

# Series V70 and V90 Directional Control Valves *For Open Center, Power-Beyond & Closed Center Systems*

Effective: February 1, 2004  
Supersedes: Cat. No. GPD-1425 dated 8/97

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## Features

- Low force required to actuate spool
- Extra fine metering
- Low open center and loop pressure drops
- SAE 4-bolt split flange or SAE straight thread porting
- All ports will accommodate ORFS fittings

## Specifications

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### Nominal Flow Rating<sup>①</sup>

V70	Up to 70+ GPM (265 lpm)
V90	Up to 90+ GPM (340 lpm)

### Operating Pressure (maximum)

Continuous	.3500 PSI (242 bar)
Exhaust Core	.500 PSI (34,5 bar)

Operating Temperature ..... -40° F (-40°C) TO + 176° F (+80°C)

### Maximum Port Sizes

Inlet	SAE 24, 1 1/2" Split Flange
Outlet & Power Beyond	SAE 24, 1 1/2" Split Flange
Work Sections	SAE 20, 1" Split Flange

Fluid ..... Petroleum Based, 60-1000 SSU (10-216 cSt)

Filtration Required (minimum) ..... .33 micrometer

Number Of Work Sections ..... .1-6

### Shipping Weight (approx.)

Inlet Cover	Approximately 31 lbs. (14,0 kg)
Outlet Cover	Approximately 25 lbs. (11,4 kg)
Work Sections	Approximately 30 lbs. (13,6 kg)

Seals ..... Buna-N (Standard), Viton (Optional)

Mounting Position ..... Not Restricted

① The minimum flow through a valve assembly is determined by the maximum pressure drop acceptable to the application.

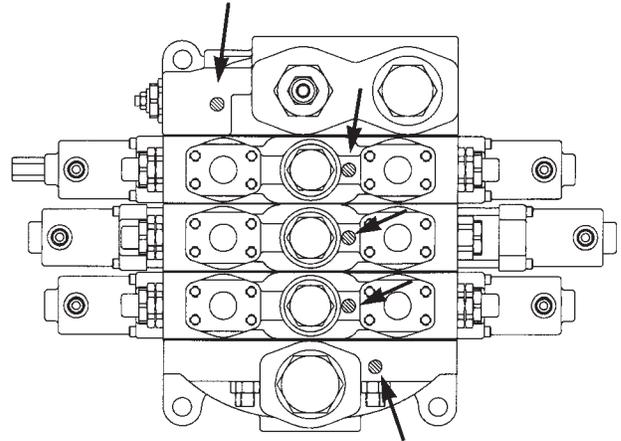
# DESCRIPTION

The Model V90 was created by modifying V70 inlet, outlet and work section housings. Port openings and inner cores were enlarged to handle increased flows while maintaining low pressure drops.

In addition, V90 work sections have special spools to minimize the effects higher flows have on spool forces.

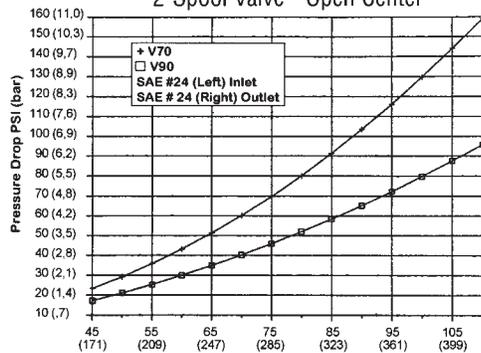
V70 and V90 housings cannot be intermixed in the same stack.

To differentiate V90 work sections and covers from their V70 counterparts, all V90 work sections and covers are identified with a round machining mark on top of each casting. (Identified with arrows in the illustration.)

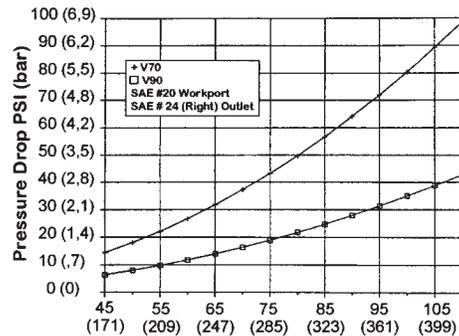


# PERFORMANCE

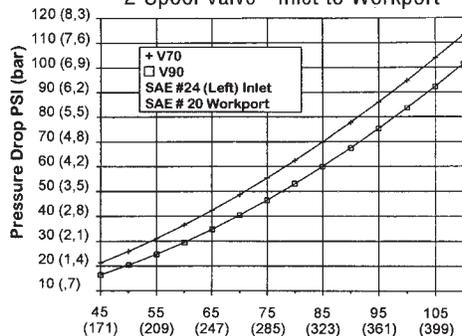
Pressure Drop vs. Flow  
2-Spool Valve - Open Center



Pressure Drop vs. Flow  
2-Spool Valve - Workport to Tank



Pressure Drop vs. Flow  
2-Spool Valve - Inlet to Workport



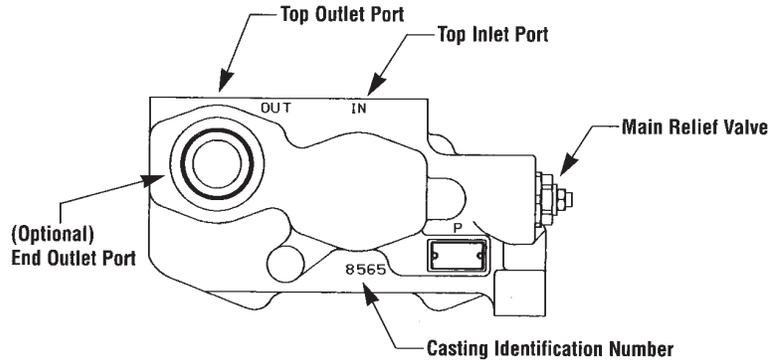
Flow GPM (lpm)

These Curves are typical results derived from actual laboratory tests run with 150 SUS Oil @ 100F (38C).

# INLET COVERS

All V70/V90 inlet covers are available with top and or end ports, and top and or end outlet ports.

These inlet covers are also machined to accept the main relief cartridge.

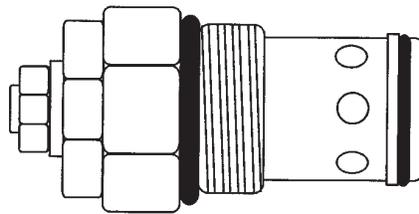


## Inlet (Main) Relief Valves

The primary function of the inlet (main) relief valve is to prevent excessive system pressures.

Model RP70 relief valve cartridges are available in adjustable (RP70A) or tamper resistant (RP70N) configurations, offering a pressure range of 500 PSI to 3500 PSI (34 to 242 bar). The relief setting at “crack pressure” or at “full flow” must be specified when ordering relief valve cartridges.

If an inlet relief valve is not required, the relief cavity (NR) plug must be installed.



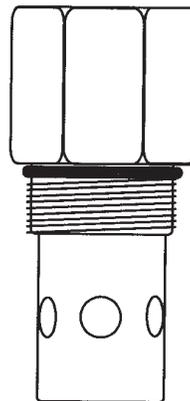
RP70 Pilot-Operated Relief Valve Cartridge

## Low Pressure Regeneration

The inlet cover may also be machined to accept a low pressure regeneration cartridge (LPR).

The LPR cartridge boosts the pressure in the exhaust core to enhance anti-cavitation valve performance. It is available for remote pilot control only. Maximum pilot pressure is 550 PSI (38 bar).

The LPR cartridge is installed in the top outlet port. The adjacent end outlet must be used (i.e. outlet cover turn around option).



Low Pressure Regeneration Cartridge

# OUTLET COVER

All V70/V90 outlet (right end) covers are available with top and/or end outlet ports. Power beyond port is end port only.

## Outlet Cover Options

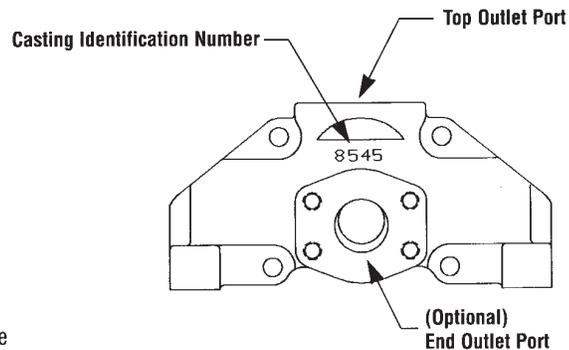
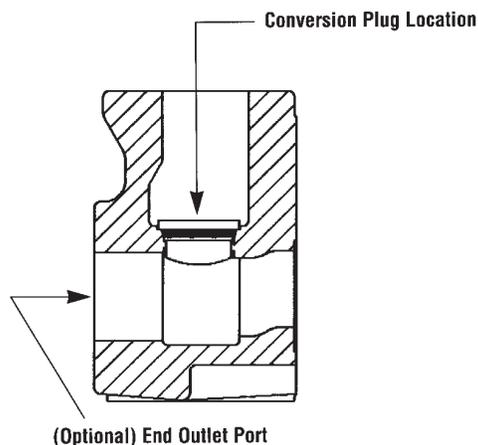
A variety of options and combinations of port sizes are offered. These options enable the user to customize valve assemblies while minimizing external plumbing. In addition, four application variations are available.

- Open Center (Standard)
- Turn Around Option (Optional)
- Power Beyond (Optional)
- Closed Center (Optional)

## Conversion Plug Port Location

Conversion to power beyond and/or closed center requires the installation of a plug in the conversion port.

The conversion port is a threaded passage located below the top port on the outlet (right) cover.



## Turn Around Option

For plumbing convenience, the outlet port may be located in the inlet (left) cover.

To convert the outlet (right) cover to turn around, simply plug both right outlet cover ports with SAE plugs. The exhausting oil may now be returned through the outlet port in the inlet (left) cover.

*Note: Prior to plugging the end port, verify that the power beyond sleeve has been removed.*

## Power Beyond Conversion

To convert the outlet (right) cover to power beyond install the conversion plug.

The end port now becomes the power beyond source. Return oil must now exit the valve through the top port in the outlet cover or through the optional outlet ports located in the inlet cover.

## Closed Center Conversion

To convert the outlet (right) cover to closed center, install the conversion plug and plug the end outlet port.

Return oil must now exit the valve through the top port in the outlet cover or through the optional outlet ports located in the inlet cover.

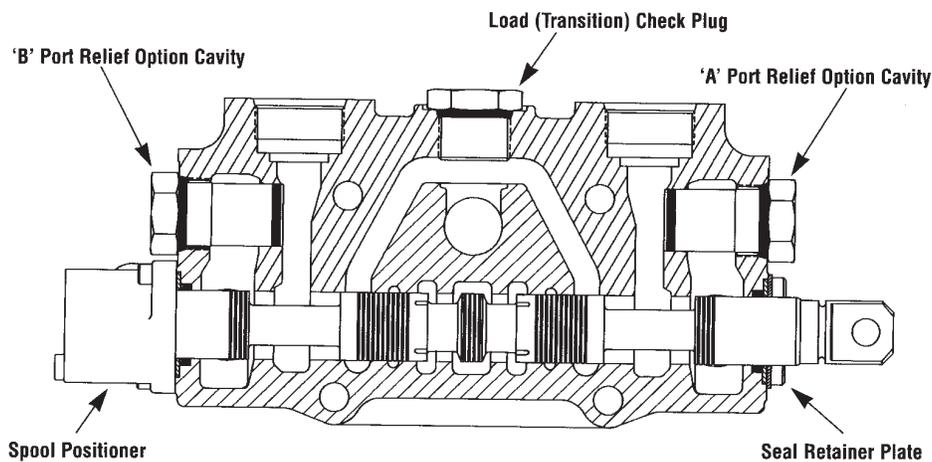
# WORK SECTIONS

V70/V90 work sections are precisely machined from high tensile gray iron housings.

Valve spools may be manually, hydraulically, pneumatically or mechanically operated. All valve spools are select hone-fitted at the factory for minimum internal leakage and are not field replaceable.

Three basic types of work sections are available:

- Parallel Section (open or closed center, parallel circuit systems)
- Tandem Section (priority circuit systems)
- Regeneration Section (open or closed center, parallel circuit systems)



## Work Port Relief Options

The primary function of a workport relief valve is to limit a part of a circuit to a pressure less than the main relief setting. Port relief valves will also provide spike protection while the valve is in neutral. The relief setting at 'crack' or 'full flow' must be specified when ordering.

### Model RP70 Relief Cartridges

RP70 workport relief valve cartridges are available in adjustable (RP70A) and tamper resistant (RP70N) configurations, with pressure ranges from 500 PSI (34 bar) to 3500 PSI (242 bar).

### Model RP70-AC Relief Cartridges

At times both a relief and an anti-cavitation check are required for the same workport. Both of these functions have been incorporated into RP70A-AC combination relief/anti-cavitation cartridges.

They are available in adjustable (RP70A-AC) and tamper resistant (RP70N-AC) configurations, offering the same pressure ranges as RP70 relief cartridges.

## Model AC Anti-Cavitation Checks

Model AC Anti-Cavitation Checks are used in the work section to prevent cylinder or motor cavitation. It allows the cavitating workport to refill from the exhaust core, supplementing pump flow.

## Handle Options

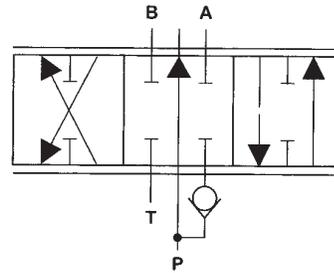
The clevis (handle end) of the spool may be located at either the "A" port or "B" port end of the valve section. Unless otherwise specified, the handle end will be located at the "A" port end for all sections. The following options are available:

- CVHA (complete vertical handle assembly)*
- CHHA (complete horizontal handle assembly)*
- LHO (less handle only)*
- HBO (handle bracket only)*
- LCHA (less complete handle assembly)*
- Protective Spool Boot Assembly*

# SPOOL OPTIONS

## 4-Way Cylinder Spool

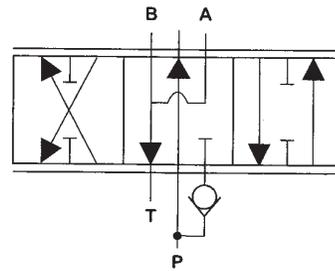
For control of double acting cylinders or reversible hydraulic motors where floating a cylinder or motor free-wheeling is not required. Both work ports are blocked in the neutral position.



## 4-Way Free Flow Motor Spool

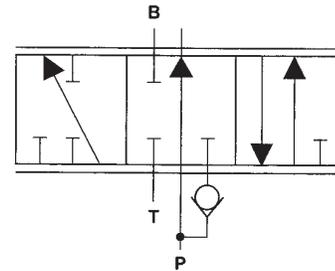
For control of double acting cylinders or reversible hydraulic motors. Because both work ports are open to tank in the neutral position, free flow spools will allow a motor to coast.

**Warning:** If you are using the free flow 'F4' spool configuration when installing a Model V70/90 directional control valve in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious property damage, bodily injury, or death if the holding device is not installed. Be sure to clear the work area prior to testing the cylinder lift application.



## 3-Way Cylinder Spool

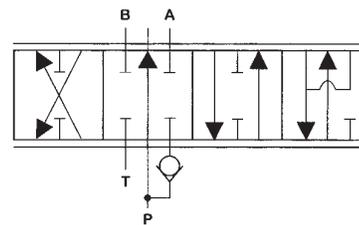
For control of single acting cylinders or starting and stopping non-reversible hydraulic motors where free-wheeling is not required. The work port is blocked in the neutral position.



## 4-Way 4-Position Float Spool

This spool is the same as the 4-Way Cylinder spool, with the addition of a fourth "Float" position. It is spring-centered to neutral from the "A" and "B" power positions.

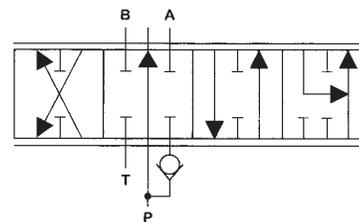
The fourth position is the detented "Float" position which allows a cylinder to float or a hydraulic motor to free wheel.



## 4-Way 4-Position Regenerative Spool

This spool is the same as the 4-Way Cylinder spool, with the addition of a fourth "Regen" position. It is spring-centered to neutral from the "A" and "B" power positions.

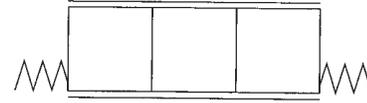
The fourth position is the "Regen" position which opens both cylinder ports to power increasing the extension speed of large bore cylinders.



# SPOOL POSITIONERS

## Spring Centering Positioner

This option spring returns the valve spool to neutral from the "A" and "B" power positions when the handle is released.



## 3-Position Detented Positioner

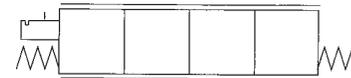
This option "detents" the valve spool in neutral and the "A" and "B" power positions. There is no spring to return the valve spool to neutral. The valve spool will remain in the position in which it was manually placed when the handle is released.

*Note: This option is NOT intended for use as a positive spool locking device against excessive external forces or machine vibration.*



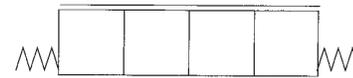
## 4-Position Float Positioner

This option is spring centered to neutral from the "A" and "B" power positions. The fourth position is the detented - float position.



## 4-Position Regenerative Positioner

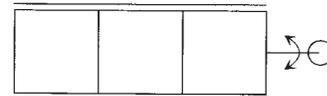
This option is spring centered to neutral from the "A" and "B" power positions. The fourth position has an increased effort, or "feel" between "B" power and regeneration.



## Rotary Spool Actuator

With this option, the positioning of the spool in the valve bore is controlled by rotating the spool. "A" and "B" power positions are at +/- 90° rotation from center, making 180° total rotation with a detent in neutral. There is no spring centering, so spool will stay in any position.

Since the standard handle assemblies do not allow rotary positioning, shifting the spool must be accomplished through direct connection to the spool by a mechanical linkage.



# SPOOL POSITIONERS

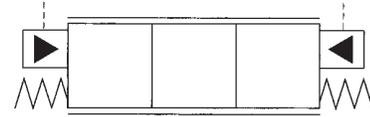
## Hydraulic Remote Spool Positioner

Hydraulic Remote spool actuators provide for remote hydraulic operation of two, three and four position V70/V90 valve sections.

A customer-supplied, hydraulic controller (Gresen Model HCJ, HCS or equivalent) will provide the pilot pressure for infinite spool positioning.

The hydraulic actuator has an optional external adjustment screw override. This override provides a means for emergency manual operation in the event of pilot pressure loss or will permit lowering a load with the pump shut down.

Hydraulic actuator pilot ports are SAE 6 straight thread. Pilot ports may be located at the top (std), bottom, or end (end not available with external override).



## Spool Actuator Specifications

Max. Pressure Rating.....750 PSI (51,8 bar)  
Pilot Press to Initiate Flow.....60 PSI (4,1 bar)  
Pilot Pressure at Full Stroke.....220 PSI (15,2 bar)  
Pilot Flow.....2 to 4 GPM (7,5 to 15 liters/min)

## Hydraulic Remote Float/Regen Positioner

Same as above actuator except designed for use with 4-position valves.



## Spool Actuator Specifications

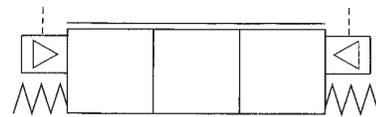
Max. Pressure Rating.....750 PSI (51,8 bar)  
Pilot Press to Initiate Flow.....60 PSI (4,1 bar)  
Pilot Pressure at Full Power.....220 PSI (15,2 bar)  
Pilot Pressure at Float/Regen...450 PSI (31,1 bar)  
Pilot Flow.....2 to 4 GPM (7,5 to 15 liters/min)

## Pneumatic Actuated Spool Actuator

Pneumatic actuated spool actuators provide for remote pneumatic operation of three position valve sections. Four position float operation is not available.

A customer-supplied, pneumatic controller is required to provide the pilot pressure for spool positioning.

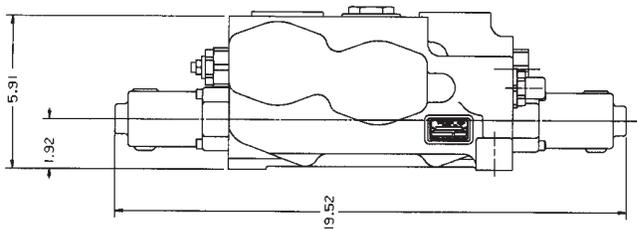
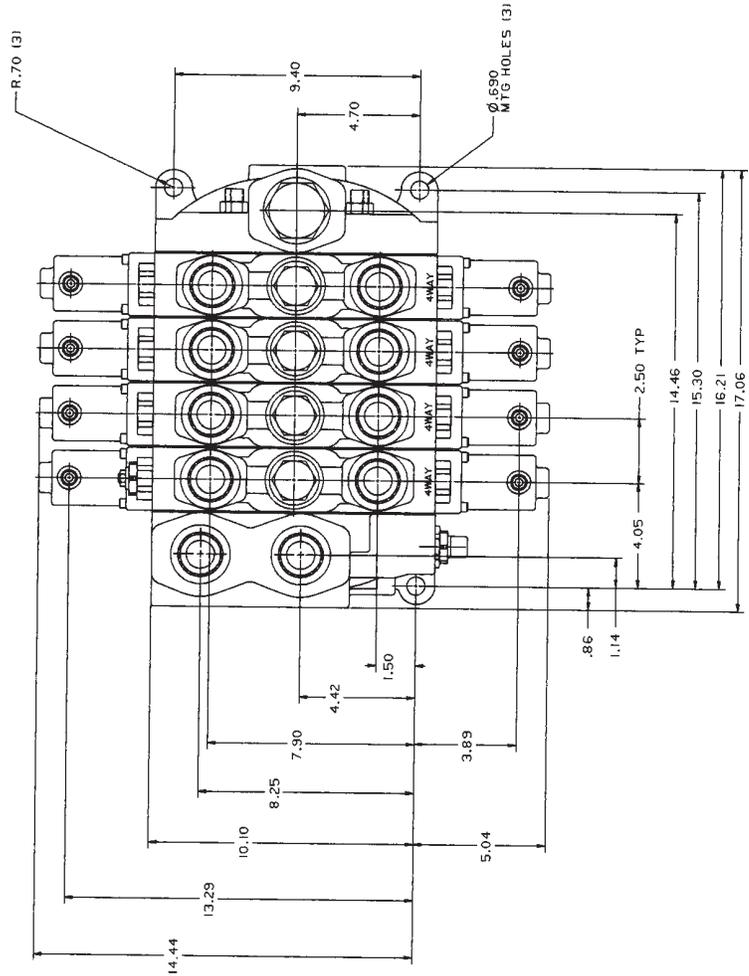
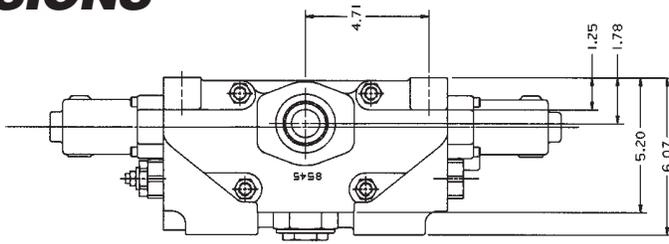
The exposed valve spool end may be used as a means for emergency manual operation in case of air pressure loss or will permit lowering a load with the pump shut down.



## Spool Actuator Specifications

Max. Pressure Rating.....150 PSI (10,3 bar)  
Min. Pressure Rating.....90 PSI (6,2 bar)  
Port Size.....1/4-18 NPTF  
Operating Temperature...-20° to +200°F (-29° to +93°C)  
Shipping Weight.....2.22 Lbs (1,01 kgs)

# DIMENSIONS



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



# ORDERING CODE

## Options Code Symbol

### No. 8565 Inlet Cover Options

Top or End Inlet Ports	-
Top or End Outlet Ports	-
Machined for Inlet Relief (std)	-
Gauge Port	-
Low Pressure Regen	-

### No. 8545 Outlet Cover Options

Open Center (std)	-
Closed Center	C
Power Beyond	Y
Turn Around	-

### Work Section Options

No. 8566 Parallel Section (3-Way, 4-Way, 4-Way Float)	V70/V90P
No. 8567 Tandem Section (3-Way, 4-Way, 4-Way Float)	V70/V90T
No. 8939 Regenerative Section - Parallel (4-Way Regen)	-

### 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, 4-Position, Regenerative	RG4

### Spool Action Options

Spring Return To Neutral (std)	-
3-Position Detent	D
Detent Stop	-
4-Position Float	K4
Rotary Positioner	W
Hydraulic Remote Spool Actuators	HR
Pneumatic Remote Spool Actuators	PA

## Options Code Symbol

### Reliefs, Checks and Restrictors

Inlet and Work Port Relief, Adjustable	RP70-A
Inlet and Work Port Relief, Non-Adj. (Tamper Resistant)	RP70-N
Combination Relief/Anti-Cav Check, Adjustable	RP70A-AC
Combination Relief/Anti-Cav Check, (Tamper Resistant)	RP70N-AC
Work Port Restrictor	-
No Relief	NR

### Handle and Handle End Options

Complete Vertical Handle Assembly	CVHA
Complete Horizontal Handle Assembly	CHHA
Handle Bracket Only	HBO
Standard Spool Seal Retainer	-
Less Handle Only	LHO
Less Complete Handle Assembly	LCHA
Protective Spool Boot Assembly	-

 **WARNING**

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