Mooney™ Flowgrid™ Regulator

Mooney
a Baker Hughes business

Addressing Today's Challenges

Baker Hughes advanced technology helps customers plan for the best and prepare for the unexpected.

Our solutions combine the excellence of our products and services with more than a century of technological knowledge and experience.

Tailored to suit your individual operating requirements, our products are designed for natural gas and industrial applications, and produced with advanced design tools and modern manufacturing technologies.

Helping our customers achieve more efficient operations, Baker Hughes has designed, manufactured and installed more than 160,000 control and safety valves since 1962.

As a strategic business partner, Baker Hughes proven technologies help enable our customers to meet and exceed productivity and business growth targets, delivering results that drive financial and environmental performance.

Save Time and Money

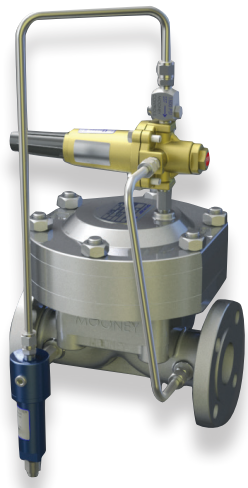
Mooney Flowgrid Regulator is an easy-to-maintain valve for self-contained pilot systems that allows users to maintain pressure and flow control of almost any gas or liquid.

The ability to control pressure and flow increases accuracy of use, responsiveness and stability while decreasing parts, noise levels and maintenance and energy costs. Combined with top entry access to all components, the Mooney Flowgrid Regulator adds value for customers looking to produce energy more efficiently and reliably with less expense and greater awareness of environmental responsibility.

As a self-contained, pilot-operated device, the advanced technology solution can offer substantial energy savings when compared to conventional air-operated or electrically operated control valves.

Features

- In-line maintenance with minimal parts
- Rugged fabric-reinforced throttling element/diaphragm provides flexibility, stability and fast response time in severe service conditions
- Elliptical main spring provides a high frequency response, proportional action for stability, consistent low minimum differential and shut-off force
- Spring case designed to enhance speed of response and stability
- More than 88 valve body options fit a wide variety of applications
- Throttle plates offered in four standard capacities: 100%, 75%, 50% and 35%. Custom capacities available if desired
- Symmetrical throttle plate design helps prevent debris from accumulating under the seat and affecting shut-off
- Drilled-hole throttle plates reduce noise and help extend diaphragm life
- Equal inlet/outlet pressure rating for all sizes assures easy operation without special start-up procedures required
- Dual-port valve design provides redundancy with dual pilots and extra capacity with one pilot
- Compact size for easy installation in any position



Mooney Flowgrid Regulator Helps Your Business

The Mooney Flowgrid Regulator is well-suited for pressure reducing (PRV), back pressure or relief (BPV), flow control and multi-function control applications where reliable regulation, simplicity and ease-of-maintenance are important.

Baker Hughes has secured global PED EN 334 certification for its Mooney Flowgrid regulators demonstrating our commitment to quality and safety. The certification was awarded by DVGW (the German Technical and Scientific Association for Gas and Water), one of the world's most recognized industry certification bodies and the largest gas and water industry certification agency in Europe. Baker Hughes has also secured the following verifications; ISO 9901, ISO 14001, CRN along with others testifying to the safety and quality of the Mooney regulator.

This advanced technology can handle gas and liquids that are relatively clean, non-corrosive and compatible with standard carbon steel/17-4ph stainless steel/nitrile rubber construction. The normal temperature range is -20°F to 150°F (-29°C to 66°C). Alternative materials for conditions outside the normal temperate range are available.

Flowgrid Regulator easily interfaces with conventional pneumatic, electronic or mircroprocessor-based controllers for a variety of pressure and flow control applications. Allowing users to be more productive, it often results in lower overall costs and sustainable energy savings.

At Baker Hughes, we provide our customers with more than a highly engineered product and reliable technical support. We offer free training videos to our customers that cover the products' principles of operation, installation, maintenance, and troubleshooting. A 3D model library of the Flowgrid is also available free of charge. Please contact your local representative for more information.

Flowgrid Applications

- Pressure reducing
  - Single regulator
  - Standby monitor
  - Working monitor
- Back pressure or relief
- Flow control
- Pneumatic control application

Industrial Applications

- Boiler fuel gas
- Power plant
- Check valve
- Fertilizer plants
- Bi-directional pressure control
- Differential control pressure or flow
- Oil, water and industrial gasses flow control

Valve Applications and Monitor Systems

Pressure Relieving Valve

At no flow, the main throttling element is closed tightly against the throttling plate. As demand for flow occurs in the downstream system, the outlet pressure drops, causing the pilot to open and start bleeding pressure out of the spring case faster than it can enter through the restricting valve. Reducing the loading pressure allows inlet pressure to progressively lift the diaphragm off the throttling plate, opening the valve and satisfying the demand for the flow in the downstream system.

When demand for flow ceases or is reduced, the downstream pressure increases, causing the pilot regulator to close. Inlet pressure continues to pass through the restriction until the loading pressure equals that of the inlet pressure.

Adjustment of the variable restricting valve impacts the response rate, stability and sensitivity of the regulator. For example, smaller restrictor openings result in higher gain (sensitivity) and slower closing speeds while larger openings result in lower gain (greater proportional band), greater stability and faster closing speeds.

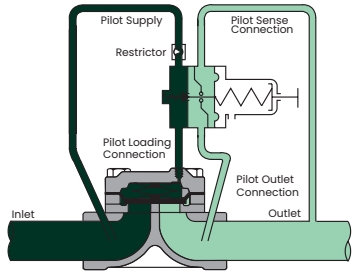


Figure 1 - Pressure reducing configuration fully closed

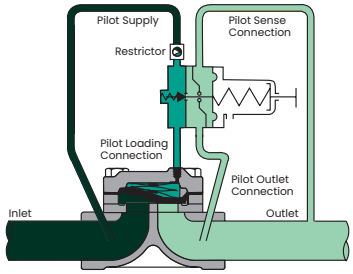


Figure 2 - Pressure reducing configuration partially open

Back Pressure Valve

In a back pressure relief application (BPV) the valve functions the same way as for a pressure relieving valve, except that the sense line for the control pilot is located upstream of the regulator. This causes the pilot to reverse action in that it opens when system pressure increases above its set-point. The pilot will then close when the system pressure is less than its set-point.

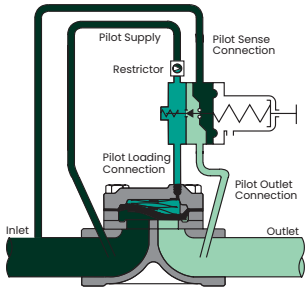


Figure 3 - Back pressure valve

Standby Monitor System

Under normal operating conditions, one of the Mooney Flowgrid Regulators operates as a worker while the other acts as a monitoring system. The upstream or downstream regulator can serve either function.

The monitor pilot is set at a slightly higher pressure than the worker (e.g., +5%). If the operating regulator should fail, P2 will increase until it reaches the set point of the monitor pilot, allowing the monitor regulator to take over protecting the downstream system P2 from being over pressured. On dead-end systems, a token relief downstream of the second stage regulator is recommended to compensate for slight leaks due to wear or debris in the monitor regulator and/or operating regulator.

If the pressure across the regulator is less than 60 psid (4 bar), use an alternative outlet to ensure full capacity.

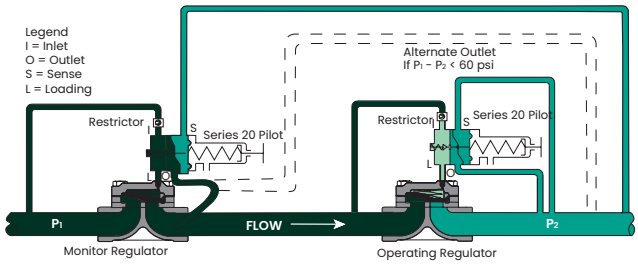


Figure 4 - Standby monitor system

Working Monitor System

Under normal conditions, both Mooney Flowgrid Regulators reduce pressure in a two-stage sequence. If a problem occurs in the upstream regulator, the downstream regulator takes over the entire pressure cut, maintaining P3 at the same pressure. If the downstream regulator fails, P3 will rise, causing the monitor pilot on the upstream regulator to take over maintaining the pressure in the downstream system P3 at the set point of the monitor pilot.

On dead-end systems, a token relief downstream of the second stage regulator is recommended to compensate for slight leaks due to wear and debris in the monitor regulator. An additional benefit of this system is the lower noise level that results when the pressure is reduced in two stages.

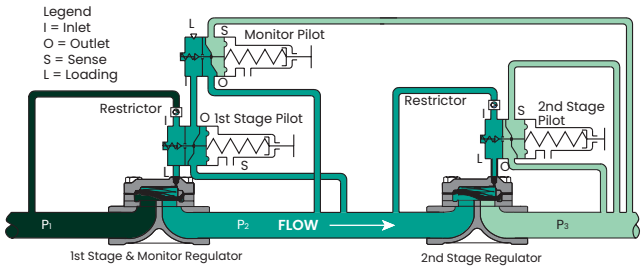


Figure 5 - Working monitor system

Product Specifications and Sizing Equations

Baker Hughes skilled professionals help customers calculate gas sizing and velocity to guarantee each unit is properly installed and operated. In addition, to avoid the possibility of excessive noise, vibration and damage to the regulator and piping, Baker Hughes professionals appropriately set each unit to offer ease of use and maintenance for customers.

Specifications

Sizes	1"- 12" (DN25 – DN300)
Body Styles	Single Port (1" – 8") Dual Port (10" and 12")
Body Materials[1]	Steel, Ductile Iron
End Connections	Screwed, Socket Weld, Flanged, Flangeless & Buttweld
Outlet Pressures	5" w.c. – 900 psi (0.01 bar – 62 bar)
Maximum Operating Differential	800 psi (55 bar)
Maximum Emergency Differential[2]	1000 psi (70 bar)
Cracking Differential	4 ± 1 psid (0.28 ± 0.07 bar)
Temperature	-20°F to 150°F (-29°C to 66°C)
Min/Max Temperature	-40°F to 175°F (-40°C to 79°C)
Flow Direction	Bi-Directional

1. Stainless steel available in some sizes, factory quote required
2. Unless limited by body rating

Universal Gas Sizing Equation

$$Q = \sqrt{\frac{520}{G \cdot T}} \; Cg \cdot P_1 \cdot SIN \left[\frac{3417}{C_1} \sqrt{\frac{DP}{P_1}} \right] \text{deg.}$$

$$Cg = \frac{Q}{\cdot P_1 \sqrt{\frac{520}{G \cdot T}} \cdot SIN \left[\frac{3417}{C_1} \sqrt{\frac{P_1 - P_2}{P_1}} \right] \text{deg.}}$$

Simplifies 1.29 — Natural Gas at 60°F & 0.6 Sg

Simplifies 1.00 — Critical Flow

Q	Flow Rate (SCFH)
Cg	Gas Sizing Coefficient
P_1	Inlet Pressure (psia)
DP	Pressure Drop Across Valve ($DP = P_1 - P_2$) (psid)
P_2	Outlet Pressure (psia)
C1	Valve Recovery Coefficient ($C_1 = Cg/C_v$)
Cv	Liquid Sizing Coefficient
G	Specific Gravity (0.6 for Natural Gas) (1.0 for Air)
T	Gas Temperature (°Rankine) (T - 460 + °F)

Simplified Gas Sizing Equation

In the following term $(P_1 - P_2) / P_1$ equals .64 or greater, then sonic velocity is present in the valve and the simplified version of the gas-sizing equation may be used.

Air: $Q = P_1 Cg$ **Natural Gas:** $Q = P_1 Cg\ 1.29$

Note: Valve sizing and selection software is available for download at: valves.bakerhughes.com/resource-center

A Trusted Business Partner

A name synonymous with quality, Baker Hughes is a trusted global partner for companies around the world. With a broad range of products and services, Baker Hughes integrated solutions and unique expertise help manage and overcome important challenges in an ever-evolving industry, while promoting the responsible and sustainable resource savings our customers have come to expect. Through innovation, breakthrough technology and dedicated teams of global experts, we help you successfully compete—and win—in today's natural gas and industrial landscape.

Find the nearest local Channel Partner in your area:

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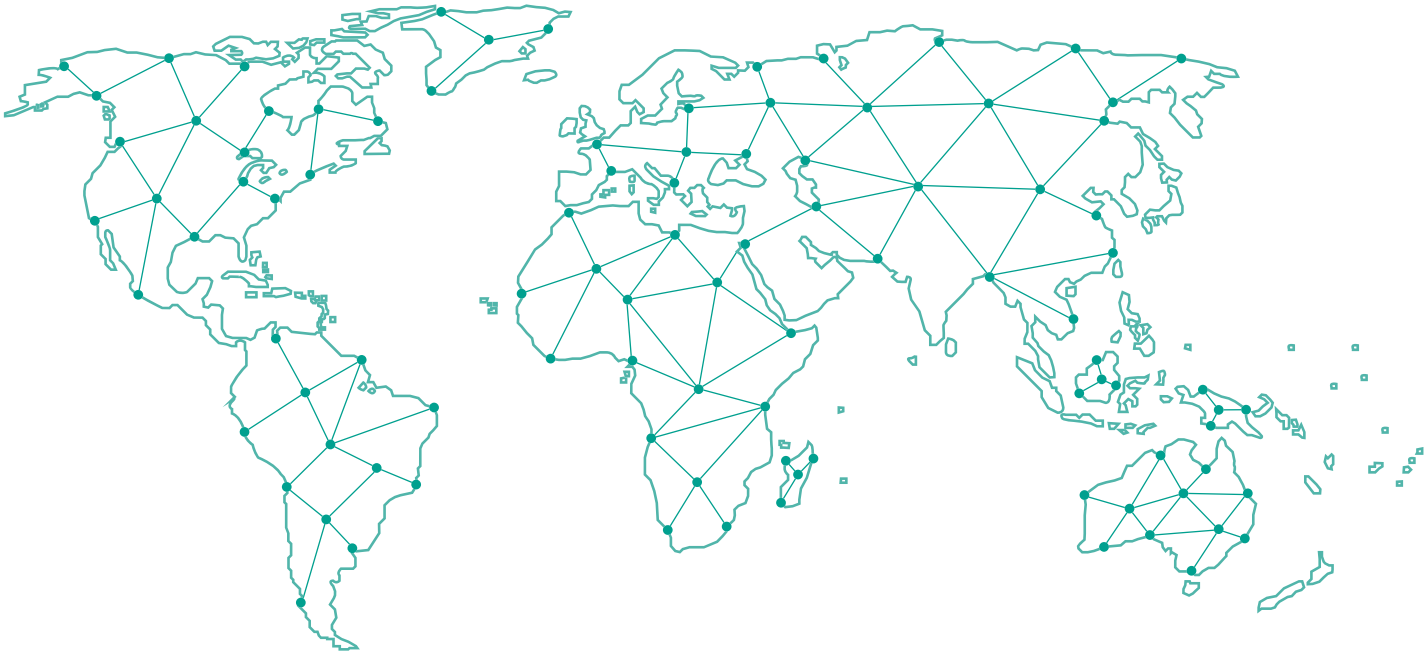

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BHMY-Flowgrid-Regulator-BR-19187B-X-0820 08/2020

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