WOODWARD

Product Specification
36534

PG-04 Control System
Power Generation & Stationary Control System

APPLICATIONS

Woodward's PG-04 control system controls engines in generator sets, pumps, and other stationary industrial equipment. It controls spark-ignited engines fueled by LPG (vapor or liquid), natural gas and/or gasoline. Suitable for engines up to 250 HP.

The highly accurate, closed-loop control system helps OEMs and packagers comply with local emission standards while providing discerning customers with advanced capability for remote monitoring and control to reduce fuel consumption and increase engine life.

PG-04 provides accurate and reliable performance control over the service life of the engine in the extreme operating environments typical of heavy-duty, stationary industrial applications.

SYSTEM OVERVIEW

Components on LPG & NG Engines

- Electronic control module
- Electric fuel lock off solenoid valve
- Fuel pressure regulator*
- Fuel trim valve
- Fixed venturi mixer assembly
- Electronic throttle assembly
- Oxygen sensor
- Integrated temperature and manifold pressure sensor
- Smart coil

Components on Gasoline Engines

- Electronic control module and related sensors
- Fuel rail
- Fuel pressure regulator
- Fuel injectors
- Smart coil

(*) Two-stage pressure regulator/vaporizer on LPG liquid fuel systems

DESCRIPTION

PG-04 delivers precise and fully integrated control of fixed-speed, stationary industrial engines.

Using proven, reliable components of Woodward's MI-04 closed-loop control system and the L-Series electronic throttle, PG-04 monitors and regulates functions of the following engine subsystems.

Fuel Delivery

- LPG, natural gas or gasoline

Spark-Ignition

- Distributor (2 to 8 cylinders) and waste spark (1 to 6 cylinders)

Air

- Electronic throttle

PG-04 commands full authority over spark, fuel, and air. This integrated approach permits precise governing and air/fuel ratio control while remaining flexible enough to handle transients. The control algorithms are model-based, feed-forward, adaptive strategies. Continual updates to the adaptive parameters allow for more responsive control.

LPG and natural gas engines

An inline Woodward L-Series fuel trim valve controls fuel delivery based on a PWM signal from the ECU. The position of the trim valve biases the output pressure of the fuel flowing from the regulator. The feedback voltage from the oxygen sensor determines if the fuel delivery needs to be increased or decreased. Sophisticated powertrain models maintain optimum performance and response throughout the life of the engine.

- Helps OEMs reduce fuel consumption and engine wear
- Complete packaged system trims integration costs
- Preprogrammed configurations tailored to specific application
- Closed-loop fuel control with adaptive-learn technology
- Diagnostics available via CAN
- Remote start/auto start capability
- Speed setpoints configurable to four different speeds
- Field extractable fault codes
- Selectable limited operating mode for troubleshooting and diagnostics

Gasoline engines (up to 4 cylinders)

The ECM and sensors provide the computational power, algorithm logic, sensor inputs and control outputs to control the system. The ECM receives signals from the sensors, digitizes these signals, and then through algorithms and calibration maps computes the desired output response to manage fuel, spark and air to the engine. The ECM also provides a variety of other functions and features, including system monitoring and diagnostics to aid in maintaining efficient system operation and auxiliary control.

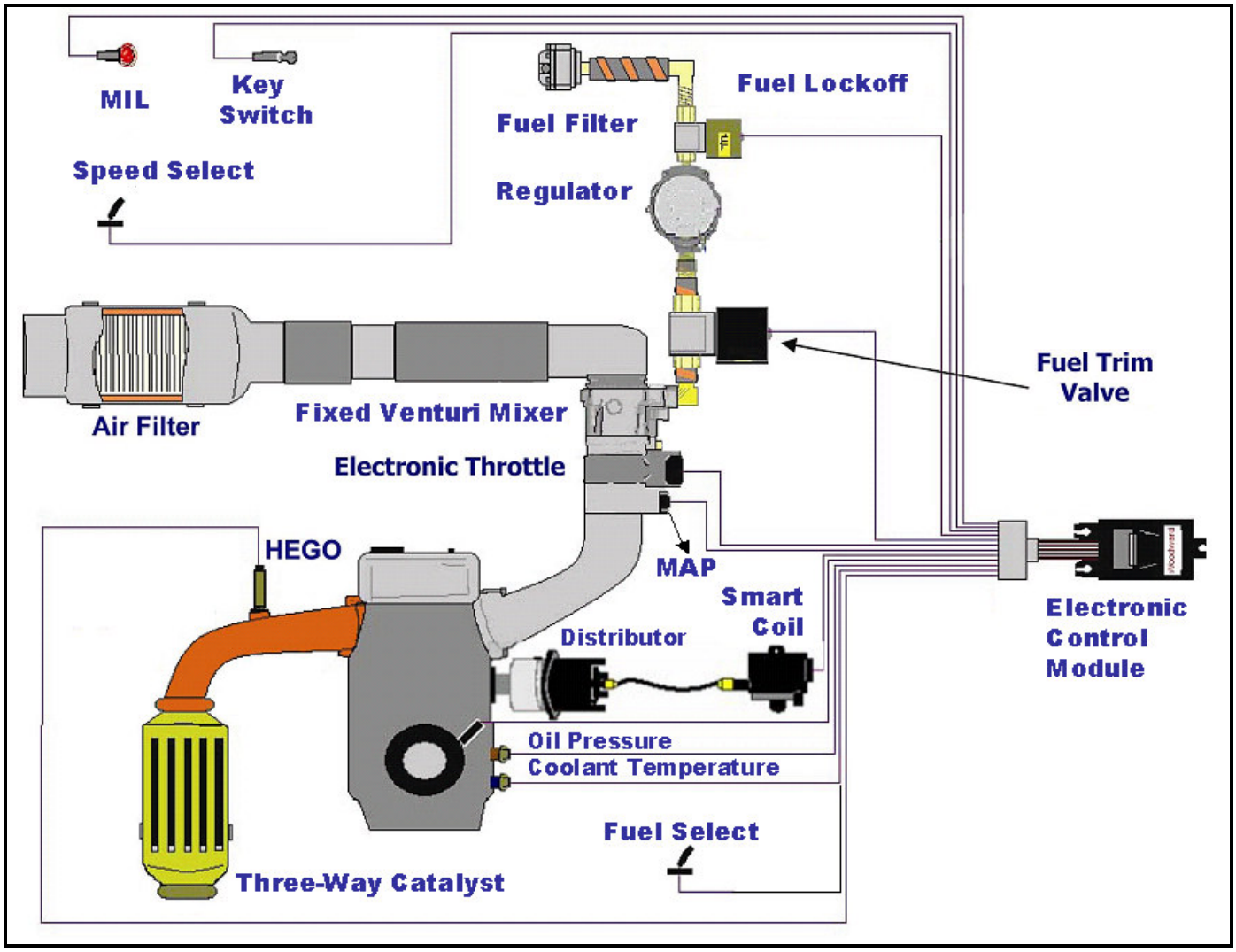
All gasoline specific components are automotive production parts and validated to strict automotive standards.

PG-04 CONTROL SYSTEM FEATURES

- Closed-loop control of air-fuel ratio improves equipment durability by reducing maintenance, fuel consumption, and engine component wear.
- Control strategy ensures optimal transient performance for efficient system response.
- Comparisons of actual engine operation to expected values allows the system to compensate for wear, tolerances and adverse operating environments. This improvement in operating economics is a result of the sophisticated software models in the PG-04 system.
- Programmable idle speed control includes speed setpoint modifications for coolant temperature and speed selector switch input.
- Monitoring and diagnostic communication via J1939 CAN allows immediate assessments and corrections either on-site or remotely.
- Individual diagnostic codes detect functional faults, intermittent faults, sensor and actuator failures, and engine protection problems.
- Malfunction indicator lamp (MIL) with field-extractable fault codes pinpoints problem areas.
- Extensive engine protection features include monitoring of engine coolant temperature, oil pressure, and overspeed.
- Fault conditions can be calibrated to trigger a limited operating mode for diagnostics and troubleshooting.

FUNCTIONAL DIAGRAM

The diagram below shows the PG-04 components that are integrated into an LPG vapor or natural gas engine system. Note that PG-04 can also accept inputs from existing engine sensors (such as coolant and oil pressure) and incorporate that data into the engine control and diagnostic strategies.



PG-04 Components on LPG or Natural Gas Engine System

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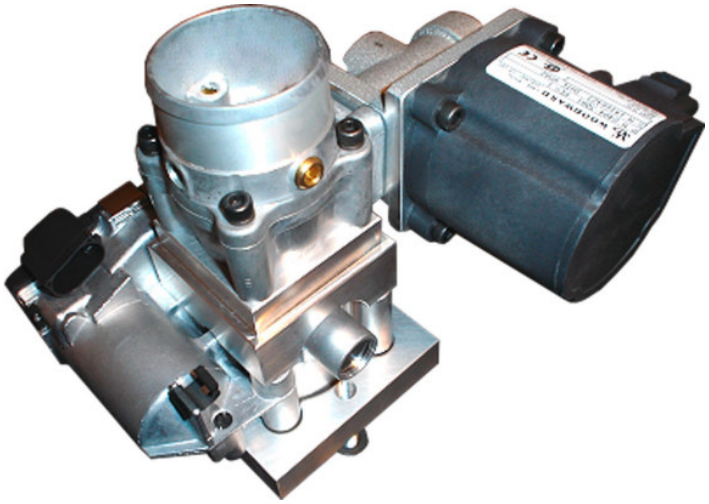
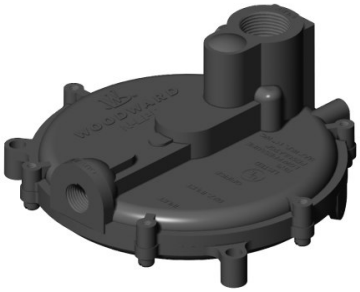
PG-04 KEY COMPONENTS

Venturi Mixer **Fuel Trim Valve**



Electronic Throttle

Designed for sensitivity and simple operation, the LPR regulator is used with low-pressure gaseous fuels, where dependable starting is required. Because of its extreme sensitivity, it provides superior performance in most remote starting applications such as standby power generators. (Up to 25 HP)



LPR Pressure Regulator

Incorporating built-in ignition driver circuitry, the “Smart Coil” eliminates the need for a driver circuit inside the SECM or externally from the coil. Engines with distributors use a single VR sensor and a smart coil to control the spark ignition. Engines without distributors control spark ignition with multiple smart coils (waste spark).

Smart Coil
(for distributor)

For more information contact:

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