

## Selecting Mass Flow Systems and Options

### Guidelines for Selecting Mass Flow Measuring and Control Systems

1. Review the Operator Console features in Table I (page 128) and select the console that meets your requirements.

2. Review the specifications in Tables III and VI (pages 130 & 132) and determine the type of flow control or sensing devices required for your operation. Then select the appropriate model number.

**Note:** As previously discussed, Mass Flow Control Modules are used where both measurement and control are desired, or for gas blending applications. Mass Flow Sensors are used in applications requiring flow measurement only.

3. Review the applicable selection guide in Table V or VIII (pages 131 & 133) and choose the flow range(s) required for your operation.

**Example:** You require a system to measure and control the flow of Nitrogen in a range of 4 to 6 slpm, and Carbon Dioxide at 500 to 1000 sccm; and also to measure (only) the flow of Butane at 15 to 50 sccm. All gases will be at 70°F and 20 psig.

From the Operator Console features in Table I, you would most likely select Model FM4575A because:

- FM4560A does not provide flow control as required for Nitrogen and Carbon Dioxide, and
- FM4660A with 8 channel capability exceeds your requirements.

Next, you would select the appropriate Mass Flow Control Modules for Nitrogen and Carbon Dioxide. A review of the specifications in Table III will determine that you do not require high pressure control modules, since the requirement is for 20 psig. Therefore you would select the fast response module.

Using Table V, you would then make the following selections to best match your Nitrogen and Carbon Dioxide flow requirements:

- Model 14FRC, with a range of 0.2–10 slpm, for your Nitrogen stream, and
- Model 11FRC, with a range of 20–1000 sccm, for the Carbon Dioxide stream.

Since the Butane stream requires flow measurement only, you would select a Mass Flow Sensor for this application. Using Table VIII, you would select the Model 8FRM Mass Flow Sensor (1.0–50 sccm).

In this example, the complete part number for the system would be FM4575A-14FRC-11FRC-8FRM. When ordering, include the complete part number along with the service gases; required operating pressures and temperatures; and any optional equipment selected (see below).

### Guidelines for Selecting Gas Blending Systems

1. Review the Operator Console features in Table I (page 128) and select the console for your needs. As shown in Table I, the choices for blending applications are limited to models FM4575A and FM4660A.

2. Select the appropriate range for each Mass Flow Control Module. This can be done by determining the total mixture flow required and multiplying this by the percentage composition that each component represents in the mixture. Then compare this to the flow ranges available in Table V.

3. Review the specifications in Table III and select the model number of the desired control module.

**Note:** In blending systems, the outlets of flow control modules must be manifolded together to create the blend. Therefore to prevent the possibility of backflow from one module to another, it is strongly recommended that you select proper check valves and install them at the outlet of each module. See page 141 for check valves available from Advanced.

**Example:** You require a blending system to create a three component gas mixture of Ethylene and Methane in Nitrogen. The Ethylene composition will range between 5% and 15%, and the Methane composition will range between 20% and 35%, with the balance being made up of Nitrogen. The total flow required for the mixture will be 5 slpm. Operating conditions are 35 psig and 70°F.

Reviewing the Operator Console features in Table I will determine that Model FM4575A will meet this requirement.

Given a 5 slpm total mixture flow, the flow range required for Ethylene will be 250–750 sccm (5–15% of 5 slpm). Reviewing the selection guide in Table V will determine that Flow Control Modules 12FRC or 12HPC with a range of 20–1000 sccm will both meet this requirement. Reviewing the specifications in Table III would indicate that Model 12HPC is not required due to the 35 psig operating pressure, therefore, you would select the 12FRC.

A similar calculation as above would result in the selection of the Model 12FRC for Methane (20–35% of 5 slpm), and a Model 13FRC for Nitrogen (50–75% of 5 slpm).

In this example, the complete part number for the system would be FM4575A-13FRC-12FRC-12FRC. When ordering, include the complete part number along with the service gases; required operating pressures and temperatures; and any optional equipment selected (see below).

**Note:** In a blending system, the balance gas (Nitrogen in this case) should always be placed in Channel 1.

### Options for Mass Flow Systems

The following available options can be specified when ordering Advanced Mass Flow Systems:

- VCR® Connections for Flow Control Modules or Sensors
- Buna-N or Kalrez® Seals for Flow Control Modules or Sensors (required for certain gas services)
- In-line Filters
- High Pressure Calibrations (required for calibrations above 200 psig for most models).
- Low Flow Calibrations (Required for all calibrations 10 sccm or less)
- 220/240 VAC Power for Operator Consoles