Pilot Control Valves

<table>
<thead>
<tr>
<th>Cartridge Type</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electro-Proportional, Relief Valve, Pilot Capacity</td>
<td>142</td>
</tr>
<tr>
<td>Direct Acting, Relief Valve, Pilot Capacity</td>
<td>143</td>
</tr>
<tr>
<td>Air Controlled, Direct Acting, Relief Valve, Pilot Capacity</td>
<td>144</td>
</tr>
<tr>
<td>Flow Control, Fully Adjustable Needle Valve, Pilot Capacity</td>
<td>145</td>
</tr>
<tr>
<td>2-Way, Solenoid Operated, Directional Spool Valve, Pilot Capacity</td>
<td>146</td>
</tr>
<tr>
<td>2-Way, Hydraulically Operated, Directional Spool Valve, Pilot Capacity</td>
<td>147</td>
</tr>
<tr>
<td>2-Way, Manually Operated, Directional Spool Valve, Pilot Capacity</td>
<td>148</td>
</tr>
<tr>
<td>2-Way, Air Operated, Directional Spool Valve, Pilot Capacity</td>
<td>149</td>
</tr>
<tr>
<td>3-Way, 2-Position, Solenoid Operated, Directional Spool Valve, Pilot Capacity</td>
<td>150</td>
</tr>
<tr>
<td>3-Way, 2-Position, Hydraulically Operated, Directional Spool Valve, Pilot Capacity</td>
<td>151</td>
</tr>
<tr>
<td>3-Way, 2-Position, Air Operated, Directional Spool Valve, Pilot Capacity</td>
<td>152</td>
</tr>
<tr>
<td>3-Way, 2-Position, Manually Operated, Directional Spool Valve, Pilot Capacity</td>
<td>153</td>
</tr>
</tbody>
</table>
Pilot Control Valves

ELECTRO-PROPORTIONAL, RELIEF VALVE, PILOT CAPACITY

- 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

<table>
<thead>
<tr>
<th>Nominal Capacity</th>
<th>Control*</th>
<th>Adjustment Range</th>
<th>Coil Options**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M Manual Override</td>
<td>B 10.5 - 105 bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L Manual Override</td>
<td>D 3.5 - 50 bar</td>
<td>** Consult the Sun website for complete information on Spool Configurations, the full line of Coil Options and Embedded Amplifer Coils/Controllers.</td>
</tr>
<tr>
<td></td>
<td>T Tuning Adjustment</td>
<td>W 35 - 350 bar</td>
<td></td>
</tr>
</tbody>
</table>

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

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

DIRECT ACTING, RELIEF VALVE, PILOT CAPACITY

- Maximum operating pressure = 350 bar.
- Typical response time 2 ms.
- Maximum valve leakage at reseat 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

<table>
<thead>
<tr>
<th>Nominal Capacity</th>
<th>Control**</th>
<th>Adjustment Range</th>
<th>Seal Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 1 L/min.</td>
<td>L Standard Screw Adjustment</td>
<td>A 1.7 - 210 bar Standard set at 70 bar</td>
<td>N Buna-N</td>
</tr>
<tr>
<td>A 2 L/min.</td>
<td>C Tamper Resistant Factory Set</td>
<td>B 1.7 - 105 bar Standard set at 70 bar</td>
<td>V Viton</td>
</tr>
<tr>
<td>E 10 L/min.</td>
<td>K Handknob with Lock Knob</td>
<td>C 1.7 - 420 bar Standard set at 70 bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Handknob with Panel Mount</td>
<td>D 1.7 - 55 bar Standard set at 28 bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Special setting required. Specify at time of order:</td>
<td>E 1.7 - 28 bar Standard set at 14 bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>W 1.7 - 315 bar Standard set at 70 bar</td>
<td></td>
</tr>
</tbody>
</table>

** See page 178 for information on Control Options

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.
Pilot Control Valves
AIR CONTROLLED, DIRECT ACTING, RELIEF VALVE, PILOT CAPACITY

- 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 reseat at 24 cSt = 1 cc/min.
- Ports 1 and 2 may be pressured 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

<table>
<thead>
<tr>
<th>Cartridge Dimensions</th>
<th>Cartridge Model Code</th>
<th>Cavity</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>Installation Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 l/min.</td>
<td>RBAR – DWN</td>
<td>T - 8A</td>
<td>19,1</td>
<td>22,2</td>
<td>40,9</td>
<td>35 - 40</td>
</tr>
<tr>
<td>10 l/min.</td>
<td>RBAR – DYN</td>
<td>T - 8A</td>
<td>19,1</td>
<td>28,6</td>
<td>40,9</td>
<td>35 - 40</td>
</tr>
</tbody>
</table>

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

FLOW CONTROL, FULLY ADJUSTABLE NEEDLE VALVE, PILOT CAPACITY

- 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

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Control*</th>
<th>Maximum Orifice Diameter</th>
<th>Seal Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFAB</td>
<td>K</td>
<td>X 0.9 mm</td>
<td>N Buna-N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>V Viton</td>
</tr>
</tbody>
</table>

* See page 178 for information on Control Options

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

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

- 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 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.
Pilot Control Valves

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

Performance Curves

- 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

<table>
<thead>
<tr>
<th>Nominal Capacity</th>
<th>Pilot Control Port</th>
<th>Spool Configuration</th>
<th>Seal Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1 L/min.</td>
<td>A External 1/8 NPTF Port</td>
<td>H Normally Open</td>
<td>N Buna-N</td>
</tr>
<tr>
<td></td>
<td>B External SAE-4 Port</td>
<td>C Normally Closed</td>
<td>V Viton</td>
</tr>
<tr>
<td></td>
<td>D External 1/8 BSFP Port</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

- 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.

DAAM - LCN

Cartridge Dimensions

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Typical Cartridge Model Code</th>
<th>Cavity</th>
<th>Cartridge Dimensions</th>
<th>Installation Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 L/min.</td>
<td>DAAM - LCN</td>
<td>T-8A</td>
<td>18.5 28.6 61.0 48.3</td>
<td>35 - 40</td>
</tr>
</tbody>
</table>

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

DAAM - LCN *

Nominal Capacity

| A | 1 L/min. |

Control

| D | Twist/Lock, Dual, Manual Override |
| L | Twist/Lock, Detent, Manual Override |
| T | Twist/Lock, Momentary, Manual Override |

Spool Configuration

| C | Normally Closed |
| H | Normally Open |

Seal Material

| N | Buna-N |
| V | Viton |

* See page 178 for information on Control Options

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

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

- 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.

### Nominal Capacity

<table>
<thead>
<tr>
<th>Nominal Capacity</th>
<th>Pilot Control Port</th>
<th>Spool Configuration</th>
<th>Seal Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1 L/min.</td>
<td>E External SAE-4 Port</td>
<td>H Normally Open</td>
<td>N Buna-N</td>
</tr>
<tr>
<td></td>
<td>F External 1/8 NPTF Port</td>
<td>C Normally Closed</td>
<td>V Viton</td>
</tr>
<tr>
<td></td>
<td>P External 1/8 BSPP Port</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.
Pilot Control Valves

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

- Maximum operating pressure = 350 bar.
- Maximum valve leakage at 24°C = 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**

**Coil Options**

See page 187: Coil option information for Metal Housing (Round) Solenoid Cartridges.

**Seal Material**

- N Buna-N
- V Viton

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

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

- 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.
Pilot Control Valves

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

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

<table>
<thead>
<tr>
<th>Nominal Capacity</th>
<th>Pilot Control Port</th>
<th>Spool Configuration</th>
<th>Seal Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1 L/min.</td>
<td>E  SAE-4 Port</td>
<td>H  Normally Open</td>
<td>N  Buna-N</td>
</tr>
<tr>
<td></td>
<td>F  1/8 NPTF Port</td>
<td>Port 1 to 2, 1 to 3 Closed</td>
<td>V  Viton</td>
</tr>
<tr>
<td></td>
<td>P  1/8 BSPP Port</td>
<td>C  Normally Open</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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.

Performance Curves

Pressure Differential vs. Flow

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Typical Cartridge Model Code</th>
<th>Cavity</th>
<th>Installation Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 L/min.</td>
<td>DBAM – LCN</td>
<td>T - 9A</td>
<td>27.4, 22.2, 61.0, 35.6</td>
</tr>
</tbody>
</table>

OPTION ORDERING INFORMATION

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