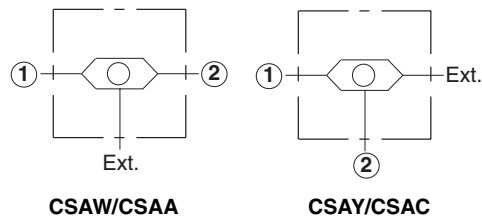
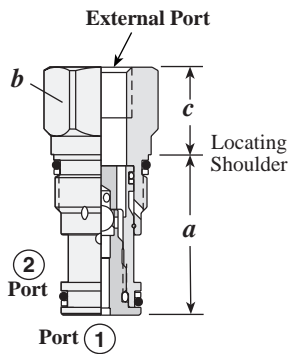


SINGLE BALL SHUTTLE



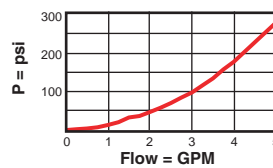
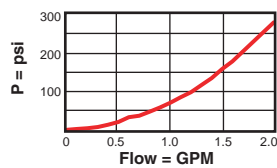
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
1.25 GPM	CSAW – BXN	T - 162A	1.22	3/4"	.81	25/30
1.25 GPM	CSAY – BXN	T - 162A	1.22	3/4"	.81	25/30
2.5 GPM	CSAA – BXN	T - 13A	1.38	7/8"	1.19	30/35
2.5 GPM	CSAC – BXN	T - 13A	1.38	7/8"	1.19	30/35

Performance Curves

CSAW/CSAY

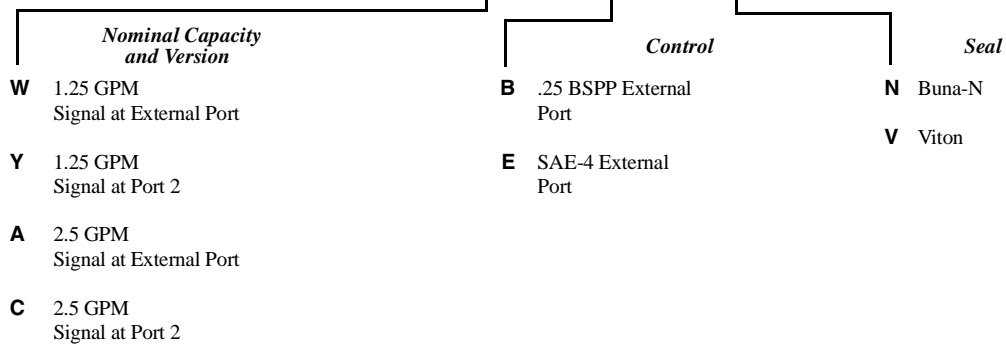
CSAA/CSAC

Typical Pressure Drop

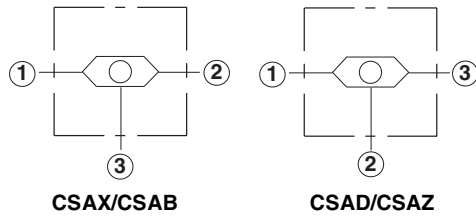
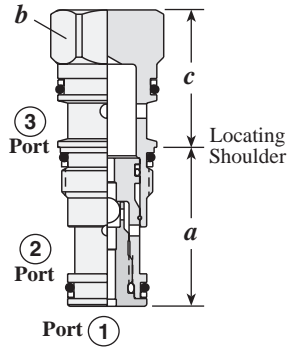


- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 5 drops/min.

CS A * - * X *



SINGLE BALL SHUTTLE VALVE WITH SIGNAL AT PORT 3 OR PORT 2



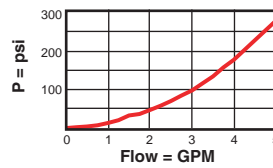
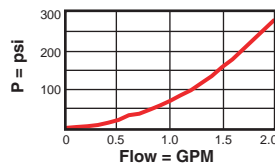
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
1.25 GPM	CSAX – XXN	T - 163A	1.22	3/4"	1.25	25/30
1.25 GPM	CSAZ – XXN	T - 163A	1.22	3/4"	1.25	25/30
2.5 GPM	CSAB – XXN	T - 11A	1.38	7/8"	1.17	30/35
2.5 GPM	CSAD – XXN	T - 11A	1.38	7/8"	1.19	30/35

Performance Curves

CSAX/CSAZ

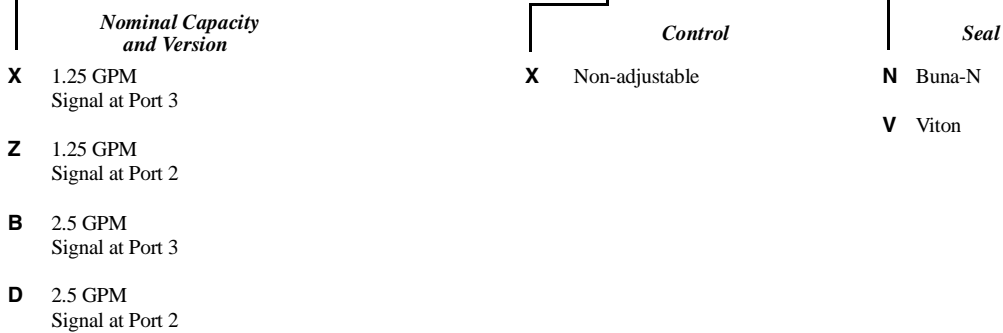
CSAB/CSAD

Typical Pressure Drop



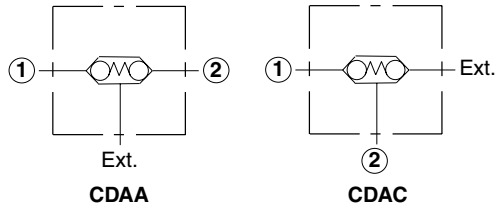
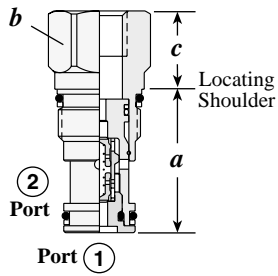
- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 5 drops/min.

CS A ★ - X X ★



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BACK-TO-BACK CHECK/SHUTTLE

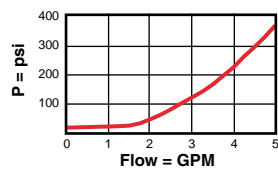


Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
2.5 GPM	CDAA – BBN	T - 13A	1.38	7/8"	1.19	30/35
2.5 GPM	CDAC – BBN	T - 13A	1.38	7/8"	.75	30/35

Performance Curves

CDAA/CDAC

Typical Pressure Drop

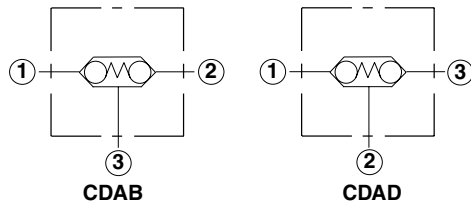
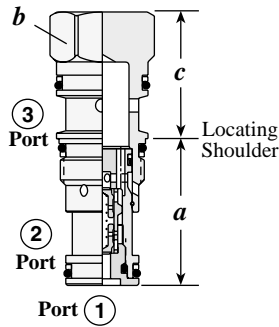


- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 5 drops/min.
- The back-to-back checks do not provide a means of lowering a signal. They will trap a high signal if the load pressures drop to a lower pressure. Some means of bleeding off the signal should be provided.
- 15 psi check.

CD A ★ – ★ B ★

<p><i>Nominal Capacity and Version</i></p> <p>A 2.5 GPM Signal at External Port</p> <p>C 2.5 GPM Signal at Port 2</p>	<p><i>Control</i></p> <p>B .25 BSPP External Port</p> <p>E SAE-4 External Port</p>	<p><i>Seal</i></p> <p>N Buna-N</p> <p>V Viton</p>
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BACK-TO-BACK CHECK/SHUTTLE

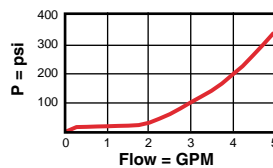


Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
2.5 GPM	CDAB - XBN	T - 11A	1.38	7/8"	1.19	30/35
2.5 GPM	CDAD - XBN	T - 11A	1.38	7/8"	1.19	30/35

Performance Curves

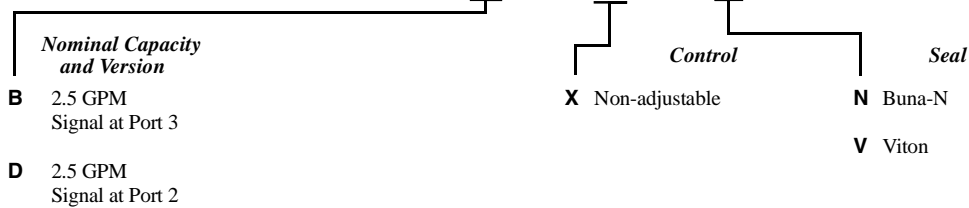
CDAB/CDAD

Typical Pressure Drop



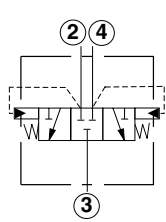
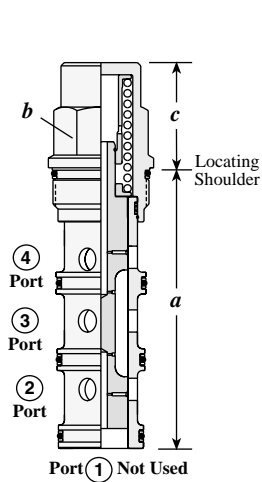
- Maximum operating pressure = 5000 psi
- Maximum valve leakage = 5 drops/min.
- The back-to-back checks do not provide a means of lowering a signal. They will trap a high signal if the load pressures drop to a lower pressure. Some means of bleeding off the signal should be provided.
- 15 psi check

CD A ★ - X B ★



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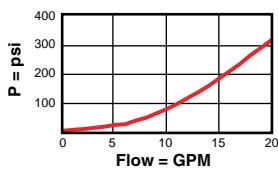
LOW SIDE, 3-POSITION, HOT OIL SHUTTLE VALVE



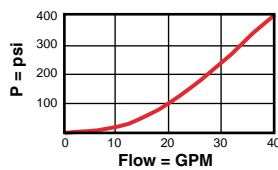
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
15 GPM	DSCH – XHN	T - 31A	3.35	7/8"	1.19	30/35
30 GPM	DSEH – XHN	T - 32A	3.63	1 1/8"	1.31	45/50
60 GPM	DSGH – XHN	T - 33A	4.50	1 1/4"	1.63	150/160
120 GPM	DSIH – XHN	T - 34A	5.50	1 5/8"	2.00	350/375

Performance Curves

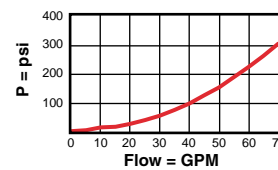
DSCH



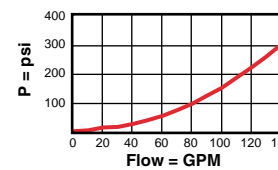
DSEH



DSGH



DSIH



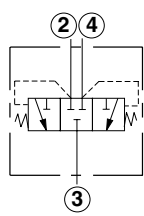
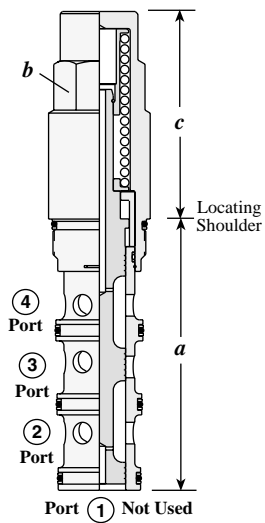
Typical Pressure Drop

- Maximum operating pressure = 5000 psi
- Pilot flow = DSCH, DSEH: 23 in³/min., DSGH, DSIH: 46 in³/min. (Port 2 and 4 to Port 3).
- Note: Low shift values can potentially result in charge pump pressure alone inadvertently shifting the valve. Use care when selecting shift pressure.
- Pressures on Ports 2 and 4 must equalize before reversed shift can take place.

DS ★ H – X ★ ★

Nominal Capacity	Control	Shifting Pressure	Seal
C 15 GPM	X Non-adjustable	G 150 psi	N Buna-N
E 30 GPM		H 200 psi	V Viton
G 60 GPM			
I 120 GPM			

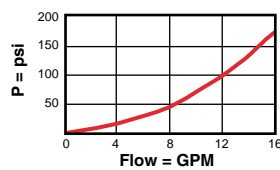
HIGH SIDE, 3-POSITION, SHUTTLE VALVE



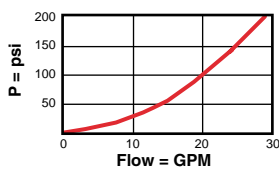
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
15 GPM	DSCS - XCN	T - 31A	3.35	7/8"	1.44	30/35
30 GPM	DSES - XCN	T - 32A	3.63	1 1/8"	1.63	45/50
60 GPM	DSGS - XCN	T - 33A	4.50	1 1/4"	2.83	150/160
120 GPM	DSIS - XCN	T - 34A	5.50	1 5/8"	4.21	350/375

Performance Curves

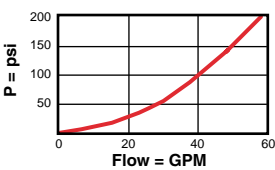
DSCS



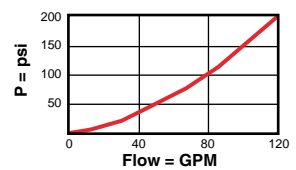
DSES



DSGS



DSIS



Pressure Drop, Port 2 or 4 to Port 3

- Maximum operating pressure = 5000 psi
- Maximum valve leakage = DSCS: 2 in³/min. at 1000 psi, DSES: 3 in³/min. at 1000 psi, DSGS: 4 in³/min. at 1000 psi, DSIS: 5 in³/min. at 1000 psi

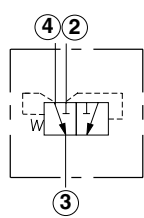
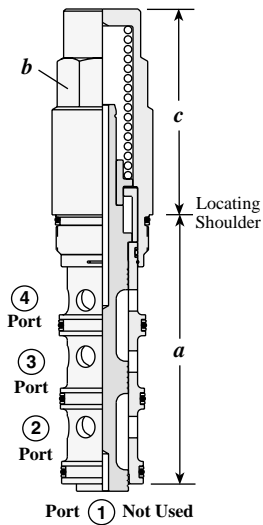
DS * S - X * *

Nominal Capacity	Control	Shifting Pressure	Seal
C 15 GPM	X Non-adjustable	C 30 psi	N Buna-N
E 30 GPM		E 75 psi	V Viton
G 60 GPM		F 100 psi	
I 120 GPM		G 150 psi	

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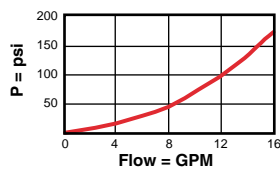
SPRING OFFSET, 2-POSITION, HIGH SIDE SHUTTLE



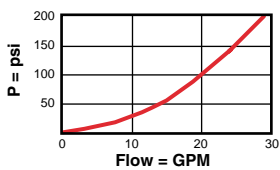
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque lb. ft.
			a	b	c	
15 GPM	DSCO – XCN	T - 31A	3.35	7/8"	1.44	30/35
30 GPM	DSEO – XCN	T - 32A	3.63	1 1/8"	1.63	45/50
60 GPM	DSGO – XCN	T - 33A	4.50	1 1/4"	2.83	150/160
120 GPM	DSIO – XCN	T - 34A	5.50	1 5/8"	4.21	350/375

Performance Curves

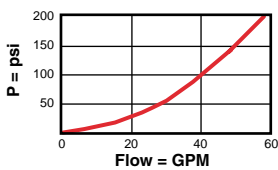
DSCO



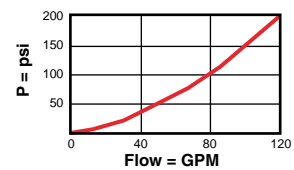
DSEO



DSGO



DSIO



Pressure Drop, Port 4 or 2 to Port 3

- Maximum operating pressure = 5000 psi
- Minimum pilot pressure required to shift valve = C Range: 30 psi, E Range: 75 psi

DS * O - X * *

Nominal Capacity	Control	Shifting Pressure	Seal
C 15 GPM	X Non-adjustable	C 30 psi	N Buna-N
E 30 GPM		E 75 psi	V Viton
G 60 GPM			
I 120 GPM			