

HPP-SB Series Pneumatic Valve Positioner

HPP-SB pneumatic positioners provide accurate positioning of single-acting actuated control valves

Description

The Becker Model HPP-SB Single-Acting Positioner provides accurate valve positioning when utilized with a single-acting (spring & piston style) actuated control valves. The HPP-SB accepts a pneumatic instrument signal and positions the single-acting actuator (spring & piston style) proportionally. The HPP-SB Positioner may be utilized for most valve positioning applications. HPP-SB's are available in both reverse acting and direct acting configurations with a variety of different input signal ranges. The HPP-SB features a zero steady state bleed that minimizes emissions when the positioner must bleed to atmosphere.



Figure 1.0 - Becker Model HPP-SB Single-Acting Valve Positioner

Figure 2.0 - HPP-SB Series Positioner installed on Becker RPSR Series Actuator

The HPP-SB Series Positioner may be utilized with any Becker single-acting series actuator (spring & piston type) for accurate positioning of control valves. The HPP-SB is designed to accept a pneumatic instrument signal from an I/P transducer or a pneumatic controller. The HPP-SB is available in both reverse and direct acting with a variety of instrument signal input ranges. The configuration shown above shows the HPP-SB mounted on a Becker RPSR Series actuator. The HPP-SB features zero bleed at steady state combined with high speed response.

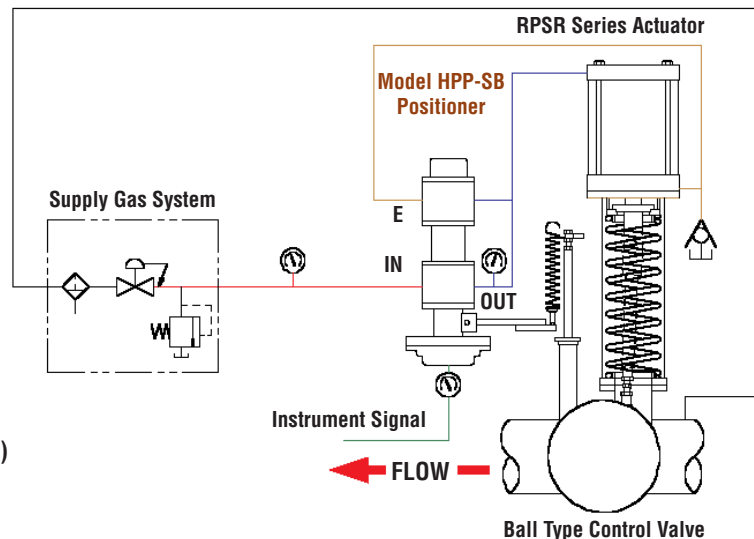
Schematic Legend

- Instrument Signal
- Upstream Pressure (P₁)
- Exhaust (Discharge)
- Supply Gas (Regulated)
- Intermediate Pressure (Loading)

HPP-SB Applications	
•	Pressure Control
•	Flow Control
•	Power Plant Type Pressure Control
•	Power Plant Type Flow Control
•	Surge Control
Compatible Actuators	
•	RPDA Series (Small Volume Models)
•	RPDA Series (Large Volume Models)
•	RPSR Series
•	LPDA Series (Small Volume Models)
•	LPDA Series (Large Volume Models)
•	LPSR Series
•	LD Series

Application Guidelines

- **Large Volume Actuators:**
Large Volume Actuators are defined as actuators with piston displacement (volume) greater than 2000 in³ that typically require high flow volume instrumentation. For actuators larger than 2000 in³, it is recommended that a Model HPP-SB with Model VB-Series Volume Boosters be utilized.
- **LPDA Series Actuators:**
HPP-SB Positioners may be utilized with LPDA Series Linear actuators, but are not capable of accepting an actuator with stroke length less than 2". This excludes usage of CVE Globe Valves of 4" nominal bore or less with HPP-SB Positioner.



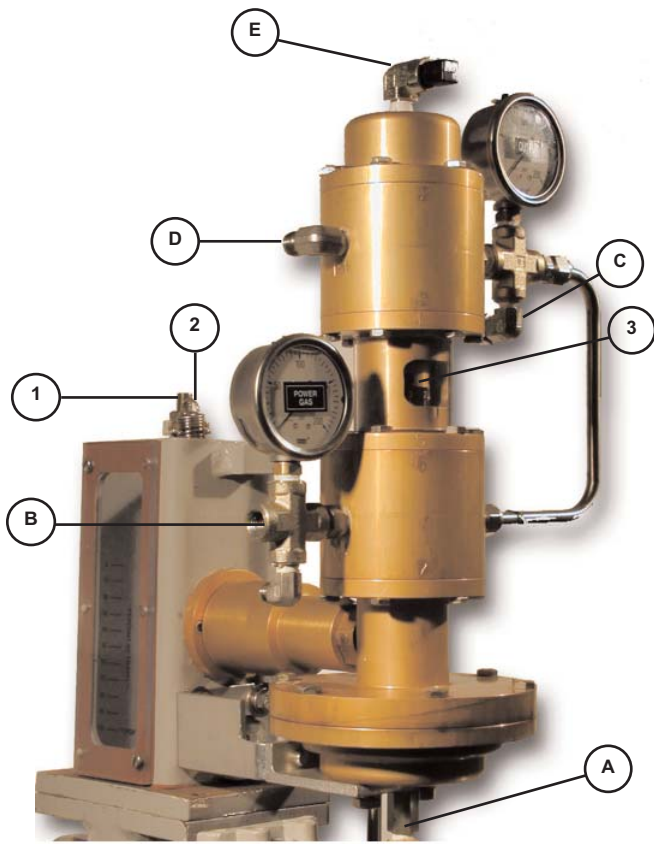


Figure 3.0 - Becker Model HPP-SB Single-Acting Valve Positioner

Benefits of the HPP-SB Positioner

- Superior resolution and sensitivity and positioning capabilities for improved process performance.
- HPP-SB exhibits highest flow capacity of any valve positioner in the industry, making it ideal for fast acting applications including compressor surge control.
- Zero bleed when control valve is full open and full closed.
- Balanced seat design exhibits zero bleed when process is at steady state
- Becker's unique Bleed to Pressure System™ feature allows for complete elimination of atmospheric bleed gas by maintaining vent gas within the process piping.
- Stable, accurate positioning with minimal overshoot
- Vibration resistant design will perform in the most demanding applications and maintain calibration. No annual adjustments required.
- Anodized AL 2024 Aluminum and Stainless Steel construction provide rugged durability for long life.

Improve Performance and Minimize Bleed Gas Emissions!

If you already have existing Becker control valve actuators in service with older, obsolete Becker Model HPP-S pneumatic positioners, the addition of an HPP-SB Positioner can improve performance, reduce maintenance, and minimize bleed gas emissions. Becker HPP-SB Positioners are compatible to retrofit older Becker Model HPP-S Positioners originally installed on Becker RPSR Actuators. Consult Becker Precision Equipment for more info.



Table 1.0 - Becker Model HPP-SB Port Definitions

HPP-SB Port Definitions	Port Size	Item
Instrument Signal (Input)	1/4" FNPT	A
Power Gas Supply (Input)	1/2" FNPT	B
Actuator Loading (Output)	1/4" FNPT	C
Exhaust (Discharge)	1/4" FNPT	D
Breather Vent	1/4" FNPT	E

Figure 2.0 - Becker Model HPP-SB

HPP-5 Adjustments	Item
Bias Adjustment (Zero/Offset)	1*
Range Adjustment (Span)	2*
Sensitivity (Deadband) Adjustment	3

How it Works

HPP-SB Configuration shown is “close on increasing instrument input signal” - Control valve will “Fail Open” on loss of instrument input signal. The HPP-SB is a force-balanced instrument that provides a control valve position proportional to a pneumatic instrument input signal. The energy to operate the control valve is obtained from the differential between supply gas pressure and discharge gas pressure. From a steady state position (figure 4.1), an increase in the instrument signal causes the internal pistons to move up and load pressure to the actuator (figure 4.2), closing the valve. As the force from the positioner range spring increases to a point equal to the diaphragm force created by the instrument input signal, the internal pistons will center. Centering of the internal pistons will close both of the balanced seats and cease loading of the control valve (figure 4.1). At steady state, the control valve will remain in a fixed position with zero bleed. Decrease of the instrument input signal will result in the opposite reaction, opening the valve (figure 4.3). Note that loss of instrument input signal causes the control valve to fail in the full open position (configuration shown).

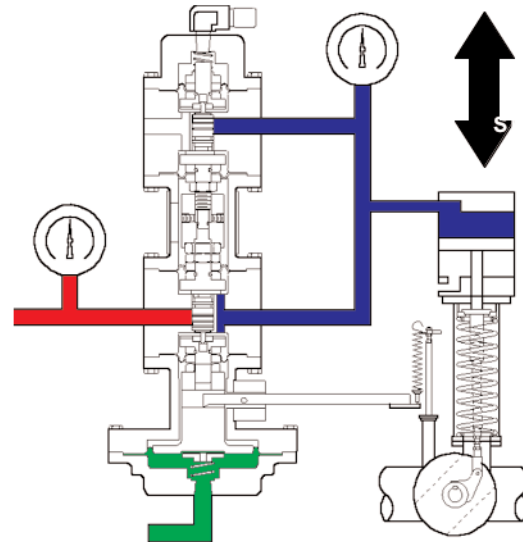


Figure 4.1 - Steady State Position (Fixed)

At steady state, the instrumentation diaphragm force is equal to the feed-back spring force, centering the internal pistons and closing the internal balanced seat valves. Steady state conditions exhibit zero bleed.

Schematic Legend

- Exhaust Pressure (Discharge)
- High Pressure Gas
- Actuator Loading Pressure (Medium Pressure)
- Actuator Loading Pressure (Low Pressure)
- Actuator Loading Pressure (High Pressure)
- Instrument Signal
- Exhaust Pressure

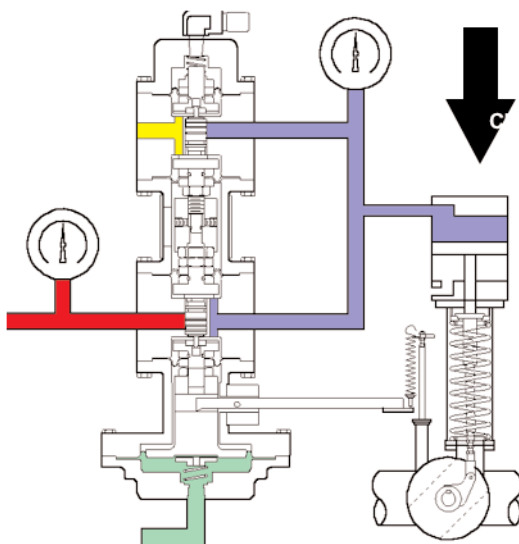


Figure 4.2 - Increase in Instrument Input Signal to CLOSE Valve

An increase in the instrument input signal causes the internal pistons to move up and load pressure to the actuator, closing the valve.

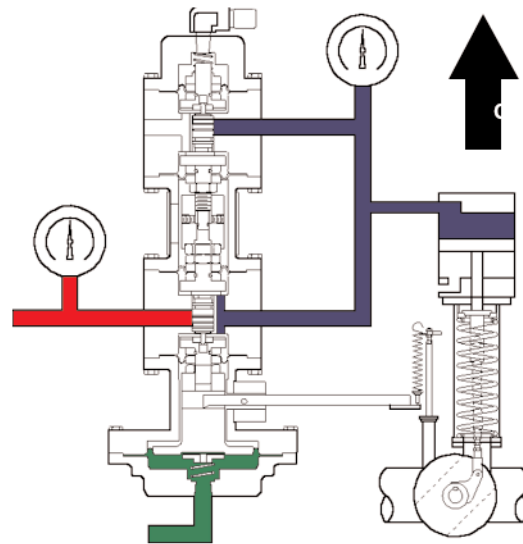


Figure 4.3 - Decrease in Instrument Input Signal to OPEN Valve

A decrease in the instrument input signal causes the internal pistons to move down and exhaust pressure from the actuator, opening the valve.

Table 1.0 - Technical Specifications for Model HPP-SB Positioner

Technical Specifications	
Steady State Gas Consumption	ZERO (see table 2.0)
Supply Gas	dry, filtered (100 micron) gas 500 psig maximum
Maximum Flow Capacity	2400 scfh (40 scmh)
Maximum Supply-Discharge Differential	150 psig (1034 kPa)
Minimum Supply-Discharge Differential	50 psig (348 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
Independent Linearity	+/- 1.0% positioning range
Resolution	0.1% of position range
Instrument (Input) Signal Ranges	3-15 psig, 6-30 psig (std.) (See table 2.0)
Available Stroke Lengths	2", 4", 6", 8", 12" (See Table 3.0) reverse acting / direct acting*
Housing	meets NEMA 3 Classification
Installation Orientation	Vertical position recommended.
Materials of Construction	
External Parts	anodized AL 2024 316 SS available (for marine environments)
Internal Parts	316 SS and anodized AL 2024
Springs	plated steel
Diaphragms	buna-n reinforced by nylon fabric
Seats and O-rings	buna-n
Tubing and Tubing Fittings	316 SS
Guages	2 1/2" dial liquid filled brass connection w/stainless steel case* *standard issue with units of psig *dual units of psig/kPa available

Notes

- * Direct Acting: increasing instrument signal causes control valve to open (fail closed upon loss of instrument signal)
- * Reverse Acting: decreasing instrument signal causes control valve to open (fail open upon loss of instrument signal)

Table 2.0 - Bleed Rates (consumption) for Becker Control Instrumentation
Becker control instrumentation features low bleed & zero bleed technologies to minimize fugitive natural gas emissions and environmental impact.

	VRP-CH Pilot	VRP-B-CH Pilot	VRP-SB-CH Pilot	VRP-SB-PID Pilot	HPP-4 Positioner	HPP-5 Positioner	HPP-SB Positioner	EFP Positioner
Bleed Rates (Consumption)								
Steady State Bleed* Non-Bleed	100	<10	zero	zero	100	<10	zero	zero
Full-Open/Full Closed Bleed to Pressure	Y ₁	Y ₂	Y	Y	Y ₁	Y ₂	Y	Y
Bleed to Pressure System (BPS™) †	Y	Y	Y	Y	Y	Y	Y	Y

Notes

- * Bleed rates are estimated utilizing Supply Gas Pressure = 100 psig
- 1. Requires Model PS-2 or NBV Non-Bleed Device to eliminate bleed
- 2. Requires Model DPS-2 or NBV Non-Bleed Device to eliminate bleed
- † Bleed to Pressure System (BPS™) eliminates all atmospheric Bleed

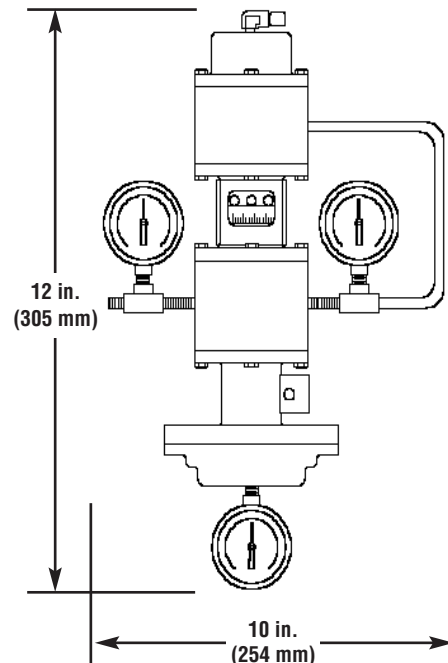


Figure 5.0 - Overall dimensions of Becker Model HPP-SB Pneumatic Positioner (Standard Range)

HPP-SB Series Pneumatic Valve Positioner

Table 3.0 - Bias and Range Spring Part Numbers for Specific Model HPP-SB Actuator Stroke Lengths

Bias and Range Spring Part Numbers for Model HPP-SB						
Signal Range	Spring Type	2" (51 mm)	4" (102 mm)	6" (152 mm)	8" (203 mm)	12" (305 mm)
3-15 psig (21-103 kPa)	Range Spring	25-1151	25-1151	25-1152	25-1153	25-1154
	Bias Spring	Not Required				
6-30 psig (41-207 kPa)	Range Spring	25-1218	25-1218	25-1219	25-1220	25-1221
	Bias Spring	Not Required				
3-9 psig (21-62 kPa)	Range Spring	01-6288	01-6288	01-6287	01-6287	01-6801
	Bias Spring	Green (20-2592)				
9-15 psig (62-103 kPa)	Range Spring	01-6288	01-6288	01-6287	01-6287	01-6801
	Bias Spring	Blue (25-1036)				
6-24 psig (41-166 kPa)	Range Spring	25-1599	25-1599	25-1600	25-1601	25-1602
	Bias Spring	Silver (25-1038)				
18-30 psig (124-207 kPa)	Range Spring	25-1151	25-1151	25-1152	25-1153	25-1154
	Bias Spring	Red (25-1037)				

Standard model Range Spring and Bias Spring part numbers for the Model HPP-SB Positioners. Other configurations are available upon request.

Repair or Rebuild?

Becker instrumentation rebuild kits are available from stock for regular maintenance or emergency needs. To order repair kits for your Becker products call us Toll-Free at (800) 323-8844, or contact your local sales representative.

Model HPP-SB Pneumatic Positioner Repair Kit* (Std. Range) Part Number 30-0210

*Includes all rubber goods and finite life items for rebuild or repair of your Model HPP-SB Pneumatic Positioner.

Figure 6.0 - Becker HPP-SB Pneumatic Positioners

Becker HPP-SB Series Pneumatic Positioners are available in both reverse acting and direct acting. Standard instrument signal ranges are 3-15 psig and 6-30 psig. Alternate instrument ranges are available for split range control to enable staging of control valve runs.

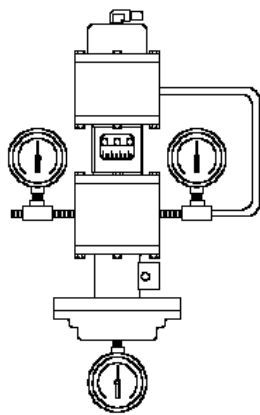


Figure 6.1 - Model HPP-SB Reverse Acting (Std. Range)

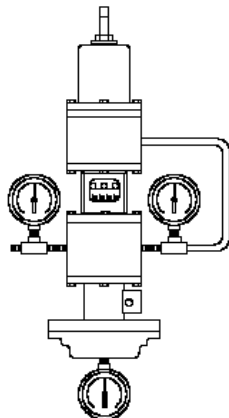


Figure 6.2 - Model HPP-SB Reverse Acting (Split Range)

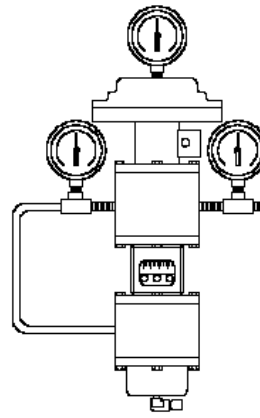


Figure 6.3 - Model HPP-SB Direct Acting (Std. Range)

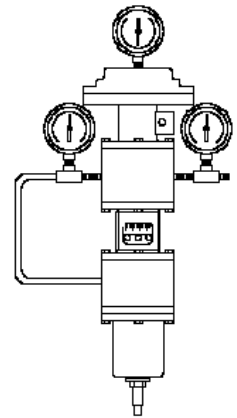


Figure 6.4 - Model HPP-SB Direct Acting (Split Range)

HPP-SB Series Positioner Accessories

Realize Optimum Performance of your HPP-SB Series Positioner with these popular instrumentation accessories!



Bled to Pressure System (BPSTM)

All Becker control instrumentation feature the unique capability to discharge vent gas into the downstream pipeline or alternate low pressure gas system. This feature is exclusive to Becker and provides complete elimination of atmospheric bleed gas emissions.



AB Series Atmospheric Bleed Control

When conditions allow discharge to pressure system only part of the time, install an AB-Control for automatic switching that temporarily permits atmospheric bleed. The AB-Control will maintain adequate differential pressure between supply gas pressure and discharge pressure to operate the control valve actuator and the VRP-SB-CH. The AB-Control is not applicable when the VRP-SB-CH discharges to atmosphere all of the time.

Reference Becker AB Atmospheric Bleed Sales Literature for additional information.



VB Series Volume Boosters

VB Series Volume Boosters are utilized in conjunction with Becker control instrumentation to provide adequate instrumentation flow volume for larger volume piston actuators. Volume Boosters are typically only required for Ball Valve Regulators model 12T and larger. Additionally, Volume Boosters may be utilized to provide increased actuator stroking speed when applications require, such as power plant and other short system applications. As with all Becker instrumentation, Volume Boosters may be discharged into a lower pressure system to eliminate atmospheric bleed. Volume Boosters are compatible with the HPP-4, HPP-5, & HPP-SB High Pressure Positioners.



QEV Series Quick Exhaust Valve

QEV Series Quick Exhaust Valves are utilized in conjunction with Becker "single acting" control instrumentation and "single acting" actuators to provide fast stroking speed. When control instrumentation loads pressure to a "single acting" actuator the QEV provides normal straight through flow. When the control instrumentation unloads the "single acting" actuator, the QEV opens to provide increased exhaust capacity allowing quick stroking. QEV's may be added in parallel to provide even greater actuator unloading (stroking) speed where required.



I/P Transducer

The I/P Transducer provides communication between the flow computer and the control valve. The I/P transducer converts the analog electrical signal (4-20 mA typical) to a pneumatic input signal (3-15 psig or 6-30 psig). All Becker I/P Transducers are rated Explosion Proof Class 1, Div. 1 for use in hazardous locations. I/P transducers are compatible with all Becker HPP Family Pneumatic Positioners. Typically a pneumatic positioner and I/P Transducer combination may be required for fast-acting processes. Becker also offers the EFP Series electro-pneumatic positioner that eliminates the need for an I/P transducer. The EFP electro-pneumatic positioner accepts the electronic input signal direct and positions the control valve proportionally. For more information on the EFP, see Becker brochure EFP Series Environmentally Friendly Positioner.

HPP-SB Series Positioner Accessories

Realize Optimum Performance of your HPP-SB Series Positioner with these popular instrumentation accessories!



Stainless Steel Option

All Becker Precision Control instrumentation is manufactured from high-strength anodized aircraft aluminum alloy (AL2024). The standard aluminum construction typically will provide adequate durability in most installation environments. In applications where the installation environment is unusually harsh, the instrumentation may be specially ordered in a stainless steel option. The stainless steel option is typically utilized in the following areas:

- Marine environments
- Offshore platforms
- Chemical plants
- Coastal regions



SLV-30 Signal Lock Valve

The Becker SLV-30 Signal Lock Valve is designed to prevent any instrument signal loss from affecting actuator positioning. In the event of instrument signal failure, the SLV-30 will maintain the last position of the control valve and positioner. The Becker SLV-30 can be factory installed or easily retrofit to most existing pneumatic actuator/positioner models, and is compatible with all pneumatic controllers and I/P transducers.

For more information see Becker SLV brochure

The HPP-SB provides high performance for the Becker Surge Control Valve

Becker's high quality Surge Control Valve is the most important control valve for protection of centrifugal natural gas compressors. The Surge Control Valve must provide:

- Accurate control
- Fast action
- Friction free design
- Repeatability
- Stability
- Vibration resistance

The Model HPP-SB is the ideal choice for this demanding app. The HPP-SB provides all the necessary performance combined with these environmentally-friendly features:

- ZERO bleed at steady state
- ZERO bleed when control valve is at full open position
- ZERO bleed when control valve is at full closed position

Complete elimination of atmospheric bleed gas emissions with Becker's unique Bleed to Pressure System (BPS™) feature



Figure 7.0 - Surge Control Brochure

For in-depth information about Becker's high quality Surge Control Valve for centrifugal natural gas compressors ask for our Surge Control Valve brochure.



Figure 8.0 - Surge Control Valve

Typical Becker Surge Control Valve. Becker's SCV features accuracy and reliability with standard stroking times of 750 mSec. Our SCV has been utilized by many major natural gas transmission companies and compressor manufactures.

Table 4.0 - Application Guidelines for Becker Control Instrumentation	VRP-CH Pilot	VRP-B-CH Pilot	VRP-SB-CH	VRP-SB-PID	HPP-4 Positioner	HPP-5 Positioner	HPP-SB Positioner	EFP Positioner	Notes
Applications									
Pressure Control	•	•	•	•	•	•	•	•	1,2
Flow Control					•	•	•	•	2
Power Plant Type Pressure Control	•			•	•		•	•	3
Power Plant Type Flow Control					•	•	•	•	3
Surge Control					•		•		
Compatible Actuators									
RPDA Series (Small Models)	•	•			•	•		•	4
RPDA Series (Large Models)	•				•			•	5
SYDA Series (Small Models)	•	•			•			•	
SYDA Series (Large Models)	•				•			•	
RPSR Series			•	•			•	•	
LPDA Series (Small Models)	•	•			•	•			4
LPDA Series (Large Models)	•				•			•	5
LPSR Series			•	•			•	•	
LD Series			•	•			•	•	6
Instrumentation Options									
Bleed to Pressure System BPS™	•	•	•	•	•	•	•	•	7
AB Series Atmospheric Bleed Control	•	•	•	•	•	•	•	•	
NBV Series No-Bleed Valve	•	•			•	•			8
DPS-2 Series Non-Bleed Sensor		•				•			9
PS-2 Series Non-Bleed Sensor	•				•				9
SP Series Setpoint Pump	•	•	•	•					
RSM Series Remote Setpoint Module	•	•	•	•					
Panel Mounting	•	•	•	•				•	
Stainless Steel Option	•	•	•	•	•	•	•	•	
VB Series Volume Booster	•		•	•	•	•			10
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 & LPDA Small Models defined as actuator sizes <2000 in³ (32,774 cm³)
5. RPDA, SYDA & LPDA Large Models defined as actuator sizes >2000 in³ (32,774 cm³)
6. LD Series Actuators are limited to Becker CVE Series Globe Valves
7. BPS™ is limited to discharge pressure systems below 300 psig (2068 kPa). Consult Becker for application assistance.
8. NBV No-Bleed Valves may only be utilized when $P_{discharge} < 60$ psig (414 kPa) and/or $P_{supply} < 150$ psig (1034 kPa).
9. PS-2 & DPS-2 Non-Bleed Sensors must be utilized when $P_{discharge} > 60$ psig (414 kPa) and/or $P_{supply} > 150$ psig (1034 kPa).
10. VB Series Volume Boosters are necessary for Power Plant Regulation, Surge Control Applications, or when Large Model SYDA, RPDA & LPDA Series Actuators are utilized.



Figure 9.0 - Model HPP-SB Positioners on RPSR Actuators
 Becker Model HPP-SB Positioner on Ball Valve Regulators equipped with RPSR Actuators. HPP-SB Positioners feature high flow capacity, vibration resistance, and superior sensitivity. These features make it ideal for applications such as power plant pressure control – shown here. Additionally, the HPP-SB exhibits zero bleed at steady state, full-open and full-closed positions.

***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.

www.BPE950.com

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

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