

# E<sup>3</sup> Rich Burn Control

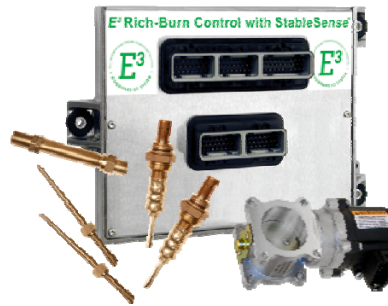
## with StableSense\* Technology

### Applications

Woodward's E<sup>3</sup> Rich Burn control provides highly stable, closed-loop control of air-fuel ratio on engines using three-way catalysts, to help engine owners meet regulated emission levels without operator adjustment. The exclusive StableSense\* technology maintains up-time and catalyst performance by using the only industrial-gas-engine-specific O<sub>2</sub> sensor.

The E<sup>3</sup> Rich Burn control is designed for use on stoichiometric, spark-ignited natural-gas engines used in gas compression, power generation, pumping, and other stationary applications ranging from under 300 kW (400 hp) to over 2 MW (2700 hp).

The E<sup>3</sup> Rich Burn 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> Rich Burn control is a fully integrated engine control solution. It can be used as a stand-alone air/fuel ratio controller or as a complete gas engine emissions and engine control. The control features exclusive StableSense technology, to optimize the amount of time the engine remains in compliance. The StableSense technology contains special software and uses an industrial natural gas O<sub>2</sub> sensor that is unaffected by engine exhaust methane and hydrogen.

The E<sup>3</sup> Rich Burn control has full authority over spark, fuel, and air. Additionally, diagnostics such as misfire detection as well as other health monitoring and engine protection are integrated into the control.

**E<sup>3</sup>**—A fully integrated control for increased reliability:

- Air-fuel ratio control (base control)
- Integrated speed/load control (optional)
- Ignition control (optional)
- Engine protection
  - Full misfire detection for increased catalyst life and engine diagnostics
  - Overspeed monitoring for immediate engine shutdown
- Start fuel limiting for easier, more consistent starting
- Scalable from small mono- to large stereo-fuel systems

The E<sup>3</sup> Rich Burn control works in conjunction with Woodward's full range of gas engine components:

- Woodward Integrated fuel valves and engine throttle bodies, from 16 mm to 180 mm
- Fixed-venturi mixers
- Ignition systems (Woodward IC-920 or IC-922)

Engine health and diagnostics are integrated to ensure the engine remains in a safe operating mode.

\*Trademark of Woodward, Inc.    \*\*—Trademark of Schneider Automation Inc.

- Greatly reduced out-of-compliance downtime
- Exclusive StableSense\* technology
- Engine and catalyst health monitoring and alarming
- Consistent engine starting over a wide range of conditions
- Integrated engine protection and diagnostics to ensure safe engine operation
- Works with both single- and dual-bank engines
- Improved engine performance with automatic on-line cylinder bank balancing on dual-bank engines
- Integrated approach improves reliability and reduces overall cost
- Scalable to meet the entire range of customer needs
- Supports RS-485 serial Modbus\*\* slave multi-drop communications up to 115 kBaud

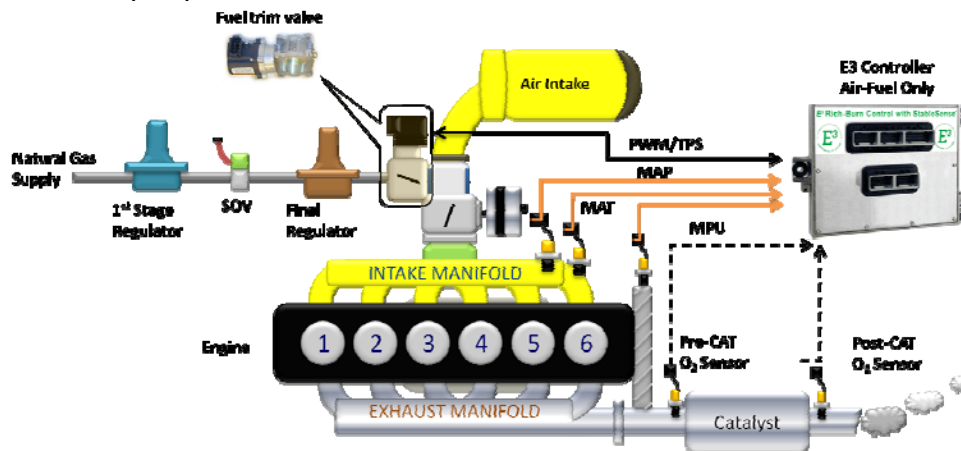
### Relevant Item Numbers

Control - E3 Rich Burn AFR Only	8280-1104	StableSense Mating Connector	8928-7363
Control - E3 Rich Burn Speed Control	8280-1105	L-Series AFR Trim Valve	Per Catalog
Pickup - Magnetic (.625-18,1680-622 P.U.)	5430-929	L-Series AFR Connector Kit	8928-396
KIT - E3 - Mono AFR Sensor	8928-7264	F-Series AFR Trim Valve	Per Catalog
KIT - E3 - Stereo AFR Sensor	8928-7265	F-Series AFR Connector Kit	8923-1312
StableSense Sensor	1689-1197	E3 Rich Burn Control Manual	26473

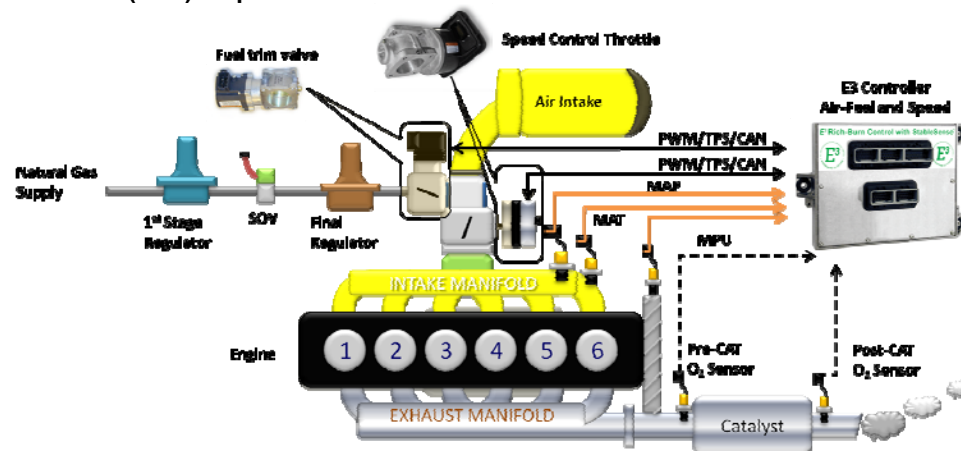
## Typical Configurations

The E<sup>3</sup> Rich Burn control can be applied in a number of configurations, including mono and stereo fuel supply, air-fuel only or air-fuel plus speed control variations, as well as high-energy ignition control options.

### Mono-supply, Air-Fuel-Ratio (AFR) Control



### Mono-supply, Air-Fuel-Ratio (AFR) + Speed Control



Stereo systems are dual-bank engine configurations that have two separate fuel-supply systems **and** two separate exhaust manifolds with one pre-catalyst HEGO sensor for each bank.

### 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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