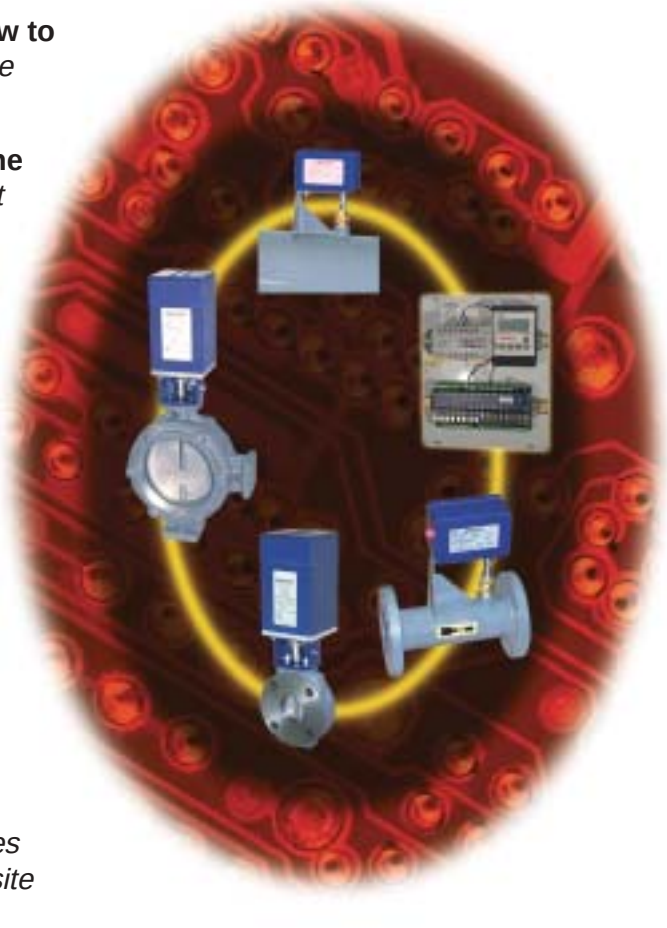
SMARTFIRE™
Intelligent Combustion Control System



- **Precise electronic control of air and fuel flow to the burner** *to maximize efficiency and minimize emissions simultaneously*
- **Maintain emissions or fuel efficiency over the entire operating range of the burner,** *not just at one burner set point*
- **Automatically compensates for changes in combustion or process conditions** *with full cross-limited ratio control, maximizing burner performance and ensuring a highly repeatable heat source*
- **Plug 'n Play, turnkey system** *for easy installation and set-up*
- **Integrates easily with all burner management systems,** *reducing engineering costs in retrofit applications*
- **Advanced diagnostics and troubleshooting** *provide real-time information about combustion and process system performance*
- **Optional remote monitoring gateway** *reduces process downtime by providing immediate off-site technical support over a standard phone line*
- **Rugged industrial design** *includes NEMA 4X enclosures, high torque actuators, and all-digital field device communications, ensuring reliable operation in harsh environments*
- **Redundant system safety checks built into intelligent components,** *significantly reducing the risks associated with combustion system commissioning and maintenance neglect*
- **FM and CSA approved**
- **Meets requirements for European Electromagnetic Compatibility (EMC) and Low Voltage Directives**

Manufactured under U.S. patent #6,247,919

MAXON®
CORPORATION 201 East 18th Street, P.O. Box 2068, Muncie, Indiana, 47307-0068. Phone: (765) 284-3304. Fax: (765) 286-8394

SMARTFIRE™ Intelligent Combustion Control System

Design and Application Details

The **SMARTFIRE™** Intelligent Combustion Control System is a turnkey, mass flow air/fuel ratio control system for industrial burners. The System is comprised of five components that integrate easily with a conventional burner management system and pipe train: an Interface Panel; Air Valve Actuator and Fuel Valve Actuator; and Air Flow Controller and Fuel Flow Controller.

The Interface Panel includes a Burner Brain, 24 VDC Power Supply, and User Display. The Burner Brain contains all of the factory-installed, combustion intelligence (such as burner-specific air/fuel ratio and flow data), enabling the SMARTFIRE™ System to be easily commissioned after field installation. The User Display panel allows the Operator to monitor and adjust the performance of the combustion system. The Valve Actuators are factory-calibrated assemblies that include rugged, high-quality planetary gearheads and stepper motors for highly repeatable and precise control of Maxon's butterfly valves. The Air and Fuel Flow Controllers each consist of a precision-calibrated thermal mass flow sensor, control electronics, and flow body with integrated flow conditioners for a highly repeatable measurement.

Other SMARTFIRE™ System functions include fuel totalizing, air/fuel flow and valve position analog outputs for DCS interfacing, (optional) remote monitoring, and many redundant system safety functions. The SMARTFIRE™ System specifications are as follows:

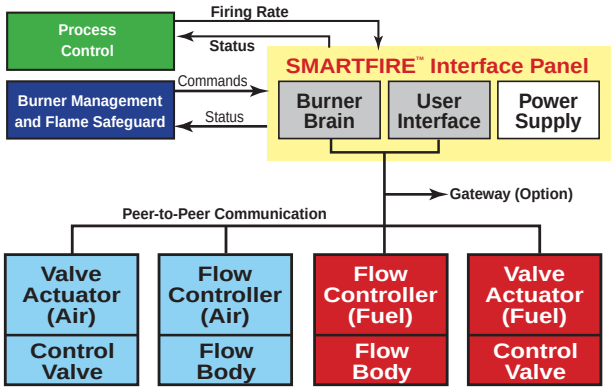
Valve Position Control	0.1 angular degree resolution
Flow Control	± 1% of flow reading over a turndown of 20:1
Air/Fuel Ratio Control	± 2% with turndown of 20:1
Power Supply Input	100-120 VAC @ 2.5 Amps max, 50-60 Hz 200-240 VAC @ 1.5 Amps max, 50-60 Hz
Approvals	FM & CSA (CE approval pending)
Ambient Temperature	-20°F to 122°F (-29°C to 50°C)
4-20 mA I/O	Output: 350 Ohms max user load resistance
	Input: 20 mA max current, 250 Ohm input resistance
Control Relays	Input Coil: 120 VAC @ 7.5 mA 240 VAC @ 3.8 mA
	Output Contacts: 250 VAC @ 10 Amps, 30 VDC @ 10 Amps

Burners and Fuels

The SMARTFIRE™ System can be used with the majority of Maxon's natural gas fired burners, especially those designed for low-emission applications (e.g., KINEDIZER®, CYCLOMAX®, CROSSFIRE®, OXYTHERM®). For application of SMARTFIRE™ to non-Maxon burners or use with other fuels, contact Maxon.

Principle of Operation

As shown in the block diagram below, the five SMARTFIRE™ components each communicate over a peer-to-peer digital network. Control functions are performed in the field devices and the Burner Brain, providing higher accuracy and reliable operation in electrically noisy industrial environments that often affect the performance of systems with analog (4-20mA or low voltage) control signals. The distributed intelligence also allows redundant system safety checks which prevent tampering and unsafe conditions that can occur during combustion system commissioning and after long-term operation.



The SMARTFIRE™ System permits the burner to be started in response to the commands from the User's burner management system. Once the sequence is completed, the System maintains the factory-installed air/fuel ratio for the desired heat output set by the User's process controller. The System's cross-limited mass flow control of air and fuel automatically compensates for changes that affect combustion performance such as air and fuel temperature and pressure and chamber pressure. The process controller and burner management system are not included as part of the SMARTFIRE™ System. These functions can be obtained using one of several Maxon combustion command panel products.

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MAXON®
CORPORATION

Authorised Distributor:

AMPMECH
46, Jalan SS 22/21, Damansara Jaya,
47400 Petaling Jaya,
Selangor Darul Ehsan, Malaysia.

Email: ampmech@ampmech.com
Website: www.ampmech.com