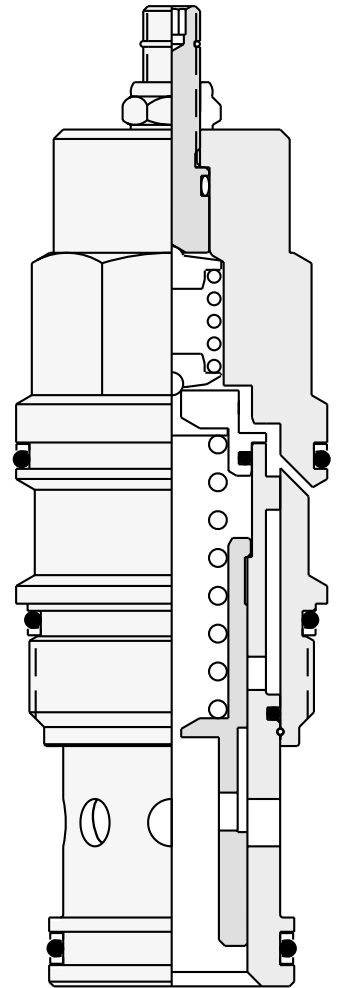
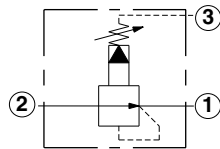
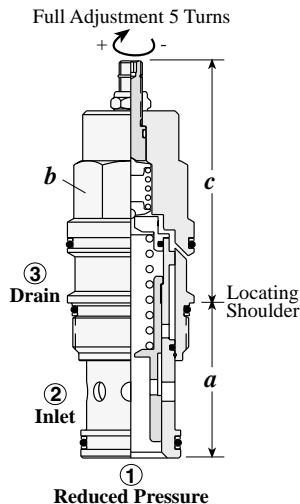


Reducing and Reducing/Relieving Cartridge Valves

<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated Reducing 30
	Pilot Operated Reducing/Relieving 31
	Direct Acting Reducing/Relieving 32
	Pilot Operated Reducing/Relieving, Externally Drained 33
	Pilot Operated Reducing/Relieving, Ventable 34
	Air Controlled, Pilot Operated Reducing 35
	Air Controlled, Pilot Operated Reducing/Relieving 36
	Modulating Element with Integral Pilot Control Cavity 37
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	3-Way, Externally Drained, Modulating Element with Integral Pilot Control Cavity 39
	Electro-proportional, Direct Acting Reducing/Relieving 40
	Electro-proportional, Direct Acting with Low Leakage 41



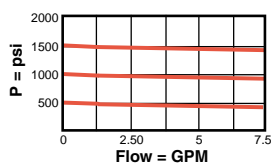
PILOT OPERATED REDUCING



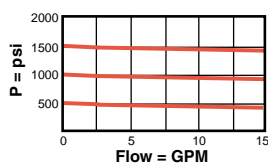
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
5 GPM	PBBB – LAN	T - 163A	1.22	3/4"	2.55	2.63	2.77	25/30
10 GPM	PBDB – LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
20 GPM	PBFB – LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
40 GPM	PBHB – LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
80 GPM	PBJB – LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

Performance Curves

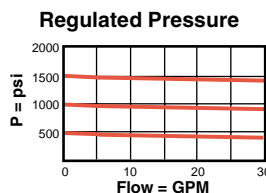
PB*B



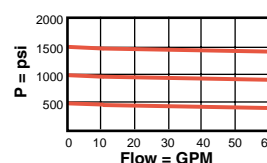
PBDB



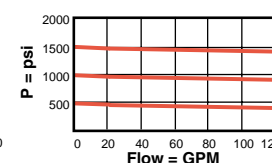
PBFB



PBHB



PBJB



- Maximum operating pressure = 5000 psi
- Factory pressure setting established at blocked control port (deadhead)
- Control pilot flow = PBBB, PBDB: 7 to 10 in³/min., PBFB: 10 to 15 in³/min., PBHB, PBJB: 15 to 20 in³/min.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.

PB ★ B – ★ ★ ★

Nominal Capacity	Control**	Adjustment Range	Seal
B 5 GPM*	L Standard Screw	A 100 - 3000 psi	N Buna-N
D 10 GPM	C Tamper Resistant	B 50 - 1500 psi	V Viton
F 20 GPM	K Handknob	N 60 - 800 psi	
H 40 GPM		Q 60 - 400 psi	
J 80 GPM		W 150 - 4500 psi	

Adjustment Range Options:

All are standard set at 200 psi.

Maximum pressure differentials for spring ranges:

A and B are 3000 psi.

N and Q are 2000 psi.

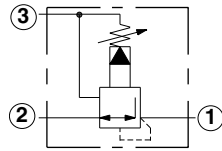
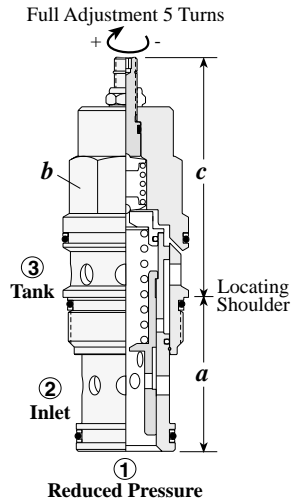
W is 5000 psi inlet pressure.

** See page 162 for information on Control Options

* Minimum setting 75 psi on all ranges.

Customer may specify pressure setting.

PILOT OPERATED REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	L	C	K	
10 GPM	PPDB - LAN	T - 11A	1.38	7/8"	2.50	2.56	2.75	30/35
20 GPM	PPFB - LAN	T - 2A	1.38	1 1/8"	2.81	2.88	3.06	45/50
40 GPM	PPHB - LAN	T - 17A	1.81	1 1/4"	3.28	3.31	3.53	150/160
80 GPM	PPJB - LAN	T - 19A	2.50	1 5/8"	3.94	4.09	4.19	350/375

Performance Curves

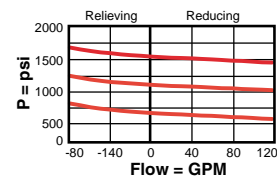
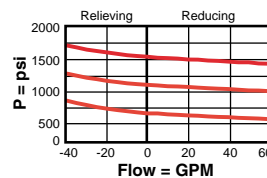
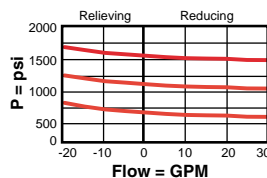
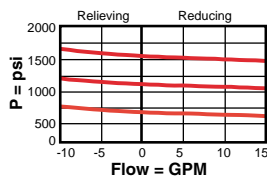
PPDB

PPFB

PPHB

PPJB

Regulated Pressure



- Maximum operating pressure = 5000 psi
- Factory pressure setting established at blocked control port (deadhead)
- Control pilot flow = PPDB: 7 to 10 in³/min., PPFB: 10 to 15 in³/min., PPHB, PPJB: 15 to 20 in³/min.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.

PP ★ B - ★ ★ ★

Nominal Capacity	Control**	Adjustment Range	Seal
D 10 GPM	L Standard Screw	A 100 - 3000 psi	N Buna-N
F 20 GPM	C Tamper Resistant	B 50 - 1500 psi	V Viton
H 40 GPM	K Handknob	N 60 - 800 psi	
J 80 GPM		Q 60 - 400 psi	
		W 150 - 4500 psi	

Adjustment Range Options:

All are standard set at 200 psi.

Maximum pressure differentials for spring ranges:

A and B are 3000 psi.

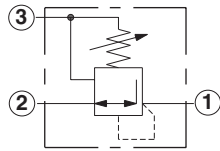
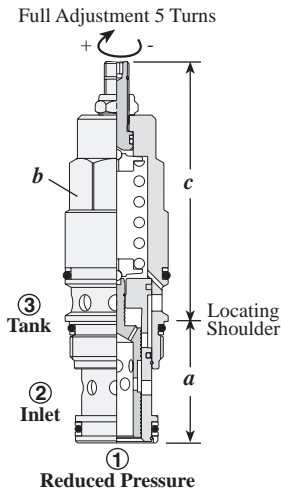
N and Q are 2000 psi.

W is 5000 psi inlet pressure.

Customer may specify pressure setting.

** See page 162 for information on Control Options

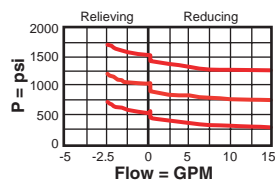
DIRECT ACTING REDUCING/RELIEVING



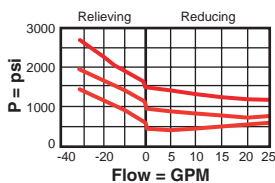
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
10 GPM	PRDB – LAN	T - 11A	1.38	7/8"	3.09	3.16	3.34	30/35
20 GPM	PRFB – LAN	T - 2A	1.38	1 1/8"	3.47	3.53	3.75	45/50
40 GPM	PRHB – LAN	T - 17A	1.81	1 1/4"	3.94	4.00	4.19	150/160
80 GPM	PRJB – LAN	T - 19A	2.50	1 5/8"	4.88	5.03	5.12	350/375

Performance Curves

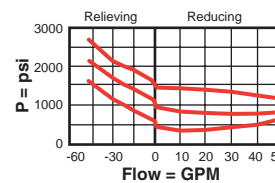
PRDB



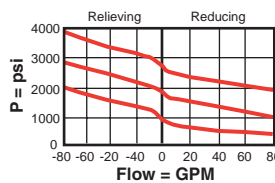
PRFB



PRHB



PRJB



- Maximum operating pressure = 5000 psi
- Factory pressure setting established at blocked control port (deadhead)
- Maximum valve leakage = PRDB: 2 in³/min./1000 psi; PRFB: 3 in³/min./1000 psi, PRHB: 4 in³/min./1000 psi, PRJB: 5 in³/min./1000 psi
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- All spring ranges are capable of operating with 5000 psi inlet pressure.

PR ★ B - ★ ★ ★

Nominal Capacity	Control**	Adjustment Range	Seal
D 10 GPM	L Standard Screw	A 500 - 3000 psi	N Buna-N
F 20 GPM	C Tamper Resistant	B 50 - 1500 psi	V Viton
H 40 GPM	K Handknob	D 20 - 800 psi	
J 80 GPM		E 20 - 400 psi	
		S 20 - 200 psi	
		W*750 - 4500 psi	

Available for PRFB and PRHB

- A 750 - 3000 psi
- B 300 - 1500 psi
- D 200 - 800 psi
- E 100 - 400 psi
- S 50 - 200 psi

Adjustment Range Options:

PRDB Only:

- A is standard set at 1000 psi.
- B, D, E, S are standard set at 200 psi.

PRFB, PRHB:

- A, W are standard set at 1000 psi.
- D is standard set at 400 psi.
- E is standard set at 200 psi.
- S is standard set at 100 psi.

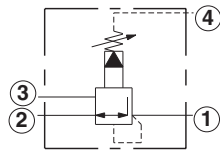
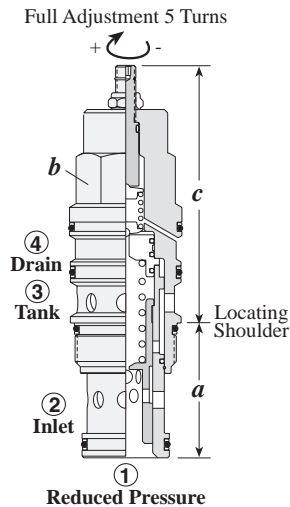
** See page 162 for information on Control Options

* Not available for PRFB, PRHB

Customer may specify pressure setting.

Visit www.sunhydraulics.com for detailed and complete technical information on our full line of products.

PILOT OPERATED REDUCING/RELIEVING, EXTERNALLY DRAINED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
10 GPM	PVDA – LAN	T - 21A	1.38	7/8"	3.09	3.15	3.34	30/35
20 GPM	PVFA – LAN	T - 22A	1.38	1 1/8"	3.44	3.50	3.69	45/50
40 GPM	PVHA – LAN	T - 23A	1.81	1 1/4"	3.93	3.99	4.18	150/160
80 GPM	PVJA – LAN	T - 24A	2.50	1 5/8"	4.78	4.90	5.03	350/375

Performance Curves

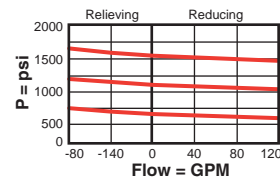
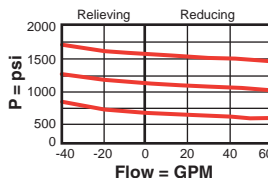
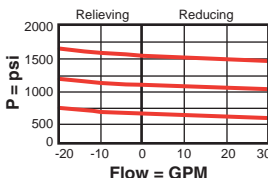
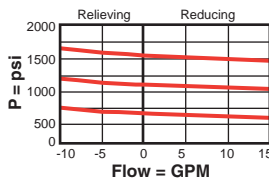
PVDA

PVFA

PVHA

PVJA

Regulated Pressure



- Maximum operating pressure = 5000 psi
- Factory pressure setting established at blocked control port (deadhead)
- Control pilot flow = PVDA: 7 to 10 in³/min., PVFA: 10 to 15 in³/min., PVHA, PVJA: 15 to 20 in³/min.
- Maximum pressure at port 3 should be limited to 3000 psi.
- Pressure on the drain (port 4) is directly additive to the valve setting at a 1:1 ratio and should not exceed 5000 psi.

PV ★ A – ★ ★ ★

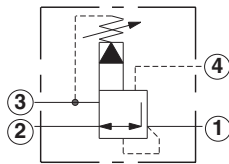
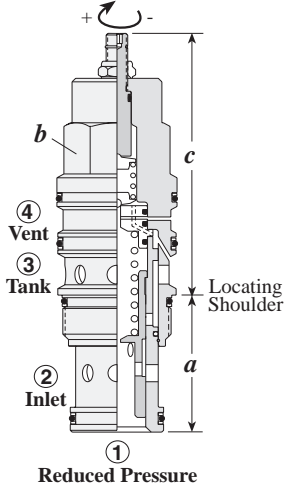
Nominal Capacity	Control**	Adjustment Range	Seal
D 10 GPM	L Standard Screw	A 100 - 3000 psi	N Buna-N
F 20 GPM	C Tamper Resistant	B 50 - 1500 psi	V Viton
H 40 GPM	K Handknob	D 25 - 800 psi	
J 80 GPM		E 25 - 400 psi	
		W 150 - 4500 psi	

Adjustment Range Options:
 All are standard set at 200 psi.
 Maximum pressure differentials for spring ranges:
 A and B are 3000 psi.
 D and E are 2000 psi.
 W is 5000 psi inlet pressure.
 Customer may specify pressure setting.

**See page 162 for information on Control Options

PILOT OPERATED REDUCING/RELIEVING, VENTABLE

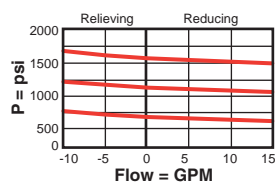
Full Adjustment 5 Turns



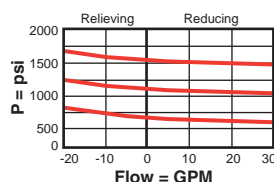
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c			
					L	C	K	
10 GPM	PVDB – LAN	T - 21A	1.38	7/8"	3.09	3.15	3.34	30/35
20 GPM	PVFB – LAN	T - 22A	1.38	1 1/8"	3.44	3.50	3.69	45/50
40 GPM	PVHB – LAN	T - 23A	1.81	1 1/4"	3.93	3.99	4.18	150/160
80 GPM	PVJB – LAN	T - 24A	2.50	1 5/8"	4.78	4.90	5.03	350/375

Performance Curves

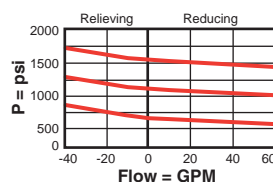
PVDB



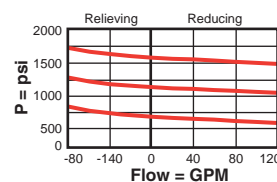
PVFB



PVHB



PVJB



Regulated Pressure

- Maximum operating pressure = 5000 psi
- Factory pressure setting established at blocked control port (deadhead)
- Control pilot flow = PVDB: 7 to 10 in³/min., PVFB: 10 to 15 in³/min., PVHB, PVJB: 15 to 20 in³/min.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- By controlling the pressure at the vent (port 4), the effective setting of the valve can be controlled below the nominal valve setting.

PV ★ B – ★ ★ ★

Nominal Capacity	Control**	Adjustment Range	Seal
D 10 GPM	L Standard Screw	A 100 - 3000 psi	N Buna-N
F 20 GPM	C Tamper Resistant	B 50 - 1500 psi	V Viton
H 40 GPM	K Handknob	D 25 - 800 psi	
J 80 GPM		E 25 - 400 psi	
		W 150 - 4500 psi	

Adjustment Range Options:

All are standard set at 200 psi.

Maximum pressure differentials for spring ranges:

A and B are 3000 psi.

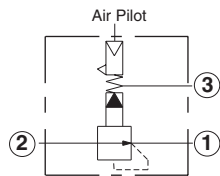
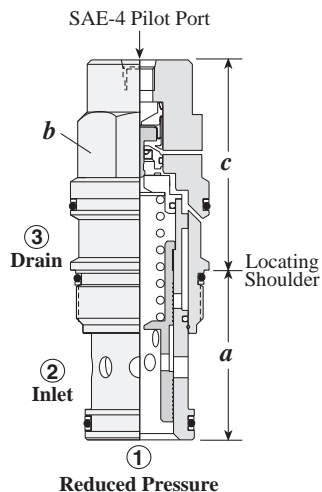
D and E are 2000 psi.

W is 5000 psi inlet pressure.

Customer may specify pressure setting.

** See page 162 for information on Control Options

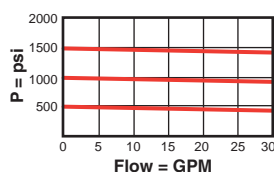
AIR CONTROLLED, PILOT OPERATED REDUCING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	c		
					A	B	
20 GPM	PBFC – ABN	T - 2A	1.38	1 1/8"	2.01	-	45/50
40 GPM	PBHC – BBN	T - 17A	1.81	1 1/4"	-	2.48	150/160
80 GPM	PBJC – BBN	T - 19A	2.50	1 5/8"	-	3.11	350/375

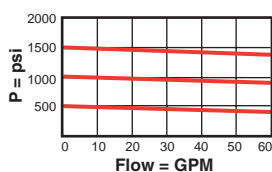
Performance Curves

PBFC

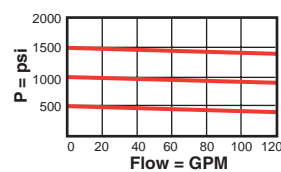


PBHC

Regulated Pressure



PBJC



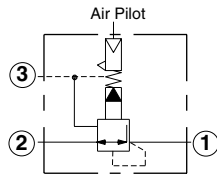
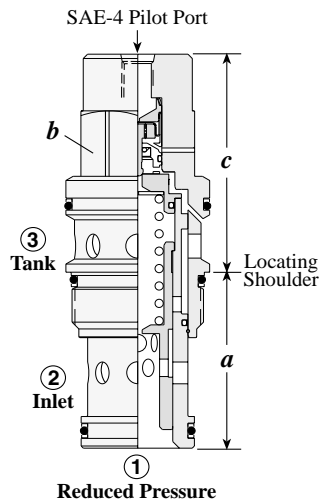
- Pilot ratio, air to hydraulic 1:20
- Maximum operating pressure = 2000 psi
- Maximum air pressure should not exceed 150 psi.
- Control pilot flow = PBFC: 10 to 15 in³/min., PBHC, PBJC: 15 to 20 in³/min.
- Maximum pressure differential, inlet to outlet = 3000 psi.
- The pressure at port 3 determines the minimum valve setting and should not exceed 1000 psi.

PB ★ C – ★ ★ ★

Nominal Capacity	Control	Adjustment Range	Seal
F 20 GPM	Available in PBFC only	B 50 - 1500 psi	N Buna-N
H 40 GPM	A 1/4" NPTF Pilot Port at end of Cartridge		V Viton
J 80 GPM			
Available for PBHC, PBJC only			
	B SAE-4 Pilot Port at end of Cartridge		

Reducing and Reducing/Relieving Valves

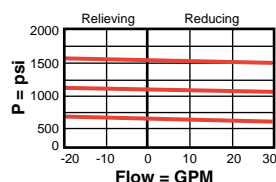
AIR CONTROLLED, PILOT OPERATED REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	c		
					A	B	
20 GPM	PPFC – ABN	T - 2A	1.38	1 1/8"	2.24	-	45/50
40 GPM	PPHC – BBN	T - 17A	1.81	1 1/4"	-	2.48	150/160
80 GPM	PPJC – BBN	T - 19A	2.50	1 5/8"	-	3.11	350/375

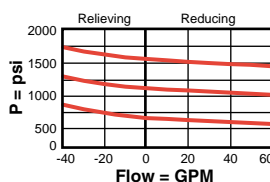
Performance Curves

PPFC

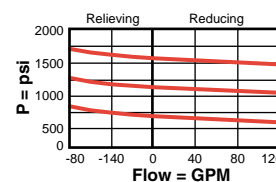


PPHC

Regulated Pressure



PPJC

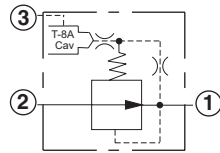
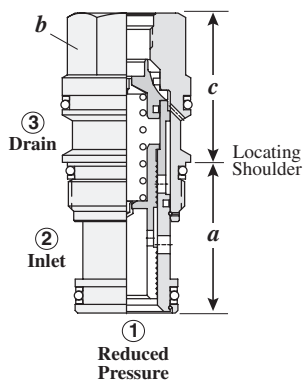


- Pilot ratio, air to hydraulic 1:20
- Maximum operating pressure = 2000 psi
- Maximum air pressure should not exceed 150 psi.
- Control pilot flow = PPFC: 10 to 15 in³/min., PPHC, PPJC: 15 to 20 in³/min.
- Maximum pressure differential, inlet to outlet = 3000 psi.
- The pressure at port 3 determines the minimum valve setting and should not exceed 1000 psi

PP ★ C – ★ ★ ★

Nominal Capacity	Control	Adjustment Range	Seal
F 20 GPM	Available in PPFC only	B 50 - 1500 psi	N Buna-N
H 40 GPM	A 1/4" NPTF Pilot Port at end of Cartridge		V Viton
J 80 GPM	Available for PPHC, PPJC only		
	B SAE-4 Pilot Port at end of Cartridge		

MODULATING ELEMENT WITH INTEGRAL PILOT CONTROL CAVITY

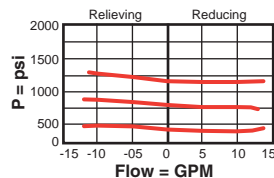


The -8 control option allows a pilot control valve to be incorporated directly into the end of the modulating element via the T-8A cavity. These pilot control cartridges are sold separately and include electro-proportional, solenoid, air pilot, and hydraulic pilot operation. See Pilot Control Cartridges on page 121.

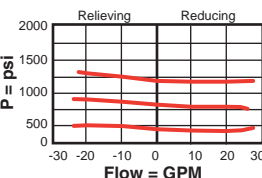
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (lb. ft.)
			a	b	c	
10 GPM	PBDB - 8WN	T - 11A	1.38	7/8	1.19	30/35
20 GPM	PBFB - 8WN	T - 2A	1.38	1 1/8	1.38	45/50
40 GPM	PBHB - 8WN	T - 17A	1.81	1 1/4	1.81	150/160
80 GPM	PBJB - 8WN	T - 19A	2.50	1 5/8	2.31	350/375

Performance Curves

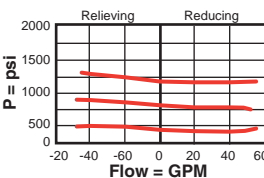
PBDB-8



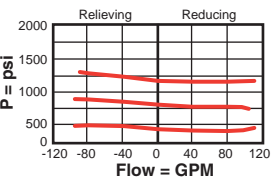
PBFB-8



PBHB-8



PBJB-8



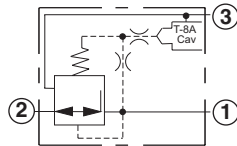
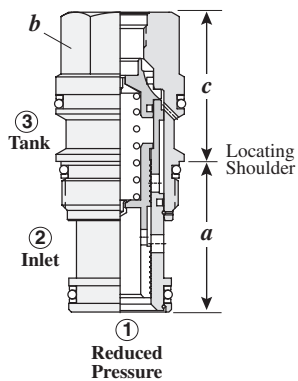
Regulated Pressure with T-8A Pilot Stage Installed

- Maximum operating pressure = 5000 psi
- Control pilot flow = PBDB-8: 7 to 10 in³/min., PBFB-8: 10 to 15 in³/min., PBHB-8, PBJB-8: 15 to 20 in³/min.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- Maximum inlet pressure is determined by the bias spring. The D spring is limited to 2000 psi maximum differential pressure and the W spring is limited to 5000 psi maximum inlet pressure.
- With the -8 control option, the main stage valve should first be installed to the correct torque value. The T-8A pilot control valve should then be installed into the main stage valve to its required torque value.

PB ★ B - 8 ★ ★

Nominal Capacity	Control	Minimum Control Pressure	Seal
D 10 GPM	8 T-8A Cavity in hex body for pilot operation (Pilot valve to be ordered separately)	D 25 psi	N Buna-N
F 20 GPM		W 100 psi	V Viton
H 40 GPM			
J 80 GPM			

3-WAY, MODULATING ELEMENT WITH INTEGRAL PILOT CONTROL CAVITY

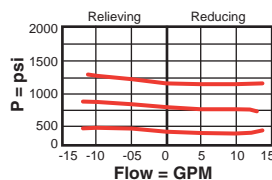


The -8 control option allows a pilot control valve to be incorporated directly into the end of the modulating element via the T-8A cavity. These pilot control cartridges are sold separately and include electro-proportional, solenoid, air pilot, and hydraulic pilot operation. See Pilot Control Cartridges on page 121.

Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (lb. ft.)
			a	b	c	
10 GPM	PPDB - 8WN	T - 11A	1.38	7/8	1.19	30/35
20 GPM	PPFB - 8WN	T - 2A	1.38	1 1/8	1.38	45/50
40 GPM	PPHB - 8WN	T - 17A	1.81	1 1/4	1.81	150/160
80 GPM	PPJB - 8WN	T - 19A	2.50	1 5/8	2.31	350/375

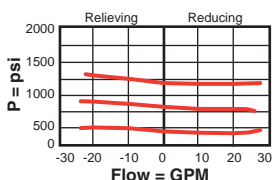
Performance Curves

PPDB-8

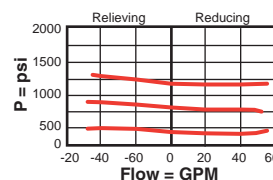


PPFB-8

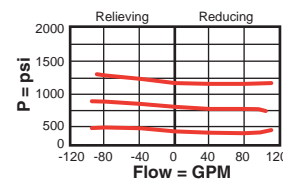
Regulated Pressure with T-8A Pilot Stage Installed



PPHB-8



PPJB-8

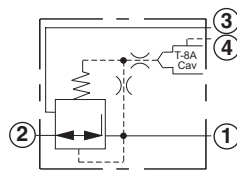
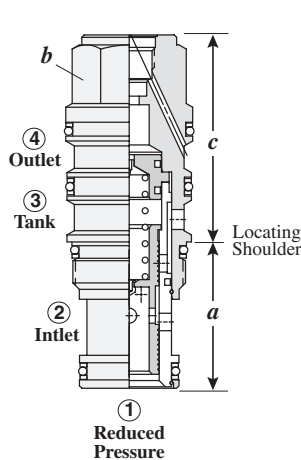


- Maximum operating pressure = 5000 psi.
- Control pilot flow = PPDB-8: 7 to 10 in³/min., PPFB-8: 10 to 15 in³/min., PPHB-8, PPJB-8: 15 to 20 in³/min.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- Maximum inlet pressure is determined by the bias spring. The D spring is limited to 2000 psi maximum differential pressure and the W spring is limited to 5000 psi maximum inlet pressure.
- With the -8 control option, the main stage valve should first be installed to the correct torque value. The T-8A pilot control valve should then be installed into the main stage valve to its required torque value.

PP ★ B - 8 ★ ★

Nominal Capacity	Control	Minimum Control Pressure	Seal
D 10 GPM	8 T-8A Cavity in hex body for pilot operation (Pilot valve to be ordered separately)	D 25 psi	N Buna-N
F 20 GPM		W 100 psi	V Viton
H 40 GPM			
J 80 GPM			

3-WAY, EXTERNALLY DRAINED, MODULATING ELEMENT WITH INTEGRAL PILOT CONTROL CAVITY



The -8 control option allows a pilot control valve to be incorporated directly into the end of the modulating element via the T-8A cavity. These pilot control cartridges are sold separately and include electro-proportional, solenoid, air pilot, and hydraulic pilot operation. See Pilot Control Cartridges on page 121.

Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (lb. ft.)
			a	b	c	
10 GPM	PVDA - 8WN	T - 21A	1.38	7/8	1.78	30/35
20 GPM	PVFA - 8WN	T - 22A	1.38	1 1/8	2.00	45/50
40 GPM	PVHA - 8WN	T - 23A	1.81	1 1/4	2.59	150/160
80 GPM	PVJA - 8WN	T - 24A	2.50	1 5/8	3.16	350/375

Performance Curves

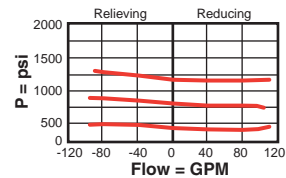
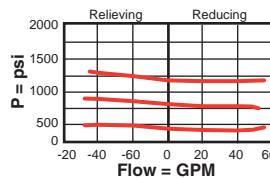
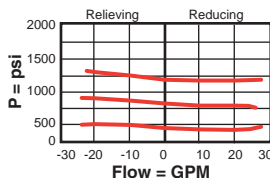
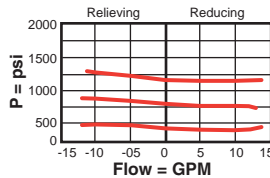
PVDA-8

PVFA-8

PVHA-8

PVJA-8

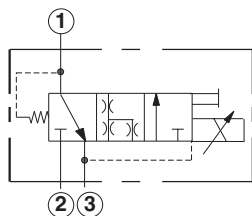
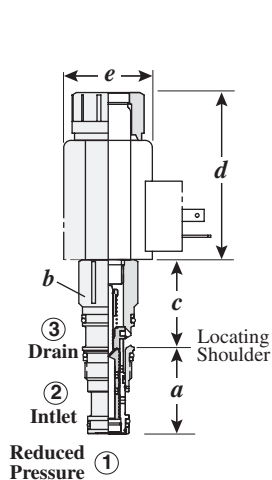
Regulated Pressure with T-8A Pilot Stage Installed



- Maximum operating pressure = 5000 psi
- Control pilot flow = PVDA-8: 7 to 10 in³/min., PVFA-8: 10 to 15 in³/min., PVHA-8, PVJA-8: 15 to 20 in³/min.
- Maximum pressure at port 3 should be limited to 3000 psi.
- Pressure on the drain (port 4) is directly additive to the valve setting at a 1:1 ratio and should not exceed 5000 psi.
- Maximum inlet pressure is determined by the bias spring. The D spring is limited to 2000 psi maximum differential pressure and the W spring is limited to 5000 psi maximum inlet pressure.
- With the -8 control option, the main stage valve should first be installed to the correct torque value. The T-8A pilot control valve should then be installed into the main stage valve to its required torque value.

PV ★ A - 8 ★ ★

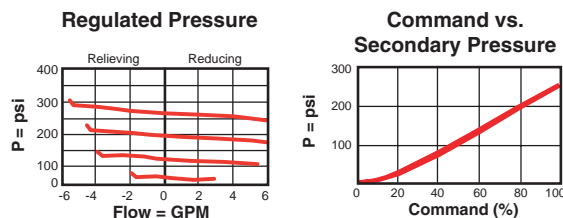
Nominal Capacity	Control	Minimum Control Pressure	Seal
D 10 GPM	8 T-8A Cavity in hex body for pilot operation (Pilot valve to be ordered separately)	D 25 psi	N Buna-N
F 20 GPM		W 100 psi	V Viton
H 40 GPM			
J 80 GPM			



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c	d	e (dia.)	
5 GPM	PRDL - MDN	T-11A	1.38	7/8"	1.50	2.76	1.47	30/35

Performance Curves

PRDL



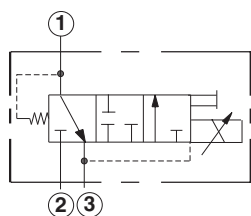
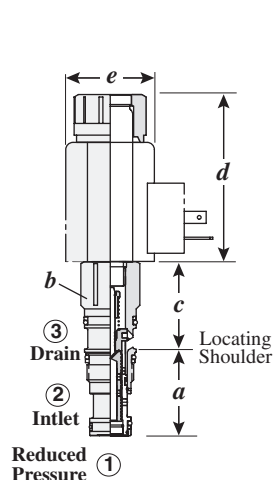
- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 20 in³/min. at deadhead.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- For optimum performance, an amplifier with current sensing and adjustable dither should be used. Dither should be adjustable between 100 - 250 Hz.

PRDL - MDN

Nominal Capacity	Control	Operating Range	Seal
L 5 GPM	M Manual Override (Standard)	D 50 - 500 psi	N Buna-N
		E 25 - 250 psi	V Viton
		S 10 - 100 psi	

NOTE: Coil must be ordered separately. Use 12V DC or 24V DC (Series 770-***) coils only. See page 167.

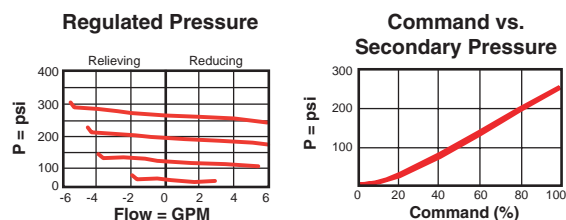
ELECTRO-PROPORTIONAL, DIRECT ACTING WITH LOW LEAKAGE



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (lb. ft.)
			a	b	c	d	e (dia.)	
5 GPM	PRDP - MDN	T-11A	1.38	7/8"	1.50	2.76	1.47	30/35

Performance Curves

PRDP



- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 2 in³/min. at deadhead.
- Pressure at port 3 is directly additive to the valve setting at a 1:1 ratio and should not exceed 3000 psi.
- For optimum performance, an amplifier with current sensing and adjustable dither should be used. Dither should be adjustable between 100 - 250 Hz.

PRDP - MDN

Nominal Capacity	Control	Operating Range	Seal
P 5 GPM	M Manual Override (Standard)	D 50 - 500 psi E 25 - 250 psi	N Buna-N V Viton

NOTE: Coil must be ordered separately. Use 12V DC or 24V DC (Series 770-***) coils only. See page 167.

NOTES