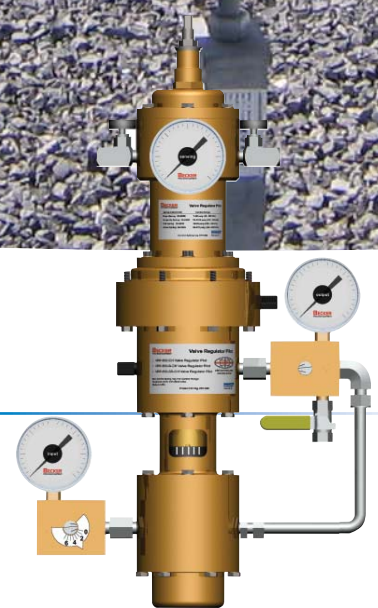




VRP-SB-CH Series Valve Regulation Pilot

VRP-SB-CH Pilot Provides ZERO Steady State Bleed Pressure Control
When Used With Single-Acting Actuators





Description

The Becker Model VRP-SB-CH Single-Acting Pilot provides pressure control when utilized with a single-acting actuated control valve. The VRP-SB-CH measures process sensing pressure and positions the single-acting actuator to maintain the pressure setpoint. The VRP-SB-CH Pilot may be utilized for pressure control applications with setpoints ranging from 1.0 psig (6.9 kPa) to 1500 psig (10342 kPa). The VRP-SB-CH features ZERO steady state bleed and may incorporate Becker's unique Bleed to Pressure System (BPS™) capability to completely eliminate atmospheric emissions.

Application Guidelines

■ High Gain Systems

Power plant feeds and other similar systems require fast stroking speed in order to satisfy required system gain. Becker VRP-SB-CH Pilots are NOT recommended for use in high gain applications that require fast stroking. For power plant type applications, with LD Series Actuators, reference Becker's VRP-SB-PID Pilots.

■ Two-Stage Pressure Cuts

Becker VRP-SB-CH Pilots are not recommended for use as first stage pressure cut where two-stage (series) pressure cuts are incorporated. This includes working monitor regulators. For two-stage cut and working monitor applications reference Becker's VRP-SB-PID Series Pilots.

VRP-SB-CH Features

- Simple cost effective pneumatic control
- Pressure setpoints from 1.0 psig (6.9 kPa) to 1500 psig (10342 kPa)
- Setpoint accuracy of $\pm 0.75\%$ of setpoint
- ZERO steady state bleed emissions eliminate atmospheric emissions
- Bleed to Pressure System (BPS™) eliminates all emissions by maintaining all gas within the piping system
- Compatible with most manufacturer's spring return actuated control valves
- Quick and easy retrofit replaces high bleed pneumatic controllers and positioners
- Design specifically suited for natural gas pipelines and distribution systems
- Rugged design is vibration resistant and suitable for demanding pipeline applications
- Easy, intuitive adjustment and maintenance techniques greatly minimize training

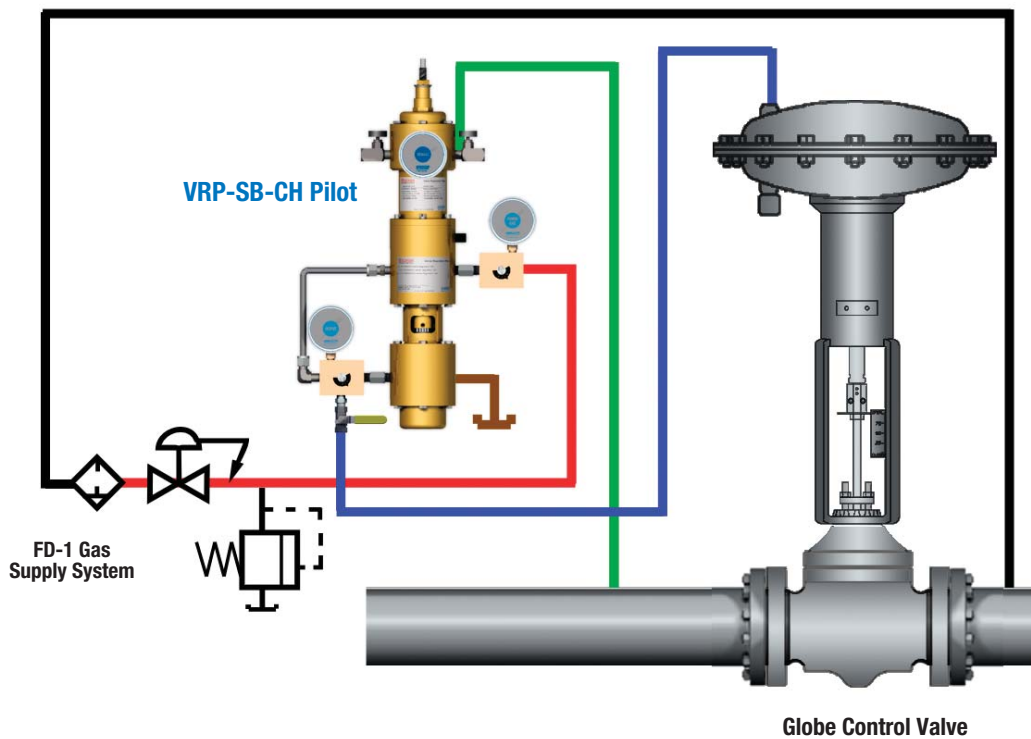


Figure 1 - VRP-SB-CH Series Pilot configured for downstream pressure control.

The VRP-SB-CH may be utilized with any Becker single-acting series actuator and control valve combination to achieve downstream pressure control. Shown here with Becker Globe Control Valve and LD Series linear diaphragm actuator.

Schematic Legend

- Sensing Pressure (P_2)
- Upstream Pressure (P_1)
- Exhaust (Discharge)
- Supply Gas (Regulated)
- Power Gas Pressure (Actuator)

Improve Performance and Minimize Bleed Gas Emissions!

Optimum performance is achieved by pairing the VRP-SB-CH with genuine Becker control valve actuators. If you already have existing control valve actuators in service, the addition of a VRP-SB-CH can improve performance and minimize bleed gas emissions. Becker VRP-SB-CH Pilots are compatible for retrofit with most manufacturers' single-acting actuators. Consult Dresser for more information.



Figure 2 - Model VRP-SB-CH (Direct-Acting)
Direct -acting VRP-SB-CH Pilots will provide decreasing output pressure upon increasing sensing pressure. The direct-acting VRP-SB-CH is typically paired with a spring-to-open control valve and actuator combination for downstream pressure control.

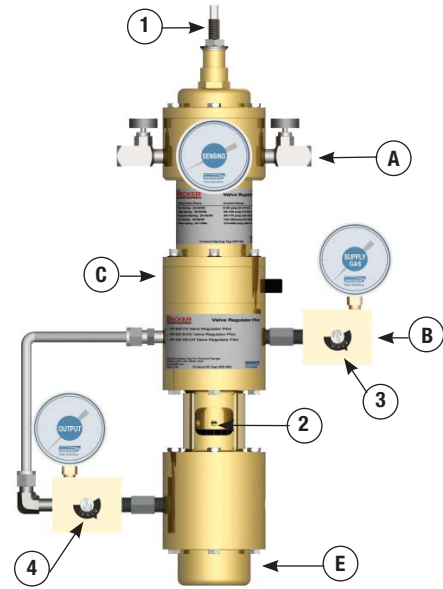


Figure 3 - Model VRP-600-SB-CH pressure control system.
The VRP-SB-CH is specifically designed for use in natural gas pressure regulation and provides a simple, economical alternative to the controller and positioner combination.

Table 1 - VRP-SB-CH Port Definitions

VRP-SB-CH Port Definitions	Port Size	Item
Sensing (input)	1/4" FNPT	A
Power Gas Supply (input)	1/4" FNPT	B
Loading (output)	1/4" FNPT	C
Exhaust (discharge)	1/4" FNPT	D
Breather Vents	1/4" FNPT	E

Table 2 - VRP-SB-CH Adjustments

VRP-SB-CH Adjustments	Item
Setpoint Elevation Adjustment	1
Deadband (sensitivity)	2
Loading Adjustable Orifice	3
Exhaust Adjustable Orifice	4

Reference Figure 3

How it Works

(Downstream Pressure Control)

The VRP-SB-CH configuration shown is reverse-acting, the VRP-SB-CH output decreases on rising sensing pressure. The LPSR Series Actuator is configured to fail-closed on loss of pressure. The energy to operate the control valve is obtained from the differential between supply gas pressure and discharge gas pressure. When the measured variable, downstream pressure, is at setpoint the pilot output remains in steady state with ZERO bleed. From a steady state position (Figure 4.1), an increase in the sensing pressure causes the internal pistons to move down and vent pressure to the actuator (Figure 4.2), closing the valve. The downstream pressure returns to setpoint, and the pilot pistons center in the steady state position (Figure 4.1). If the downstream pressure falls below setpoint, the opposite reaction takes place (Figure 4.3). Note that loss of supply gas causes the control valve to fail in the full-closed position in the configuration shown.

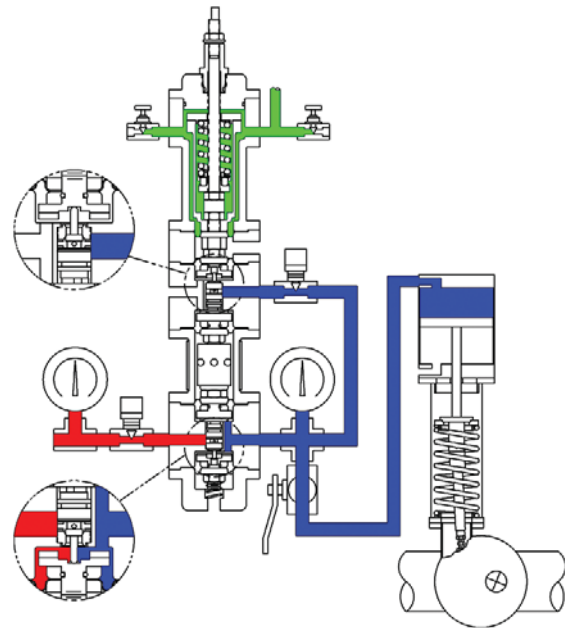


Figure 4.1 - Setpoint satisfied

When the measured variable is at setpoint the pilot output pressure remains static and holds the control valve stationary. The pilot remains in steady state with ZERO bleed.

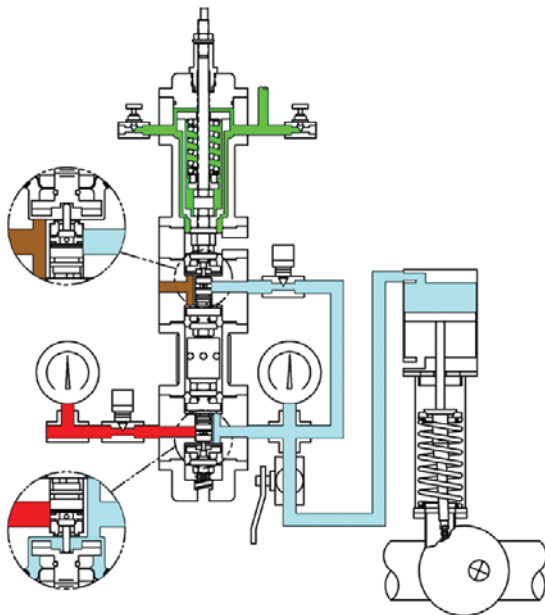


Figure 4.2 - Downstream pressure climbs above setpoint

When the measured variable rises above setpoint the pilot pistons move downward causing a decrease in cylinder loading pressure (light blue) and the control valve moves toward the closed position. The pilot vents only enough pressure to reestablish the desired setpoint pressure.

Schematic Legend

- Atmospheric Pressure
- High Pressure Gas
- Cylinder Loading Pressure (high pressure)
- Cylinder Loading Pressure (medium pressure)
- Cylinder Loading Pressure (low pressure)
- Measured Variable (downstream pressure)

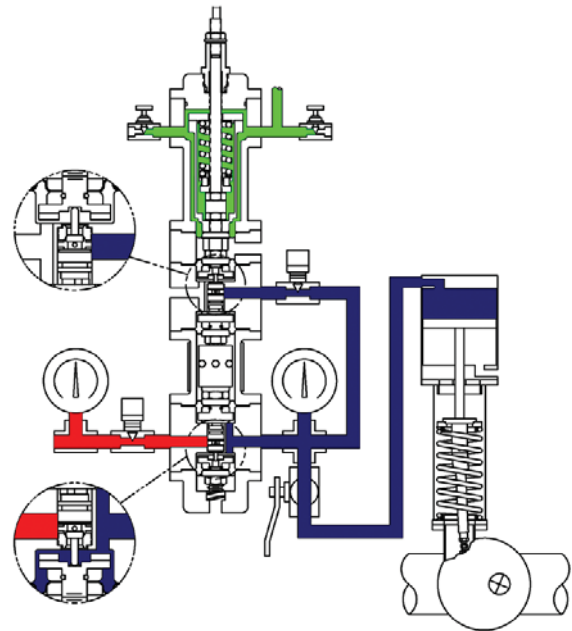


Figure 4.3 - Downstream pressure falls below setpoint

When the measured variable falls below setpoint the pilot pistons move upward causing an increase in cylinder loading pressure (dark blue) and the control valve moves toward the open position. The VRP-SB-CH is non-bleeding in the loading mode.

Table 3 - Technical Specifications for VRP-SB-CH Pilot

Technical Specifications	
Steady State Gas Consumption	ZERO (see Table 4)
Supply Gas	Dry, filtered (100µ) gas
Maximum Flow Capacity	2400 scfh (40 scmh)
Maximum Supply Pressure	400 psig (2758 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 lbs (5.4 kg)
Minimum Deadband	0.2% instrumental signal
Independent Linearity	±1.0% of positional range
Control Accuracy	±0.75% of setpoint
Maximum Sensing Pressure	
VRP-175	225 psig (1551 kPa)
VRP-600	600 psig (4136 kPa)
VRP-1000/1500	1500 psig (10342 kPa)
Setpoint Range	1.0 psig - 1500 psig (6.9 kPa - 10342 kPa)
Housing	Meets NEMA 3 Classification
Installation Orientation	Vertical position recommended. Custom bracket supplied with Becker Actuators. 2" pipe mount provided for retrofit to other manufacturers' actuators.

Materials of Construction	
External Parts	Anodized AL 2024 316 SS available (for marine environments)
Internal Parts	316 SS and anodized AL 2024 ³
Springs	Alloy steel
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 with 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 open (fail-closed upon loss of instrument signal)
2. Reverse-acting: decreasing instrument signal causes control valve to open (fail-open upon loss of instrument signal)
3. Extreme environment material specification available

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 any 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 Non-Bleed	~100	<10	zero	zero	zero	~100	<10	zero	zero
Full-Open/Full-Closed Bleed to Pressure	Y ₁	N	Y	Y	N	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

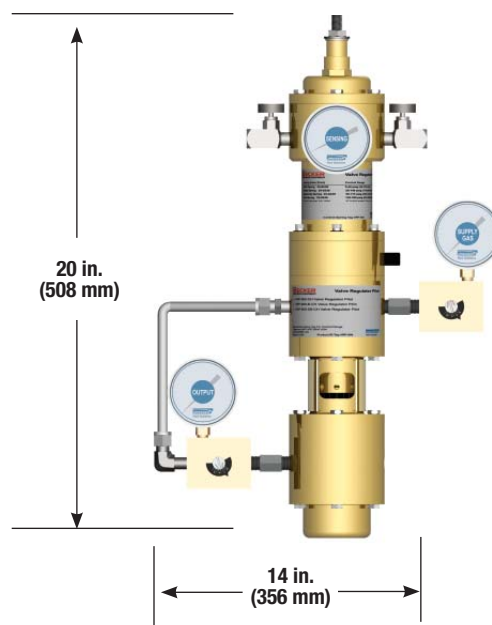
**Figure 5** - Overall dimensions of Becker Model VRP-600-SB-CH Pilot Control System (Direct-Acting)

Table 5 - Selection Chart for VRP-SB-CH Series Pilots

VRP-SB-CH Model Number	Control Range (psig/kPa)	Spring Color	Part Number	Setpoint Change/Revolution of Setpoint Screw ²	Maximum Remote Setpoint Range ³	Repair Kit Number
VRP-175-SB-CH¹	3.0 – 10 psig (21 – 69 kPa)	Gold	25-8236	0.57 psig/rev (3.9 kPa/rev)	3.1 psig (21.4 kPa)	30-9302
	7.0 – 30 psig (48 – 207 kPa)	Beige	25-8238	2.0 psig/rev (14 kPa/rev)	11 psig (75.8 kPa)	30-9302
	15 – 50 psig (103 – 345 kPa)	Burgundy	25-8239	3.0 psig/rev (21 kPa/rev)	16.5 psig (113.8 kPa)	30-9302
	20 – 85 psig (138 – 596 kPa)	Pink	25-8240	6.4 psig/rev (44 kPa/rev)	35.2 psig (242.7 kPa)	30-9302
	50 – 175 psig (345 – 1207 kPa)	Yellow	25-1306	23 psig/rev (159 kPa/rev)	125 psig (862 kPa)	30-9302
VRP-600-SB-CH	50 – 175 psig (345 – 1207 kPa)	Burgundy	25-8239	11 psig/rev (76 kPa/rev)	62 psig (427 kPa)	30-9304
	135 – 300 psig (931 – 2069 kPa)	Pink	25-8240	24 psig/rev (166 kPa/rev)	132 psig (910 kPa)	30-9304
	275 – 600 psig (1896 – 4137 kPa)	Yellow	25-1306	85 psig/rev (586 kPa/rev)	325 psig (2241 kPa)	30-9304
VRP-1000-CH	550 – 1000 psig (3792 – 6895 kPa)	Yellow	25-1306	144 psig/rev (993 kPa/rev)	700 psig (4826 kPa)	30-9305
VRP-1500-CH⁴	800 – 1300 psig (5516 – 8964 kPa)	Gray	25-1562	227 psig/rev (1565 kPa/rev)	850 psig (5860 kPa)	30-9305
	1000-1500 psig (6895-10342 kPa)	Violet	25-8073	276 psig/rev (1903 Kpa/rev)	950 psig (6550 kPa)	30-9305

Notes

1. These models should only be used for applications that require high gain. Consult Becker prior to specifying these models.
2. Maximum remote setpoint range is based upon Model SM-1140 remote setpoint module with maximum motor range of 5.8 revolutions. See Becker RSM brochure for additional information.
3. Maximum remote setpoint range reported is applicable to units with discrete (pulse) signal. Remote setpoint modules with analog (4-20 mA) signal have a maximum remote setpoint range equal to the full control range of the VRP-SB-CH Pilot.
4. Kits are available to convert obsolete VRP-1300-SB-CH to VRP-1500-SB-CH.

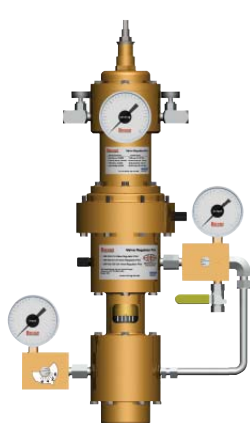


Figure 6.1 - VRP-175-SB-CH
(Reverse-Acting)



Figure 6.2 - VRP-600-SB-CH
(Direct-Acting)



Figure 6.3 - VRP-1000-SB-CH
(Reverse-Acting)



Figure 6.4 - VRP-1500-SB-CH
(Reverse-Acting)

VRP-SB-CH Series Pilot Accessories

Realize Optimum Performance of your VRP-SB-CH Series Pilot 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.



AB Series Atmospheric Bleed Control

When conditions allow discharge to pressure system only part of the time, install an AB Series Atmospheric Bleed Control. The AB-Control may be installed for automatic switching that temporarily permits atmospheric bleed. The AB-Control will maintain adequate differential pressure between supply gas and discharge pressure to operate the control valve actuator and control instrumentation. The AB-Control is not applicable when the control instrumentation constantly discharges to atmosphere.

Reference Becker AB Atmospheric Bleed sales literature for additional information.



SP Series Setpoint Pump

Provides a simple and accurate method of applying false signal pressure during initial adjustment of pilots. The pump can provide a false signal pressure of 20%-40% in excess of working pipeline pressure which eliminates the need for nitrogen bottles or electronic calibration devices. The Setpoint Pilot is compatible with all models and series of Becker VRP Pilots.

Reference Becker SP Setpoint Pump sales literature for additional information.



RSM Series Remote Setpoint Module

The Remote Set Point Module provides remote adjustment of VRP-CH set point via an electrical input signal. All Remote Setpoint Motors are equipped with internal limit switches to prevent over-travel of setpoint. A 4-20 mA feedback of Remote Setpoint Module motor is standard. All Becker RSMs are rated explosion proof Class 1, Div. 1 for use in hazardous locations.

The standard RSM input signals are:

Digital Pulse Input

- 24 V D.C.
- 120 V A.C.

Analog Current Input

- 4-20 mA command signal/12 or 24 V supply power
- 4-20 mA command signal/120 V A.C. supply power

Reference Becker RSM Remote Setpoint Module sales literature for additional information.



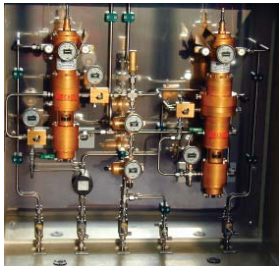
VB Series Volume Boosters

VB Series Volume Boosters are utilized in conjunction with some Becker control instrumentation to provide adequate instrumentation flow volume for larger volume piston actuators. Volume Boosters are typically only required for ball valve regulators models 12T and larger. Additionally, Volume Boosters may be utilized to provide increased actuator stroking speed for applications 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 VRP-CH.

Reference Becker VB Volume Booster sales literature for additional information.

VRP-SB-CH Series Pilot Accessories

Realize Optimum Performance of your VRP-SB-CH Series Pilot with these popular instrumentation accessories!



Panel Mounting

Custom panel mounting is available to suit the specific application needs. All panels come fully assembled, tested, and adjusted per requirements. Panel mounting simplifies retrofit of Becker instrumentation to existing equipment and ensures satisfactory performance and fit. A variety of configurations and options are available.



Stainless Steel Option

All Becker Precision Control instrumentation is manufactured from high-strength anodized aircraft aluminum alloy (AL2024). The standard aluminum construction provides adequate durability in most installation environments. In applications where the 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



Retrofit Compatibility

Achieve optimum performance by pairing the VRP-SB-CH with genuine Becker control valve actuators. If control valve actuators are already in service, the addition of a VRP-SB-CH can improve performance and minimize atmospheric bleed emissions. VRP-SB-CH Pilots are compatible for retrofit with most manufacturers' single-acting type actuators.

- Fisher Type 1051/1052™ (Rotary) and Type 657/667™ (Linear) spring & diaphragm type actuators
- Welker Jet® Control Valves
- Compatible with other manufacturer's system



Figure 7 - VRP-SB-CH Retrofit Simplifies Control Instrumentation

VRP-175-SB-CH pilot retrofit to a Fisher 657 direct acting spring & diaphragm actuator replacing a high bleed positioner and pressure controller combination. This retrofit replaced two control instruments with one instrument providing more reliable, accurate control with lower operational costs.

Figure 8 - VRP-SB-CH Retrofit Virtually Eliminates Atmospheric Bleed Gas

VRP-600-SB-CH pilot retrofit to a Fisher 657 direct-acting spring and diaphragm actuator replacing an existing high bleed pressure controller. The installation will pay for itself in a short period of time based on elimination of steady state bleed emissions.

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
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 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 ($< 2000 \text{ in}^3 / 0.033\text{m}^3$)
5. RPDA and LPDA Large Models are defined as actuator sizes 12T and larger ($\geq 2000 \text{ in}^3 / 0.033\text{m}^3$)
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 $P_{\text{discharge}} \leq 60 \text{ psig (414 kPa)}$ and/or $P_{\text{supply}} \leq 150 \text{ psig (1034 kPa)}$.
9. PS-2 and DPS-2 Non-Bleed Sensors must be utilized when $P_{\text{discharge}} > 60 \text{ psig (414 kPa)}$ and/or $P_{\text{supply}} > 150 \text{ psig (1034 kPa)}$.
10. VB Series Volume Boosters are necessary for power plant regulation, surge control applications, or when large model RPDA are utilized.



BECKER Valve Regulator Pilot

Setting Code (PSIG)	Control Range
Range Setting: 25-4000	1-500 psig (6.9 - 34.5 MPa)
Accuracy Setting: 25-4000	10-5000 psig (0.7 - 34.5 MPa)
Flow Setting: 25-4000	10-500 psig (0.7 - 34.5 MPa)
Control Setting: 25-4000	10-500 psig (0.7 - 34.5 MPa)

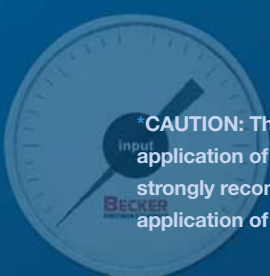
Checklist Setting Tag: 999-999-999

BECKER Valve Regulator Pilot

- VSP-450-CH Valve Regulator Pilot
- VSP-450-S-CH Valve Regulator Pilot
- VSP-450-SH-CH Valve Regulator Pilot

See Control Spring Tag For Control Range
Telephone (247) 437-6640 USA
Becker USA

Product ID Tag VSP-450



***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.dresser.com/becker



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Dresser brand products are highly engineered, technically superior and are designed to help global customers meet and exceed requirements for mission critical energy applications.

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Dresser, Inc. is a leader in providing highly engineered infrastructure products for the global energy industry. The company has leading positions in a broad portfolio of products, including valves, actuators, meters, switches, regulators, piping products, natural gas-fueled engines, retail fuel dispensers and associated retail point-of-sale systems, and air and gas handling equipment. Leading brand names within the Dresser portfolio include Dresser Wayne® retail fueling systems, Waukesha® natural gas-fired engines, Masoneilan® control valves, Consolidated® pressure relief valves, and Roots® blowers. It has manufacturing and customer service facilities located strategically worldwide and a sales presence in more than 100 countries.

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