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MASS FLOW CONTROLLER

Bulletin 8077-MFC

December 2011

- **Electronic ratio control**
- **Air or fuel primary**
- **Air or oxygen as oxidants**
- **Flexible configuration options**
- **LCD for configuration and display**
- **Diagnostics messages**
- **DIN rail mounting**
- **Manual mode**
- **RS-485 ModBus communications (read only)**

INTRODUCTION

In industrial processes, a precise mix of fuel and air for combustion is required for maximum efficiency, low emissions and low operating costs. The Fives North American 8077-MFC (Mass Flow Controller) is designed to effectively regulate the ratio between the primary and secondary flows.

OVERVIEW

The 8077-MFC provides ratio control between the primary flow, controlled by a separate process controller and the secondary flow controlled by an analog output. Here is how it accomplishes the key benefits:

- Maximum efficiency comes from optimum ratio setting, permitting reduced excess air. Both the primary and secondary flow inputs can be temperature compensated for increased accuracy.
- Maintaining precise ratio is important in minimizing NOx and CO effluents. Tight flow control in proper ratio contributes to reduced emissions to meet the strictest of environmental regulations.
- There are discrete inputs to change the operating state and discrete outputs that can be used as process permissives.
- Built in diagnostics allow quick return to service. The pushbuttons and display provide clear messages to simplify its use and configuration. Manual control of the analog output provides an easy method of setting and troubleshooting issues with the secondary flow control valve.

The functions include:

1. Air or oxygen as the oxidant.
2. One primary flow input and one secondary flow input and output.
3. Ratio control with either air/O_2 or fuel as the primary flow signal.
4. Temperature compensation is selectable for both flow inputs.
5. Temperature inputs can be either RTD or 4-20 mA.
6. Manual control of the secondary flow actuator.
7. Second analog output to retransmit one of 5 signals.
8. RS-485 ModBus communications (read only).

Discrete inputs read by the controller change the operating state to match the burner system conditions (Drive High, Drive Low, Hold or System Reset). Discrete Outputs are provided to interface with the burner control system (System Status, System Alarm, Primary Hold or Below Ratio BP).

Flow Inputs

The 4-20 mA analog inputs have 250 ohms input impedance. 24 V dc loop power is available on the terminals to supply power to 2 wire transmitters. Alternately, an isolated signal can be connected depending on the wiring and jumper configuration. Flow 1 is always the primary flow which can be air/oxygen or fuel. Square rooting each of these signals can be selected by configuration jumpers. Each input is scaled to engineering units based on the configuration.

Temperature Inputs

The temperature inputs can be either 4-20 mA or RTD depending on the wiring and jumper configuration. These are enabled by hardware jumpers. When enabled, the associated flow is temperature compensated. When configured for 4-20 mA input, the input has 250 ohms impedance.

Analog Outputs

The 4-20 mA output for Flow 2 drives the positioner for the Flow 2 control valve. The second 4-20 mA output can be configured to retransmit one of 5 parameters, Flow 2 output, Flow 1 input, Flow 2 input, Flow 1 temperature input or Flow 2 temperature input. The outputs have 20 V dc compliance voltage.

Discrete Inputs

All of these inputs are 24 V dc inputs with LEDs that indicate green when the input is energized.

Drive High commands the unit to set the Flow 2 output to a configured percentage. This would be used for purge if Flow 2 is air.

Drive Low commands the unit to set the Flow 2 output to a configured percentage. This would be used to set the Flow 2 output at a light off position.

Hold commands the unit to freeze the Flow 2 output. This would be used for reversals on a regenerative burner system.

System Reset commands the unit to unlatch the alarm condition and attempt to return to normal operation. A System Reset pushbutton on the 8077-MFC will also perform this function.

Discrete Outputs

All of these outputs are 24 V dc outputs. Each has a dual LED that indicates green when the output is energized and operating normally and red if the current rating has been exceeded.

System Status is energized when the unit is healthy and all of the analog inputs that are in use are within range. This would be used as a burner run permissive.

System Alarm is energized when any of the analog inputs that are in use are out of range or an enabled ratio alarm is tripped. This would be used to annunciate an alarm condition or as an optional burner shut down on the ratio alarms.

Primary Hold is energized when the ratio is outside of the ratio alarm trip points (if at least one is enabled) This would be used to send a signal to the device controlling the primary flow, preventing it from modulating any farther until Flow 2 is adjusted to achieve a ratio within the alarm trip points.

Below Ratio Breakpoint is energized when Flow 1 is below the configured Ratio Breakpoint. This would be used for indication or other process controls.

Ratio Control

The 8077-MFC ratio function is very flexible. It uses the Flow 1 input as the primary flow. The user configures the engineering units that are represented by 20 mA on each flow input and the stoichiometric ratio number. The ratio setpoint and ratio deadband are configured as percent excess air. It will modulate the Flow 2 output until the Flow 2 input indicates that the ratio is within the ratio deadband. Adjustment of the Flow 2 output is easily tuned by ajusting the configured Output Speed.

Manual Control

The 8077-MFC has an Auto/Manual toggle switch. When this switch is in the auto position, the ratio control is actively updating the Flow 2 output. When this switch is in the manual position, the operator can adjust the Flow 2 output percentage using the pushbuttons and the LCD.

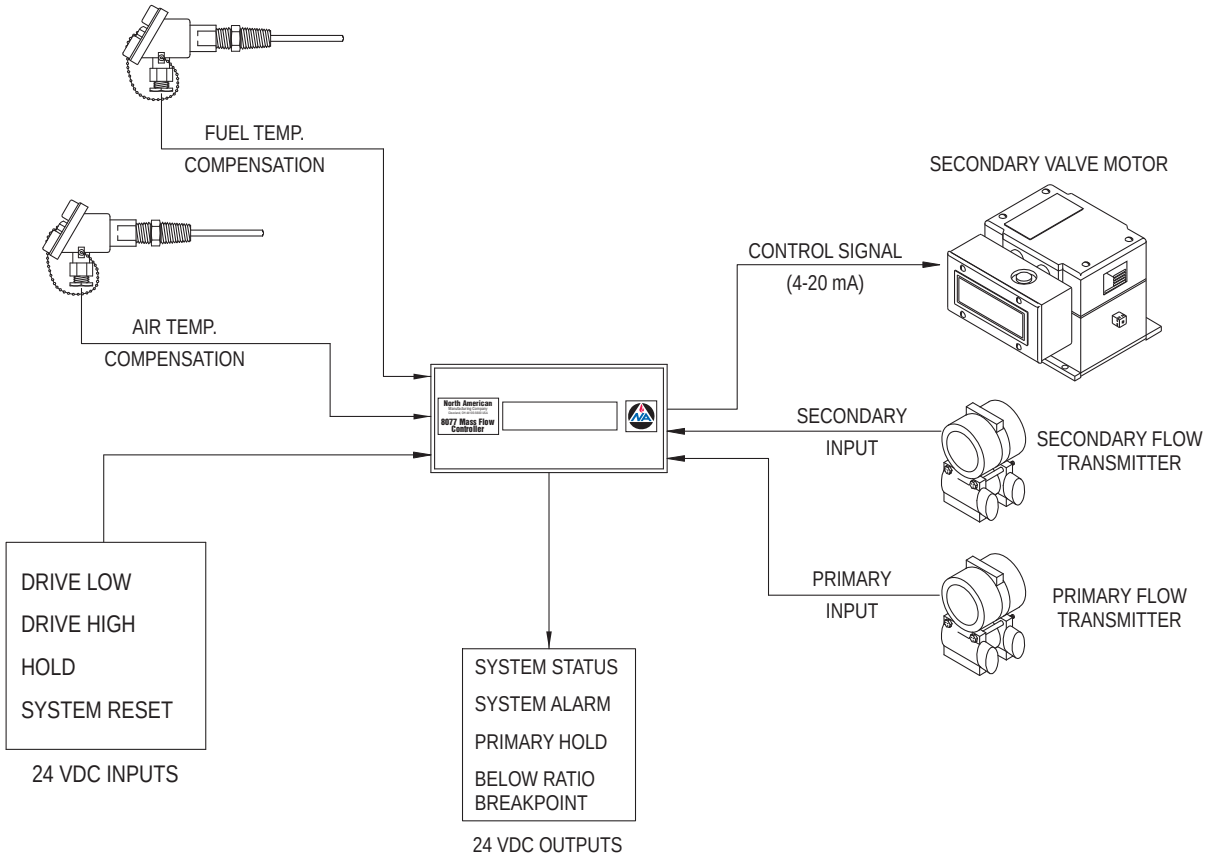
Device Configuration

The 8077-MFC is configured by hardware jumpers and a setup mode that uses the pushbuttons and LCD to step through a configuration menu. The setup mode can be accessed at any time to allow the user to make adjustments while the system is in operation. While in the Setup Mode, the Flow 2 output is held in its last state and the Primary Hold output is energized. The LCD shows the operator what the configured value is and the value that is being set at the same time.

LCD Display

The LCD on the 8077-MFC is used for configuration and to display important system information while in operation. When in normal operation, the operator can scroll through several screens to view data using the up and down pushbuttons. The display is used to set the percent output when the controller is in manual. Alarms are also annunciated on the LCD.

TYPICAL 8077-MFC SYSTEM



SPECIFICATIONS

Operating Temperature: 32-140°F

Power Source: 24 V dc, 1 amp

Dimensions: 8.375" W × 5" H × 2" D

Installation: DIN rail mounting inside a NEMA 4 enclosure is required.

Analog Inputs: 4-20 mA or RTD inputs. 250 ohm input impedance when configured for 4-20 mA. RTD inputs: 100 ohm platinum RTD (2, 3 or 4-wire)

Analog Outputs: 4-20 mA outputs with 20 V dc compliance voltage. 1000 ohms maximum load impedance.

Discrete Inputs: 24 V dc inputs with 7 mA draw.

Discrete Outputs: 24 V dc, 100 mA outputs with Self-Resetting fuses.

Display: 2 × 20 character LCD with backlight.

WARNING: Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and Insurance Underwriters recommendations, and care in operation.

Fives North American Combustion, Inc. - 4455 East 71st Street - Cleveland, OH 44105 USA - Phone 216.271.6000
Fax 216.641.7852 - email: fna.sales@fivesgroup.com - www.fivesgroup.com/fivesna