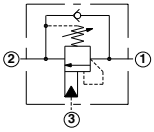
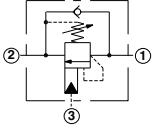
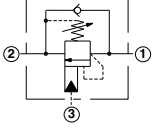
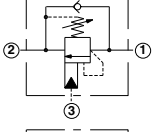
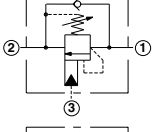
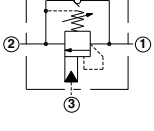
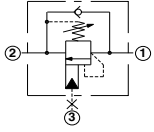
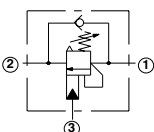
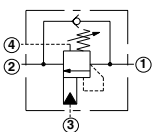
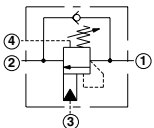
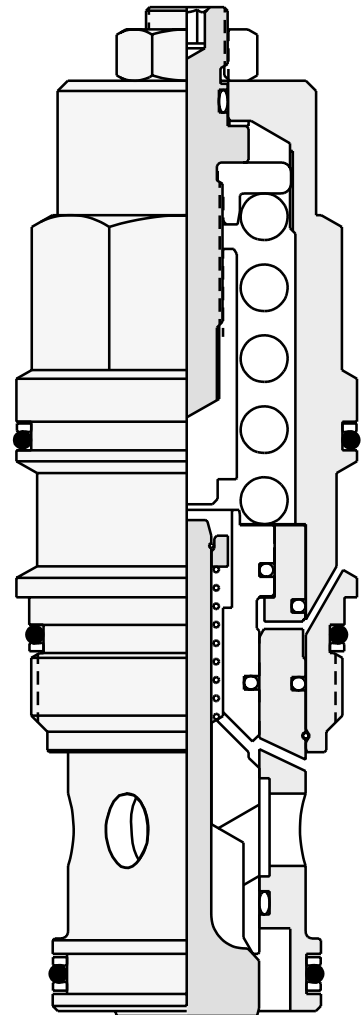


Counterbalance Cartridge Valves

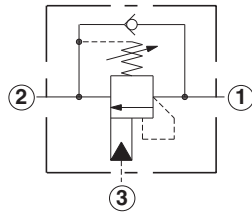
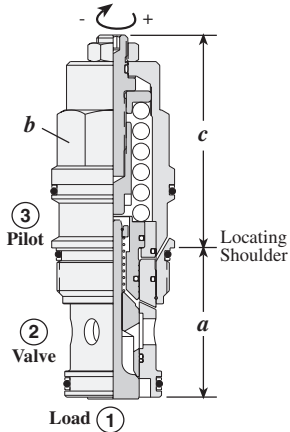
	<i>Cartridge Type</i>	<i>Page</i>
	Standard, 4000 psi Maximum Setting	48
	Standard, 5000 psi Maximum Setting	49
	Semi-Restrictive, 4000 psi Maximum Setting	50
	Semi-Restrictive, 5000 psi Maximum Setting	51
	Restrictive, 4000 psi Maximum Setting	52
	Restrictive, 5000 psi Maximum Setting	53
	Without Pilot Assist, 3 Port Cavity	54
	Atmospherically Referenced, 3 Port Cavity	55
	Vented, 4000 psi Maximum Setting	56
	Vented, 6000 psi Maximum Setting	57



Counterbalance Valves

STANDARD, 4000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CBCA - LHN	T - 11A	1.38	7/8"	1.97	2.19	30/35
30 GPM	CBEA - LHN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
60 GPM	CBGA - LHN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160
120 GPM	CBIA - LHN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

Performance Curves

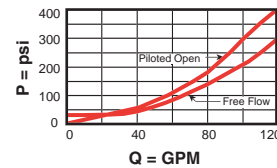
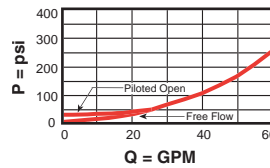
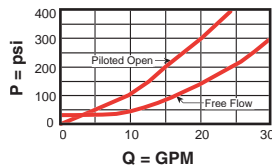
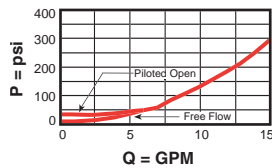
CBC*

CBE*

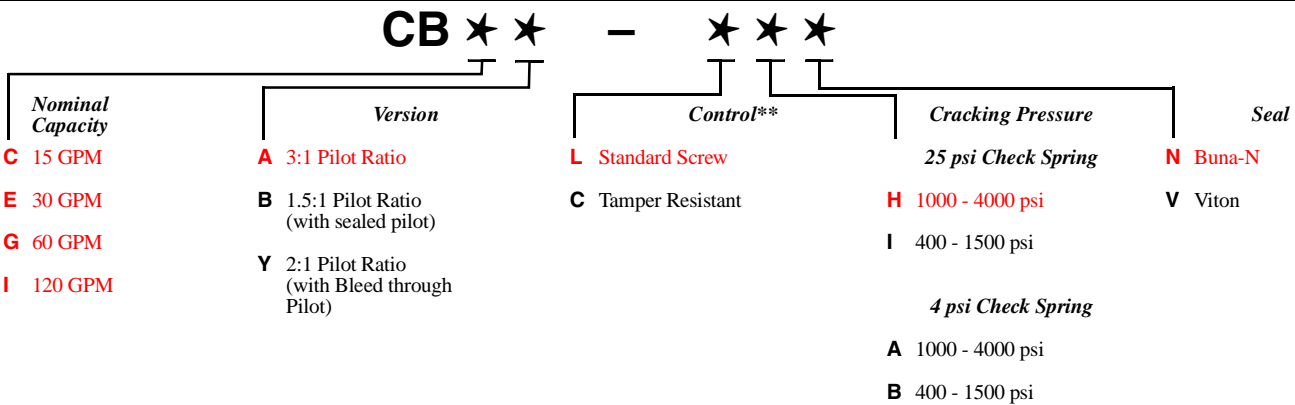
CBG*

CBI*

Free Flow and Pilot Open Pressure Drop



- Load holding to 3000 psi with 4000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.



Adjustment Range Options:
A and H are standard set at 3000 psi.
I and B are standard set at 1000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

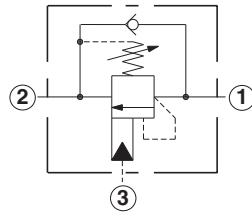
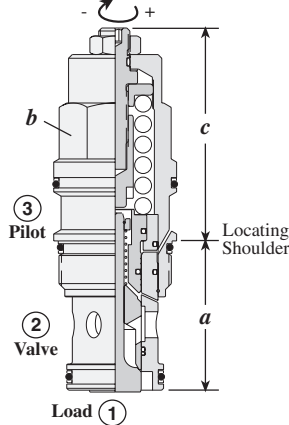
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Counterbalance Valves

STANDARD, 5000 PSI MAXIMUM SETTING

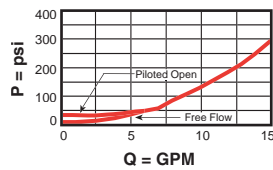
Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns



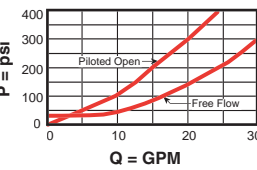
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CBCG – LJN	T - 11A	1.38	7/8"	1.97	2.19	30/35
30 GPM	CBEG – LJN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
60 GPM	CBGG – LJN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160
120 GPM	CBIG – LJN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

Performance Curves

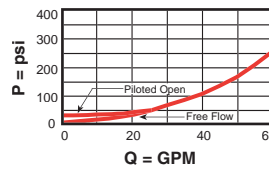
CBC*



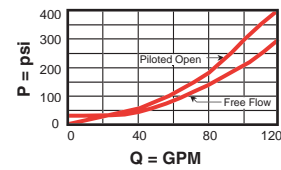
CBE*



CBG*



CBI*



Free Flow and Pilot Open Pressure Drop

- Load holding to 3850 psi with 5000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.

CB ★★

- ★★ ★

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
C 15 GPM	G 4.5:1 Pilot Ratio	L Standard Screw	25 psi Check Spring	N Buna-N
E 30 GPM	H 10:1 Pilot Ratio	C Tamper Resistant	J 2000 - 5000 psi	V Viton
G 60 GPM	L 2.3:1 Pilot Ratio (with sealed pilot)		K 1000 - 2500 psi	
I 120 GPM			4 psi Check Spring	
			C 2000 - 5000 psi	
			D 1000 - 2500 psi	

Adjustment Range Options:
J and C are standard set at 3000 psi.
K and D are standard set at 2000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

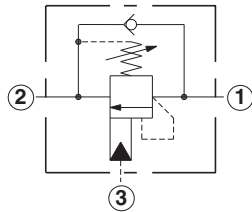
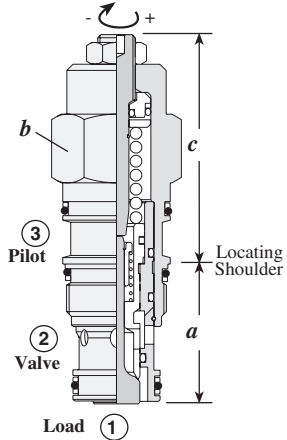
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Counterbalance Valves

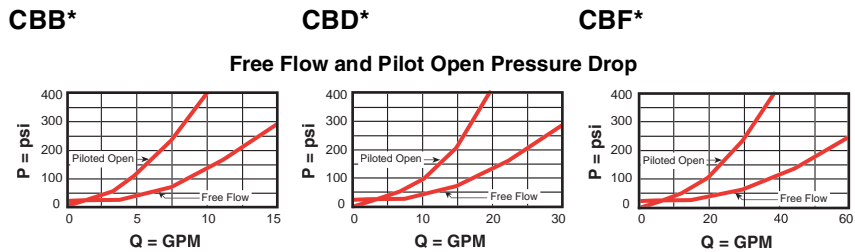
SEMI-RESTRICTIVE, 4000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns

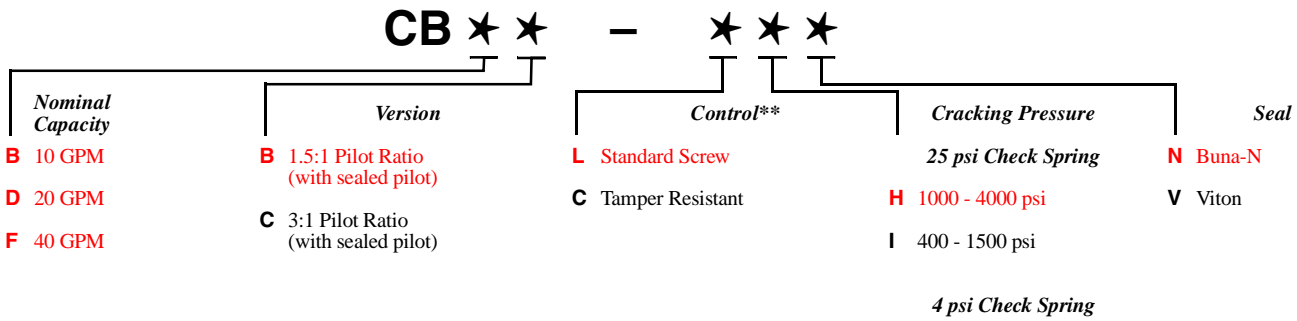


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
10 GPM	CBBC - LHN	T - 11A	1.38	7/8"	1.97	2.19	30/35
20 GPM	CBDC - LHN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
40 GPM	CBFC - LHN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160

Performance Curves



- Load holding to 3000 psi with 4000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.



** See page 162 for information on Control Options

Adjustment Range Options:
A and H are standard set at 3000 psi.
I and B are standard set at 1000 psi.
Customer may specify setting.

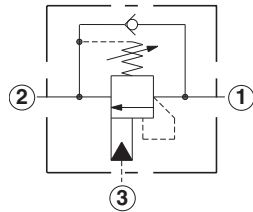
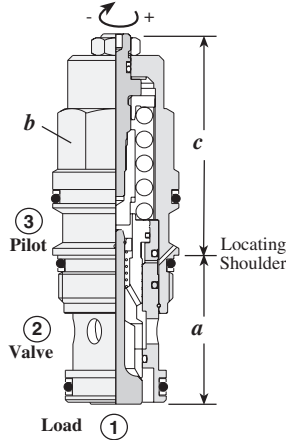
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Counterbalance Valves

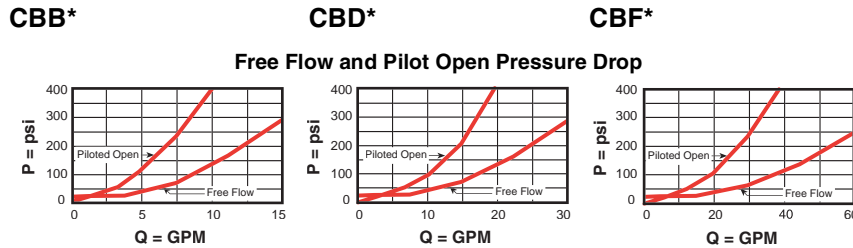
SEMI-RESTRICTIVE, 5000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns

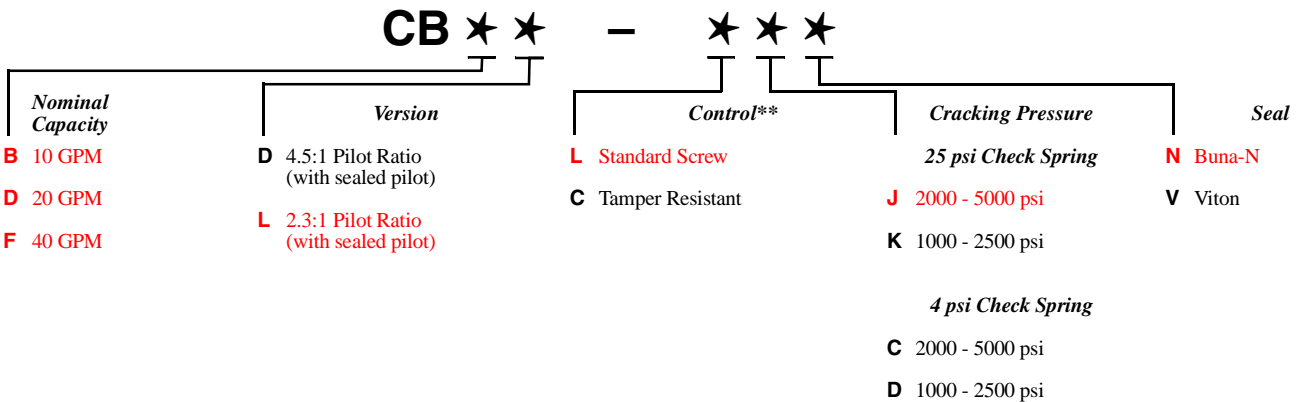


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
10 GPM	CBBD – LJN	T - 11A	1.38	7/8"	1.97	2.19	30/35
20 GPM	CBDD – LJN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
40 GPM	CBFD – LJN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160

Performance Curves



- Load holding to 3850 psi with 5000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.



Adjustment Range Options:
J and C are standard set at 3000 psi.
K and D are standard set at 2000 psi.
Customer may specify setting.

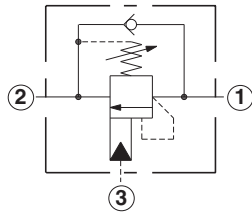
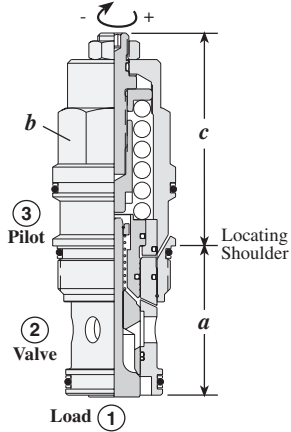
** See page 162 for information on Control Options

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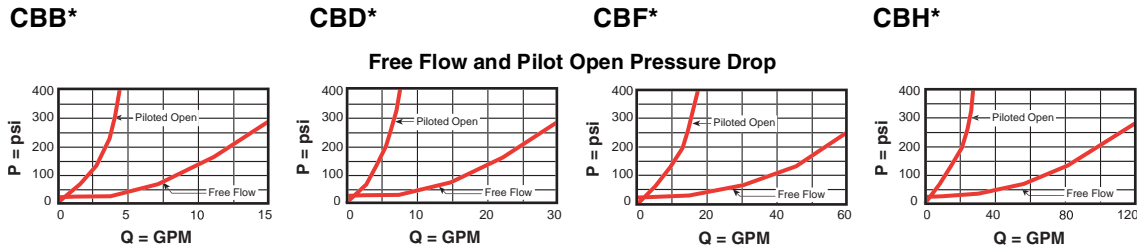
RESTRICTIVE, 4000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
5 GPM	CBBA – LHN	T - 11A	1.38	7/8"	1.97	2.19	30/35
8 GPM	CBDA – LHN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
15 GPM	CBFA – LHN	T - 17A	1.81	1 1/4"	2.74	3.31	150/160
20 GPM	CBHA – LHN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

Performance Curves



- Restrictive valves have no relief capacity other than as a thermal relief.
- Load holding to 3075 psi with 4000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.

CB ★ ★ - ★ ★ ★

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
B 5 GPM	A 3:1 Pilot Ratio (with sealed pilot)	L Standard Screw	25 psi Check Spring	N Buna-N
D 8 GPM	Available in CBBY only	C Tamper Resistant	H 1000 - 4000 psi	V Viton
F 15 GPM			I 400 - 1500 psi	
H 20 GPM	Y 2:1 Pilot Ratio (with Bleed through Pilot)		4 psi Check Spring	
			A 1000 - 4000 psi	
			B 400 - 1500 psi	

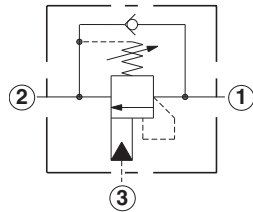
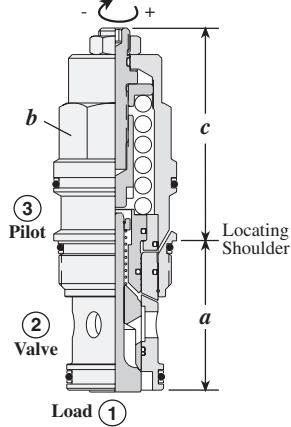
Adjustment Range Options:
A and H are standard set at 3000 psi.
I and B are standard set at 1000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

Counterbalance Valves

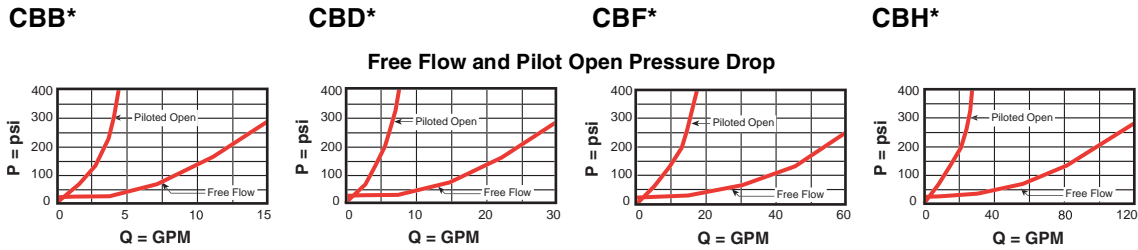
RESTRICTIVE, 5000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3 3/4 Turns



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
5 GPM	CBBG – LJN	T - 11A	1.38	7/8"	1.97	2.19	30/35
8 GPM	CBDG – LJN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
15 GPM	CBFG – LJN	T - 17A	1.81	1 1/4"	2.75	3.31	150/160
20 GPM	CBHG – LJN	T - 19A	2.50	1 5/8"	3.50	4.09	350/375

Performance Curves



- Restrictive valves have no relief capacity other than as a thermal relief.
- Load holding to 3850 psi with 5000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the back pressure.

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
B 5 GPM	G 4.5:1 Pilot Ratio (with sealed pilot)	L Standard Screw	25 psi Check Spring	N Buna-N
D 8 GPM		C Tamper Resistant		V Viton
F 15 GPM			4 psi Check Spring	
H 20 GPM				C 2000 - 5000 psi
			D 1000 - 2500 psi	

Adjustment Range Options:
J and C are standard set at 3000 psi.
K and D are standard set at 2000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

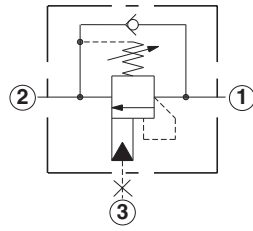
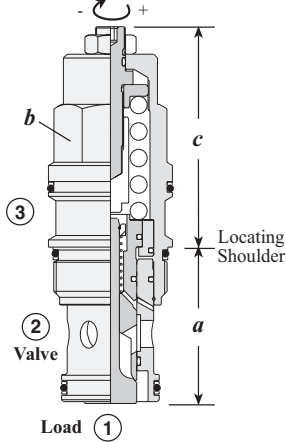
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Counterbalance Valves

WITHOUT PILOT ASSIST, 3 PORT CAVITY

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 3-3/4 Turns



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CCCA – LAN	T - 11A	1.38	7/8"	1.97	2.19	30/35
30 GPM	CCEA – LAN	T - 2A	1.38	1 1/8"	2.38	2.50	45/50
60 GPM	CCGA – LAN	T - 17A	1.81	1 1/4"	2.74	3.31	150/160
120 GPM	CCIA – LAN	T - 19A	2.50	1 5/8"	3.52	4.09	350/375

Performance Curves

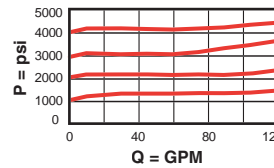
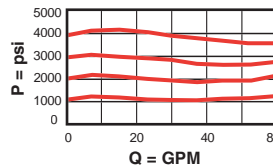
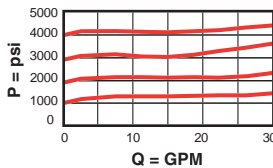
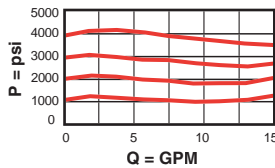
CCCA

CCEA

CCGA

CCIA

Typical Relief Characteristics



- Maximum operating pressure = 4000 psi
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Back pressure at port 2 is directly additive to the relief setting of the valve.

CC * A - * * *

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
C 15 GPM	A Standard	L Standard Screw	25 psi Check Spring	N Buna-N
E 30 GPM		C Tamper Resistant	H 1000 - 4000 psi	V Viton
G 60 GPM			I 400 - 1500 psi	
I 120 GPM			4 psi Check Spring	
			A 1000 - 4000 psi	
			B 400 - 1500 psi	

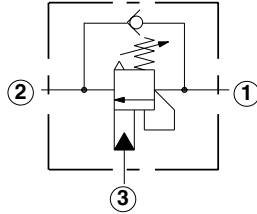
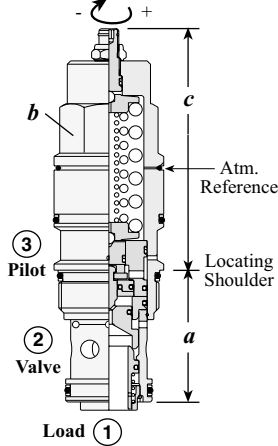
Adjustment Range Options:
A and H are standard set at 3000 psi.
I and B are standard set at 1000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

Counterbalance Valves

ATMOSPHERICALLY REFERENCED, 3 PORT CAVITY

Turn screw clockwise to reduce setting and release load.
Complete Adjustment 4 Turns



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CACA – LHN	T - 11A	1.38	7/8"	2.91	3.16	30/35
30 GPM	CAEA – LHN	T - 2A	1.38	1 1/8"	3.29	3.54	45/50
60 GPM	CAGA – LHN	T - 17A	1.81	1 1/4"	3.75	3.97	150/160
120 GPM	CAIA – LHN	T - 19A	2.50	1 5/8"	4.58	4.96	350/375

Performance Curves

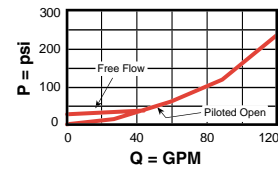
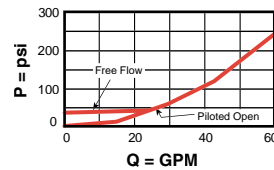
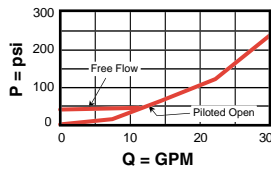
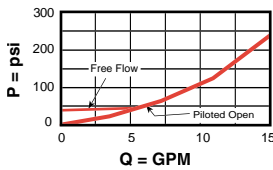
CAC*

CAE*

CAG*

CAI*

Free Flow and Pilot Open Pressure Drop



- Load holding to 3000 psi with 4000 psi valve setting for CA*A, CA*K; 4600 psi with 6000 psi valve setting for CA*G, CA*L.
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Free flow check cracking pressure = 40 psi
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.

CA** - ***

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
C 15 GPM	A 3:1 Pilot Ratio	L Standard Screw	A and K Pilot Ratios	N Buna-N
E 30 GPM	G 5:1 Pilot Ratio	C Tamper Resistant	H 1000 - 4000 psi	V Viton
G 60 GPM	K 1:1 Pilot Ratio		I 400 - 1500 psi	
I 120 GPM	L 2:1 Pilot Ratio			
			G and L Pilot Ratios	
			F 1000 - 2500 psi	
			G 2000 - 6000 psi	

Adjustment Range Options:
H is standard set at 3000 psi.
I is standard set at 1000 psi.
F is standard set at 2000 psi.
G is standard set at 4000 psi.
Customer may specify setting.

** See page 162 for information on Control Options

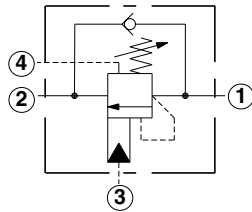
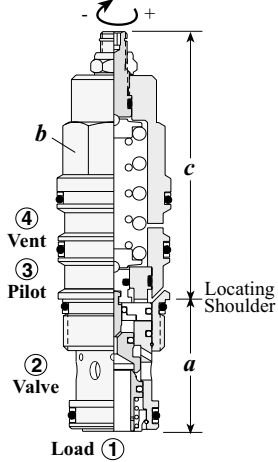
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Counterbalance Valves

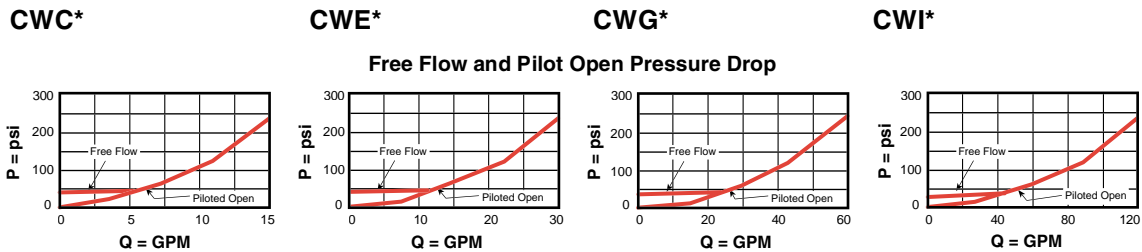
VENTED, 4000 PSI MAXIMUM SETTING

Turn screw clockwise to reduce setting and release load. Complete Adjustment 4 Turns

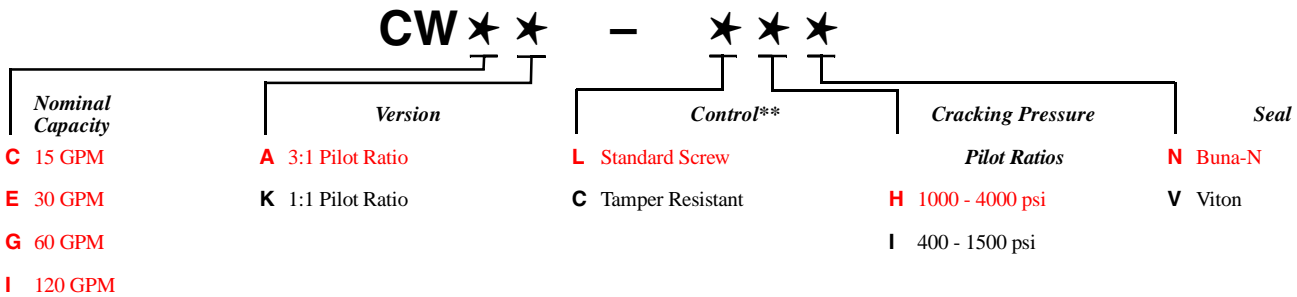


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CWCA- LHN	T - 21A	1.38	7/8"	2.91	3.16	30/35
30 GPM	CWEA- LHN	T - 22A	1.38	1 1/8"	3.29	3.54	45/50
60 GPM	CWGA- LHN	T - 23A	1.81	1 1/4"	3.75	3.97	150/160
120 GPM	CWIA - LHN	T - 24A	2.50	1 5/8"	4.58	4.78	350/375

Performance Curves



- Load holding to 3000 psi with 4000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Free flow check cracking pressure = 40 psi
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.



** See page 162 for information on Control Options

Adjustment Range Options:
H is standard set at 3000 psi.
I is standard set at 1000 psi.
Customer may specify setting.

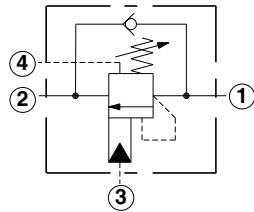
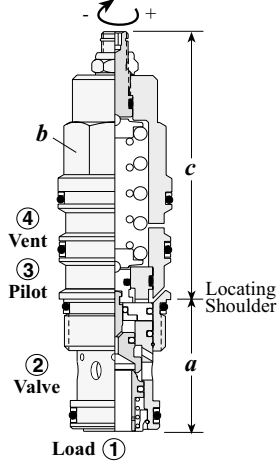
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Counterbalance Valves

VENTED, 6000 PSI MAXIMUM SETTING

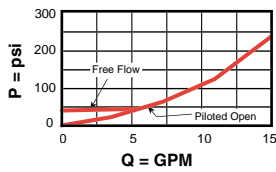
Turn screw clockwise to reduce setting and release load. Complete Adjustment 4 Turns



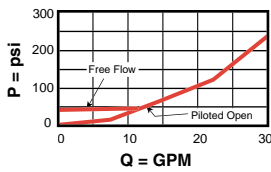
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (lb. ft.)
			a	b	L	C	
15 GPM	CWCG- LFN	T - 21A	1.38	7/8"	2.91	3.16	30/35
30 GPM	CWEG- LFN	T - 22A	1.38	1 1/8"	3.29	3.54	45/50
60 GPM	CWGG- LFN	T - 23A	1.81	1 1/4"	3.75	3.97	150/160
120 GPM	CWIG - LFN	T - 24A	2.50	1 5/8"	4.58	4.78	350/375

Performance Curves

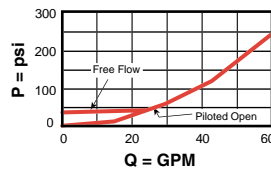
CWC*



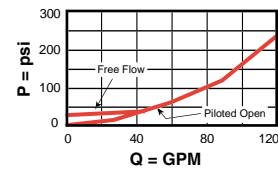
CWE*



CWG*



CWI*



Free Flow and Pilot Open Pressure Drop

- Load holding to 4600 psi with 6000 psi valve setting
- Maximum valve leakage at reseal = 5 drops/min.
- Reseat exceeds 85% of set pressure
- Factory pressure setting established at 2 in³/min.
- Free flow check cracking pressure = 40 psi
- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.

CW ★ ★

Nominal Capacity	Version	Control**	Cracking Pressure Pilot Ratios	Seal
C 15 GPM	G 5:1 Pilot Ratio	L Standard Screw	F 1000 - 2500 psi	N Buna-N
E 30 GPM	L 2:1 Pilot Ratio	C Tamper Resistant	G 2000 - 6000 psi	V Viton
G 60 GPM				
I 120 GPM				

Adjustment Range Options:
 F is standard set at 2000 psi.
 G is standard set at 4000 psi.
 Customer may specify setting.

** See page 162 for information on Control Options

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