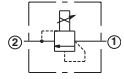
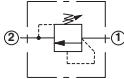
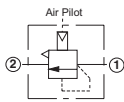
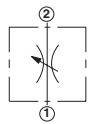
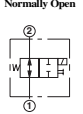
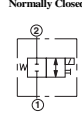
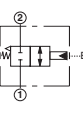
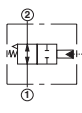
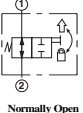
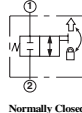
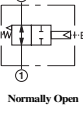
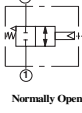
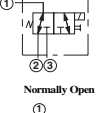
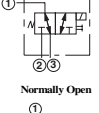
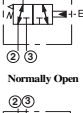
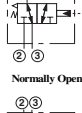
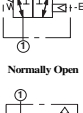
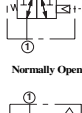
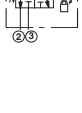
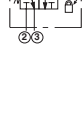
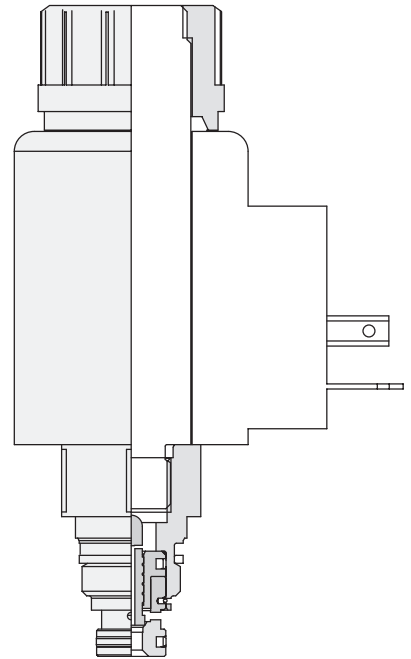
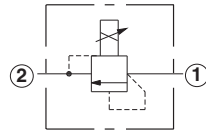
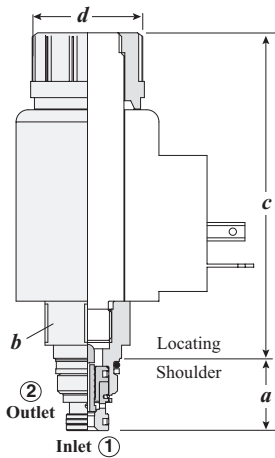


Pilot Control Valves

	<i>Cartridge Type</i>	<i>Page</i>
	Electro-Proportional, Relief Valve, Pilot Capacity	142
	Direct Acting, Relief Valve, Pilot Capacity	143
	Air Controlled, Direct Acting, Relief Valve, Pilot Capacity	144
	Flow Control, Fully Adjustable Needle Valve, Pilot Capacity	145
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Closed</p>  </div> </div>	2-Way, Solenoid Operated, Directional Spool Valve, Pilot Capacity	146
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Closed</p>  </div> <div style="text-align: center;"> <p>Normally Open</p>  </div> </div>	2-Way, Hydraulically Operated, Directional Spool Valve, Pilot Capacity	147
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Closed</p>  </div> </div>	2-Way, Manually Operated, Directional Spool Valve, Pilot Capacity	148
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Closed</p>  </div> </div>	2-Way, Air Operated, Directional Spool Valve, Pilot Capacity	149
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Open</p>  </div> </div>	3-Way, 2-Position, Solenoid Operated, Directional Spool Valve, Pilot Capacity	150
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Open</p>  </div> </div>	3-Way, 2-Position, Hydraulically Operated, Directional Spool Valve, Pilot Capacity	151
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Open</p>  </div> </div>	3-Way, 2-Position, Air Operated, Directional Spool Valve, Pilot Capacity	152
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Normally Open</p>  </div> <div style="text-align: center;"> <p>Normally Open</p>  </div> </div>	3-Way, 2-Position, Manually Operated, Directional Spool Valve, Pilot Capacity	153



ELECTRO-PROPORTIONAL, RELIEF VALVE, PILOT CAPACITY



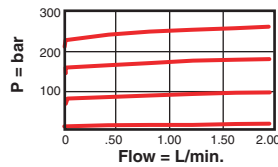
Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c***		d	
1 L/min.	RBAP - XAN	T - 8A	18,8	22,2	130,0	85,1	37,3	35 - 40

***An additional 50,8 mm clearance is needed for coil installation and removal.

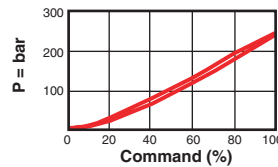
Performance Curves

RBAP

Constant Command Varying Flow

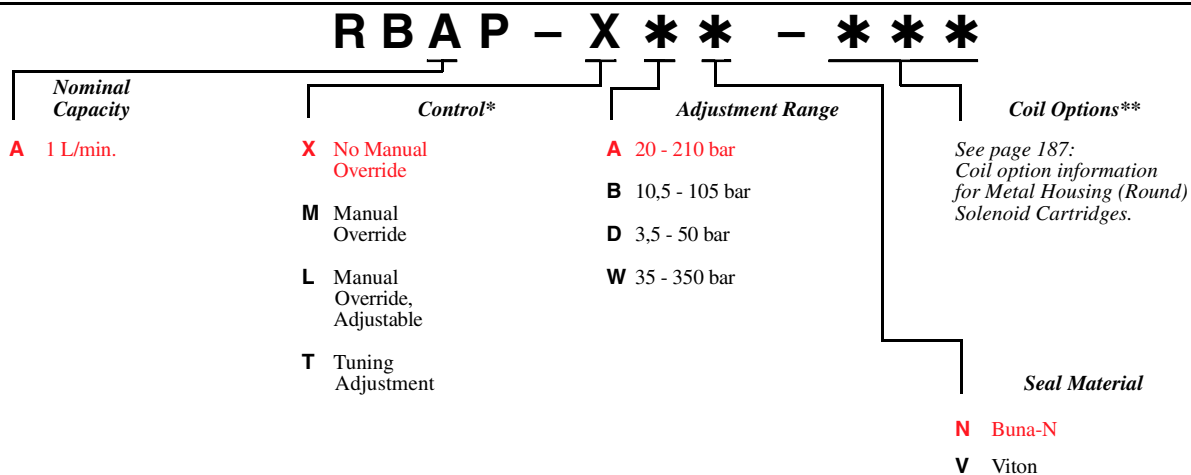


Pressure vs. Command Flow 0,37 L/min.



- Maximum operating pressure = 350 bar.
- Maximum valve leakage at reseat = 25 cc/min.
- Low leakage levels in the closed position. Reseat > 85% of set pressure.
- Hysteresis with dither <4% and with DC input <8%.
- Linearity with dither <2% and repeatability with dither <2%.
- Recommended dither frequency = 140 Hz.
- For optimum performance, an amplifier with current sensing and adjustable dither should be used. Dither should be adjustable between 100 - 250 Hz.
- The L control allows one to manually adjust the valve in case of an electrical failure. The L control also allows offsetting the pressure range. For instance, if an A range valve is offset to a setting of 100 bar with no analog input signal, the new maximum will be 300 bar.
- This electro-proportional cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2 port pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION

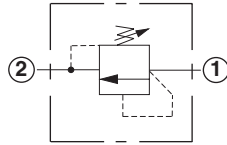
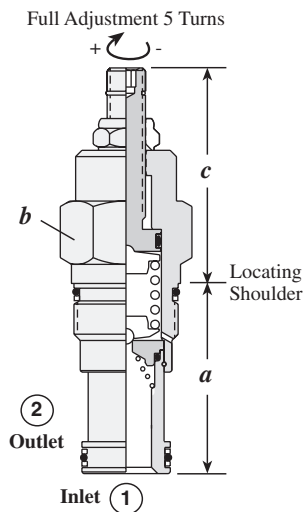


* See page 178 for information on Control Options

** Consult the Sun website for complete information on Spool Configurations, the full line of Coil Options and Embedded Amplifier Coils/Controllers.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

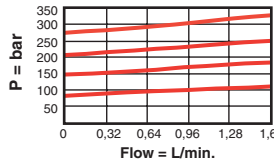
DIRECT ACTING, RELIEF VALVE, PILOT CAPACITY



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions						Installation Torque (Nm)
			a	b	c				
					L	C	K	O	
1 L/min.	RBAC – LAN	T - 10A	39,7	22,2	51,0	55,0	58,0	58,0	45 - 50
2 L/min.	RBAA – LAN	T - 3A	47,8	28,6	54,0	56,0	61,0	61,0	60 - 70
10 L/min.	RBAE – LAN	T - 8A	19,1	22,2	60,5	62,7	67,6	67,6	35 - 40

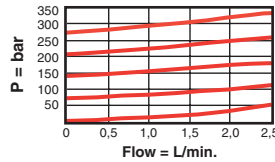
Performance Curves

RBAC

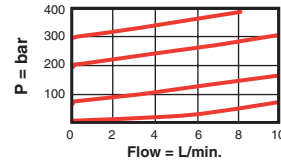


RBAA

Typical Pressure Rise

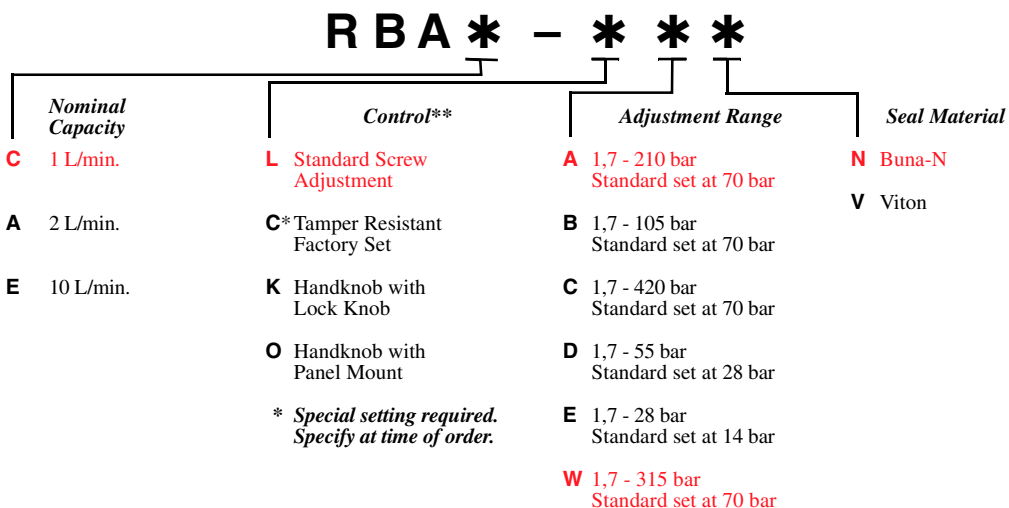


RBAE



- Maximum operating pressure = 350 bar.
- Typical response time 2 ms.
- Maximum valve leakage at reseal at 24 cSt = RBAC, RBAA, 0,3 cc/min.; RBAE: 1 cc/min.
- Back pressure on the tank port (port 2) is directly additive to the pressure setting at port 1 (inlet) at a 1:1 ratio to the valve setting.
- RBAE: This cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION

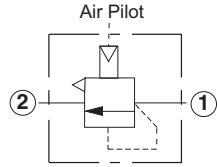
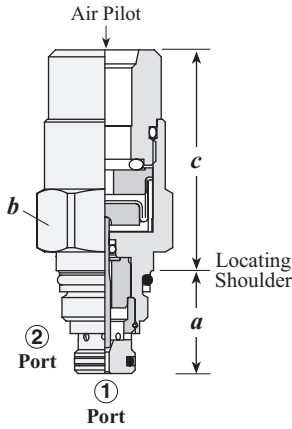


** See page 178 for information on Control Options

Consult the Sun website for our most recent and complete information on the full Corrosion Resistant line of products.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

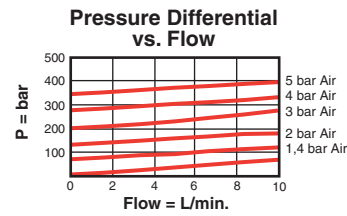
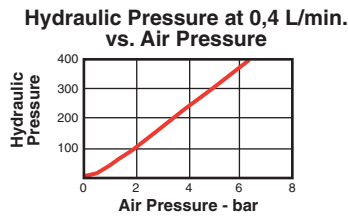
AIR CONTROLLED, DIRECT ACTING, RELIEF VALVE, PILOT CAPACITY



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
10 L/min.	RBAR – DWN	T - 8A	19,1	22,2	40,9	35 - 40
10 L/min.	RBAR – DYN	T - 8A	19,1	28,6	40,9	35 - 40

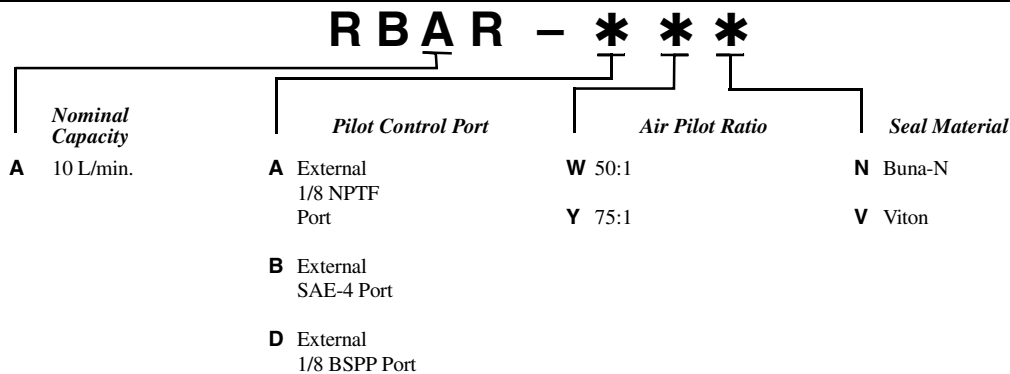
Performance Curves

RBAR



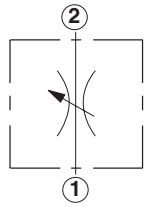
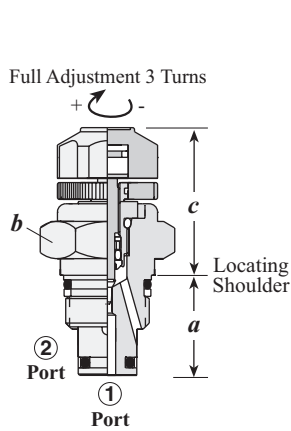
- Amplifies air pilot pressure to hydraulic by a nominal 50:1 or 75:1 ratio.
- Maximum air pilot pressure = 10,5 bar.
- Minimum operational air pressure = 1,4 bar.
- Reseat = > 90% of amplified set pressure.
- Maximum amplified operating pressure = 350 bar.
- Maximum valve leakage at reseal at 24 cSt = 1 cc/min.
- Ports 1 and 2 may be pressurized to 350 bar.
- Back pressure at port 2 increases the relief setting by .43 multiplier.
- This cartridge utilizes the Sun T-8A 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

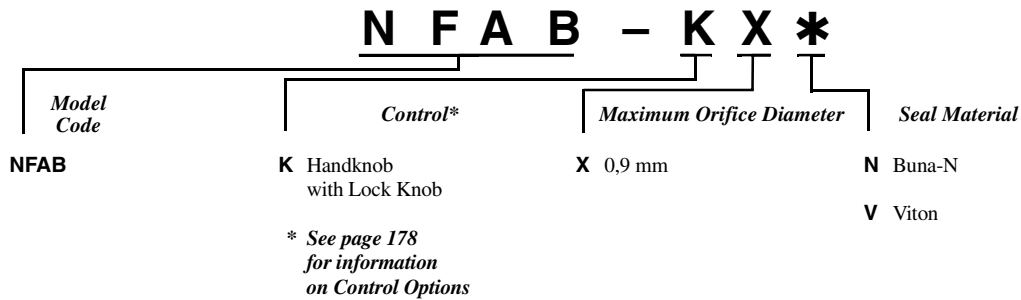
FLOW CONTROL, FULLY ADJUSTABLE NEEDLE VALVE, PILOT CAPACITY



Maximum Orifice Diameter	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
0,9 mm	NFAB – KXN	T - 8A	19,1	22,2	27,9	35 - 40

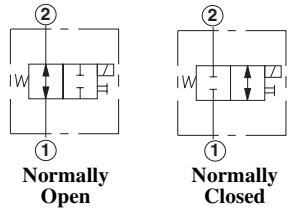
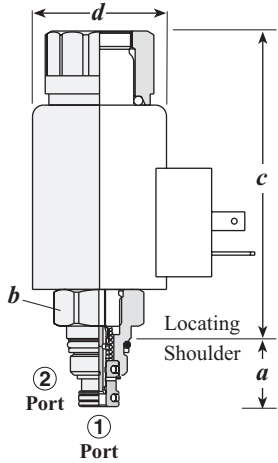
- Maximum operating pressure = 350 bar.
- Leakage rate at shutoff is less than .07 cc/min.
- Effective orifice size = 0,9 mm.
- Ports 1 and 2 may be pressured to 350 bar.
- Needle adjusts from fully closed to fully open in three complete turns resulting in extremely fine resolution.
- Adjustment mechanism equipped with locking device to maintain consistent orifice diameter/flow rate.
- This cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun’s main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

2-WAY, SOLENOID OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

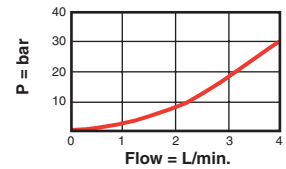


Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)	
			a	b	c***			d
					M,X,S	D,L,T		
1 L/min.	DAAL-***	T - 8A	18,5	22,2	83,6	108,7	38,0	35 - 40

***An additional 50,8 mm clearance is needed for coil installation and removal.

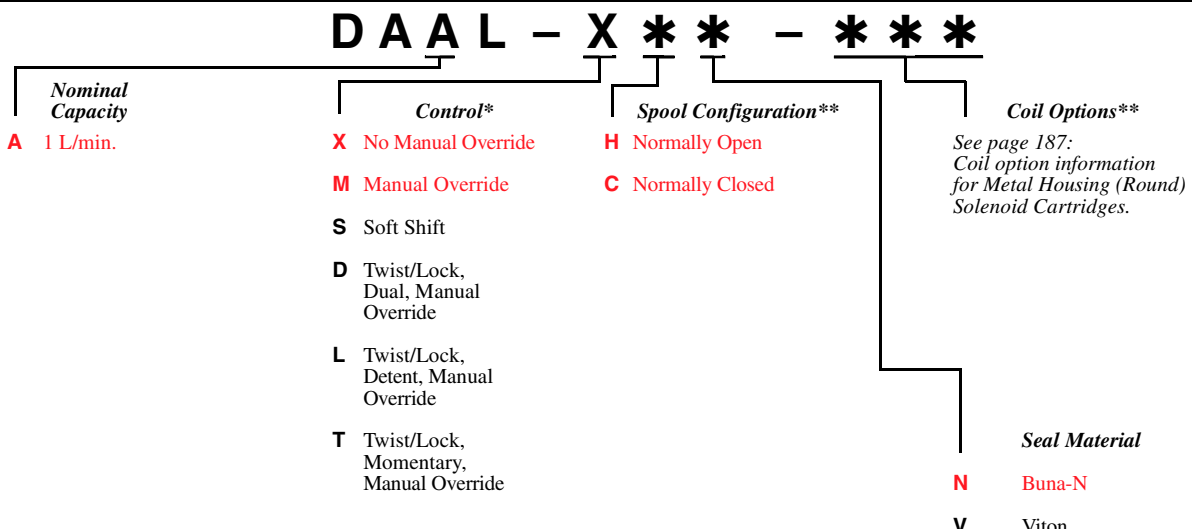
Performance Curves

DAAL-X, DAAL-S****
Pressure Differential vs. Flow



- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = < 0,6 cc/min. at 350 bar.
- Response time - typical = 50 ms.
- Manual override force requirement = 6,6 kg at 100 bar at port 1.
- Manual override stroke = 2,5 mm.
- Maximum switching frequency = 15000 cycles/hr.
- Viscosity range = 10 - 600 cSt.
- This valve is direct actuated and requires no minimum hydraulic pressure for operation.
- The solenoid tube assembly is fatigue rated for 350 bar service.
- The soft shift feature results in significantly longer response time over Sun's standard solenoid. Response time is dependant on flow, pressure, coil voltage, oil viscosity and ambient temperature. Typical response time ranges from 150 ms to 300 ms.
- A wide variety of coil termination and voltage options are available. See Sun website: Products: Accessories: Coils.

OPTION ORDERING INFORMATION

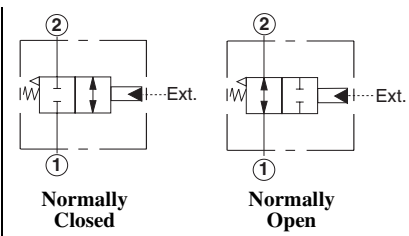
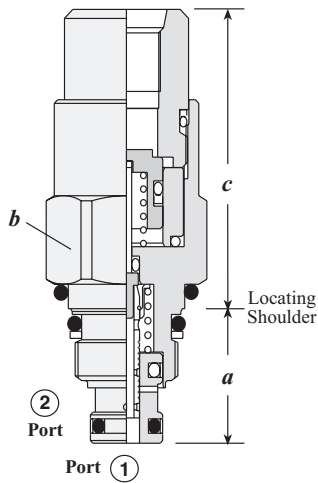


* See page 178 for information on Control Options

** Consult the Sun website for complete information on Spool Configurations, the full line of Coil Options and Embedded Amplifier Coils/Controllers.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

2-WAY, HYDRAULICALLY OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

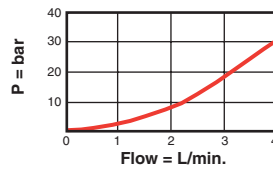


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
1 L/min.	DAAH – DCN	T - 8A	19,1	22,2	52,5	35 - 40

Performance Curves

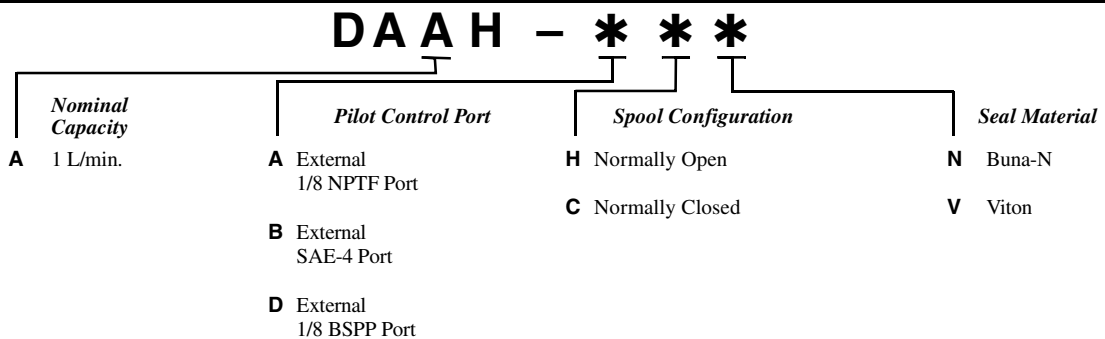
DAAH

Pressure Differential vs. Flow



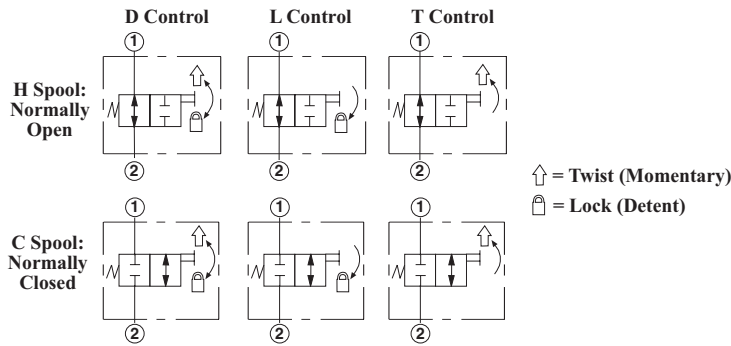
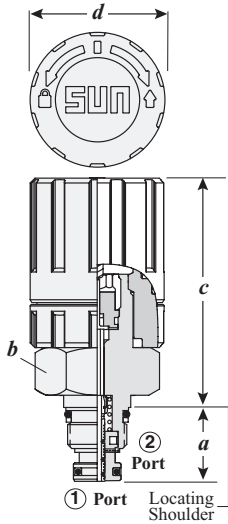
- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = 0,3 cc/min.
- The minimum pilot pressure required to operate the valve is determined by the following formula: pilot pressure = 6 bar + pressure at port 1 times 0,023. This results in a pilot pressure range of 6 to 14 bar.
- All ports will accept 350 bar including the pilot control port.
- The preferred flow path through the valve is port 2 to port 1.
- This cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

2-WAY, MANUALLY OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

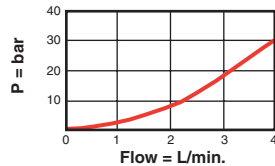


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c	d	
1 L/min.	DAAM - LCN	T-8A	18,5	28,6	61,0	48,3	35 - 40

Performance Curves

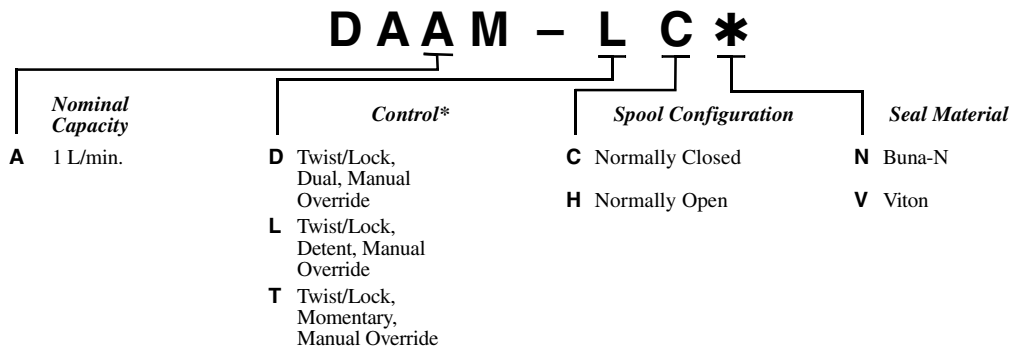
DAAM

Pressure Differential vs. Flow



- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = 0,6 cc/min. at 350 bar.
- This valve is designed for intermittent use such as a manual override. The manual control assembly has a mechanical life expectancy of about 10,000 cycles.
- The preferred flow path through the valve is port 2 to port 1.
- The dual-operation control option D allows the operator to either shift the valve momentarily by twisting the knob clockwise or shift it into a mechanically detented position by twisting counter-clockwise.
- The detent/lock control option L allows the operator to shift the valve into a mechanically detented position by twisting the knob counter-clockwise. This detented position will be maintained until the operator twists the knob clockwise and allows the valve to return to its normal position.
- The momentary/twist control option T allows the operator to momentarily shift the valve by twisting the knob clockwise and releasing. Once released, the valve returns to its normal position.
- This cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

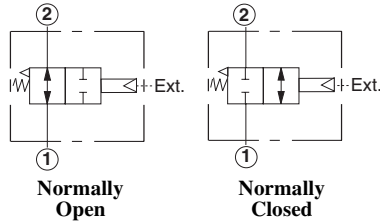
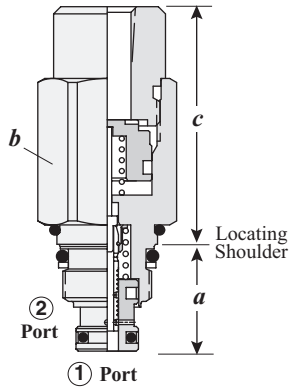
OPTION ORDERING INFORMATION



* See page 178 for information on Control Options

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

2-WAY, AIR OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

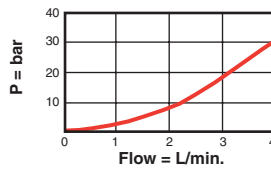


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
1 L/min.	DAAP-PCN	T - 8A	19,1	22,2	42,2	35 - 40

Performance Curves

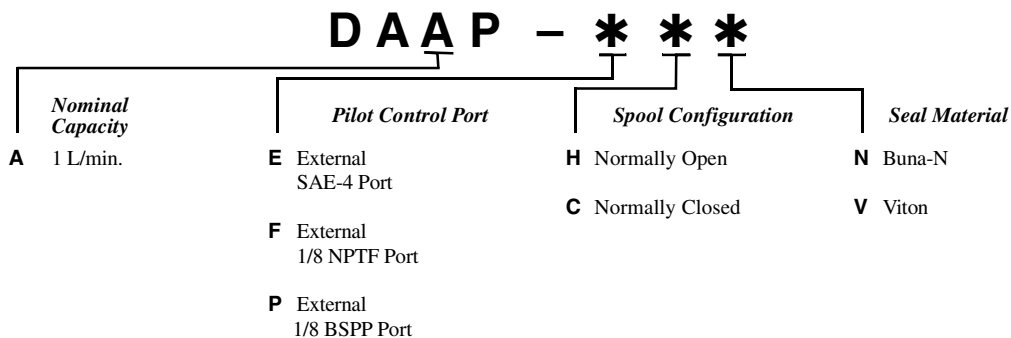
DAAP

Pressure Differential vs. Flow



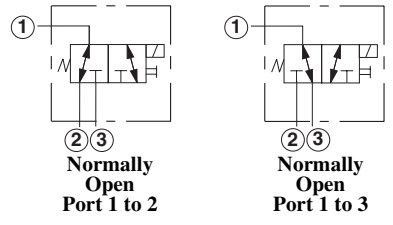
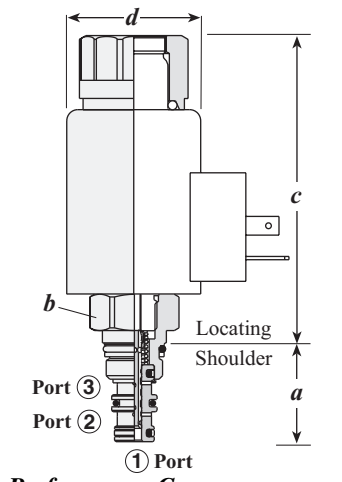
- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = 0,6 cc/min. at 350 bar.
- The minimum pilot pressure required to operate the valve is determined by the following formula: pilot pressure = 6 bar + pressure at port 1 divided by 100. This results in a pilot pressure range of 1,4 to 5 bar.
- All ports will accept 350 bar with the exception of the pilot port which accepts 35 bar maximum.
- The preferred flow path through the valve is port 2 to port 1.
- This cartridge utilizes the Sun T-8A, 2 port cavity making it the ideal choice to use in conjunction with Sun's main stage pilot or vent-to-operate cartridges. Separate pilot lines are eliminated and only one cavity needs to be machined to accommodate both the control and primary function. Note: All 2-position, 2-way, pilot stage control cartridges utilize the same cavity and are physically interchangeable. Functionality is the only consideration.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

3-WAY, 2-POSITION, SOLENOID OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY



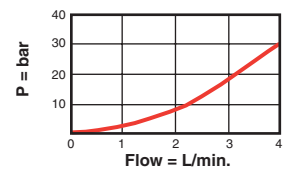
Nominal Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c***	d	
1 L/min.	DBAL - ***	T - 9A	27,4	22,2	83,5	94,7	35 - 40

***An additional 50,8 mm clearance is needed for coil installation and removal.

Performance Curves

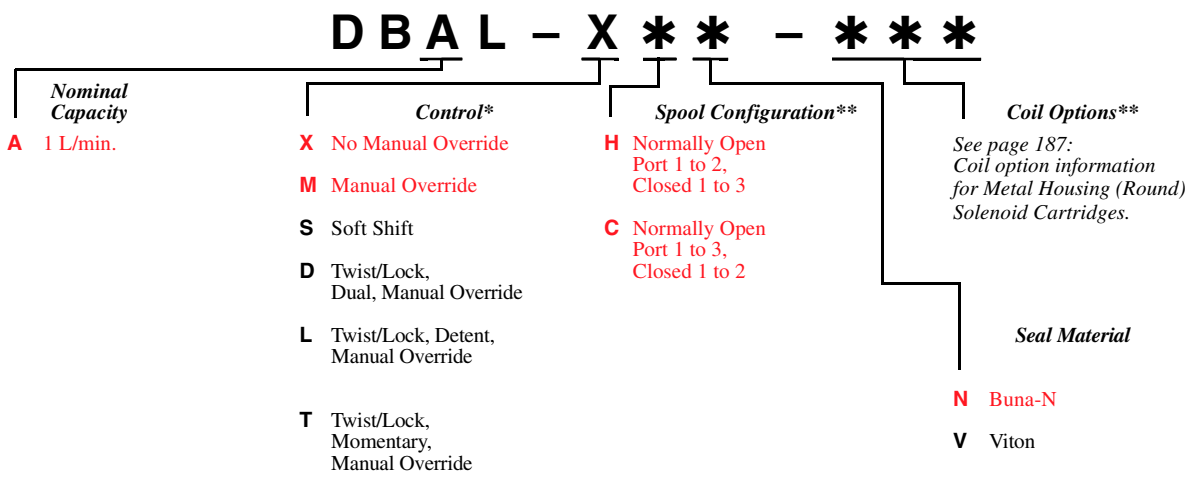
DBAL-X**, DBAL-S**

Pressure Differential vs. Flow



- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24cSt = 0,6 cc/min. at 350 bar.
- Response time - typical = 50 ms.
- Manual override force requirement = 6,6 kg at 100 bar at port 1.
- Manual override stroke = 2,5 mm.
- Maximum switching frequency = 15000 cycles/hr.
- Viscosity range = 10 - 600 cSt.
- This valve is direct actuated and requires no minimum hydraulic pressure for operation.
- The solenoid tube assembly is fatigue rated for 350 bar service.
- The soft shift feature results in significantly longer response time over Sun's standard solenoid. Response time is dependant on flow, pressure, coil voltage, oil viscosity and ambient temperature. Typical response time ranges from 150 ms to 300 ms.
- A wide variety of coil termination and voltage options are available. See Sun website: Products: Accessories: Coils.

OPTION ORDERING INFORMATION



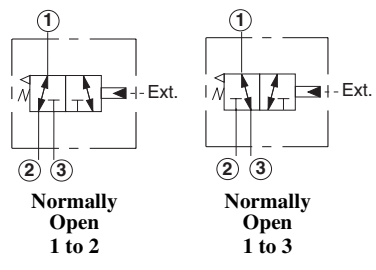
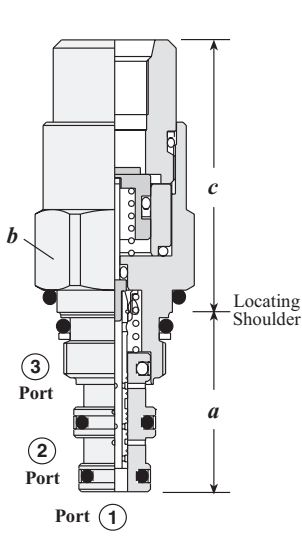
* See page 178 for information on Control Options

** Consult the Sun website for complete information on Spool Configurations, the full line of Coil Options and Embedded Amplifier Coils/Controllers.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.



3-WAY, 2-POSITION, HYDRAULICALLY OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

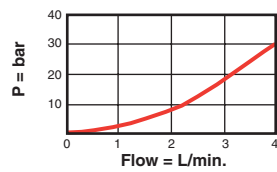


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
1 L/min.	DBAH - DCN	T - 9A	27,7	22,2	42,1	35 - 40

Performance Curves

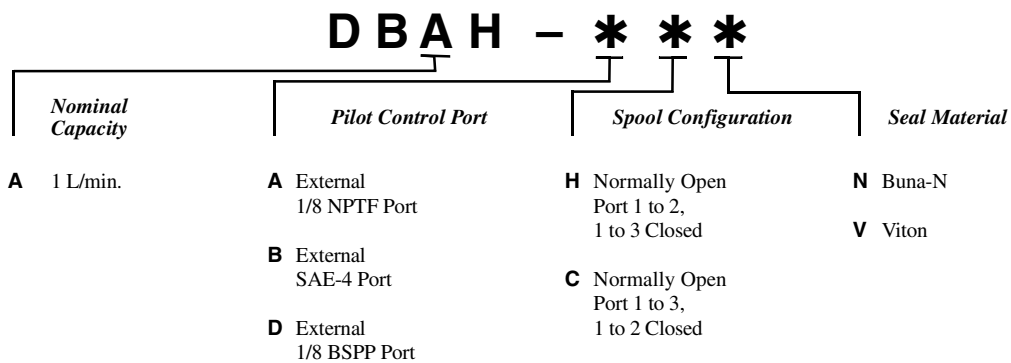
DBAH

Pressure Differential vs. Flow



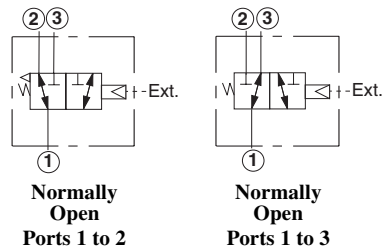
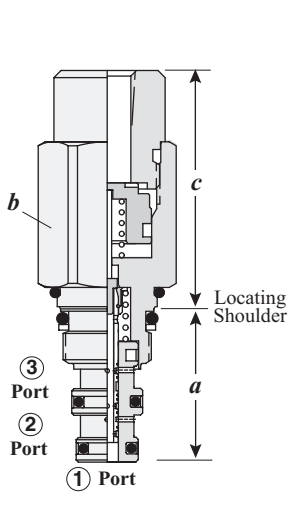
- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24cSt = 0,6 cc/min. at 350 bar.
- The minimum pilot pressure required to operate the valve is determined by the following formula: pilot pressure = 6 bar + pressure at port 1 times 0,023. This results in a pilot pressure range of 6 to 14 bar.
- All ports will accept 350 bar including the pilot control port.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

3-WAY, 2-POSITION, AIR OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

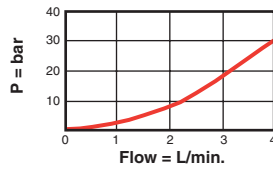


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c	
1 L/min.	DBAP-PCN	T - 9A	27,7	22,2	42,1	35 - 40

Performance Curves

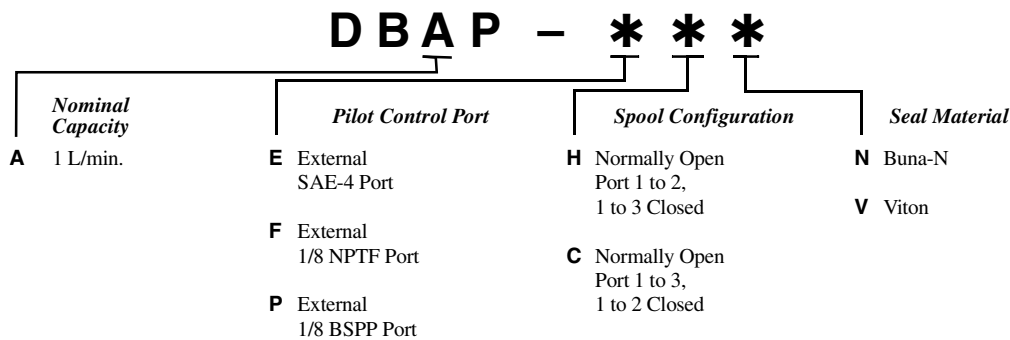
DBAP

Pressure Differential vs. Flow



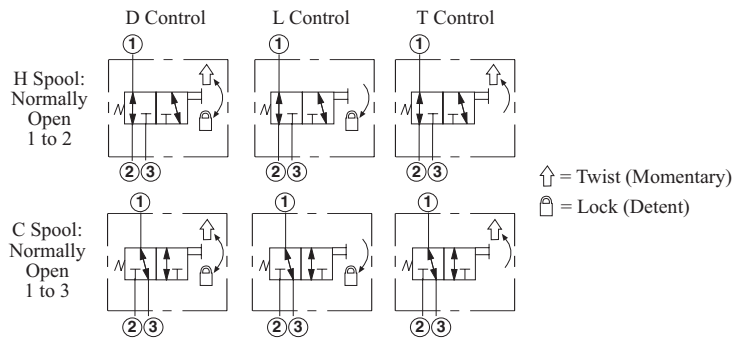
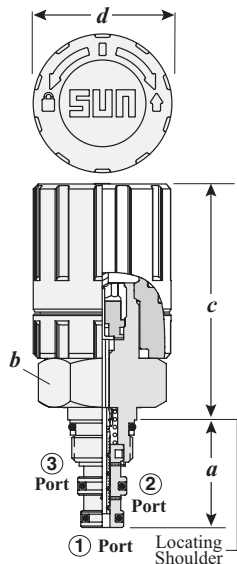
- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = 0,6 cc/min. at 350 bar.
- The minimum pilot pressure required to operate the valve is determined by the following formula: pilot pressure = 6 bar + pressure at port 1 divided by 100. This results in a pilot pressure range of 1,4 to 5 bar.
- All ports will accept 350 bar with the exception of the pilot port which accepts 35 bar maximum.

OPTION ORDERING INFORMATION



Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

3-WAY, 2-POSITION, MANUALLY OPERATED, DIRECTIONAL SPOOL VALVE, PILOT CAPACITY

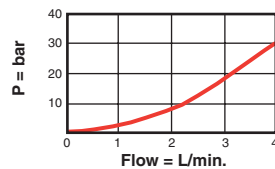


Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c	d	
1 L/min.	DBAM - LCN	T - 9A	27,4	22,2	61,0	35,6	35 - 40

Performance Curves

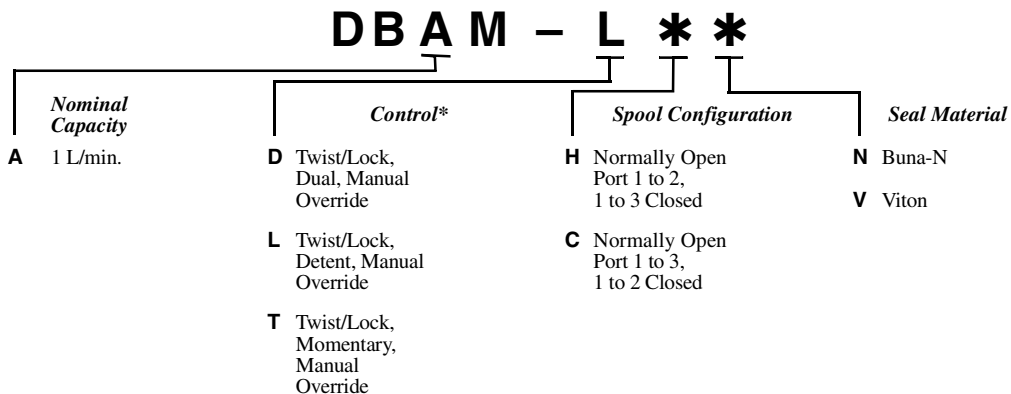
DBAM

Pressure Differential vs. Flow



- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24 cSt = 0,6 cc/min. at 350 bar.
- This valve is designed for intermittent use such as a manual override. The manual control assembly has a mechanical life expectancy of about 10,000 cycles.
- The dual-operation control option D allows the operator to either shift the valve momentarily by twisting the knob clockwise or shift it into a mechanically detented position by twisting counter-clockwise.
- The detent/lock control option L allows the operator to shift the valve into a mechanically detented position by twisting the knob counter-clockwise. This detented position will be maintained until the operator twists the knob clockwise and allows the valve to return to its normal position.
- The momentary/twist control option T allows the operator to momentarily shift the valve by twisting the knob clockwise and releasing. Once released, the valve returns to its normal position.

OPTION ORDERING INFORMATION



* See page 178 for information on Control Options

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