Applications

Regenerative circuits allow a cylinder to be advanced more rapidly than it could be with pump flow alone. To achieve this, oil from the rod end of a cylinder is added to the pump flow to the blind end, increasing the rate of advance.

NOTE: Regeneration circuits apply only to single rod cylinders in the extended direction.

SUN Hydraulics offers two types of regenerative valve assemblies, pressure sensitive and continuous regeneration.

Determination of the type of regenerative circuit to be used is dependent upon the system requirements. In making this determination, several areas need careful consideration.

Pressure sensitive regenerative valves will provide regenerative flow to the blind end of the cylinder until the load induced pressure reaches the setting of the counterbalance valve, at which time rod end oil is automatically diverted to tank. The circuit then becomes non-regenerative and full system pressure is applied to the full blind area, allowing it to develop maximum force.

Continuous (or full time) regenerative valves will provide regenerative flow to the blind end of the cylinder during the complete extension cycle.

Hydraulic cylinders are manufactured with an almost unlimited combination of cylinder-to-rod ratios. These ratios can have a dramatic effect on the speed of extension and retraction of the cylinders.

A 2:1 cylinder (i.e. The blind end piston area is twice the rod end area.) will extend and retract at the same speed if regeneration is used. Without regeneration, the extend speed would be 50% of the retract speed.

Cylinders with large rod diameters typically offer small amounts of oil for use in cylinder extension in regenerative circuits. Rod extension speed therefore may not be increased substantially. In contrast, when retracting a large rod diameter cylinder in a regenerative circuit, the speed may be so great, due the small volume of oil required, that the system may become unstable and generate shock. Conversely, cylinders with small rod diameters may produce shock on rod extension, and retract slowly.

When applying pressure sensitive regenerative valve assemblies, several factors must be considered:

- The pressure required to move a cylinder.
- Rod-to-diameter ratio.
- Pressure adjustment methods required to control the setting of the SUN counterbalance valve.

Losses due to high flows and seal friction may prevent a circuit from staying in regeneration. Be conservative in system design.

NOTE: In applications where the load tends to extend the cylinder, a vented pilot to open check valve or a vented counterbalance valve may be installed in the cylinder rod port to positively lock the cylinder.

Formulae to calculate flow in regenerative circuits include:

\[
\text{Regenerative Flow} = \frac{Db^2 - Dr^2}{Dr^2} \times \text{Pump Flow}
\]

\[
\text{Combined Flow} = \frac{Db^2}{Dr^2} \times \text{Pump Flow}
\]

\[
\text{Retraction Flow} = \frac{Db^2}{Db^2 - Dr^2} \times \text{Pump Flow}
\]

\[
Db = \text{Bore Diameter}
\]

\[
Dr = \text{Rod Diameter}
\]

Design Concepts and Features

SUN’s pressure sensitive regenerative valve assembly incorporates a pressure adjustable counterbalance valve that provides a smooth transition when the work is engaged and pressure in the blind end rises to approximately 25% of the set point of the counterbalance valve, at which time the regenerative flow decreases smoothly until rod end flow is fully diverted to tank. Full pump pressure is then applied to the blind end area developing maximum force.

SUN’s full time regenerative valve assembly utilizes a standard check valve in place of the counterbalance valve. This allows flow from the rod end to be supplied to the blind end continuously during the complete extension cycle.

SUN’s regenerative valve assemblies are available in various flow rates and packaged as inline, ISO sandwich assemblies, and subplate versions.
**REGENERATION ASSEMBLY**

**PRESSURE SENSITIVE**

Refer to page 13.42 for further technical information.

- Aluminium rated to 210 bar and SG Iron rated to 350 bar.

### YDCC: 60 L/min maximum regenerative flow

Regeneration diminishes progressively above setting of CBCA.

#### ALUMINIUM

<table>
<thead>
<tr>
<th>Port Code</th>
<th>List Price</th>
<th>Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>.50 NPTF</td>
<td>C</td>
<td>C/S</td>
<td></td>
</tr>
<tr>
<td>SAE-10</td>
<td>K</td>
<td>K/S</td>
<td></td>
</tr>
<tr>
<td>.50 BSPP</td>
<td>V</td>
<td>V/S</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Refer to page 13.42 if load causes cylinder to extend.

#### SG IRON

<table>
<thead>
<tr>
<th>Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### YDCD: 40 L/min maximum regenerative flow

With load holding check valve. Regeneration diminishes progressively above setting of CBCA.

#### ALUMINIUM

<table>
<thead>
<tr>
<th>Port Code</th>
<th>List Price</th>
<th>Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>.50 NPTF</td>
<td>C</td>
<td>C/S</td>
<td></td>
</tr>
<tr>
<td>SAE-10</td>
<td>K</td>
<td>K/S</td>
<td></td>
</tr>
<tr>
<td>.50 BSPP</td>
<td>V</td>
<td>V/S</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Refer to page 13.42 if load causes cylinder to extend.

#### SG IRON

<table>
<thead>
<tr>
<th>Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OPTIONS

**YDC** – **LHN** – **A**

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>PORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>See Chart above</td>
</tr>
<tr>
<td>D</td>
<td>For Viton Seals Change LHN to LHV.</td>
</tr>
</tbody>
</table>

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

NOTE: Refer to page 13.42 if load causes cylinder to extend.

---

Mounting Holes: 8.6 diameter through holes 2 places.
**OPTIONS**

**FUNCTION**

- **C** Less CKEB Load Holding Check
- **D** Includes CKEB Load Holding Check See Pg 4.16

**PORTS**

- **YDE** - **LHN** - **A**
  - **YDE** See Chart above

**NOTE:** Refer to page 13.42 if load causes cylinder to extend.

---

**YDEC:** 120 L/min maximum regeneration flow. Regeneration diminishes progressively above setting of CBEA.

**YDED:** 80 L/min maximum total flow, with load holding check valve. Regeneration diminishes progressively above setting of CBEA.

---

**UK Line Mount Catalogue 12/94 #999-901–101**

**CD #999-901-105 Rev. 01-JAN-95**
### REGENERATION ASSEMBLY

**PRESSURE SENSITIVE**

*Refer to page 13.42 for further technical information.*

- Aluminium rated to 210 bar and SG Iron rated to 350 bar.

---

#### YDGC: 240 L/min maximum regeneration flow.
Regeneration diminishes progressively above setting of CBGA.

<table>
<thead>
<tr>
<th>Mounting Hole Dimensions</th>
<th>ALUMINIUM</th>
<th>SG IRON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports CR, CH &amp; VR Port Code</td>
<td>List Price</td>
<td>Port Code</td>
</tr>
<tr>
<td>Inch</td>
<td>.75 NPTF</td>
<td>D</td>
</tr>
<tr>
<td>Inch</td>
<td>1.00 NPTF</td>
<td>E</td>
</tr>
<tr>
<td>Inch</td>
<td>1.25 NPTF</td>
<td>F</td>
</tr>
<tr>
<td>Inch</td>
<td>SAE-12</td>
<td>L</td>
</tr>
<tr>
<td>Inch</td>
<td>SAE-16</td>
<td>M</td>
</tr>
<tr>
<td>Inch</td>
<td>SAE-20</td>
<td>N</td>
</tr>
<tr>
<td>Metric</td>
<td>.75 BSPP</td>
<td>W</td>
</tr>
<tr>
<td>Metric</td>
<td>1.00 BSPP</td>
<td>X</td>
</tr>
<tr>
<td>Metric</td>
<td>1.25 BSPP</td>
<td>Y</td>
</tr>
<tr>
<td>Inch</td>
<td>1.00° SAE Code 61</td>
<td>P</td>
</tr>
<tr>
<td>Metric</td>
<td>P/M</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Refer to page 13.42 if load causes cylinder to extend.

### OPTIONS

**YDGC – LHN – A**

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

### PORTS

See Chart above
REGENERATION ASSEMBLY
PRESSURE SENSITIVE
Refer to page 13.42 for further technical information.

- Aluminium rated to 210 bar and Ductile Iron rated to 350 bar.

### OPTIONS

**YDGD – LHN – A**

For Viton Seals Change LHN to LHV.
Customer Specified Setting Stamped on Hex

### TABLE

<table>
<thead>
<tr>
<th>Mounting Hole Dimensions</th>
<th>ALUMINUM Port Code</th>
<th>List Price</th>
<th>SG IRON Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inch 0.75 NPTF</td>
<td>D</td>
<td></td>
<td>D/S</td>
<td></td>
</tr>
<tr>
<td>Inch 1.00 NPTF</td>
<td>E</td>
<td></td>
<td>E/S</td>
<td></td>
</tr>
<tr>
<td>Inch 1.25 NPTF</td>
<td>F</td>
<td></td>
<td>F/S</td>
<td></td>
</tr>
<tr>
<td>Inch SAE-12</td>
<td>L</td>
<td></td>
<td>L/S</td>
<td></td>
</tr>
<tr>
<td>Inch SAE-16</td>
<td>M</td>
<td></td>
<td>M/S</td>
<td></td>
</tr>
<tr>
<td>Inch SAE-20</td>
<td>N</td>
<td></td>
<td>N/S</td>
<td></td>
</tr>
<tr>
<td>Metric 0.75 BSPP</td>
<td>W</td>
<td></td>
<td>W/S</td>
<td></td>
</tr>
<tr>
<td>Metric 1.00 BSPP</td>
<td>X</td>
<td></td>
<td>X/S</td>
<td></td>
</tr>
<tr>
<td>Metric 1.25 BSPP</td>
<td>Y</td>
<td></td>
<td>Y/S</td>
<td></td>
</tr>
<tr>
<td>Inch 1.25” SAE Code 61</td>
<td>Q</td>
<td></td>
<td>Q/S</td>
<td></td>
</tr>
<tr>
<td>Metric 1.25” SAE Code 61</td>
<td>Q/M</td>
<td></td>
<td>Q/T</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Refer to page 13.42 if load causes cylinder to extend.
**OPTIONS**  
**YGHC** – **LHN** – A*

For Viton Seals Change  
LHN to LHV.

Customer Specified Setting  
Stamped on Hex

**NOTES:** Refer to page 13.42 if load causes cylinder to extend.

**Pressure Drop**

![Pressure Drop Chart]

**Mounting Holes:**

Inch: .375-16 UNC-2B x 19.0 deep  
Metric: M10 X 1.50-6H x 19.0 deep  
2 places.

**Dimensions:**

1.25 SAE" Code 62  
4–Bolt Flange Pattern  
3 places

**NOTE:** Refer to page 13.42 for further technical information.

- Aluminium rated to 210 bar and SG Iron rated to 350 bar.

**Regeneration ASSEMBLY**  
**PRESSURE SENSITIVE**

Regeneration diminishes progressively above setting of CBGA.

**YDHC:** 480 L/min maximum regeneration flow. Regeneration diminishes progressively above setting of CBGA.

**Options**

- ALUMINIUM
- SG IRON

<table>
<thead>
<tr>
<th>Mounting Hole Dimensions</th>
<th>ALUMINIUM</th>
<th>SG IRON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Code</td>
<td>List Price</td>
<td>Port Code</td>
</tr>
<tr>
<td>Inch</td>
<td>5</td>
<td>5/S</td>
</tr>
<tr>
<td>Metric</td>
<td>5/M</td>
<td>5/T</td>
</tr>
</tbody>
</table>

- For Viton Seals Change  
- LHN to LHV.

Customer Specified Setting  
Stamped on Hex
**REGENERATION ASSEMBLY**

**PRESSURE SENSITIVE**

Refer to page 13.42 for further technical information.

- Aluminium rated to 210 bar and SG Iron rated to 350 bar.

---

**YDJC**: 480 L/min maximum regeneration flow. Regeneration diminishes progressively above setting of CBIA.

### ALUMINIUM

<table>
<thead>
<tr>
<th>Port Code</th>
<th>List Price</th>
<th>Port Code</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N/S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**: Refer to page 13.42 if load causes cylinder to extend.

---

**PRESSURE DROP**

**PORTS**

- CBIA-LHN
- COJA-XEN

Mounting Holes:
13.5 diameter through hole
2 places.

---

**OPTIONS**

**YDJC – LHN – A**

For Viton Seals Change
LHN to LHV.

Customer Specified Setting
Stamped on Hex

**PORTS**

See Chart above
**REGENERATION ASSEMBLY**

**PRESSURE SENSITIVE**

*Refer to page 13.42 for further technical information.*

- Aluminium rated to 210 bar and SG Iron rated to 350 bar.

---

**YDJC**: 960 L/min maximum regeneration flow. Regeneration diminishes progressively above setting of CBIA.

**NOTE**: Refer to page 13.42 if load causes cylinder to extend.

<table>
<thead>
<tr>
<th>Mounting Hole Dimensions</th>
<th>ALUMINIUM</th>
<th>SG IROn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port Code</td>
<td>List Price</td>
</tr>
<tr>
<td>Inch</td>
<td>S</td>
<td>S/S</td>
</tr>
</tbody>
</table>

**NOTE**: Refer to page 13.42 if load causes cylinder to extend.

---

**OPTIONS**

**YDJC – LHN – A**

For Viton Seals Change
LHN to LHV.
Customer Specified Setting
Stamped on Hex

**PORTS**

See Chart above

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