HPP-4 Series
Pneumatic Valve Positioner

HPP-4 Pneumatic Positioners Provide Accurate Positioning of Double-Acting Actuated Control Valves

Description

GE's Becker HPP-4 Series Pneumatic Valve Positioner provides accurate valve positioning when utilized with a double-acting piston actuated control valve. The HPP-4 positioner accepts a pneumatic instrument signal and positions the double-acting actuator proportionally. The HPP-4 positioner may be utilized for most valve positioning applications. HPP-4 positioners are available in both reverse-acting and direct-acting configurations with a variety of different input signal ranges. The HPP-4 positioner is typically utilized when Bleed to Pressure System (BPS™) may be used to completely eliminate atmospheric bleed emissions. Additionally, the HPP-4 positioner is typically utilized for high speed applications and large volume control actuators that both require VB-250 volume boosters.

HPP-4 Positioner 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 HPP-4 positioner with VB-Series Volume Boosters be utilized.

High Gain Systems:

Power plant feeds and other similar systems require fast stroking speed in order to satisfy required gain of the system. For high gain applications, it is recommended that a HPP-4 positioner with VB-Series Volume Boosters be utilized.

LPDA Series Actuators:

HPP-4 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-4.

Figure 1 - Becker Model HPP-4 Pneumatic Positioner

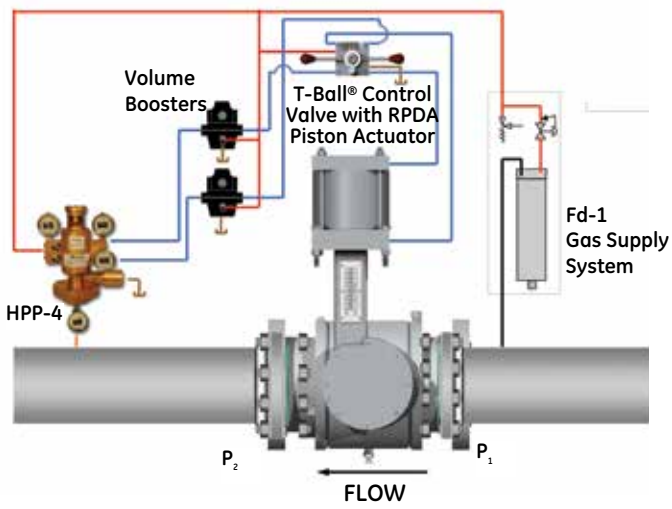

Figure 2 - HPP-4 positioner installed on Becker RPDA Series Actuator
The HPP-4 positioner may be utilized with any of GE's Becker products' double-acting series actuator for accurate positioning of control valves. The HPP-4 positioner is designed to accept a pneumatic instrument signal from an I/P transducer or a pneumatic controller. The HPP-4 positioner is available in both reverse and direct-acting with a variety of instrument signal input ranges. The configuration shows the HPP-4 positioner mounted on a Becker RPDA actuator with an optional NBV-100 to shutoff bleed when the control valve is at both full-open and full-closed positions. Additionally, the HPP-4 positioner is equipped with VB-250 Series Volume Boosters to provide increased flow capacity for large control valve actuators and/or high speed applications such as power plants.

The new HPP-4 positioner provides improved performance over the previous HPP-2 positioner design

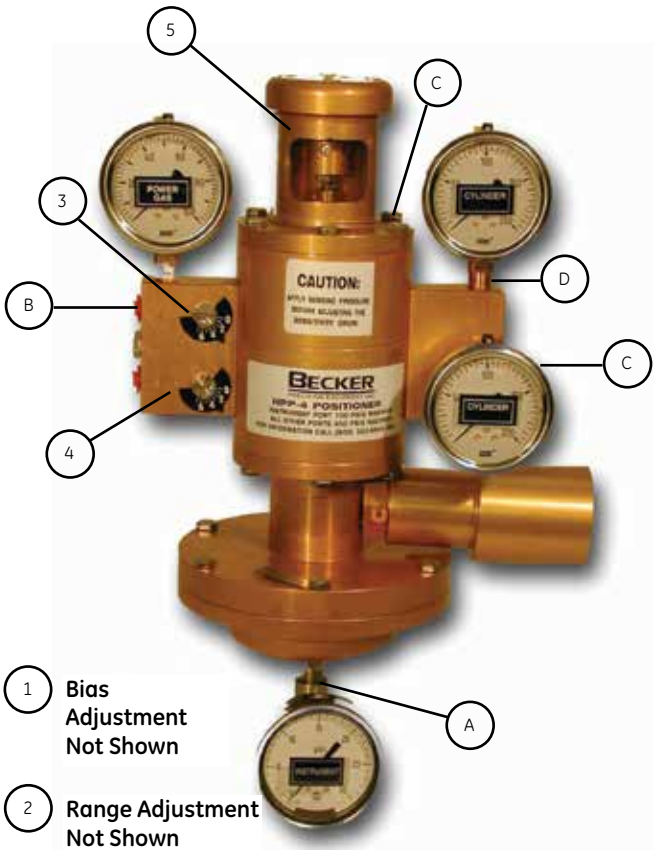

Figure 3 - HPP-4 Pneumatic Positioner
The HPP-4 positioner is specifically designed for positioning natural gas control valves when a pneumatic instrument signal is provided.

Benefits of the HPP-4 Positioner

- Increased sensitivity as compared with older HPP-2 positioner design.
- Better resolution and positioning capabilities for improved process performance
- ZERO bleed when control valve is full open and full closed (requires addition of NBV or DPS Non-Bleed Device)
- Becker's unique Bleed to Pressure System™ feature allows for complete elimination of atmospheric bleed gas by maintaining vent gas within the process piping
- Capable of high speed stroking when paired with VB-250 Series Volume Boosters
- Simple, reliable "seat & nozzle" design
- 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 GE's Becker products' control valve actuators in service with older, obsolete pneumatic positioners, the addition of an HPP-4 positioner can improve performance, reduce maintenance, and minimize bleed gas emissions. Becker's HPP-4 positioners are compatible to retrofit Fisher Type 3570 Positioners originally installed on Becker RPDA Actuators. Consult GE for more information.

Table 1 - HPP-4 Positioner Port Definitions

HPP-4 Positioner Port Definitions	Port Size	Item
Instrument Signal (Input)	1/4" FNPT	A
Power Gas Supply (Input)	1/4" FNPT	B
Cylinder Top (Output)	1/4" FNPT	C
Cylinder Bottom (Output)	1/4" FNPT	D
Exhaust (Discharge)	1/4" FNPT	E

Reference Figure 3.

Table 2 - HPP-4 Positioner Adjustments

HPP-4 Positioner Adjustments	Item
Bias Adjustment (Zero/Offset)	1*
Range Adjustment (Span)	2*
Cylinder Top Adjustable Orifice	3
Cylinder Bottom Adjustable Orifice	4
Sensitivity Adjustment	5

Reference Figure 3.

*Bias and range adjustments not shown

How it works

The HPP-4 positioner configuration shown is “close on increasing instrument input signal”, the control valve will fail-open on loss of instrument input signal. The HPP-4 positioner is a force-balanced instrument that provides a control valve position proportional to a pneumatic instrument 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 exhaust pressure from cylinder top (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 signal, the internal pistons will center. Centering of the internal pistons will close both the balanced seats and cease stroking of the actuator (Figure 4.1). At steady-state, the control valve will remain in a fixed position with near ZERO bleed. Decrease of the instrument signal will result in the opposite reaction, opening the valve (Figure 4.3). Note that loss of instrument signal causes the control valve to fail in the full open position in the configuration shown.

Schematic Legend

- **Exhaust Pressure (Discharge)**
- **High Pressure Gas**
- **Intermediate Pressure Gas**
- **Instrument Signal**

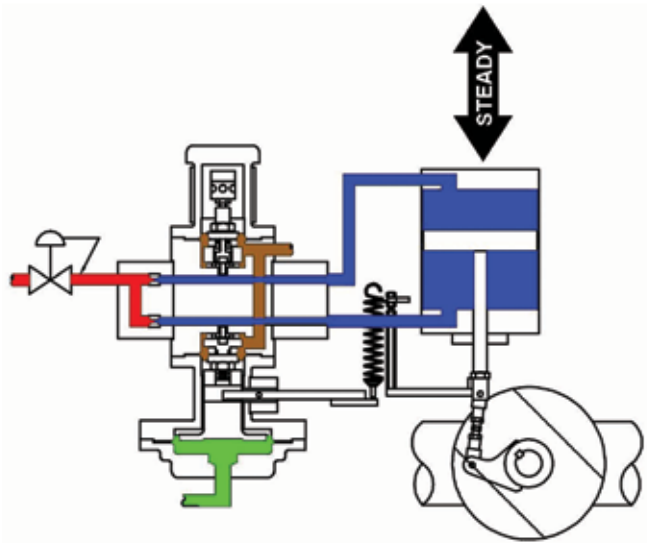

Figure 4.1 - Steady State Position (Fixed)
At steady state, the instrumentation diaphragm force is equal to the feedback spring force, centering the internal pistons and loading Cylinder Top and Cylinder Bottom with equal pressures, holding the control valve in a steady position.

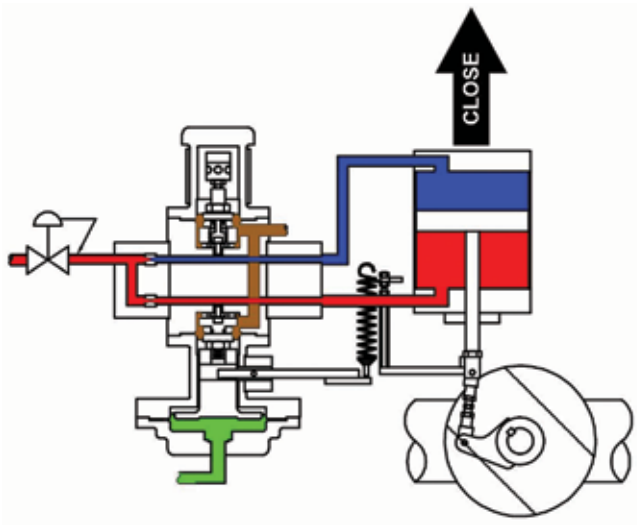

Figure 4.2 - Increase in Instrument Input Signal to CLOSE Valve
An increase in the instrument input signal causes the internal pistons to move up, simultaneously loading Cylinder Bottom and unloading Cylinder Top. The actuator pressure differential moves the valve toward the CLOSED position.

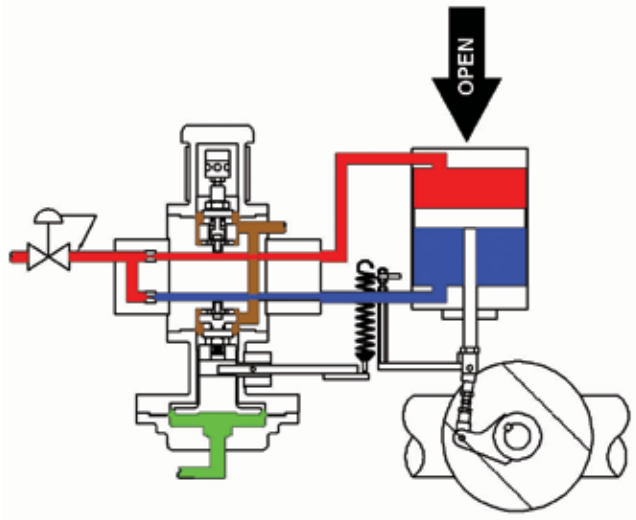

Figure 4.3 - Decrease in Instrument Input Signal to OPEN Valve
A decrease in the instrument input signal causes the internal pistons to move down, simultaneously loading Cylinder Top and unloading Cylinder Bottom. The actuator pressure differential moves the valve toward the OPEN position.

Table 3 - Technical Specifications for Model HPP-4 Positioner

Technical Specifications	
Steady State Gas Consumption	See Table 4
Supply Gas	Dry, filtered (100 micron) gas 500 psig maximum
Maximum Flow Capacity	500 scfh (14.2 scmh) without volume boosters
Maximum Supply-Discharge Differential	250 psig (1724 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	10 lbs (4.5 kg)
Minimum Deadband	0.2% instrument signal
Independent Linearity	±1.0% of positional range
Resolution	0.1% of position range
Instrument (Input) Signal	3-15 psig, 6-30 psig (standard)
Ranges	(See Table 3)
Available Stroke Lengths	2", 4", 6", 8", 12" (See Table 5) 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
Internal Parts	316 SS and anodized AL 2024
Springs	Plated Steel
Diaphragms	Buna-n reinforced by nylon rabric
Seats and O-rings	Buna-n
Tubing and Tubing Fittings	316 SS
Gauges	2 1/2" dial liquid filled with (stainless steel case and connection)

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 & zero bleed technologies to minimize fugitive natural gas emissions and environmental impact.

	VRP-CH Pilot	VRP-B-CH Pilot	VRP-S B-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[2]	Y[2]	Y	Y	Y	Y[2]	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

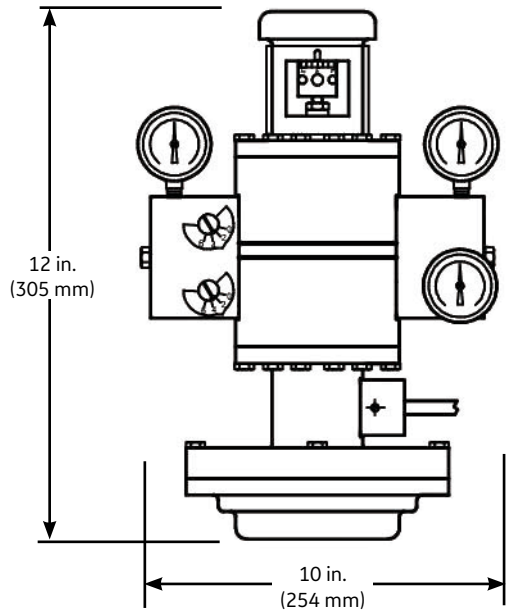

Figure 5 - Overall dimensions of HPP-4 Positioner (Standard Range)

Table 5 - Bias Range Spring Part Numbers for HPP-4 Actuator Stroke Lengths

Bias and Range Spring Part Numbers for Model HPP-4

Bias and Range Spring Part Numbers for Model HPP-4						
Single 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	Not Required				
9-15 psig (62-103 kPa)	Range Spring	01-6288	01-6288	01-6287	01-6287	01-6801
	Bias Spring	Not Required				
6-24 psig (41-166 kPa)	Range Spring	25-1599	25-1599	25-1600	25-1601	25-1601
	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 HPP-4 positioner. Other configurations are available upon request.

Repair or Rebuild?

GE's Becker Products' 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-4 Pneumatic Positioner Repair Kit* (Standard Range) Part Number 30-9501
Model HPP-4 Pneumatic Positioner Repair Kit* (Split Range) Part Number 30-9502

*Includes all rubber goods and finite life items for rebuild or repair of your HPP-4 positioner.

Figure 6 - Becker HPP-4 Pneumatic Positioners
Becker HPP-4 Series positioners are available in both reverse-acting and direct-acting. Standard instrument signal ranges are 3-15 psig (kPa) and 6-30 psig (kPa). Alternate instrument ranges are available for split range control to enable staging of control valve runs.

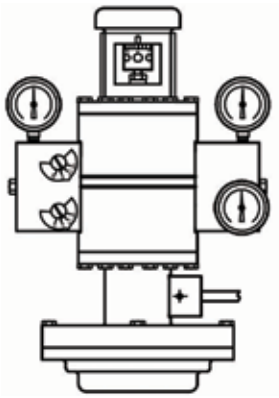

Figure 6.1 - Model HPP-4 Reverse-Acting Positioner (Standard Range)

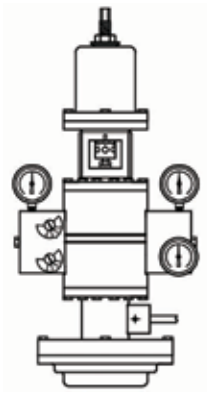

Figure 6.2 - Model HPP-4 Reverse-Acting Positioner (Split Range)

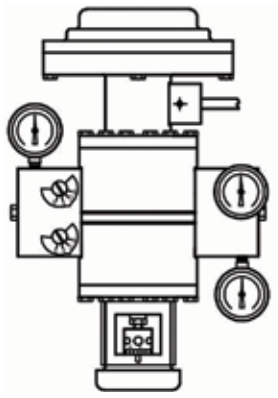

Figure 6.3 - Model HPP-4 Direct-Acting Positioner (Standard Range)

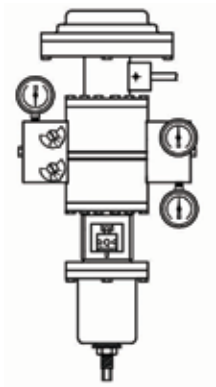

Figure 6.4 - Model HPP-4 Direct-Acting Positioner (Split Range)

HPP-4 Series Positioner Accessories

Realize Optimum Performance of your HPP-4 Series Positioner with these popular instrumentation accessories!

Bleed to Pressure System (BPS™)

Most 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.

NBV Series No-Bleed Valve

The NBV Series No-Bleed Valve eliminates bleed gas from Becker double-acting control instrumentation when corresponding control valve is at full-open and full-closed positions. This is ideal for monitor regulators and standby regulators that typically remain in full-open or full-closed positions. This is ideal for monitor regulators and both ends of valve travel without adjustment. The NBV is the primary choice for non-bleed technology or Becker double-acting control instrumentation. The NBV is compatible with all Becker double-acting Valve Regulator Pilots (VRP) and double-acting High Pressure Positioners (HPP).

Reference Becker NBV No-Bleed Valve sales literature for more information.

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 HPP-4. The AB-Control is not applicable when the HPP-4 discharges to atmosphere all of the time.

Reference Becker AB Atmospheric Bleed sales literature for more information.

DPS Series Non-Bleed Sensor

The DPS Series Non-Bleed Sensor renders the HPP-4 positioner non-bleeding when the control valve reaches full-open and full-closed positions. This is ideal for monitor regulators and standby regulators that typically remain in the full-open or full-closed positions. The DPS sensor features bleed shutoff at one end of valve travel. If bleed shutoff is required at both ends of travel, two DPS Non-Bleed Sensors will be required. The DPS sensor is the secondary choice for non-bleed technology and should be used be utilized only in applications where the NBV will not function such as when the HPP-4 positioner must discharge to high pressure systems (above 60 psig).

Reference Becker DPS Non-Bleed Sensor sales literature for more information.

I/P Transducer

The I/P Transducer provides communication between the flow computer and the control valve, and converts the analog electrical signal (4-20 mA typical) to a pneumatic input signal (3-15 psig or 6-30 psig). All of GE's 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 positioners. Typically a pneumatic positioner and I/P Transducer combination may be required for fast-acting processes.

HPP-4 Series Positioner Accessories

Realize Optimum Performance of your HPP-4 Series Positioner with these popular instrumentation accessories!

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. QEVs may be added in parallel to provide even greater actuator unloading (stroking) speed where required.

Stainless Steel Option

All of GE's Becker products are 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
- Chemical plants
- Offshore platforms
- 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 valve will maintain the last position of the control valve and positioner. The Becker SLV-30 valve 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

Improve Performance and Minimize Bleed Gas Emissions!

If you already have existing control valve actuators in service with older, obsolete pneumatic positioners, the addition of an HPP-4 positioner can improve performance, reduce maintenance, and minimize bleed gas emissions. Becker HPP-4 Positioners are compatible to retrofit many manufacturers' piston style valve actuators. Consult GE for more information.

Becker Model HPP-4 positioners are compatible for retrofit with the following:

- Fisher Type 470/480 Piston Actuators
- Fisher Type 1061 Piston Actuators
- Other types and other manufacturers' actuators. Contact GE or your local GE sales representative for assistance.

Figure 7 - Becker Model HPP-3 Positioner Retrofit to Fisher Type 470 Actuator.
The entire HPP positioner series easily retrofit to existing piston style actuators. In this application, the customer replaced a total of four existing high-bleed pneumatic positioners with Becker HPP-3 positioner. The retrofit was efficient and eliminated constant bleed associated with other manufacturers' pneumatic valve positioners. Ultimately, the customer directed all emissions into a nearby medium pressure distribution system, thus eliminating all atmospheric emissions and maintaining all discharge gas within the process piping system.

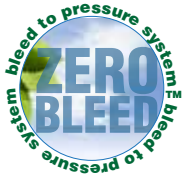

Table 6 - Application Guidelines for Becker Control Instrumentation

	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	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
RPDA 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 Control	•	•				•	•			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 in^3 / 0.033m^3) 5. RPDA and LPDA Large Models are defined as actuator sizes 12T and larger (≥ 2000 in^3 / 0.033m^3)
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 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.

Figure 8 - HPP-4 with VB-250 Volume Boosters
The HPP-4 represents a new and improved version of the HPP-2 Positioner. The HPP-4 providesincreased sensitivity and process performance with the same Becker reliability. The HPP-4 is typically utilized in high speed applications or scenarios where large volume valve actuators are required. Note that the HPP-4 pictured above incorporates Becker Model VB-250 Volume Boosters. VB-250 Volume Boosters provide additional instrument flow volume capacity necessary for operation of large volume actuators and high speed applications. Additionally, the HPP-4 is shown with Becker’s NBV No-Bleed Valve to completely shut off bleed gas when the control valve is in either the full-open or full-closed position.

***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.

GE Oil & Gas
3300 North Sam Houston Parkway East
Houston, TX 77032

24/7 customer support: +1 281 449 2000
geoilandgas.com

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