

# E<sup>3</sup> Lean Burn Trim Control

## for Lean Burn Industrial Spark-Ignited Engines

### Applications

Woodward's E<sup>3</sup> Lean Burn Trim Control system controls industrial gas engines used in power generation, pumping, and other stationary applications ranging from 300 kW to 2000 kW (400–2700 hp).

The highly accurate, closed-loop control system helps customers meet regulated emission levels, while maintaining engine performance over a very large range of fuel qualities.

The E<sup>3</sup> Lean Burn Trim Control is part of the Woodward line of E<sup>3</sup> All-Encompassing Engine and Emissions controls designed to meet the performance and reliability needs of gas engine manufacturers, owners, and operators.



### Control Overview

The E<sup>3</sup> Lean Burn Trim Control is a fully integrated engine control solution that calculates and controls the air-to-fuel ratio required to keep the engine's exhaust emissions within compliance limits, and can also control engine speed and power for the driven load as well as controlling ignition timing. The control uses engine speed, air manifold absolute pressure (MAP), air manifold air temperature (MAT), and exhaust oxygen levels to control the fuel gas going to the air-to-fuel ratio controlling device, like a carburetor, to improve the accuracy of the air-to-fuel ratio. Additionally, diagnostics such as detonation and misfire as well as other health monitoring are included in the control.

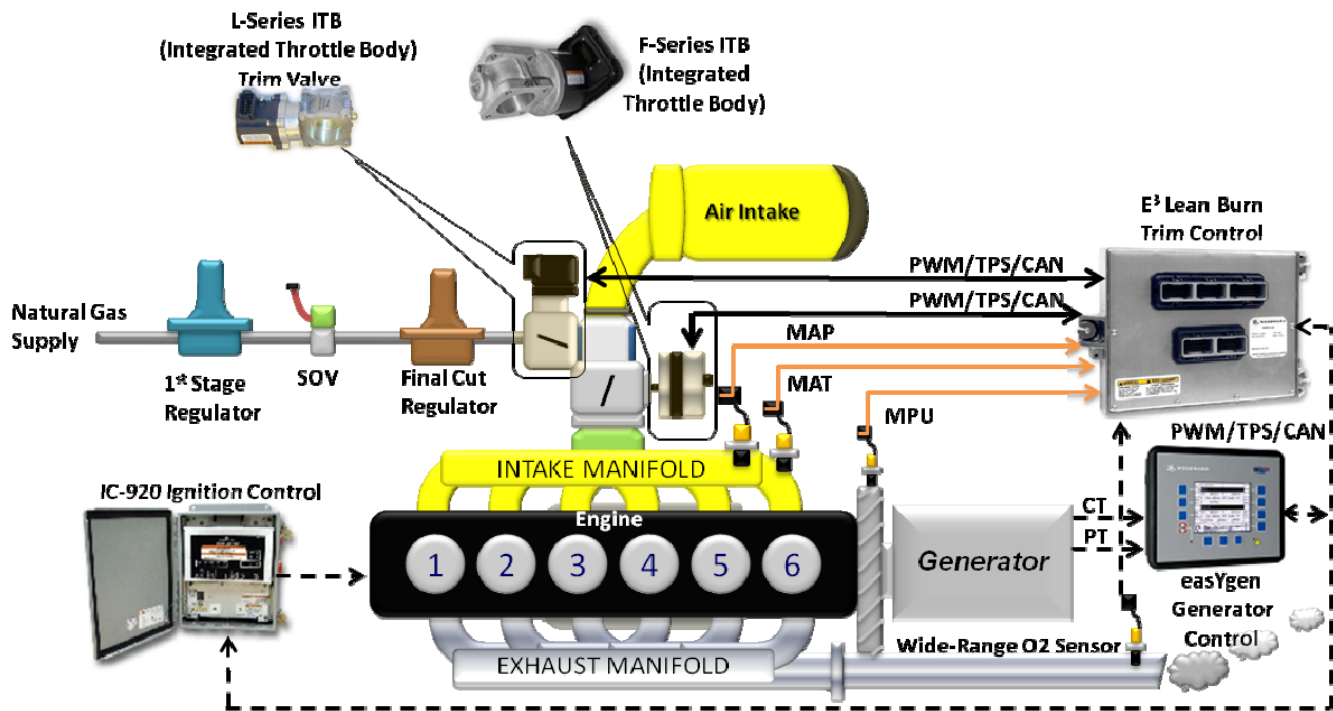
The E<sup>3</sup> Lean Burn Trim Control integrates with Woodward's full range of gas engine components:

- Integrated fuel valves and engine throttle bodies ranging from 16 mm to 180 mm
- Fixed Venturi Mixers
- Ignition Systems
  - ✓ SmartCoils
  - ✓ IC-920 or IC-922

The E<sup>3</sup> Lean Burn Trim Control also works with the easYgen™ power management products for generator load control, load sharing, and synchronization, and can form the gateway to external systems and also display information that is available from the E<sup>3</sup> Lean Burn Trim Control.

- Integrated approach reduces system complexity and reduces overall cost
- Scalable to meet entire range of customer needs
- Integrated engine protection and diagnostics to ensure safe engine operation
- Power generation or mechanical drive applications

The following functional diagram shows how all the components are integrated into a power generating system:



**E³ Lean Burn Trim Control System**

### Environmental Specifications

#### Operating Temperature:

–40 °C to +85 °C (–40 °F to +185 °F)

#### Storage Temperature:

–40 °C to +105 °C (–40 °F to +221 °F)

#### Mechanical Vibration:

Woodward Vibration Test RV2 (Procedure 3-04-6231): 0.1 G<sup>2</sup>/Hz, 10 Hz to 2000 Hz, 12.8 Grms, 3 h/axis w/vibration isolation dampeners

#### Mechanical Shock:

50 G, 11 ms, half-sine wave, 4 shocks in each direction (24 total shocks)

#### Ingress Protection:

IP66 per EN60529

#### EMC Specifications:

EN61000-6-2: Immunity for Industrial Environments

EN61000-6-4: Emissions for Industrial Environments

For environmental specifications of other system components, please refer to the applicable product specifications.

### Regulatory Compliance

**European Compliance for CE Marking**—These listings are limited only to those units bearing the CE Marking.

**EMC Directive:** Declared to 2004/108/EC COUNCIL DIRECTIVE of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and all applicable amendments.

**North American Compliance**—These listings are limited only to those units bearing the CSA agency identification.

**CSA:** CSA Certified for Class I, Division 2, Groups A, B, C, D, T4 at 85 °C ambient. For use in Canada and the United States. Certificate 1604047.



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