

**VRP-SB-GAP Gap Controller provides ZERO steady state bleed
Gap (on-off) control when utilized with pneumatically actuated valves**

Description:

The Becker Model VRP-SB-GAP Single Acting Gap Controller provides gap control (on-off) when utilized with pneumatically actuated valves. The VRP-SB-GAP measures the process sensing pressure and closes the actuated valve upon pressure rising to the high pressure setpoint. Conversely, VRP-SB-GAP will re-open the actuated valve upon pressure falling to the low pressure setpoint. The action of the VRP-SB-GAP Gap Controller may be reversed to open an actuated valve upon rising pressure while closing on falling pressure. The VRP-SB-GAP may be utilized for gap control applications with setpoints ranging from 1.0 psig to 1300 psig (6.9 kPa - 8964 kPa). The VRP-SB-GAP features zero steady state bleed; simple adjustment; and may incorporate Becker's unique BPS™ Bleed to Pressure System capability to completely eliminate atmospheric emissions.



Figure 1.0 - Becker Model VRP-600-SB-GAP Gap Controller

The Becker VRP-SB-GAP Gap Controller provides simple adjustment and operation for gap control (on-off) applications combined with ZERO steady state bleed gas emissions. The Becker Gap Controller is compatible with all Becker control valves as well as most other manufacturer's pneumatic actuators. The Becker Gap Controller may replace other manufacturer's gap controllers to simplify operations; improve reliability and eliminate bleed gas emissions.

Improve Performance and Minimize Bleed Gas Emissions!

Optimum performance is achieved by pairing the VRP-SB-GAP Gap Controller with genuine Becker control valve actuators. If you already have existing control valve actuators in service, the addition of a VRP-SB-GAP Gap Controller can improve performance and minimize bleed gas emissions. Becker Gap Controllers are compatible for retrofit with most manufacturer's actuators and can replace most other manufacturer's "venting" gap controllers. Consult Becker Precision Equipment for more information.



VRP-SB-GAP Applications

- Tube Switching
- Overpressure Protection
- Backpressure Protection
- Underpressure Protection
- Slam Shut (High Speed) Overpressure Protection

Compatible Actuators

- RPDA Series*
- RPSR Series
- SYDA Series*
- SYSR Series
- LPDA Series*
- LPSR Series
- LD Series
- Grove Flexflo® Regulators

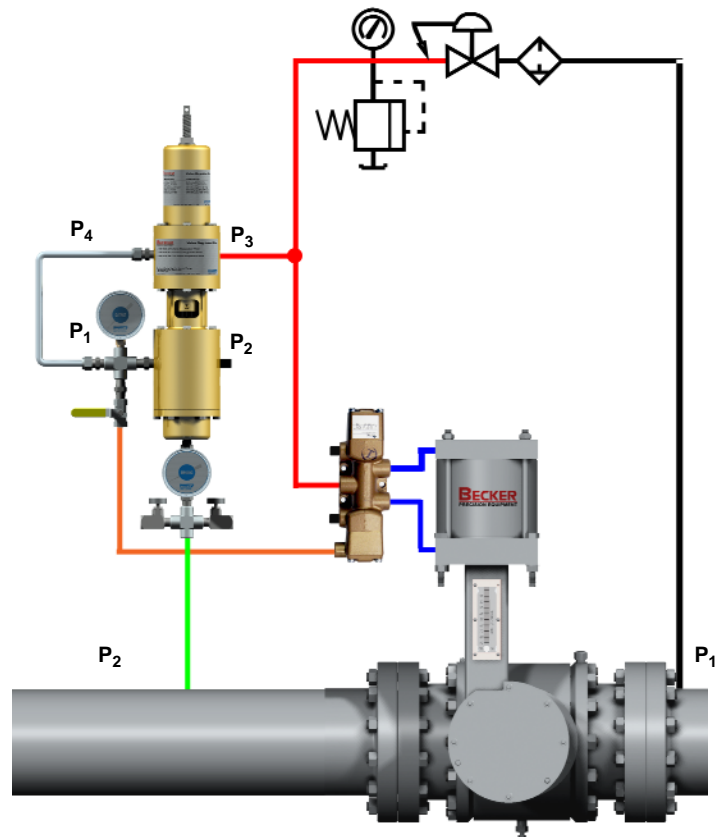


Figure 2.0 - VRP-SB-GAP Gap Controller configured to Close Actuated Valve on High Pressure

The VRP-SB-GAP Controller is commonly utilized with double acting piston actuators to close a valve on increasing pressure. The VRP-SB-GAP is shown here incorporated with a 4-Way, 2-Position Versa Valve to interface with the double acting RPDA Rotary Piston Double Acting Actuator. Becker Gap Controllers are compatible with all Becker valve actuators as well as most other manufacturer's pneumatic valve actuators.

VRP-SB-GAP Series Gap Controller

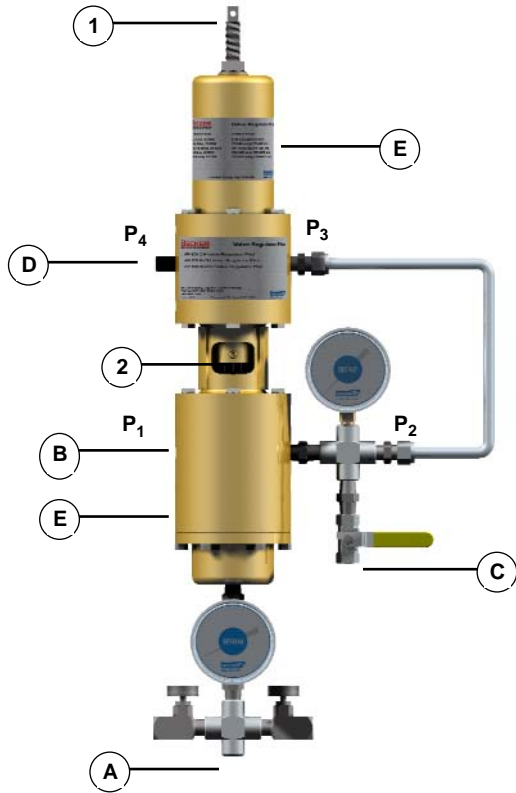


Figure 3.0 - VRP-600-SB-GAP Direct Acting Version
The VRP-SB-GAP Controller Direct Acting Version will provide an increasing output when sensing pressure rises to the High Setpoint of the Gap Controller. Conversely, the Direct Acting Gap Controller will provide a decreasing output when the sensing pressure falls to the Low Setpoint of the Gap Controller.

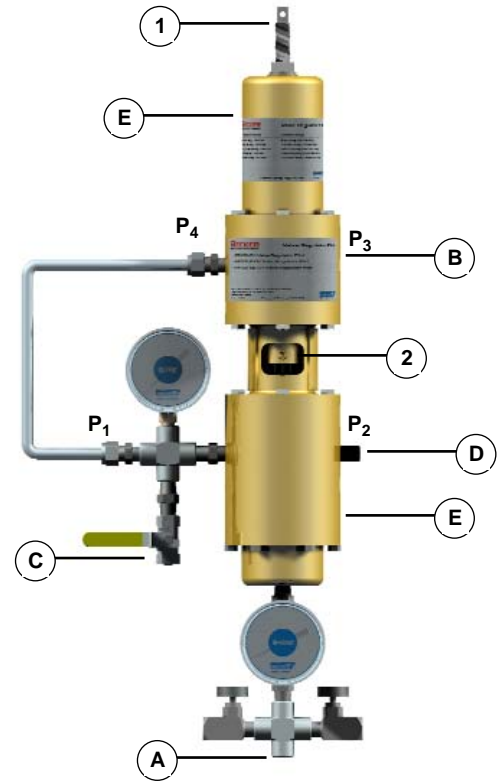


Figure 4.0 - VRP-600-SB-GAP Reverse Acting Version
The VRP-SB-GAP Controller Reverse Acting Version will provide a decreasing output when sensing pressure rises to the High Setpoint of the Gap Controller. Conversely, the Reverse Acting Gap Controller will provide an increasing output when the sensing pressure falls to the Low Setpoint of the Gap Controller.

Table 1.0 - VRP-SB-GAP Gap Controller Port Definitions

VRP-SB-GAP Port Definitions	Port Size	Item
Sensing Port	¼" FNPT	A
Power Gas Supply (Input)	¼" FNPT	B
Loading (Output)	¼" FNPT	C
Exhaust (Discharge)	¼" FNPT	D
Breather Vents	¼" FNPT	E

Table 2.0 - VRP-SB-GAP Gap Controller Adjustments

VRP-SB-GAP Adjustments	Item
Setpoint Deviation Adjustment	1
Gap Adjustment	2

Table 3.0 - VRP-SB-GAP Selection Table

App	Actuator Type	Normal Position	Action No. 1	Action No. 2	VRP-SB-GAP Controller	Versa Pilot Operated Valve (Non-Latching)	Versa Pilot Operated Valve (Latching)	Basic Schematic
1	Double Acting	Open	Close Valve on Rising Pressure	Open Valve on Falling Pressure	Reverse Acting	VSP-4302-S-11	VSP-4302-S-11-181D	35-9363
2	Double Acting	Close	Open Valve on Falling Pressure	Close Valve on Rising Pressure	Direct Acting	VSP-4302-S-11	VSP-4302-S-11-181D	35-9364
3	Single Acting (Spring Close)	Open	Close Valve on Rising Pressure	Open Valve on Falling Pressure	Reverse Acting	VSP-3301-S-11	VSP-3301-S-11-181D	35-9367
4	Single Acting (Spring Open)	Close	Open Valve on Falling Pressure	Close Valve on Rising Pressure	Direct Acting	VSP-3301-S-11	VSP-3301-S-11-181D	35-9368

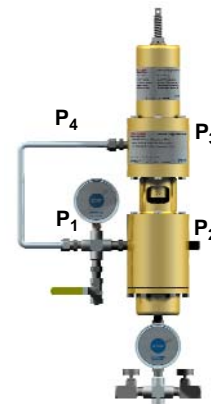
Notes

- 1 Versa Pilot-Operated Valves supply gas pressure is limited to Maximum of 175 psig (1207 kPa)
- 2 Standard Becker Versa Pilot Operated Valves are plated steel bodies.
- 3 316 SS Construction is available for Versa Pilot Operated Valves upon request at additional charge.
- 4 Standard Becker Versa Pilot Operated Valves are 1/4 NPT Ports
- 5 Larger port size configuration is available for Versa Pilot Operated Valves upon request at additional charge.
- 6 Alternate VRP-SB-Gap Controller configurations are available. Please contact Becker Precision Equipment for specific information.

VRP-SB-GAP Direct Acting



VRP-SB-GAP Reverse Acting



Single Acting Units Versa Valve Options



For Non-Latching Applications:
Versa Model VSP-3301-S-11
3-Way, 2-Position Valve



For Non-Latching Applications:
Versa Model VSP-4302-S-11
4-Way, 2-Position Valve



For Latching Applications:
Versa Model VAP-3301-S-11-181D
3-Way, 2-Position Valve with latching mechanism



For Latching Applications:
Versa Model VAP-4302-S-11-181D
4-Way, 2-Position Valve with latching mechanism
Control Valve will "latch" and remain in triggered position until locally manually reset

VRP-SB-GAP Series Gap Controller

Table 3.0 – Selection Chart for VRP-CH Series Pilots

VRP-SB-GAP	Control Range	Maximum Gap Range	Spring Color	Part Number	Setpoint Change/Revolution of Setpoint Elevation Adjustment	Repair Kit Part Number
Model Number	(psig/kPa)	(psig/kPa)			(psig/kPa)	
VRP-30-SB-GAP	1 psig - 6 psig 7 - 41 kPa	0 - 0.5 psig 0 - 3.4 kPa	Green	20-2592	0.46 psig 3 kPa	35-0212
	3.0 - 30 psig 21 - 207 kPa	0.5 - 4 psig 3.4 - 28 kPa	Red	25-1037	3.0 psig 21 kPa	35-0212
VRP-200-SB-GAP	5.0 - 40 psig 34 - 276 kPa	1 - 3.5 psig 7 - 24 kPa	Green	20-2592	2.8 psig 19 kPa	35-0214
	10 - 70 psig 69 - 483 kPa	1 - 7 psig 7 - 48 kPa	Silver	25-1038	5.3 psig 3.7 kPa	35-0214
	25 - 140 psig 172 - 965 kPa	1 - 20 psig 7 - 138 kPa	Blue	25-1036	16 psig 110 kPa	35-0214
	50 - 175 psig 345 - 1207 kPa	2 - 25 psig 14 - 172 kPa	Red	25-1037	18 psig 124 kPa	35-0214
VRP-600-SB-GAP	135 - 300 psig 931 - 2068 kPa	3 - 40 psig 21 - 276 kPa	Orange	25-1052	33 psig 228 kPa	35-0214
	175 - 600 psig 1207 - 4137 kPa	5 - 100 psig 34 - 689 kPa	Yellow	25-1306	85 psig 586 kPa	35-0214
VRP-1000-SB-GAP	200 - 675 psig 1379 - 4654 kPa	5 - 90 psig 34 - 621 kPa	Black	25-1053	76 psig 524 kPa	35-0216
	300 - 1000 psig 2068 - 6895 kPa	10 - 175 psig 69 - 1207 kPa	Yellow	25-1306	143 psig 986 kPa	35-0216
VRP-1300-SB-GAP	300 - 1300 psig 2068 - 8963 kPa	10 - 275 psig 69 - 1896 kPa	Grey	25-1562	226 psig 1558 kPa	35-0216



Figure 5.1 -
Model VRP-30-SB-GAP
Reverse Acting



Figure 5.2 -
Model VRP-200-SB-GAP
Reverse Acting



Figure 5.3 -
Model VRP-600-SB-GAP
Reverse Acting



Figure 5.4 -
Model VRP-1000-SB-GAP
Reverse Acting



Figure 5.5 -
Model VRP-1300-SB-GAP
Reverse Acting

Technical Specifications

Steady State Gas Consumption: ZERO (see Table 4.0)
Supply Gas: dry, filtered (100 micron) gas
Maximum flow capacity: 2400 scfh (40 scfm) at 100 psig
Maximum Supply Pressure: 150 psig (1034 kPa)
Maximum Supply-Discharge Differential: 150 psig (1034 kPa)
Minimum Supply-Discharge Differential: 20 psig (138 kPa)
Operative Ambient Temperature Range: -20°F to 160°F (-29°C to 71°C)
Approximate Weight: 12 pounds (5.4 kg)
Minimum Deadband: 0.2% instrument signal
Minimum Gap Capability: 0.5 psig (3.5 kPa)
Maximum Gap Capability: 226 psig (1558 kPa)
Control Accuracy: ± 0.75% of setpoint
Maximum Sensing Pressure: 1300 psig (8966 kPa)
Setpoint Range: 1.0 psig - 1300 psig (6.9 kPa - 8966 kPa)
Housing: meets NEMA 3 Classification

Materials of Construction External Parts:

Anodized AL 2024
 304 SS available (for marine environments)
 316 SS and anodized AL 2024
 Alloy steel
 buna-n reinforced by nylon fabric
 buna-n
 316 SS
 2½ inch dial liquid filled brass connection w/ stainless steel case*
 (standard issue with units of psig-dual units of psig/kPa available)

Internal Parts:

Springs: Alloy steel
Diaphragms: buna-n reinforced by nylon fabric
Seats and O-rings: buna-n
Tubing & Tubing Fittings: 316 SS
Gauges: 2½ inch dial liquid filled brass connection w/ stainless steel case*
 (standard issue with units of psig-dual units of psig/kPa available)

Installation Orientation:

Vertical position recommended
 Custom bracket supplied with Becker Actuators
 2" pipe mount provided for retrofit to other manufacturer's actuators

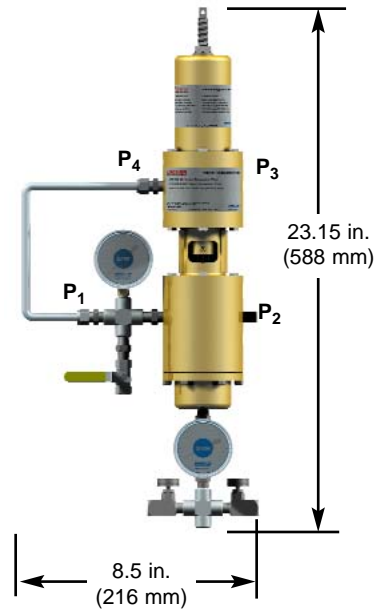


Figure 6.0 - Overall Dimensions Model VRP-600-SB-GAP (Reverse Acting)

	VRP-CH Pilot	VRP-B-CH Pilot	VRP-SB-CH Pilot	VRP-SB-GAP	VRP-SB-PID Pilot	HPP-4 Positioner	HPP-5 Positioner	HPP-SB Positioner	EFP Positioner
Bleed Rates (Consumption)									
Steady State Bleed*	~100	<10	zero	zero	zero	~100	<10	zero	zero
Non-Bleed Full-Open/Full Closed	Y ₁	Y ₂	Y	Y	Y	Y ₁	Y ₂	Y	Y
Bleed to Pressure System (BPS™)†	Y	Y	Y	Y	Y	Y	Y	Y	Y
Notes:									
*- Bleed rates are estimated utilizing Supply Gas Pressure=100 psig (690 kPa) and are reliant upon process activity. All bleed rates are reported in standard cubic feet per hour (scfh). 1- Requires Model PS-2 or NBV Non-Bleed Device to eliminate bleed when control valve is in full-open or full-closed position 2- Requires Model DPS-2 or NBV Non-Bleed Device to eliminate bleed when control valve is in full-open or full-closed position †- Bleed to Pressure System (BPS™) eliminates all atmospheric bleed emission by containing bleed gas within piping system.									

Table 4.0 – Bleed Rates (consumption) for Becker Control Instrumentation

Becker control instrumentation features low bleed and zero bleed technologies to minimize fugitive natural gas emissions and environmental impact.

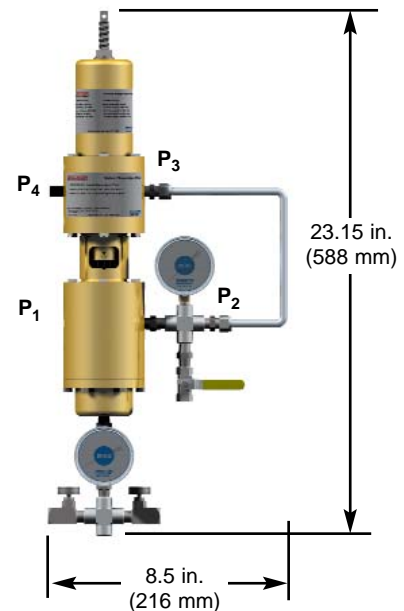


Figure 7.0 - Overall Dimensions Model VRP-600-SB-GAP (Direct Acting)

Realize Optimum Performance of your VRP-SB-GAP Gap Controller with these popular instrumentation accessories



SP Series Setpoint Pump:

Provides a simple and accurate method of applying false signal pressure during initial adjustment of the VRP-SB-GAP pilot. The pump can provide a false signal pressure of 20%-50% in excess of working pipeline pressure which eliminates the need for nitrogen bottles or electronic calibration devices. The SP Series Setpoint Pump is compatible with all models and series of Becker VRP-SB-GAP Pilots.



RSM Series Remote Setpoint Module:

The Remote Set Point Module provides remote adjustment of VRP-SB-CH Pilot set point via an electrical input signal. All Remote Setpoint Motors are equipped with internal limit switches to prevent over-travel of setpoint. 4-20 mA feedback of Remote Setpoint Module motor standard. All Becker RSM Series Remote Setpoint Modules are rated Explosion Proof Class 1, Div. 1 for use in hazardous locations. Standard RSM input signals are:

Digital Pulse Input

- 24 VDC
- 120 VAC

Analog Current Input

- 4-20 mA command signal/24 VDC Supply Power
- 4-20 mA command signal/120 VAC Supply Power



QEV Series Quick Exhaust Valve

The Quick Exhaust valve is utilized in conjunction with primary control instrumentation to provide quicker response for high speed applications. When a quick response is required from the primary control instrumentation, the Quick exhaust valve dumps gas from the pressurized actuator at a High volume in order to stroke the control valve rapidly.



Figure 8.0 - Typical High Bleed Pneumatic "GAP" Controller (Before)

Pneumatic "GAP" controllers are widely utilized throughout the natural gas industry to open/close pneumatically actuated valves and control processes. These typical "GAP" controllers exhibit constant venting of natural gas emissions to atmosphere. This constant venting (bleed) of natural gas emissions results in lost profits, environmental destruction, possible leak callouts, and potentially hazardous scenarios due to constant emissions of flammable gases. This Texas-based natural gas distribution utility made a conscious decision to eliminate constant bleed natural gas "GAP" controllers by retrofit with the Becker ZERO bleed "GAP" controller.



Figure 9.0 - Elimination of Constant Bleed Gas Emissions with Becker "GAP" Controller (After)

Constant bleed "GAP" controller was replaced with Becker Model VRP-30-SB-GAP "GAP" Controller. The Becker "GAP" controller exhibits ZERO bleed gas emissions and simplifies maintenance and adjustment. The Becker VRP-SB-GAP GAP Controller is available in both reverse acting and direct acting models with pressure setpoints up to 1300 psig (8966 kPa). The "GAP" controller installation was designed to open/close meter runs for fuel gas feed at natural gas fired power plant.



Figure 10.0 - Becker Below Ground Actuated Valve Equipped with VRP-SB-GAP Controller

A California-based natural gas distribution/transmission company utilized a Becker VRP-SB-GAP Gap Controller to open/close a Becker Below Ground actuated valve. The actuated valve, in foreground, is equipped with an RPDA Rotary Piston Double Acting Actuator. The VRP-SB-GAP Gap Controller is installed in a cabinet enclosure, in background, for safety and security. The Becker VRP-SB-GAP Gap Controller exhibits ZERO steady state bleed emissions which is critical in environmentally conscious California. See Figure 11.0 for additional information.



Figure 12.0 - Power Plant Fuel Gas Feed "Slam Shut" Override

A Chicago region natural gas fired power plant utilized Becker control valves (Left) and Grove 900TE Flexflo Regulators (Right) to provide stable and accurate regulation of the fuel gas feed to Siemens brand turbines. Monitor (Overpressure) Control Valves were equipped with Becker VRP-SB-PID "Power Plant" Pressure Controllers and Becker VRP-SB-GAP Gap Controllers. The VRP-SB-GAP Gap Controller serves as a protective device to override regulation and "Slam Shut" the Monitor Control Valves in the event that downstream pressure exceeds a preset limit.



Figure 11.0 - Becker VRP-SB-GAP Gap Controller Installed in Cabinet Enclosure

A California-based natural gas distribution/transmission company incorporated Becker environmentally-friendly instrumentation throughout their facilities to eliminate constant bleed gas emissions. The Becker VRP-SB-GAP Gap Controller shown above works in conjunction with a Becker pneumatically actuated valve (see Figure 10.0). The Becker GAP controller is shown here with the Versa pilot-operated valve and optional Model MCV-3 Manual Control Valve. The MCV-3 Manual Control Valve provides ability for manual positioning of actuated valve.



Figure 13.0 - Slam Shut Valve Installed in Natural Gas-Fired Power Plant Fuel Gas Feed

A variety of Becker control valves were incorporated to provide control of fuel gas feed to turbine driven power plant. Globe Type and T-Ball control valves were installed to provide Primary (Active) and Monitor (Overpressure) Regulation. As an added measure of safety, it is common to incorporate a Slam Shut Valve to provide high speed shutoff of gas flow in the event of system shutdown. The Slam Shut Valve incorporates a Becker VRP-SB-GAP Gap Controller for non-bleed high speed shutoff of the fuel gas supply piping. Typical slam shut operates in 0.750 seconds or less.

VRP-SB-GAP Series Gap Controller

Table 5.0 - Selection table for Becker Control Valves and Actuators

	VRP-CH Pilot	VRP-B-CH Pilot	VRP-SB-CH Pilot	VRP-SB-GAP Pilot	VRP-SB-PID Pilot	HPP-4 Positioner	HPP-5 Positioner	HPP-SB Positioner	Notes
Applications									
Pressure Control	•	•	•		•	•	•	•	1,2
Flow Control						•	•	•	2
Power Plant Type Pressure Control	•				•	•		•	3
Power Plant Type Flow Control						•	•	•	3
Surge Control						•		•	
On / Off				•					
Compatible Actuators									
RPDA Series	•	•		•		•	•		4,5,6
RPSR Series			•	•	•			•	6
SYDA Series	•			•		•	•		
SYSR Series			•	•	•			•	
LPDA Series	•	•		•		•	•		6
LPSR Series			•	•	•			•	6
LD Series			•	•	•			•	
Instrumentation Options									
Bleed to Pressure System BPS™	•	•	•	•	•	•	•	•	6
AB Series Atmospheric Bleed Control	•	•	•	•	•	•	•	•	
NBV Series No-Bleed Valve	•	•				•	•		7
DPS-2 Series Non-Bleed Sensor		•					•		8
PS-2 Series Non-Bleed Sensor	•					•			8
SP Series Setpoint Pump	•	•	•	•	•				
RSM Series Remote Setpoint Module	•	•	•	•	•				
Panel Mounting	•	•	•	•	•				
Stainless Steel Option	•	•	•	•	•	•	•	•	
VB Series Volume Booster	•		•		•	•			9
QEV Series Quick Exhaust Valve				•		•	•	•	
I/P Transducer						•	•	•	
SLV Series Signal Lock Valve						•	•	•	

1. Pressure Control applications include: pressure letdown, primary regulation, monitors, standby, overpressure protection. Underpressure protection and relief valves.
2. All Positioners require controller device to perform pressure control or flow control.
3. Power Plant Regulation includes all power plants and "fast-acting" short systems.
4. RPDA & SYDA Small Models are defined as actuator sizes <2000 in3 /0.033m₃
5. RPDA & SYSR Large Models are defined as actuator sizes larger ≥2000 in3 /0.033m₃
6. BPS™ is limited to discharge pressure systems below 300 psig (2068 kPa). Consult Becker for application assistance.
7. NBV No-Bleed Valves may only be utilized when Pdischarge ≤60 psig (414 kPa) and/or Psupply ≤150 psig (1034 kPa).
8. PS-2 & DPS-2 Non-Bleed Sensors must be utilized when PDischarge >60 psig (414 kPa) and/or PSupply >150 psig (1034 kPa).
9. VB Series Volume Boosters are necessary for Power Plant Regulation, Surge Control Applications, or when Large Model RPDA & RPSR Series Actuators are utilized.

***CAUTION:** This information is intended as a guideline for application of Becker Precision Equipment products. Becker strongly recommends consulting Becker Engineering prior to application of any product.

Additional Resources are available on our website. Sales literature, sizing software, and technical manuals are available for download at www.bpe950.com



Figure 14.0 - Flame On!
Becker Globe Type Control Valves provide pressure regulation for control of natural gas "torches" constructed at a popular Reno, Nevada casino. See Figure 15.0 for additional information.



Figure 15.0 - Becker GAP Controller Provides Additional Protection
Becker Globe Type Control Valves are equipped with VRP-SB Pressure Controllers to regulate flames in above photo. In the event of underpressure, a Becker VRP-SB-GAP Gap Controller will override and shut down the fuel feed until manually reset by qualified technicians.

Toll-Free Assistance!
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