

Becker* High Pressure Pneumatic Valve Positioners HPP-SB: Single Acting Positioner

Accurate Valve Positioning for
Multiple Control Applications



GE's Becker HPP-SB Pneumatic Positioners Provide Accurate Positioning of Single-Acting Actuated Control Valves

GE's Becker Products' High Pressure Pneumatic (HPP) Single-Acting Positioners represent a breakthrough in valve control technology for the natural gas industry. They work with any Becker single-acting series actuator (spring and piston type) to accurately position valves in a variety of control applications, including pressure control, flow control, power plant type pressure control, power plant type flow control, and surge control. The product's design includes features that improve process performance, resist vibration under demanding conditions while continuing calibration, assure long service life, eliminate atmospheric bleed gas, and perform in fast-acting applications.

HPP-SB Positioner Applications

- Pressure control
- Flow control
- Power plant type pressure control
- Power plant type flow control
- Surge control

Compatible Actuators

- RPSR Series
- LPSR Series
- LD Series



Figure 1 - HPP-SB Single-Acting Valve Positioner

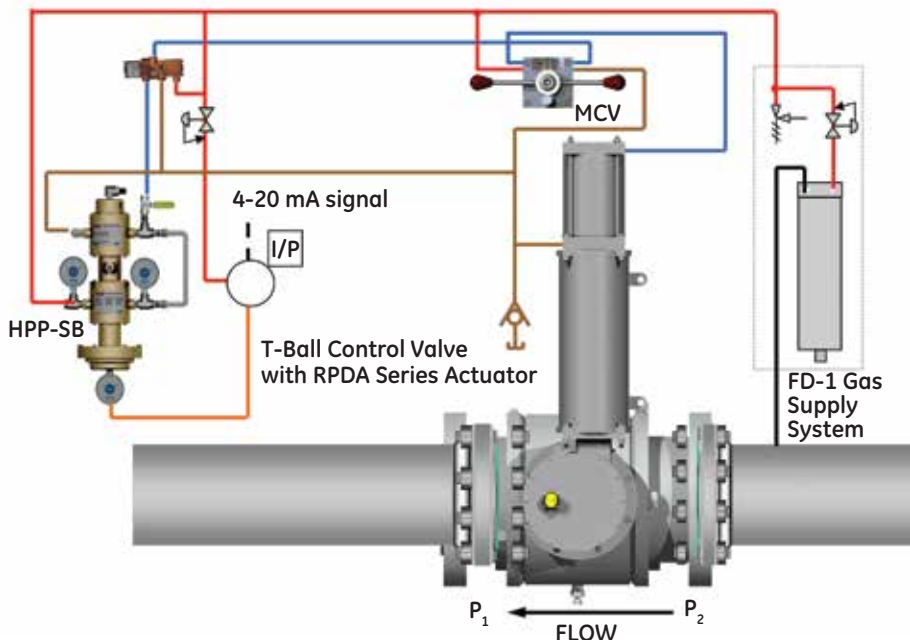


Figure 2 - HPP-SB positioner installed on GE's Becker Products' RPSR Series Actuator installed on Becker RPSR Series Actuator. The HPP-SB positioner may be utilized with any Becker single-acting series actuator (spring and piston type) for accurate positioning of control valves.

The HPP-SB positioner is designed to accept a pneumatic instrument signal from an I/P transducer or a pneumatic controller. The HPP-SB positioner is available in both reverse and direct-acting with a variety of instrument signal input ranges. The configuration shows the HPP-SB positioner mounted on a Becker RPSR Series actuator. The HPP-SB positioner features ZERO bleed at steady state combined with high speed response.

Schematic Legend

- | | |
|-----------------|--------------------|
| ■ Line Pressure | ■ Loading Pressure |
| ■ Exhaust | ■ Sensing |
| ■ Power Supply | |

Benefits

- Superior resolution and sensitivity and positioning capabilities for improved process performance
- High flow capacity of any valve positioner in the industry, makes well-suited 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 positioner's unique Bleed to Pressure System* (BPS) 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 – annual adjustments required
- Anodized AL 2024 Aluminum and Stainless Steel construction provide rugged durability for long life

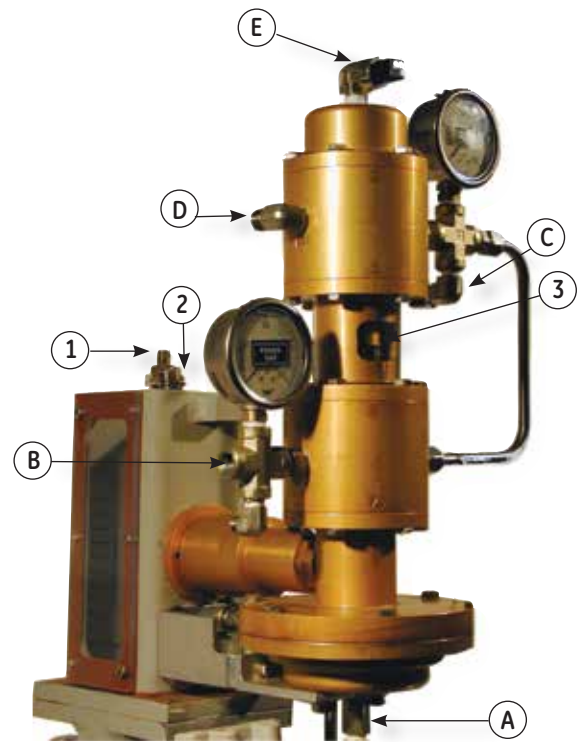


Figure 3 - HPP-SB Single-Acting Valve Positioner

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

Reference Figure 3.

Table 2 - HPP-SB Positioner Adjustments

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

Reference Figure 3.

** Bias and range adjustments not shown

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 positioner, 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 your GE representative for more information.

Precision Operation

The HPP-SB positioner configuration shown below is closed on increasing instrument input signal, the control valve will fail open on loss of instrument input signal. The HPP-SB positioner 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).

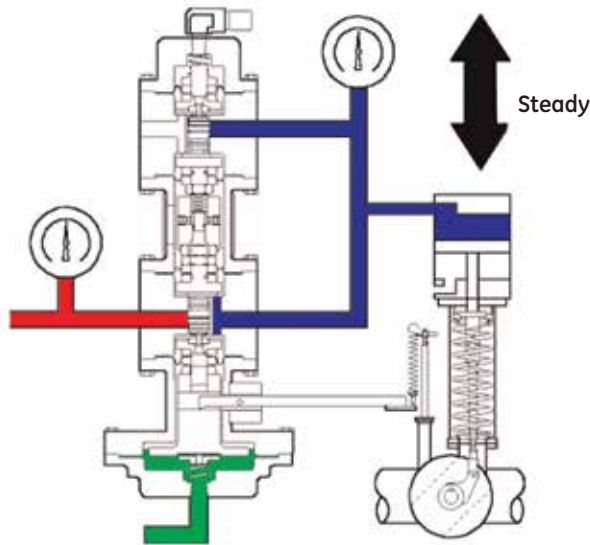


Figure 4.1 - Steady State Position (Fixed)

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

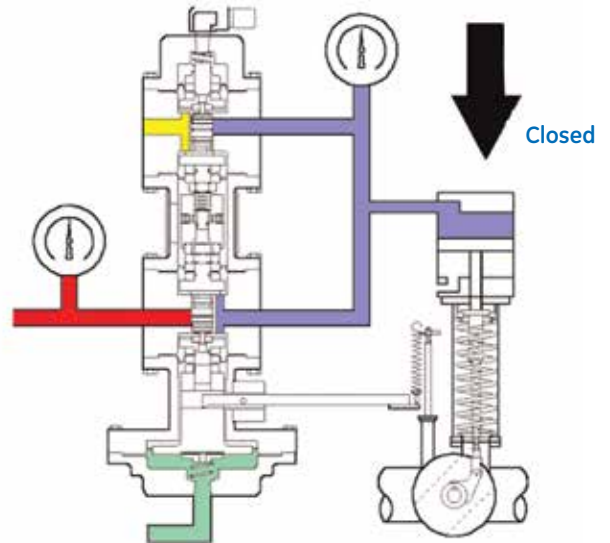


Figure 4.2 - Increase in Instrument Input Signal to CLOSE Valve
An increase in the instrument input signal causes the internal pistons to move up and load pressure to the actuator, closing the valve.

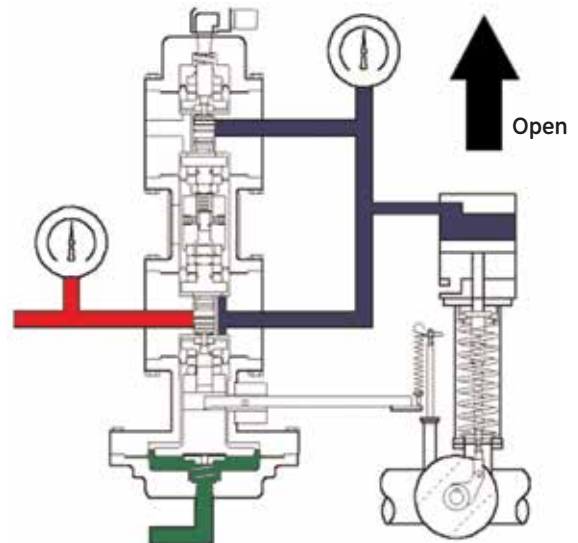


Figure 4.3 - Decrease in Instrument Input Signal to OPEN Valve
A decrease in the instrument input signal causes the internal pistons to move down and exhaust pressure from the actuator, opening the valve.

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

Table 3 - Technical Specifications for Model HPP-SB Positioner

| Technical Specifications | |
|---------------------------------------|--|
| Steady State Gas Consumption | ZERO (See Table 3) |
| 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 lbs. (5.4 kg) |
| Minimum Deadband | 0.2% instrument signal |
| Independent Linearity | ± 1.0% positioning range |
| Resolution | 0.1% of position range |
| Instrument (Input) Signal Ratings | 3-15 psig, 6-30 psig (standard) (See Table 2) |
| Available Stroke Lengths | 2", 4", 6", 8", 12" (See Table 4) reverse-acting/direct acting |
| Housing | Meets NEMA 3 Classification |
| Installation Orientation | Vertical position recommended |
| Materials of Construction | |
| External Parts | Anodized AL2024, 316SS available (for marine environments) |
| Springs | 316 SS and anodized AL 2024 |
| Diaphragms | Buna-n reinforced by nylon fabric |
| Seats and O-rings | Buna-n |
| Tubing and Tubing Fittings | 316 SS |
| Gauges | 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

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

Table 4 - 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.

| | 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 | DNGP Positioner |
|---|----------------|----------------|-----------------|------------------|------------------|------------------|------------------|-------------------|-----------------|
| Bleed Rates (Consumption) | | | | | | | | | |
| Steady State Bleed ³ | ~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) ⁴ | Y | N | Y | Y | N | Y | Y | Y | Y |

Notes

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
3. Bleed rates are estimated utilizing Supply Gas Pressure = 100 psig
4. Bleed to Pressure System (BPS) eliminates all atmospheric bleed

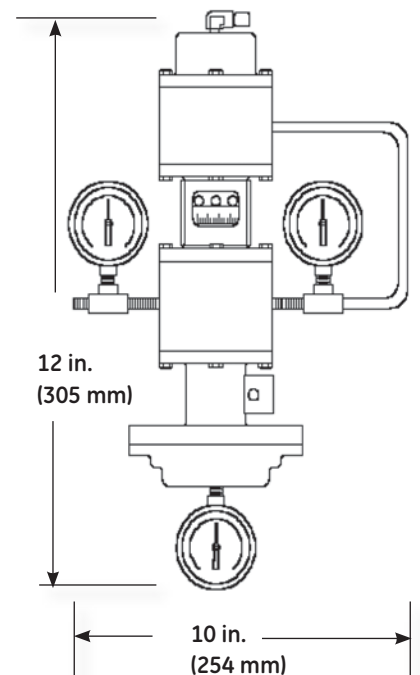


Figure 5 - Overall dimensions of HPP-SB positioner (standard range)

Table 5 - Bias and Range Spring Part Numbers for Specific Model HPP-SB Positioner Actuator Stroke Lengths

| 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 positioner. 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* (Standard Range) Part Number 35-0210

*Includes all rubber goods and finite life items for rebuild or repair for HPP-SB.

Figure 6 - Becker HPP-SB Pneumatic Positioners

Becker HPP-SB 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.

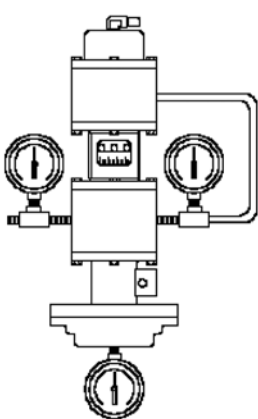


Figure 6.1 - Model HPP-SB Reverse-Acting Positioner (Standard Range)

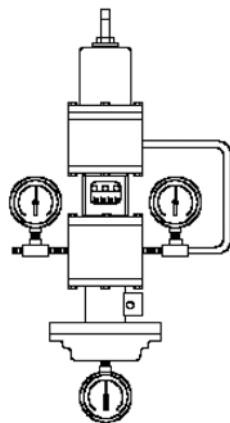


Figure 6.2 - Model HPP-SB Reverse-Acting Positioner (Split Range)

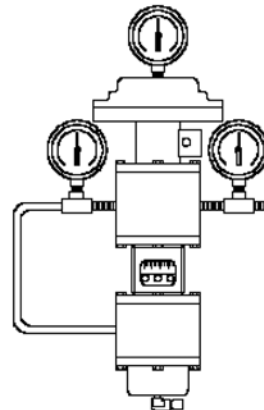


Figure 6.3 - Model HPP-SB Direct-Acting Positioner (Standard Range)

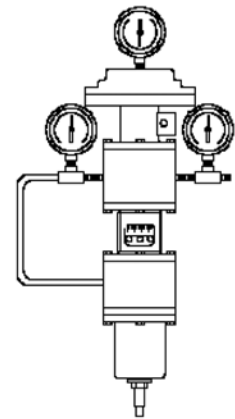


Figure 6.4 - Model HPP-SB Direct-Acting Positioner (Split Range)

Table 6 - 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 | DNGP 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 (Small Models) | • | • | | • | | • | • | | • | 4 |
| RPSR Series (Large Models) | • | | | • | • | | | | • | 5 |
| 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 valve.
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 and LPDA Small Models are defined as actuator sizes 14L and smaller (< 2000 in3 / 0.033m³)
5. RPDA and LPDA Large Models are defined as actuator sizes 12T and larger (≥ 2000 in3 / 0.033m³).
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 $P_{discharge} \leq 60$ psig (414 kPa) and/or $P_{supply} \leq 150$ psig (1034 kPa).
9. PS-2 and 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 RPDA are utilized.

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

GE's Becker Surge Control Valve is a key control valve for protection of centrifugal natural gas compressors. The Surge Control Valve offers:

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

The HPP-SB positioner is the ideal choice for this demanding application.

The HPP-SB positioner 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 the Becker positioner's unique Bleed to Pressure System (BPS) feature.

