Temperature Control	Available
Hybrid Control	Interface to Delphi Power Electronics and Inverter Available
Generator Control	Available
Starter Motor Control	Available
Transmission Control	1.) Via Controller Area Network (CAN) to Transmission Control Electronics 2.) Integrated into the ECM (Available)
Digital Engine Speed and Position Sensor	Crank and up to four Cams (True power-on optional)
Switching Oxygen Sensor	Engine out and post-converter, one per bank
Wide Range Oxygen Sensor	Optional for Homogeneous, one per bank for Spray Stratified
Air Meter/Mass Air Flow Sensor	Modular or Probe configurations available for flexible packaging options. Speed Density configurations are also available.
Purge Control Actuator	Available
Fuel Vapor Pressure Sensor	Available for U.S. OBD II
Manifold Absolute Pressure/ Manifold Air Temperature (MAP/MAT) Sensor	Available

▶ **Performance Advantages**

Delphi's high performance solenoid injection technology for stratified injection provides a high performance system with a significant cost savings compared to competitor piezo systems. The choice of solenoid technology eliminates the need for an expensive high voltage power supply in the engine control unit (ECU).

With Delphi's Multec GDi Engine Management Systems, it is possible to utilize the same ECU, high pressure fuel pump, fuel rail and Multec® 20 injectors on both homogeneous combustion and spray stratified systems—with the upgrade accomplished by means of software and calibration only. This can significantly reduce the associated hardware verification and validation requirements.

Alternatively, the customer can choose the Delphi Multec® 12 fuel injector for homogeneous combustion systems, upgrade to Multec 20 for spray stratified systems, but still use the same high pressure pump and ECU for both systems.

▶ **The Delphi Advantage**

Delphi has a long history of supplying gasoline engine management systems and components that have helped automotive manufacturers overcome market and regulatory challenges. Delphi provides unique systems-level knowledge and analysis capabilities. Delphi offers a complete engine management systems portfolio, including: valve train, ignition, fuel injection, air and fuel management, electronics, sensors and actuators, fuel handling and evaporative emissions systems.

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 expertise 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.

