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## OPEN CENTER VALVE ASSEMBLIES, Models V20P, V20T, V20PT and V20S

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## CLOSED CENTER VALVE ASSEMBLIES, Models V20C and V20LS

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V20 VALVE ASSEMBLY WITH TWO HYDRAULIC REMOTE SPOOL ACTUATORS AND ONE MANUALLY CONTROLLED SECTION.

V20 VALVE ASSEMBLY, MANUALLY CONTROLLED WITH VERTICAL HANDLES AND ADJUSTABLE MAIN RELIEF VALVE.

V20 VALVE ASSEMBLY WITH TWO SOLENOID CONTROLLED SECTIONS AND TWO MANUALLY CONTROLLED SECTIONS.
INTRODUCTION

Directional Control Valves ... start, stop and direct fluid flow. They control extension and retraction of cylinders, rotation of fluid motors and actuators, and sequence other circuit operations.

Gresen offers two basic types of body designs ... the Monoblock which has all component parts in one single casting ... and the Sectional Body design.

Sectional Body Valves ... consist of one or more complete work sections with end covers. The entire assembly is bolted together to form a complete Sectional Body Directional Control Valve. A variety of work sections, spools, and spool actions, end covers and relief combinations are available to provide the exact type of valve assembly required for any given application whether mobile, industrial or agricultural.

Gresen’s Model V20 Directional Control Valve is available for parallel, tandem, combined parallel/tandem and series hydraulic circuit applications, up to 3500 PSI [242 bar] continuous operating pressure. Its new spool design has resulted in lighter spool actuating effort making its finger-tip touch and extra-fine metering characteristics ideal for back hoe, front end loader and personnel lift applications. This sensitivity also gives the design engineer a wider latitude of mechanical linkage possibilities.

Service or conversion is simple since individual sections can be added, removed or replaced in the field. Individual service or field conversion sections, rather than complete valve assemblies, can be stocked thus reducing inventories.

FEATURES

Exact Work Port Control ... is achieved with smooth, positive metering valve spools. Spools are precisely hone-fitted to a matching work section for excellent spool-hold characteristics giving minimum load “leak down.”

Built-In Safety ... Hydraulic system and equipment protection incorporated at each work port eliminates need for any additional external plumbing. Main relief valves, work port relief valves, anti-cavitation checks and work port restrictors are available for safety, equipment protection and positive control.

Construction ... All valve housings are made of ductile cast iron for durability and resistance to shock loads.

Spools are hard, chrome-plated for long life and resistance to corrosion. All spools are select hone-fitted for minimum internal leakage and maximum load-holding ability.

Seal Compatibility ... All standard Gresen products utilize BUNA-N seals which are compatible with petroleum base, water-in-oil emulsions, and water-glycol fluids. Phosphate ester type fire-resistant fluids will cause BUNA-N seals to swell. This swelling is not normally detrimental to static seals, but will be a problem for dynamic seals such as valve spool seals. Swelling of these seals can result in binding spools. The temperature range of BUNA-N seals is -40°F [-40°C] to +200°F [+93°C] for continuous operation.

VITON seals are recommended for most applications that use phosphate-ester type fluids. VITON seals are also recommended for applications that have a continuous operating temperature of +200°F [+93°C] or more. VITON seals are available for Model V20 valves.

Due to the large number of hydraulic oil manufacturers, and the increasing availability of oil under various brand names, we recommend the customer consult his fluid manufacturer regarding compatibility ... or test to his own satisfaction.
Sectional Body Valves are custom assembled to meet specific application requirements.

When ordering a work section, valve component or a complete valve assembly, submit the information required in the Table of Options for Complete Valve Assemblies, page 54. Submit all of the information that applies to your application. Add any option information not specifically referred to in this catalog.

To properly specify the individual work sections, follow this procedure:

Using the diagram below, work ports should be on top with the "A" port nearest you. Inlet cover will be to your left and the outlet cover to your right.

The accompanying sketch of a typical control valve assembly has the handle assemblies in the standard location at the "A" port end of the valve.

Valve assembly specification forms are available to help simplify the ordering of various sections or complete valve assemblies. When ordering V20 Valves, use Form No. 9005. Specification forms have been included at the back of this Catalog. If additional forms are needed, contact any Gresen Distributor, Representative or the Sales Department, Minneapolis.

On receipt of the information, an order design number will be assigned to your valve assembly. Then, on future orders, the order design number or your part number need only be specified to identify the correct valve section, or assembly.
OPEN CENTER VALVE ASSEMBLIES

Models V20P, V20T, V20PT and V20S

Models V20P, V20T, and V20S Valve Assemblies utilize the same inlet and outlet covers, and most of the same basic options.

Model V20P, V20T, and V20S sections may be combined into one valve assembly. See page 38 for V20S stacking sequence restrictions.

FEATURES

- Minimal spool actuating effort—Maximum, 50 pounds [22.6 kg] at the spool
- Improved, extra-fine metering
- Minimum pressure drops through open center and through work ports
- Float section may be installed at any point within the Valve assembly

INLET COVERS

All Model V20 valve inlet covers are machined for the Model WH main relief. If the relief is not required, a no relief (NR) plug will be installed. The following inlet covers are available:

Inlet Cover, No. 8398

No. 8398 inlet cover is available with top, end and bottom inlet ports. It is also available with top and end outlet ports. Top in and top out are the standard port locations for this cover.

PORTING OPTIONS AVAILABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SAE STRAIGHT THREAD PORTS</th>
<th>NPT PIPE PORTS**</th>
<th>BSP PIPE PORTS</th>
<th>GAGE PORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STANDARD</td>
<td>OPTIONAL</td>
<td>OPTIONAL</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>No. 8398 LEFT</td>
<td>SAE 12 (1-1/16&quot; - 12 UNF)</td>
<td>SAE 10 (7/8&quot; - 14 UNF)</td>
<td>1/2&quot; - 14</td>
<td>3/4&quot; BSP</td>
</tr>
<tr>
<td>INLET COVER</td>
<td></td>
<td></td>
<td></td>
<td>SAE 4 (7/16&quot; - 14 UNF)</td>
</tr>
<tr>
<td>End, Top or Bottom* Inlet Ports, End or Top Outlet Ports.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Bottom inlet available only with SAE 10 or 3/4" NPT ports.
**NPT pipe ports are not recommended for pressure ports above 2000 PSI [138 bar].

NOTE: All ports in a casting must be the same type. SAE, BSP and NPT cannot be intermixed.
Top inlet and top outlet ports are cored. If not specified, they will be plugged.
Inlet Cover, No. 7736 With Flow Control

A No. 7736 Inlet Cover contains an adjustable flow control assembly which directs the controlled portion of the inlet flow to the work ports and any excess flow into the exhaust core. The adjusted flow is pressure compensated and is the maximum amount of flow available to any work section in the valve assembly.

This inlet cover is machined for the Model WH relief. A no relief (NR) plug may be installed if the main relief valve is not required.

Porting Options Available

SAE and NPT ports cannot be intermixed in the same casting.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>NPT PIPE PORTS</th>
<th>SAE STRAIGHT THREAD PORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>END INLET</td>
<td>3/4&quot;-14</td>
<td>SAE 12</td>
</tr>
<tr>
<td>TOP INLET</td>
<td>3/4&quot;-14</td>
<td>SAE 12</td>
</tr>
<tr>
<td>END OUTLET</td>
<td>3/4&quot;-14</td>
<td>SAE 10</td>
</tr>
</tbody>
</table>

Flow Control Range to 25 GPM [95 litres/min].

A control knob is furnished as standard. If it is to be omitted, please specify.

Excess Flow Option

This option utilizes the excess flow from the flow control by using the end outlet port as the excess flow port. An inlet port is not available in this cover when this option is specified. A typical application for this option is to direct the excess flow to a combined flow mid-inlet section installed downstream. When the upstream spools are in neutral, all flow is available downstream. When an upstream spool is activated, only excess flow oil is available to the downstream spools. This option also allows the flow from one pump to be split for two separate functions.

To order this option, specify "Plug B end exhaust core".

Main System Relief Valve

The main system relief valve is installed in the inlet cover. A detailed description of the main relief valve, its options and performance will be found on pages 10 and 11.

Relief setting at "crack pressure" or at "full flow" must be specified.

A main relief valve is available in the following configurations:

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>WH</td>
<td>Tamperproof (adjustable with shims)</td>
</tr>
<tr>
<td>WHNJ</td>
<td>Adjustable with screwdriver</td>
</tr>
<tr>
<td>WHA</td>
<td>Pilot operated relief</td>
</tr>
<tr>
<td>RP51</td>
<td>No Relief Plug (no relief valve installed)</td>
</tr>
</tbody>
</table>

Options:
- Stainless steel relief springs
- VITON seals to replace standard BUNA-N seals
OUTLET COVERS

A variety of options and combinations of port sizes are offered. These options enable the user to customize valve assemblies while minimizing external plumbing. In addition, four application variations are available:

1. Open Center (standard)
2. Closed Center (conversion)
3. Power Beyond
4. Conversion Plug

Outlet cover, No. 6770, is available for use with four application variations:

Outlet variations are all accomplished by the machining and/or assembly of the outlet cover. Machining and assembly of the inlet cover and center sections do not affect these variations.

OPEN CENTER

(Furnished as standard, unless otherwise specified)

Hydraulic oil is directed from the inlet port, thru the open center core to the outlet port of the Directional Control Valve when all spools are in the neutral position. Shifting the valve spool directs oil flow to the desired work port.

Maximum circuit pressure is limited by the main relief valve, which relieves into the exhaust core.

The standard Gresen valve is an open center control valve. The inlet port is open to the tank port, and both work ports are blocked when the control valve spool is in neutral position, thereby holding the cylinder or hydraulic motor in position.

The outlet port may be located in the right cover...

OR

Outlet port may be located in the left cover when a right turnaround cover is used.

Outlet Port Option ...

If the outlet port is to be located in the outlet cover and closed center, power beyond or conversion plug options are specified, then the outlet port will be in the optional location.

Turnaround Cover Option ...

For plumbing convenience, the outlet port may be located in the inlet (left) cover. When it is, the turnaround (right) cover will direct the exhausting oil back to the inlet cover.
Closed Center
Code Symbol C

To convert an open center valve to a closed center valve.

By installing a special closed center plug in the outlet cover, hydraulic oil flow from the pump is blocked at the outlet port with valve spools in neutral position.

Pressure is normally maintained at the control valve inlet by use of a variable-displacement pump or an accumulator-type circuit with an unloading valve.

In a Gresen closed center control valve, the center passage is blocked and both work ports are also blocked when the control valve spool is in neutral position.

The outlet cover can be machined to accept a power beyond sleeve which allows the open center oil to be used by a downstream valve. When a power beyond sleeve is specified, an outlet port is still required. Outlet port can be located in the left inlet cover or in the right outlet cover. The following power beyond sleeve port sizes are available for No. 6770 right outlet cover:

<table>
<thead>
<tr>
<th>THREAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; - 14 NPT (Female)</td>
</tr>
<tr>
<td>SAE 8 (3/4&quot; - 16 UN) (Female)</td>
</tr>
<tr>
<td>SAE 10 (7/8&quot; - 14 UN) (Female)</td>
</tr>
<tr>
<td>SAE 16 (1&quot; tube fitting) (Male)</td>
</tr>
</tbody>
</table>

Power Beyond (High Pressure Carryover)
Code Symbol Y

This option allows the installation of another valve downstream from the first valve.

A power beyond sleeve is installed in the outlet cover of the upstream valve which separates the open center core from the exhaust core at the outlet port. This allows hydraulic oil under pressure to be carried thru the upstream valve, thus making it available for a downstream function. A separate tank line is required from each control valve in the circuit.

Hydraulic oil is available to the downstream valve only when all spools in the upstream valve are in the neutral position.

If pressure requirements for both valves are the same, only one relief valve is required. It must be installed in the upstream valve.

Each valve in the circuit may have a different relief setting, but the highest setting must be upstream.

Conversion Plug Assembly
Code Symbol X

If additional hydraulic circuit options are to be added at a later date, or if the control valve is being ordered for stock, a conversion plug assembly should be considered. A conversion plug assembly gives a control valve great versatility and easily converts for different applications, reducing inventory requirements.

A control valve with a conversion plug remains an open center valve. The outlet cover, when machined for this option, will also accept power beyond sleeves and closed center plugs. When the need arises the proper plug or sleeve is inserted to convert the assembly into either a closed center or power beyond
valve. Service kits are available for these optional parts and must be ordered separately.

When a conversion plug is installed in the outlet cover the control valve remains an open center valve. When the outlet cover is machined for a conversion plug, it will also accept a power beyond sleeve or a closed center plug. If the need arises, the proper plug or sleeve can be inserted to convert the assembly to either a closed center or power beyond application.

Turnaround Cover Option

For plumbing convenience, the outlet port may be located in the inlet (left) cover. When it is, the turnaround cover is provided to direct the flow of exhausting oil back to the inlet cover.

Optional Outlet Cover with Top Outlet and Power Beyond Ports
No. 8644

Outlet Port Option

An optional outlet cover, No. 8644, is available. This option offers top porting options rather than end porting only. Port options are:
- Top, End or Bottom Outlet
- Top Power Beyond
- SAE12 or ¾" NPT Ports

If the outlet port is to be located in the outlet (right) cover and closed center, power beyond or conversion plug options are specified, then the outlet port will be in the optional location.

The following outlet port sizes are available for No. 6770 right outlet cover:

<table>
<thead>
<tr>
<th>Outlet Ports</th>
<th>NPT</th>
<th>SAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; - 14</td>
<td>NPT</td>
<td>SAE</td>
</tr>
<tr>
<td>3/4&quot; - 14</td>
<td>SAE 10 (7/8&quot; - 14 UN)</td>
<td></td>
</tr>
</tbody>
</table>

TOP VIEW OF CUT-AWAY 8644 COVER
DIMENSIONS: TYPICAL MODEL V20P, V20T, V20PT, OR V20S VALVE ASSEMBLY

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS) AND ARE FOR REFERENCE ONLY.

STANDARD END OUTLET OR OPTIONAL POWER BEYOND PORT (NOT AVAILABLE WHEN PILOT PORT IS SPECIFIED)

PRESURIZE "A" PORT

PRESURIZE "B" PORT

NO. 7736 INLET COVER WITH FLOW CONTROL

NO. 8644 OUTLET COVER
CLOSED CENTER VALVE ASSEMBLIES
Models V20C and V20LS

Gresen’s Models V20C and V20LS Directional Control Valves are available for parallel, hydraulic circuit applications, up to 3500 PSI [242 bar] continuous operating pressure. New spool designs have resulted in lighter spool actuating effort making their finger-tip touch and extra-fine metering characteristics ideal for back hoe, front end loader and personnel lift applications. This sensitivity also gives the design engineer a wider latitude of mechanical linkage possibilities.

Service or conversion is simple since individual sections can be added, removed or replaced in the field. Individual service or field conversion sections, rather than complete valve assemblies, can be stocked thus reducing inventories.

The Model V20C Directional Control Valve is designed specifically for high standby pressure, closed center systems. The Model V20LS Directional Control Valve is designed specifically for low standby pressure, closed center systems with load sensing.

Normally, an open center valve may be converted to a closed center valve by plugging the open center core in the outlet cover. Under these conditions, the valve’s power core is exposed to high pressure at all times. Leakage may then occur past the valve spool and on into the work port area and cause a cylinder to extend while the valve spool is in neutral position. High pressure build-up at the work port in the Models V20C and V20LS is prevented by installing an anti-drift cartridge. Refer to work port options on page 51.

APPLICATIONS
Two or more Directional Control Valve Assemblies may be supplied from a single, variable displacement pump in the hydraulic system by using a “tee” arrangement. The power beyond option normally available with open center valves is not required for Model V20C or V20LS work sections since neither work section has an open center core.

FEATURES
- Minimal spool actuating effort — Maximum, 50 pounds [23 kg] at the spool
- Improved, extra-fine metering
- Valve housings made of high tensile cast iron for durability and resistance to shock loads.
- Spools are hard, chrome plated for long life and corrosion resistance.

SPECIFICATIONS
Pressure Rating:
Continuous Operating .................. 3500 PSI [242 bar] max.

Capacity:
Nominal Flow ......................... 20 GPM [76 litres/min]
Maximum Flow ......................... 30 GPM [114 litres/min]

Maximum Exhaust Core Pressure:
With Handle Bracket or Heavy Duty Spool Seal Retainer Installed
Continuous Operating .................. 500 PSI [34.5 bar]
Intermittent Peak ....................... 1000 PSI [69.0 bar]
With Standard Spool Seal Retainer Installed .................. 200 PSI [13.8 bar]

Filtration Required (Min.) ............. 33 micrometre

Weight:
Inlet Cover .......................... Approx. 6 lbs. [2.7 kg]
Outlet Cover .......................... Approx. 3½ lbs. [1.6 kg]
Work Section, Each .................. Approx. 9 lbs. [4.1 kg]
VALVE METERING

Closed Center Systems

Valve spool metering is improved because the volume of oil is controlled by the metering notches at a constant pressure drop across the spool. The pump displacement will self-adjust to maintain full system pressure thus creating this constant pressure drop across the spool. Controlling flow across spool metering notches is improved when the pressure drop remains constant.

INLET COVER

Part No. 8398-

The inlet cover is designed to provide a variety of port sizes and locations. This permits valve assemblies to be “customized” using a minimum of external plumbing. For information regarding main system relief valves, refer to pages 10 and 11.

OUTLET COVER

Part No. 6770-

The outlet cover provides an end outlet port. It also provides for a pilot port in load sensing systems. If the outlet port and the pilot port are both required in the outlet cover, the outlet port will be furnished in the optional location. (Refer to illustration.)

A pilot drain option is available for the load sensing outlet cover. This option is required in a load sensing system when a pilot drain orifice is not provided in the pressure compensated pump. The pilot drain orifice relieves the load sensing pilot pressure in the pump compensator after the control valve spool is returned to neutral. It is necessary to relieve this pressure signal in order for the pump to return to its standby pressure setting.

Closed Center Systems with Load Sensing

Valve spool metering is further improved since pump pressure is maintained at the slightly higher standby pressure (150 to 250 PSI [10 to 17 bar]) than is required by the function. This fixed pressure drop remains the same from minimum to maximum load requirements in contrast to the conventional closed center system.

For plumbing convenience, the outlet port may be located in the inlet (left) cover. When it is, a “turnaround” (right) cover will direct exhausting oil back to the inlet cover.

A power beyond option is not available since there is no open center core in V20C or V20LS work sections.
SPOOL ACTION OPTIONS and HANDLE END OPTIONS

The Models V20C and V20LS work sections are available with the same spool action options and handle end options as offered for the Model V20P except V20LS float option can not be reversed in the housing.

**Spool Action Options**

Refer to pages 14 through 19.

<table>
<thead>
<tr>
<th>Code Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>Spring Return to Neutral (Standard)</td>
</tr>
<tr>
<td>D</td>
<td>3-Position Detent</td>
</tr>
<tr>
<td>K4</td>
<td>4-Position Float</td>
</tr>
<tr>
<td>R</td>
<td>1-Position, Spool &quot;IN&quot; Detent</td>
</tr>
<tr>
<td>RO</td>
<td>1-Position, Spool &quot;OUT&quot; Detent</td>
</tr>
<tr>
<td>RIO</td>
<td>2-Position, Spool &quot;IN&quot; and &quot;OUT&quot; Detent</td>
</tr>
<tr>
<td>A</td>
<td>Spring Extended Spool Manual</td>
</tr>
<tr>
<td>M</td>
<td>Internal Pressure Detent Release</td>
</tr>
<tr>
<td>E</td>
<td>Electro-Mechanical Detent Release</td>
</tr>
<tr>
<td>—</td>
<td>Solenoid Control (Request Catalog No. PC-1104)</td>
</tr>
<tr>
<td>HR</td>
<td>Hydraulic Remote Spool Actuator*</td>
</tr>
<tr>
<td>HRO</td>
<td>Hydraulic Remote Spool Actuator (Manual Override)* (Request Catalog No. PC-1103)</td>
</tr>
</tbody>
</table>

* Pilot Pressure For Remote Actuators

300 PSI [21 bar] is required to actuate either Gresen's Solenoid or Hydraulic Remote Actuator Assemblies. This may be accomplished by installing a pressure reducing valve at the pump discharge and plumbing the lower pressure hydraulic fluid to the Remote Actuator Assemblies.

When the system has load sensing, standby pressure must be increased to 300 PSI [21 bar].

**Handle and Handle End Options**

Refer to pages 20 and 21.

<table>
<thead>
<tr>
<th>Code Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVHA</td>
<td>Complete Vertical Handle Assembly</td>
</tr>
<tr>
<td>CHHA</td>
<td>Complete Horizontal Handle Assembly</td>
</tr>
<tr>
<td>CVHB</td>
<td>Die Cast Handle Bracket, No. 1801-001</td>
</tr>
<tr>
<td>CVJ</td>
<td>Cast Iron Handle Bracket, No. 7355-001</td>
</tr>
<tr>
<td>CVK</td>
<td>Standard Spool Seal Retainer Assembly, No. K-6033</td>
</tr>
<tr>
<td>—</td>
<td>Heavy Duty Spool Seal Retainer Assembly, No. K-6029</td>
</tr>
<tr>
<td>—</td>
<td>Spool Wiper, No. 1800-001</td>
</tr>
<tr>
<td>LHA</td>
<td>Spool Boot Assembly, No. K-6056</td>
</tr>
<tr>
<td>—</td>
<td>Less Handle Only</td>
</tr>
<tr>
<td>LCHA</td>
<td>Less Complete Handle Assembly</td>
</tr>
</tbody>
</table>

**SPOOL VARIATIONS**

Refer to page 13.

<table>
<thead>
<tr>
<th>Code Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3-Way, 3-Position</td>
</tr>
<tr>
<td>F3</td>
<td>3-Way, 3-Position, Free Flow</td>
</tr>
<tr>
<td>4</td>
<td>4-Way, 3-Position</td>
</tr>
<tr>
<td>F4</td>
<td>4-Way, 3-Position, Free Flow</td>
</tr>
<tr>
<td>K4</td>
<td>4-Way, 4-Position, Float</td>
</tr>
</tbody>
</table>

**WORK PORT OPTIONS**

The same work port options which are available for the Model V20P Directional Control Valve are also available for the Models V20C and V20LS in the "B" port location.

In the "A" port location, an optional anti-drift cartridge is also available. The anti-drift cartridge prevents any build-up of pressure at the work ports when the valve is in neutral position. Any leakage past the spool into the sensing cores is drained back to the tank through the anti-drift cartridge. When the work port is powered, pressure closes the anti-drift cartridge to eliminate any flow loss.

The anti-drift cartridge must be installed in the "A" port location only and one is required for each work section in which pressure build-up at the work port will be detrimental to the application.

The anti-drift cartridge replaces the standard load check plug. It is not available where a work port relief or anti-cavitation check is required in the "A" port location.

<table>
<thead>
<tr>
<th>OPTION</th>
<th>ORDER CODE</th>
<th>AVAILoble FOR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Port Relief</td>
<td>RC,RP20</td>
<td>&quot;A&quot; Port &quot;B&quot; Port</td>
</tr>
<tr>
<td>Combination Relief and</td>
<td>CRA</td>
<td>x</td>
</tr>
<tr>
<td>Anti-Cavitation Check</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Anti-Cavitation Check</td>
<td>AC</td>
<td>x</td>
</tr>
<tr>
<td>Load Check</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Anti-Drift Cartridge</td>
<td>B</td>
<td>x</td>
</tr>
</tbody>
</table>
Pressure Compensated Flow Control

A pressure compensated flow control option is available for Models V20C and V20LS. This option is installed in the load check area of the valve section and is externally adjustable.

The flow control allows each valve section (both work ports) to operate at a predetermined maximum flow rate independent of pump discharge flow and pressure. Flow ranges of 1 to 5 GPM, 3 to 15 GPM, and 5 to 25 GPM are available.

This flow control option cannot be field installed. Special valve section machining is required.

PRESSURE DROP

150 SUS oil at 100°F • Inlet port: SAE 12 • Work port: SAE 10

Inlet To Work Port
Typical pressure drop to any work port in a 4-spool valve

Work Port To Outlet
Typical pressure drop from any work port in a 4-spool valve

ORDERING INSTRUCTIONS

To assure delivery of the proper Directional Control Valve, Form 9005 must be completed. Additional ordering information needed for manufacture and assembly of Models V20C and V20LS work sections are:

1. To specify a valve with V20C closed center work sections or V20LS load sensing work sections, write in No. 8364 in the “Center Section Housing No.” box for each work section required. Do not check the “Closed Center” box in right cover block.
   - Under “Additional Features” write in V20C and check the box in each work section to specify a closed center valve.
   - OR
   - Write in V20LS and check the box in each work section to specify a load sensing valve. Also specify Housing No. 6770-LS in right cover block in order to include the SAE 4 pilot port.

2. If an anti-drift cartridge is required, write in under Cylinder Port “A”, order symbol Anti-Drift Cartridge and check the box for each work section requiring this option.

NOTE: A V20 closed center valve can also be made from standard V20P, No. 8072, open center section by using a closed center plug in the right cover. To specify this type of closed center valve, write in Housing No. 8072 for center sections and check the closed center box in the right cover. (Anti-drift cartridge cannot be used in this valve.)
DIMENSIONS: Typical V20C and V20LS Assembly

PORTING OPTIONS AVAILABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SAE STRAIGHT THREAD PORTS</th>
<th>BSP PIPE PORTS</th>
<th>GAGE PORT</th>
<th>PILOT PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STANDARD</td>
<td>OPTIONAL</td>
<td>OPTIONAL</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>No. 8398 LEFT INLET COVER*</td>
<td>SAE 12 (1-1/16&quot; - 12 UNF)</td>
<td>SAE 10 (7/8&quot; - 14 UNF)</td>
<td>¼&quot; BSP</td>
<td>SAE 4 (7/16&quot; - 20 UNF)</td>
</tr>
<tr>
<td>WORK SECTION</td>
<td>SAE 10 (7/8&quot; - 14 UNF)</td>
<td>SAE 8 (7/8&quot; - 16 UNF)</td>
<td>¼&quot; BSP</td>
<td></td>
</tr>
<tr>
<td>No. 6770 RIGHT OUTLET COVER</td>
<td>SAE 12 (1-1/16&quot; - 12 UNF)</td>
<td>SAE 10 (7/8&quot; - 14 UNF)</td>
<td>¼&quot; BSP</td>
<td>SAE 4 (7/16&quot; - 20 UNF)</td>
</tr>
</tbody>
</table>

*Top inlet and top outlet ports are bored. If not specified, they will be plugged.

NOTE: All ports in a casting must be the same. SAE and BSP ports cannot be intermixed.
# ORDERING

**Condensed Table of Options for Complete Valve Assemblies**

<table>
<thead>
<tr>
<th>Code Symbol</th>
<th>Inlet Cover (Left)</th>
<th>Work Sections</th>
<th>Mid-Inlet Conversion Section</th>
<th>Outlet Cover (Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Comb. Flow</td>
<td>Split Flow</td>
<td></td>
</tr>
</tbody>
</table>

## Circuits
- **Open Center—Parallel**: V20P
- **Open Center—Parallel (Reduced Pressure Drop)**: V20RP
- **Open Center—Tandem**: V20T
- **Open Center—Tandem (Reduced Pressure Drop)**: V20RT
- **Open Center—Series**: V20S
- **Closed Center**: V20C
- **Load Sensing**: V20LS

## Spool Variations
- **3-Way, 3-Position**: 3
- **3-Way, 3-Position, Free Flow**: F3
- **4-Way, 3-Position**: 4
- **4-Way, 3-Position, Free Flow**: F4
- **4-Way, 4-Position, Float**: K4
- **4-Way, 3-Position, Pilot Operated Check (V20-LO)**: K4

## Spool Action Options
- **Spring Return to Neutral (Standard)**: D
- **No. 1889-001 Detent Stop**: K4
- **4-Position Float**: R
- **1-Position, Spool "IN" Detent**: D
- **1-Position, Spool "OUT" Detent**: R0
- **2-Position, Spool "IN" and "OUT" Detent**: R10
- **Spring Extended Spool**: A
- **Manual**: M
- **Internal Pressure Detent Release**: K0
- **Electro-Mechanical Detent Release**: E
- **Solenoid Control**: M
- **Hydraulic Remote**: H1, H10

## Reliefs, Checks and Restrictors
- **Main System Relief (Standard)**: WH
- **Main System Relief, with Lockwire & Lead Seal**: WHN
- **Main System Relief, Adjustable**: WHA
- **Main System Relief, Pilot-Operated, Adjustable**: RP51A
- **Main System Relief, Pilot-Operated, Non-Adjustable**: RP51N
- **Work Port Relief, Differential Poppet**: RC
- **Work Port Relief, Pilot-Operated, Adjustable**: RP20A
- **Work Port Relief, Pilot-Operated, Non-Adjustable**: RP20N
- **Combination Relief and Anti-Cavitation Check**: C1A
- **Anti-Cavitation Check**: AC
- **Pilot Operated Check (V20-LO)**: P
- **Load Check**: L
- **Restrictor**: R
- **Expansion Relief (V20-LO)**: E
- **No Relief**: NR

## Handle and Handle End Options
- **Complete Vertical Handle Assembly**: CVHA
- **Complete Horizontal Handle Assembly**: CHHA
- **Die Cast Handle Bracket**: D
- **Cast Iron Handle Bracket**: C
- **Standard Retainer Assembly**: S
- **Heavy Duty Retainer Assembly**: H
- **Spool Wiper**: W
- **Bolt Assembly**: B
- **Less Handle Only**: LHC
- **Less Complete Handle Assembly**: LCHA
- **Hydraulic Remote with Handle Override**: HRH

## Application Variations
- **Open Center**: C
- **Closed Center**: C
- **Power Beyond**: Y
- **Conversion Plug**: X
- **Turnaround**: T

*V20P and V20T Valves can be converted to closed center systems by installing a plug in the outlet cover.*
Directional Control Valve Assembly Form

### Left Cover
- **Housing No.**
- **Port Location**
- **Port Size**
- **In**
- **Out**

### Center Sections
- **Housing No.**
- **Circuit**
  - **Parallel**
  - **Tandem**
  - **Series**
- **Check One for EA Sect.**
  - **3-Way (Handle End Work Port is Plugged as Standard)**
  - **4-Way**
  - **4-Way Float (K)**
  - **Free-Flow (F)**
  - **3-Position Detent (D)**

### Additional Features
- **A" & "B" Work Port Sizes**
  - **Work Port Relief [Specify Model]**
  - **Setting (PSI) at Full Flow or Crack**
  - **Anti-Cavitation Check**

### Cylinder Port "B" Information
- **Position**
- **A Port End**
- **B Port End**
- **Handle P/N**
- **Bracket P/N**
- **Spool Boots**

### Cylinder Port "A" Information
- **Left Cover**
- **Main Relief Left Ven Valve**
- **Bucket End**
- **Right Cover**

### Function of Section
- **Remarks**

### Right Cover
- **Housing No.**
- **Outlet**
- **Port Size**
- **Turn Around**
- **Power Beyond**
- **Closed Center**
- **Power Beyond Port Size**
- **Conversion Plug**

### Mid-Conversion Section
- **Section #**
- **Housing #**
- **Section Type**
- **Relief Model**
- **Relief Setting**
- **Port Size**

### General Information
- **Original By:**
- **Date:**
- **Application:**
- **Engr. Appr.:**
- **Customer Part No.:**
- **Order Design:**
- **Model No.:**
- **B/M**