INTRODUCTION

This technical tips section is designed to help familiarize you with the Parker line of Proportional Valves. In this section we present common options, technical terms, as well as a brief synopsis of the operation and applications of the various products offered in this section. The intent of this section is to help you in selecting the best products for your application.

COMMON OPTIONS

As you will see, Parker offers a variety of Proportional Valve products. As such, some of the options mentioned below may not be available on all valves. Consult the model coding and dimensions for each valve for specifics. Here are some of the common options available.

Seals: Valves are provided with either a 4301 Polyurethane "D"-Ring, Nitrile, or Fluorocarbon Seals. The "D"-Ring eliminates the need for backup rings. You should match the seal compatibility to the temperature and fluid being used in your application.

Overrides: Overrides are standard on many of the Parker proportional valves. The override is generally a push type that is flush with the end of the tube. Consult the individual catalog pages for more details.

TECHNICAL TERMS

To help in applying our proportional valve line of product, we have listed some technical terms below, as well as some helpful hints in applying our valves.

Ohm's Law: Electrical current is generated as a result of the relationship between input voltage and the resistance to the flow of electrical current. It is represented in equation form by I = V/R (or V=IR), where I is current, V is voltage and R is resistance. This is an important relationship to remember when dealing with any electrically operated valves. Proportional valves allow varying control of flow or pressure, dependant on the current signal provided. As coils heat up, their resistance rises. This means a higher voltage must be available to maintain the same amount of pressure or flow. Thus, the application needs to be designed such that the full on position is about 70% of the initial current draw. On the individual catalog pages a maximum control current is specified to help in applying our proportional valves.

PWM: Pulse Width Modulation (PWM) is the preferred signal for controlling electrical current. PWM is on / off voltage in a square wave form. The percent "on" time or duty cycle provides the average voltage. The valve driver adjusts the duty cycle to obtain current control. We recommend valve drivers with current control for optimum performance. PWM signals also usually provide dither for the proportional valve. Dither is a small back and forth movement of the valve spool around its set position. This rapid movement reduces the friction of the valve and leads to faster, more accurate response.

PWM Frequency: The frequency of a PWM signal is the rate at which the signal is turned on and off. Parker's analog proportional valves are designed to work with low frequency responses between 100-400 Hz. The performance curves on our catalog pages were performed with a PWM signal at 200 Hz.

Hysteresis: Due to various factors, the performance of a proportional valve will show a slightly different performance when the current signal is increasing than it will when the signal is being decreased. This difference is usually expressed as a percentage of total input change and is referred to as the hysteresis of the valve.

Deadband: Cracking or deadband refers to the amount of the control signal that is needed to produce any movement of the spool. Thus, a 20% deadband means that 20% of the control signal is needed before the spool will move.

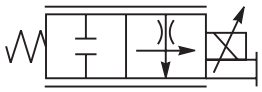
PRODUCT TYPES / APPLICATIONS

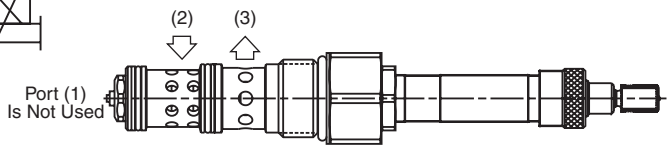
Proportional valves are nothing more than electrically adjustable hydraulic valves. They give the operator nearly infinite adjustment control and flexibility. Parker Hannifin offers various types of proportional flow control, pressure reducing, and relief valves.

Proportional Flow Control Valve

Proportional flow control valves provide pseudo pressure compensation and are used on systems requiring variable electronic control of flow. They allow the operator to vary the control signal to accelerate or decelerate an actuator. A compensator valve can be added to the circuit for enhanced compensation. Some typical applications would include the hoist control for a lift, or the speed control for a winch circuit. Parker offers both normally closed and normally open versions of proportional flow controls.

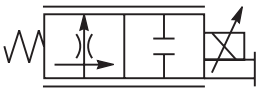
Normally Closed Proportional Flow Control

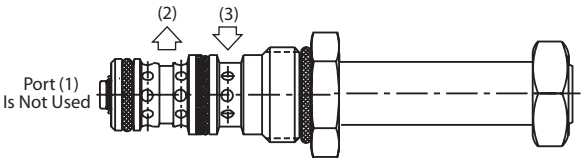




OPERATION - With the solenoid coil de-energized, the spool is held in a closed position by the spring force. When the solenoid coil is energized, the amperage of the signal moves the spool into an open position. The spool is held in this position by a balance between spring force and electrical force. As the current increases, the spools opens further; allowing more flow. As the current decreases, the spool begins closing; allowing less flow. Pseudo compensation is obtained by the pressure drop across the orifices in the spool.

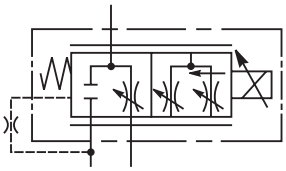
Normally Open Proportional Flow Control

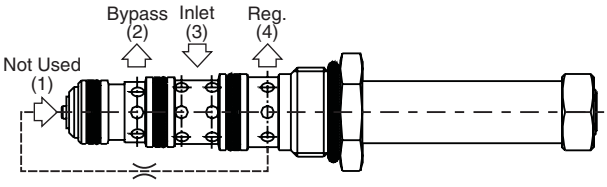




OPERATION - With the solenoid coil de-energized, the spool is held in an open position by spring force; allowing full flow to pass. As the solenoid coil is energized, the spool begins to move away from a full open position; allowing less flow to pass. Once a full electronic signal is given, the spool is held in a closed position; allowing no flow to pass. As the electronic signal is then reduced, the spool begins to open; allowing flow to pass again. Once a constant electronic signal is given, the spool is held in that position by a balance between electronic force and spring force. Pseudo compensation is obtained by the pressure drop across the orifices in the spool.

Proportional Priority Bypass Flow Control





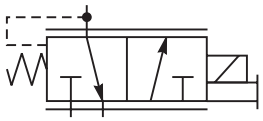
The proportional priority bypass flow controls allow electronic control of the flow setting for the priority flow circuit. The priority flow remains constant regardless of changes in load or pressure. The excess inlet flow is diverted or bypassed to tank. The bypass port must not have any restrictions or performance will be hindered.

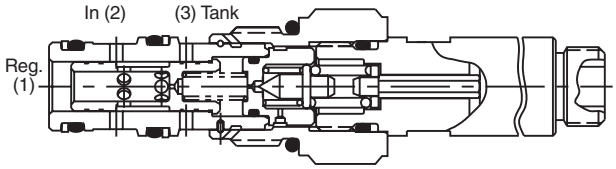
OPERATION - Flow enters the valve through port 3. With the coil de-energized, flow is bypassed to port 2. When the coil is energized, the internal orifice is increased allowing pressure compensated flow to the priority port (port 4). The excess flow is bypassed to port 2. As input current is increased, the priority flow increases and the bypass flow decreases. As the current is decreased, priority flow decreases and bypass flow is increased.

Normally Closed Proportional Pressure Reducing / Relieving Valve

Normally Closed Proportional Pressure Reducing/Relieving Valves are used to electronically reduce the inlet pressure to one leg of a hydraulic circuit. In addition these valves act as a relief valve, relieving any shocks or surges that occur between its regulating port and the actuator. Pilot operated are generally slower on response due to the two stage performance, but can have a reduced pressure as high as 3000 psi.

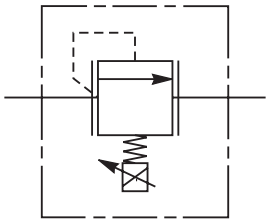
Pilot Operated

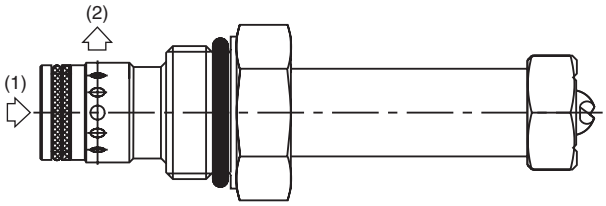




OPERATION - With the solenoid coil de-energized, the pilot dart is held open by the spring force. This allows the main spool to close and restricts flow from going from the inlet (2) port to the regulated port (1). As the electronic signal is applied to the coil, the pilot dart is moved towards the pilot seat restricting pilot flow. This restriction raises the effective pressure inside the chamber between the spool and the pilot seat, allowing the spool to travel away from the pilot seat to a position where the pressure at inlet (2) is connected to the regulated pressure port (1). At this point, reduced pressure becomes a function of the electronic signal. As long as the electronic signal is constant, the reduced pressure at the regulated pressure port (2) will remain fixed regardless of any changes in inlet flow or inlet pressure. As the electronic signal increases or decreases, the reduced pressure at port (1) will change with respect to the change in the electronic signal.

Normally Closed
Proportional Relief Valve

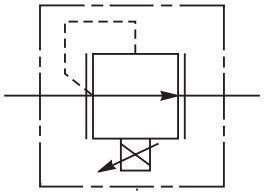


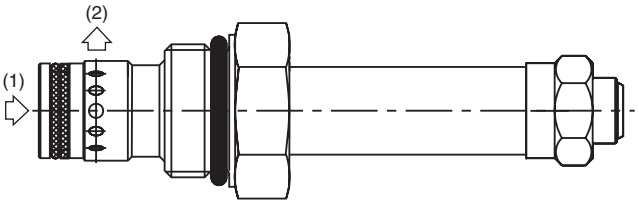


Normally closed proportional relief valves are used to electronically control the system pressure. These valves are ideal for circuits with varying system pressures demands. A small flow pilot version of the normally closed proportional relief is also offered for piloting a larger logic element or vented relief valve. The normally closed relief defaults to a maximum pressure setting (i.e. 3000 psi) when there is no current applied.

OPERATION - With the solenoid coil de-energized, the pilot dart is held closed by the spring. As current is applied to the coil, the pilot dart is moved creating less restriction of the pilot flow. As this restriction is reduced with the increasing current, the pressure setting also decreases. Once a constant electronic signal is given, the pilot dart is held in a given position, holding the pressure setting. This is maintained by the balance between the electronic spring force and the inlet pressure.

Normally Open
Proportional Relief Valve





Normally open proportional relief valves are used to electronically control the system pressure. These valves are ideal for circuits with varying system pressure demands. A small flow pilot version of the normally open proportional relief is also offered for piloting a larger logic element or vented relief valve. The normally open relief defaults to minimum system pressure (i.e. 150 psi) when there is no current applied. Normally closed versions are also available upon request.

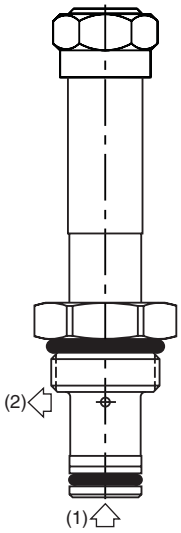
OPERATION - With the solenoid coil de-energized, the pilot dart is held open by the spring. This allows the main spool to open at minimum pressure 10.4 Bar (150 psi). As current is applied to the coil, the pilot dart is moved towards the pilot seat restricting pilot flow. This restriction raises the effective pressure setting of the valve. Once a constant electronic signal is given, the pilot dart is held in a given position, holding the pressure setting. This is maintained by a balance between electronic spring force and inlet pressure. As the electronic signal is reduced, the pilot dart is moved away from the pilot seat. This lowers the effective pressure setting of the valve.

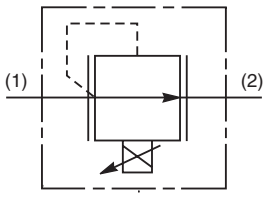
General Description

Proportional Relief Valve. Increasing Pressure With Increasing Current. For additional information see Technical Tips on pages PV2-PV5.

Features

- Analog Proportional Relief Valve regulates pressure proportionally to the solenoid current
- Direct acting poppet design
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.





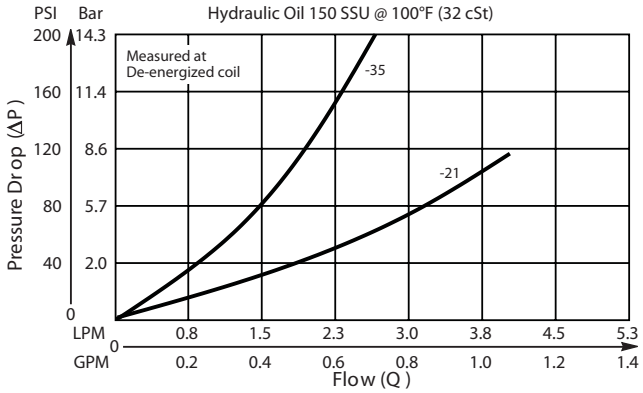
Specifications

Rated Flow (At 70 PSI ΔP)	**21C** 3.0 LPM (0.8 GPM) **35C** 1.3 LPM (.35 GPM)
Max. Pressure At Port 1 @ 75% Input Current	**21C** 210 Bar (3000 PSI) **35C** 350 Bar (5000 PSI)
Port 2 Pressure Limit	103 Bar (1000 PSI)
Hysteresis @ 200 Hz PWM	5%
Cracking Pressure	**21C** 0.21 Bar (3 PSI) **35C** 0.35 Bar (5 PSI)
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-37°C to +93°C ("D"-Ring) (-35°F to +200°F) -34°C to +121°C (Nitrile Buna-N) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.06 kg (0.14 lbs.)
Cavity	C08-2 (See BC Section for more details)

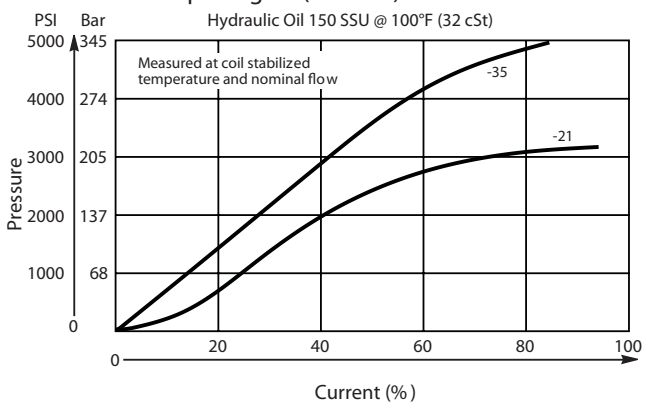
Performance Curves

▲PWM Current Regulator Recommended

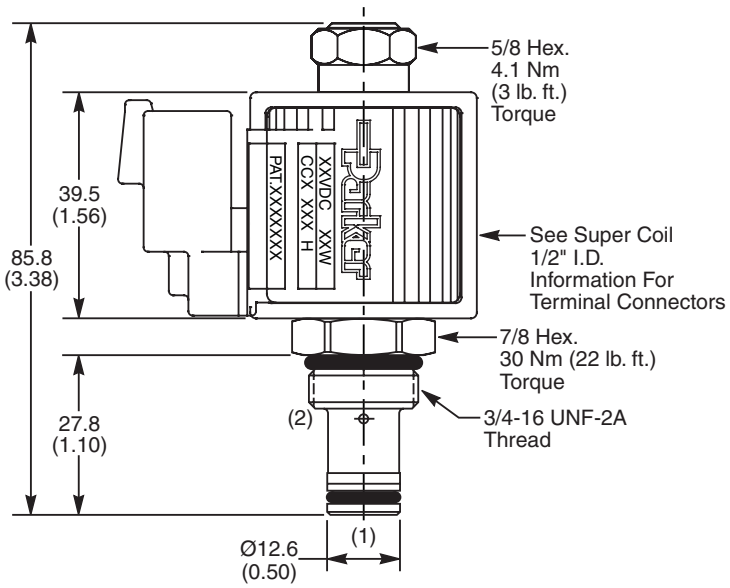
Pressure Drop vs. Flow

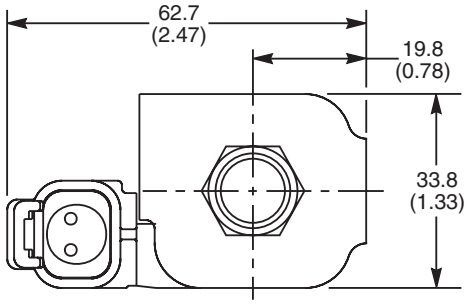


Pressure vs.Input Signal (Current)



Dimensions Millimeters (Inches)





Ordering Information

AP02B2YP	
08 Size Proportional Relief Valve	Max Relief Setting

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Max Relief Setting
21C	210 Bar (3000 PSI)
35C	350 Bar (5000 PSI)

Code	Seals
Omit	"D"-Ring

Order Bodies Separately
See section BC

B08	–	2	–	6T
08 size		2-Way Cavity		Port Size

Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

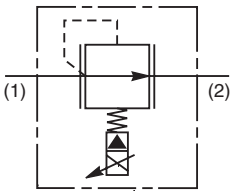
Kit	Part Number
D-Ring Seal	SK08-2
Nitrile Seal	SK08-2
Fluorocarbon Seal	SK08-2V

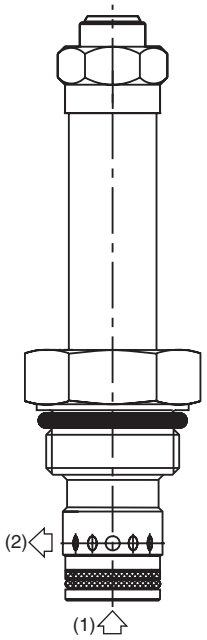
General Description

Proportional Relief Valve. Increasing Pressure With Increasing Current. For additional information see Technical Tips on pages PV2-PV5.

Features

- Pilot operated spool-type design fits industry common cavity (10-2)
- Relieving pressure output is proportional to DC current input
- Precise setting of factory preset pressure in energized mode
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.





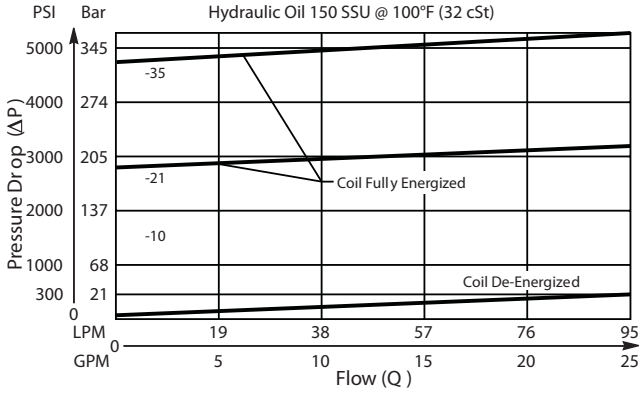
Specifications

Rated Flow (At 300 PSI ΔP) When Coil is Fully De-Energized	95 LPM (25 GPM)
Factory Set Relief Pressure When Coil De-Energized Measured at 45 LPM (12 GPM)	**21C** 210 Bar (3000 PSI) **35C** 350 Bar (5000 PSI)
Port 2 Pressure Limit	103 Bar (1000 PSI)
Hysteresis @ 200 Hz PWM	< 7% of Maximum Pressure Setting
Response Time At 75% of Nominal Voltage Change (Measured To 90% of Press. Change)	**To Unload** 10ms **To Load** **21C** 60 ms **35C** 80 ms
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile Buna-N) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.14 kg (0.31 lbs.)
Cavity	C10-2 (See BC Section for more details)

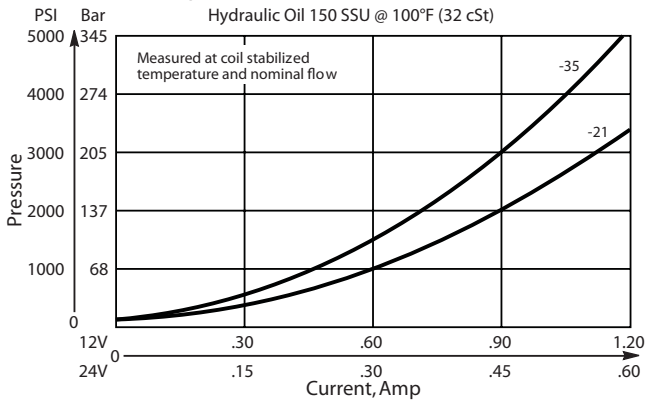
Performance Curves

▲PWM Current Regulator Recommended

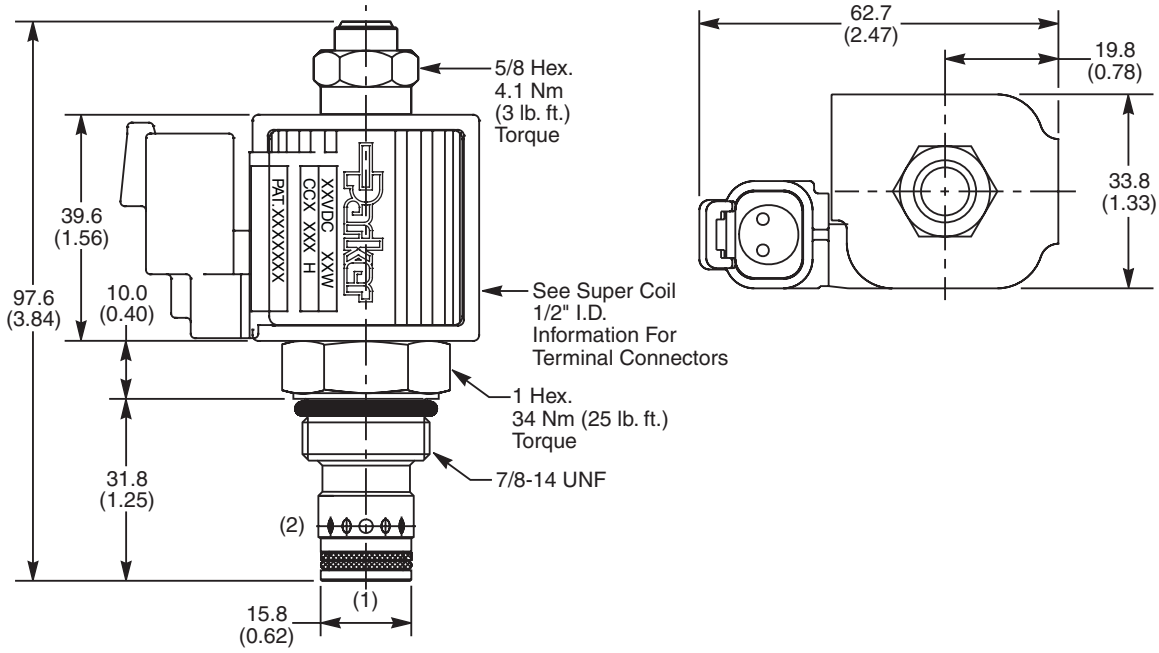
Relief Performance



Pressure vs. Input Current



Dimensions Millimeters (Inches)



Ordering Information

AP04G2YP		N
10 Size Proportional Relief Valve	Max Relief Setting	Seals

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Max Relief Setting
21C	210 Bar (3000 PSI)
35C	350 Bar (5000 PSI)

Code	Seals
N	Nitrile

Order Bodies Separately
See section BC

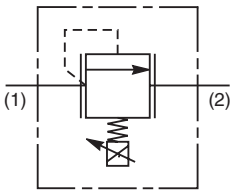
B10	–	2	–	8T
10 size		2-Way Cavity		Port Size

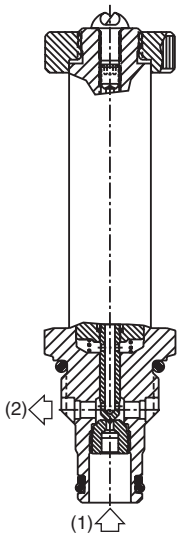
Code	Porting / Body Material
8T	SAE-8 / Steel (5000 PSI)

Kit	Part Number
Nitrile Seal	SK30503N-1
Fluorocarbon Seal	SK30503V-1

General Description

Proportional Relief Valve. Decreasing Pressure With Increasing Current. For additional information see Technical Tips on pages PV2-PV5.





Features

- Analog Proportional Relief Valve regulates pressure proportionally to the input solenoid current
- Direct acting poppet design
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.

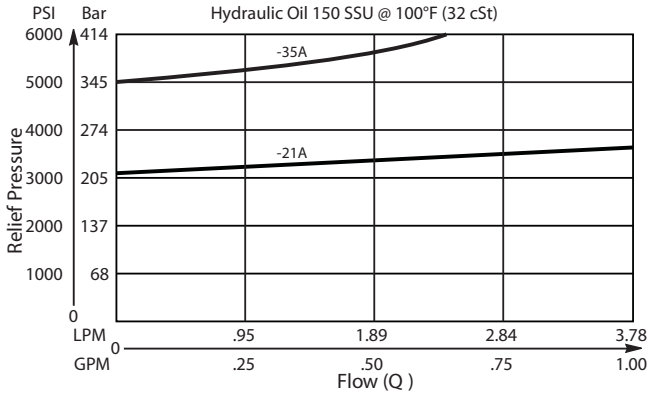
Specifications

Rated Flow (At 70 PSI ΔP)	**21A** 3.0 LPM (0.8 GPM) **35A** 1.3 LPM (.35 GPM)
Factory Set Relief Pressure When De-Energized (±5% -Std. ±2% - Low Variation)	**21A** 210 Bar (3000 PSI) **35A** 350 Bar (5000 PSI)
Port 2 Pressure Limit	103 Bar (1000 PSI)
Hysteresis @ 200 Hz PWM	< 10%
Cracking Pressure	**21C** 0.21 Bar (3 PSI) **35C** 0.35 Bar (5 PSI)
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-37°C to +93°C ("D"-Ring) (-35°F to +200°F) -34°C to +121°C (Nitrile Buna-N) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.09 kg (0.19 lbs.)
Cavity	C08-2 (See BC Section for more details)

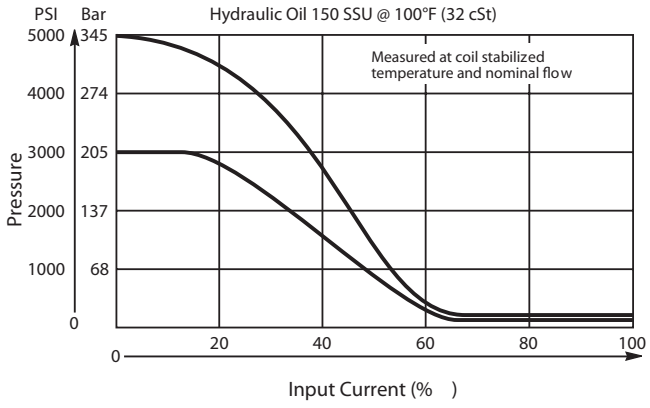
Performance Curves

▲PWM Current Regulator Recommended

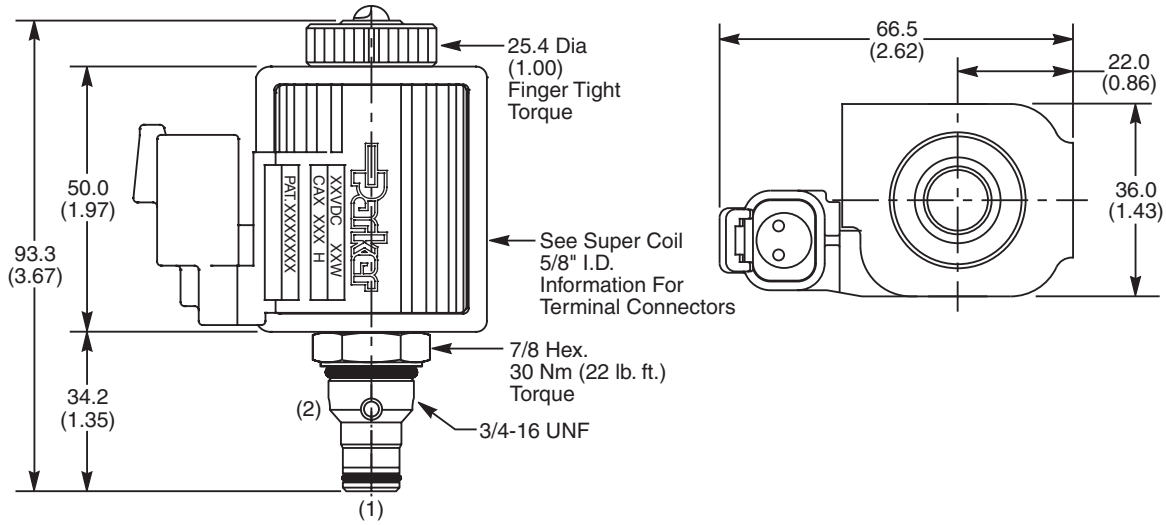
Relief Performance



Pressure vs. Input Current



Dimensions Millimeters (Inches)



Ordering Information

AP02B2YR		L
08 Size Proportional Relief Valve	Max Relief Setting	Low Variation Now Standard

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 5/8" Super-Coil (CA series), for ordering information.

Code	Max Relief Setting
21A	210 Bar (3000 PSI)
35A	350 Bar (5000 PSI)

Code	Seals
Omit	"D"-Ring

Order Bodies Separately
See section BC

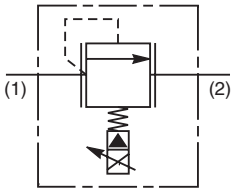
B08	–	2	–	6T
08 size		2-Way Cavity		Port Size

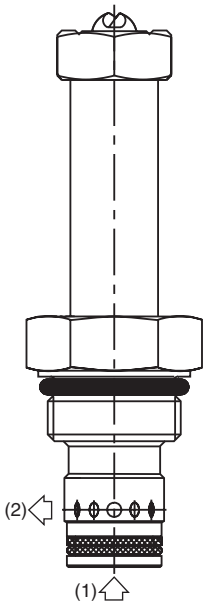
Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

Kit	Part Number
D-Ring Seal	SK08-2
Nitrile Seal	SK08-2
Fluorocarbon Seal	SK08-2V

General Description

Proportional Relief Valve. Decreasing Pressure With Increasing Current. For additional information see Technical Tips on pages PV2-PV5.





Features

- Pilot operated spool-type design
- Precise setting of factory preset pressure in de-energized mode
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.

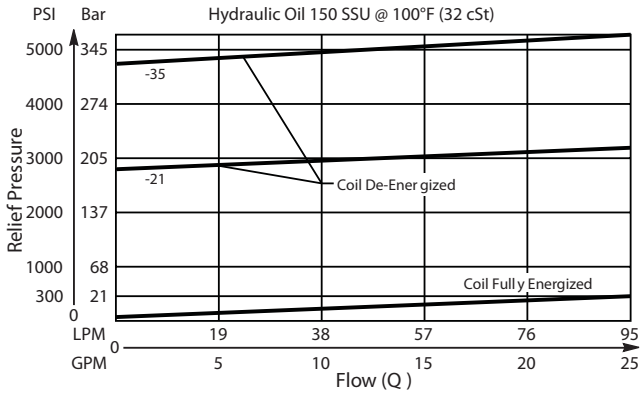
Specifications

Rated Flow (At 300 PSI ΔP) When Coil is Fully Energized	95 LPM (25 GPM)
Factory Set Relief Pressure When Coil De-Energized Measured at 45 LPM (12 GPM)	**21C** 210 Bar (3000 PSI) **35C** 350 Bar (5000 PSI)
Port 2 Pressure Limit	103 Bar (1000 PSI)
Hysteresis @ 200 Hz PWM	< 7% of Maximum Pressure Setting
Response Time At 75% of Nominal Voltage Change (Measured To 90% of Press. Change)	**To Unload** 45ms **To Load** 25 ms
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.14 kg (0.30 lbs.)
Cavity	C10-2 (See BC Section for more details)

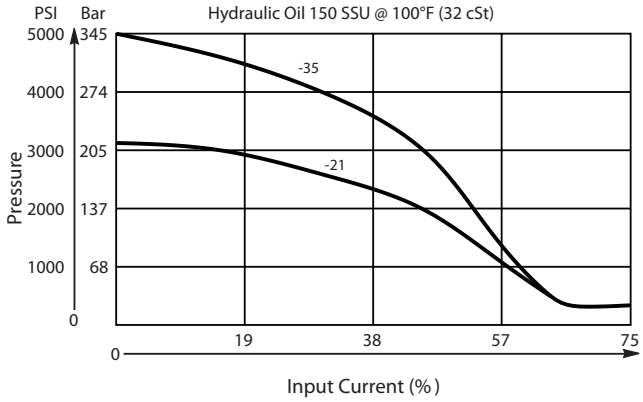
Performance Curves

▲PWM Current Regulator Recommended

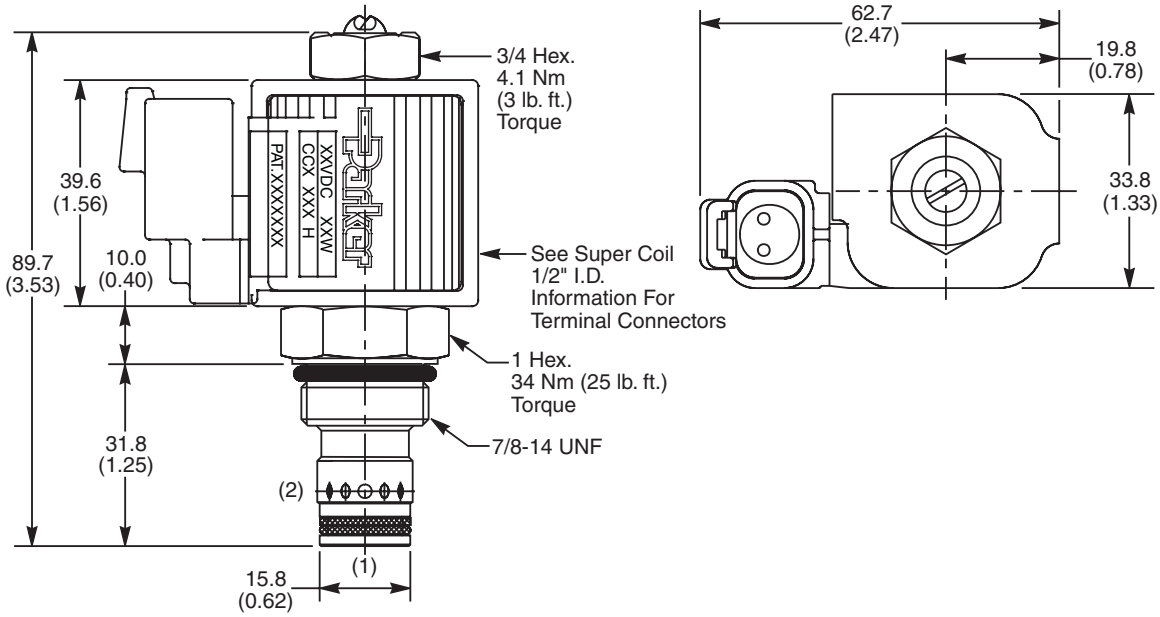
Relief Performance



Pressure vs. Input Current



Dimensions Millimeters (Inches)



Ordering Information

AP04G2YR		N
10 Size Proportional Relief Valve	Max Relief Setting	Seals

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Max Relief Setting
21C	210 Bar (3000 PSI)
35C	350 Bar (5000 PSI)

Code	Seals
N	Nitrile

Order Bodies Separately
See section BC

B10	–	2	–	8T
10 size		2-Way Cavity		Port Size

Code	Porting / Body Material
8T	SAE-8 / Steel (5000 PSI)

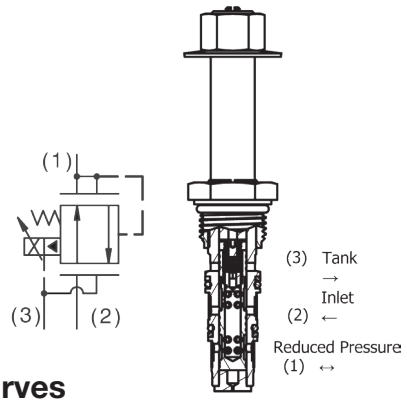
Kit	Part Number
Nitrile Seal	SK30503N-1
Fluorocarbon Seal	SK30503V-1

General Description

Pilot Operated, Pressure Increasing with Current Proportional Pressure Reducing/ Relieving Valve. For additional information see Technical Tips on pages PV2-PV5.

Features

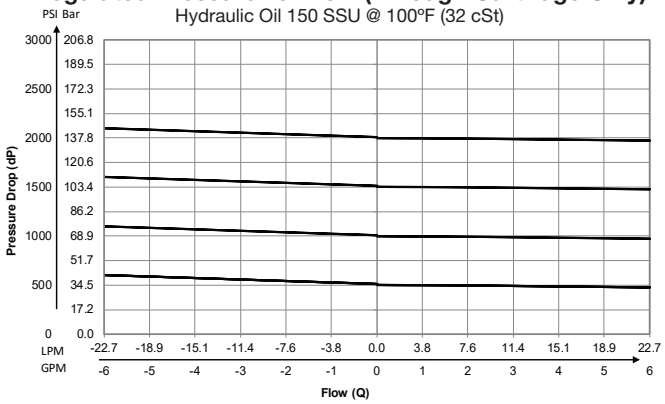
- Low hysteresis
- High flow capacity
- 400 Hz PWM signal preferred
- No dynamic seals
- Screw style manual override standard
- Polyurethane “D”-ring eliminates the need for back-up rings



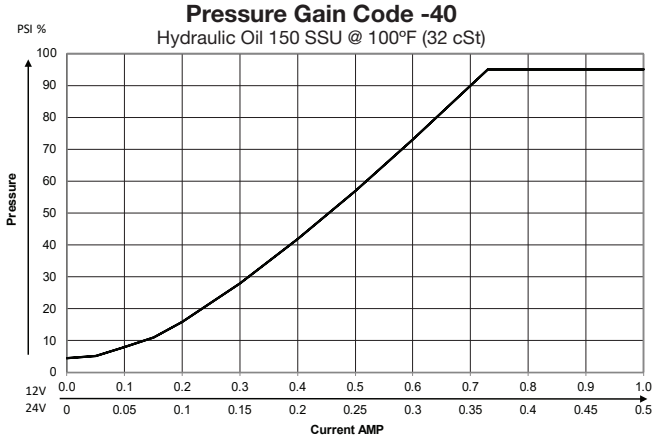
Performance Curves

Current Regulator PWM Recommended

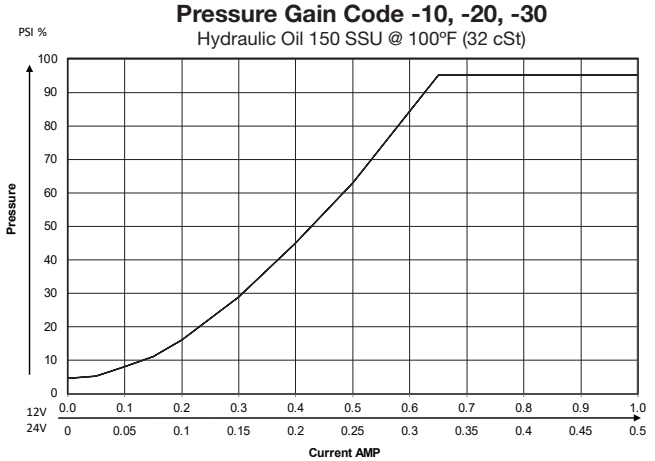
Regulated Pressure vs. Flow (Through Cartridge Only)
Hydraulic Oil 150 SSU @ 100ºF (32 cSt)



Pressure Gain Code -40
Hydraulic Oil 150 SSU @ 100ºF (32 cSt)



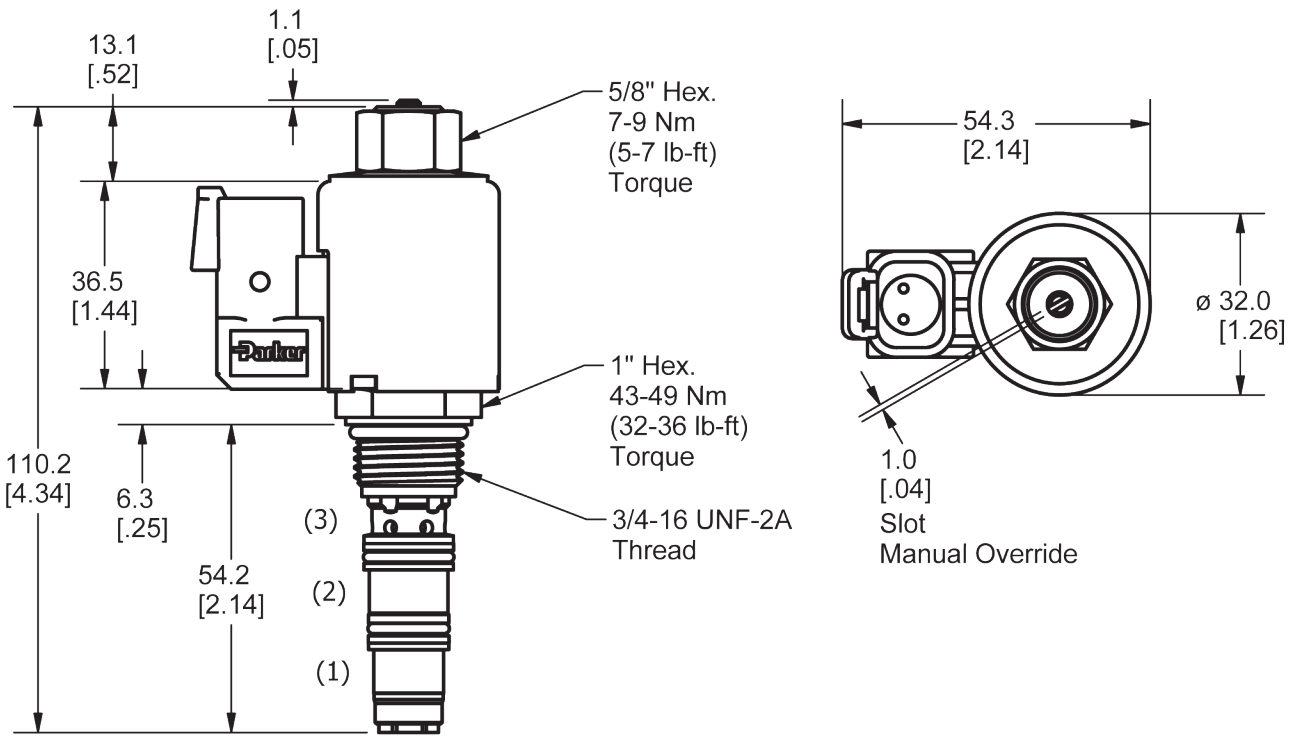
Pressure Gain Code -10, -20, -30
Hydraulic Oil 150 SSU @ 100ºF (32 cSt)



Specifications

Rated Flow	22.7 LPM (6 GPM)
Max. Input Press. At Port 1	345 Bar (5000 PSI)
Max. Internal Leakage De-energised	230 cc/min (14 in^3/min)
Hysteresis @ 400 Hz PWM	4% with 30% to 50% duty cycle
Power Consumption	8.4 Watts at max. reduced pressure
Frequency	200-600 Hz (PWM)
Continuous Duty Control Current	12VDC 24VDC .730A .365A
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-37°C to +93°C (“D”-Ring) (-35°F to +200°F) -34°C to +121°C (Nitrile Buna-N) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.25 kg (0.55 lbs.) With coil
Cavity	C08-3L (See BC Section for more details)

Dimensions Millimeters (Inches)



Ordering Information

EPR083	R	
08 Size Proportional Valve	Style	Pressure Range

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Coil Short Proportional (SW7L series), for ordering information.

Code	Coil Type
R	Pilot operated increasing "rising" pressure

Code	Pressure Range (Output)
20	138 Bar (2000 PSI)
40	276 Bar (4000 PSI)

Code	Seals
Omit	"D"-Ring

Order Bodies Separately
See section BC

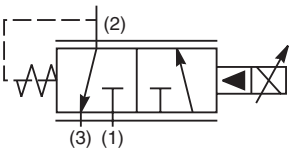
B08	–	3L	–	8T
08 size		3-Way Cavity		Port Size

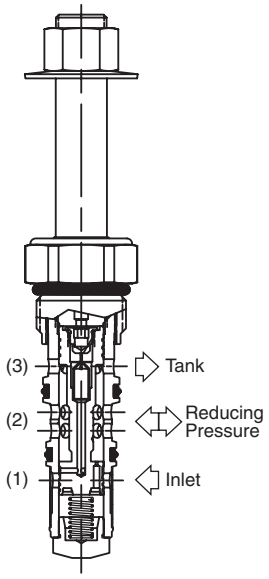
Code	Porting / Body Material
8T	SAE-8 / Steel (5000 PSI)

Kit	Part Number
D-Ring Seal	SK08-3
Nitrile Seal	SK08-3
Fluorocarbon Seal	SK08-3V

General Description

Pilot Operated, Normally Closed, Proportional Pressure Reducing/Relieving Valve. For additional information see Technical Tips on pages PV2-PV5.





Features

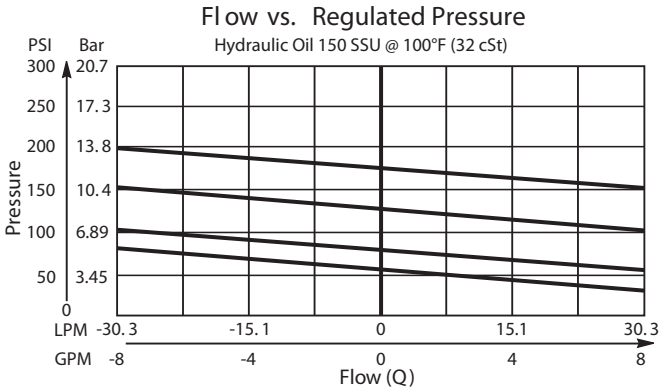
- High flow capacity
- Low hysteresis
- 400 Hz PWM signal preferred
- No dynamic seals
- Polyurethane “D”-Ring eliminates need for backup rings

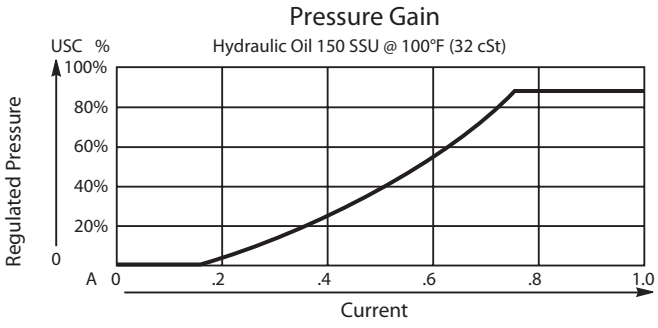
Specifications

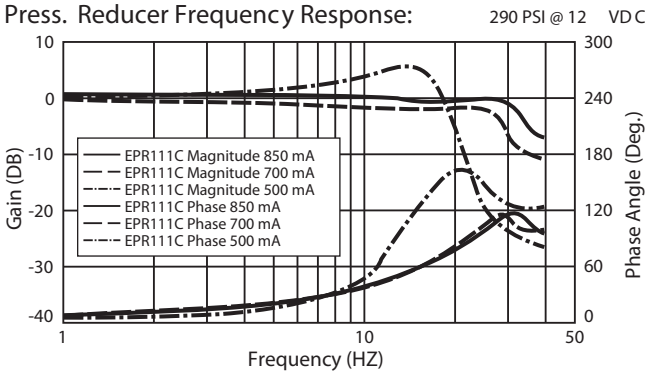
Rated Flow	37.5 LPM (10 GPM)
Maximum Input Pressure at Port 2	350 Bar (5000 PSI)
Maximum Internal Leakage	0.5 LPM (0.13 GPM) @ 20.7 Bar (300 PSI) 0.95 LPM (0.25 GPM) @ 207 Bar (3000 PSI)
Hysteresis @ 400 Hz PWM	4% with 60% duty cycle
Power Consumption	9 watts at max. reduced pressure
Frequency	200-600 Hz (PWM)
Maximum Control Current	**12 VDC** .90A **24 VDC** .45A
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-37°C to +93°C (“D”-Ring) (-35°F to +200°F) -34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.59 kg (1.3 lbs.)
Cavity	C10-3L (See BC Section for more details)

Performance Curves

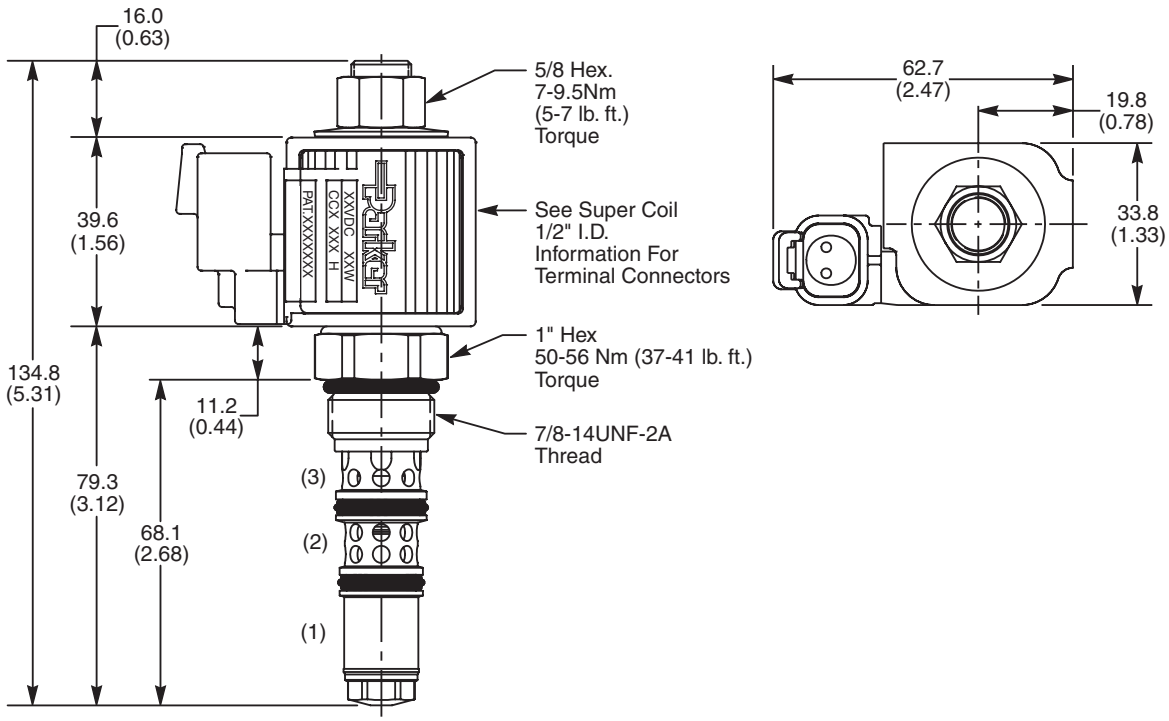
▲PWM Current Regulator Recommended







Dimensions Millimeters (Inches)



Ordering Information

EPR111	C	
11 Size Proportional Red./Rel. Valve	Style	Pressure Range

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Style
C	Normally Closed, Pilot Operated

Code	Pressure Range
10	68.9 Bar (1000 PSI)
20	138 Bar (2000 PSI)
30	207 Bar (3000 PSI)

Code	Seals
Omit	"D"-Ring

Order Bodies Separately
See section BC

B10	–	3	–	8T
10 size		3-Way Cavity		Port Size

Code	Porting / Body Material
8T	SAE-8 / Steel (5000 PSI)

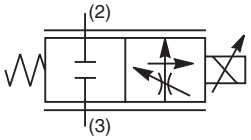
Kit	Part Number
D-Ring Seal	SK10-3L
Nitrile Seal	SK10-3LN
Fluorocarbon Seal	SK10-3LV

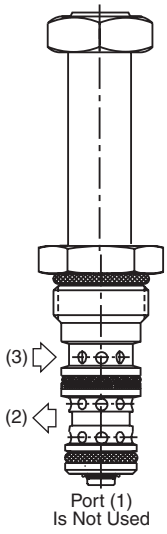
General Description

2 Way, Normally Closed, Proportional Flow Regulator Valve. Pressure Compensated. For additional information see Technical Tips on pages PV2-PV5.

Features

- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.
- Nonmagnetic spool and housing assembly
- Factory-adjusted low variation option (Model "L") is available for applications where low variation of flow from valve to valve is essential at a given current.





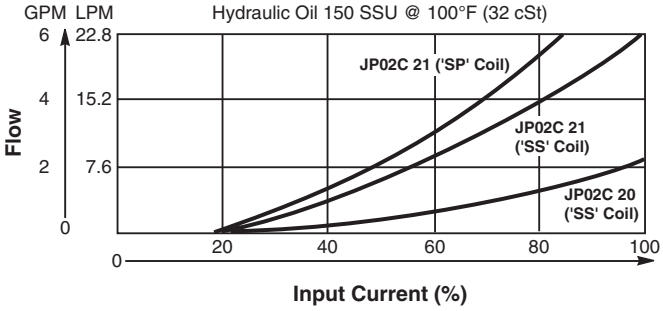
Specifications

Rated Flow	**20** 7.5 LPM (2 GPM) Low Flow ('SS' Coil) **21** 15 LPM (4 GPM) Standard ('SS' Coil) **21** 23 LPM (6 GPM) High Flow ('SP' Coil)
Maximum Input Pressure at Port 3	210 Bar (3000 PSI)
Minimum Pressure Differential	**20** 10.3 Bar (150 PSI) Low Flow **21** 13.8 Bar (200 PSI) Standard **21** 20.7 Bar (300 PSI) High Flow
Maximum Internal Leakage	570 cc (35 cu. in.) @ 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	<10% (Low Flow and Standard) <3% (High Flow)
Cracking Pressure	25% of Input Signal
Variation of Flow @ 35% of Rated Current	**Model "L"** ±7% Of Rated Flow
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.08 kg (0.17 lbs.)
Cavity	C08-3 (See BC Section for more details)

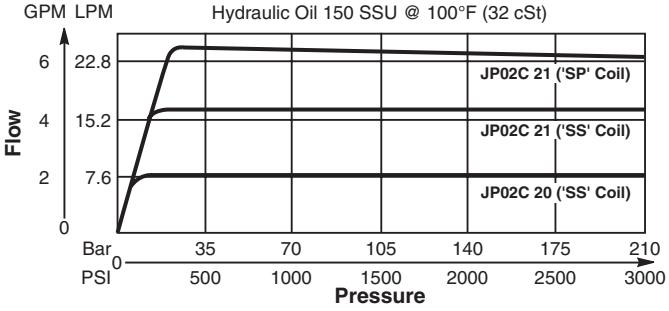
Performance Curves

▲PWM Current Regulator Recommended

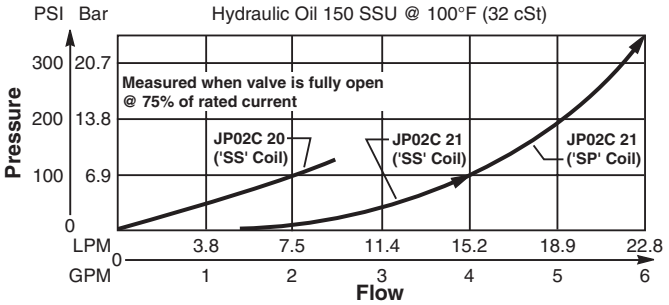
Flow vs. Input Current



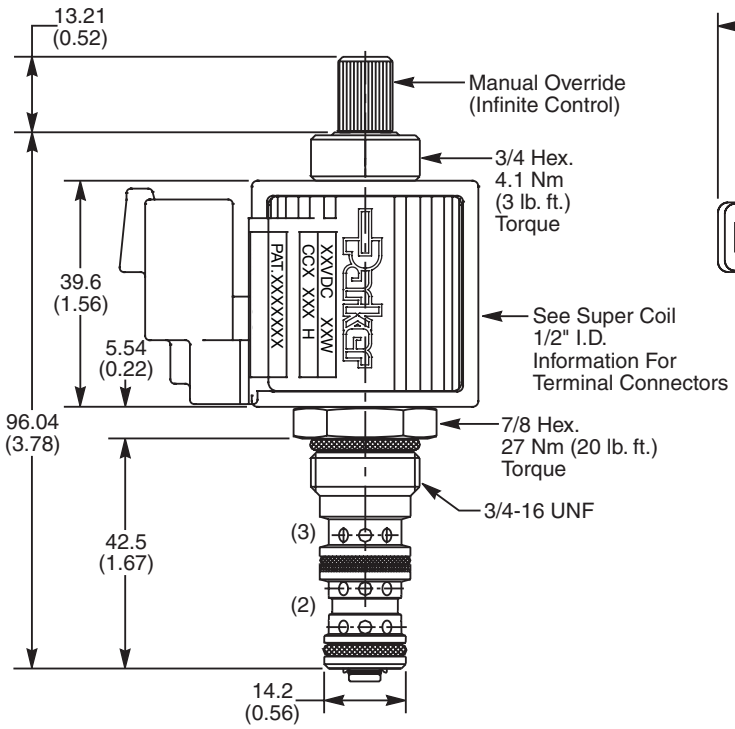
Flow Regulation (Measured 75% of Rated Current)

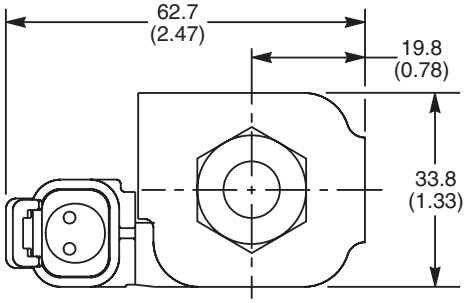


Pressure Drop vs. Flow



Dimensions Millimeters (Inches)





Ordering Information

JP02C				N	L
08 Size Proportional Valve	Style	Override Option	Filter Screen	Seals	Flow Variation

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Style (Maximum Regulated Flow)
20	Low Flow ('SS' Coil) 7.5 LPM (2 GPM)
21	Standard ('SS' Coil) 15 LPM (4 GPM)
21	High Flow ('SP' Coil) 23 LPM (6 GPM)

Code	Override Option
0	Not Required
5	Infinite Control M.O.

Code	Filter Screen
0	Not Available
1	60 Mesh Screen on Inlet Port

Code	Seals
N	Nitrile

Code	Flow Variation
L	Low Variation (±7% of Rated Flow)

Kit	Part Number
Nitrile Seal	SK30105N-1
Fluorocarbon Seal	SK30105V-1

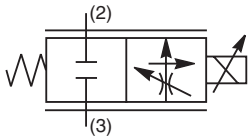
Order Bodies Separately
See section BC

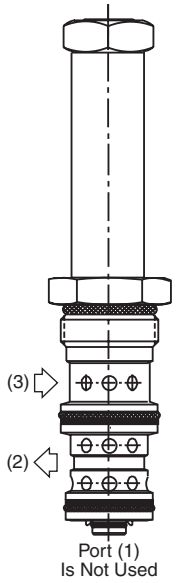
B08	–	3	–	6T
08 size		3-Way Cavity		Port Size

Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

General Description

2 Way, Normally Closed, Proportional Flow Regulator Valve. Pressure Compensated.
For additional information see Technical Tips on pages PV2-PV5.





Features

- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.
- Nonmagnetic spool and housing assembly
- Factory-adjusted low variation option (Model "L") is available for applications where low variation of flow from valve to valve is essential at a given current.

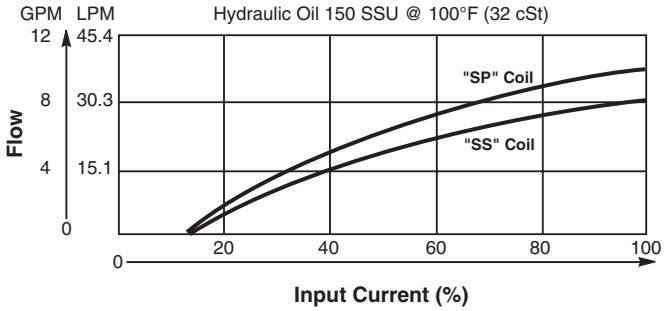
Specifications

Rated Flow	**21** 30 LPM (8 GPM) Standard ('SS' Coil) **21** 36 LPM (9.5 GPM) High Flow ('SP' Coil)
Maximum Input Pressure at Port 2	210 Bar (3000 PSI)
Minimum Pressure Differential	**21** 13.8 Bar (200 PSI) Standard **21** 20.7 Bar (300 PSI) High Flow
Maximum Internal Leakage	780 cc (46 cu. in.) @ 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	7%
Cracking Pressure	25% of Input Signal
Variation of Flow @ 35% of Rated Current	**Model "L"** ±7% Of Rated Flow
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.13 kg (0.28 lbs.)
Cavity	3X (See BC Section for more details)

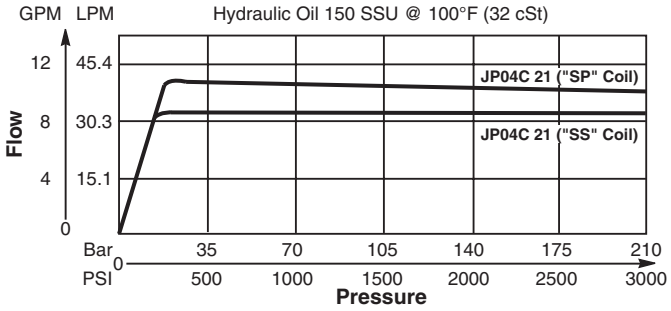
Performance Curves

▲PWM Current Regulator Recommended

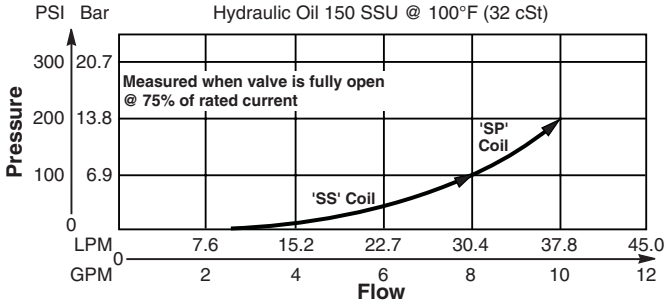
Flow vs. Input Signal



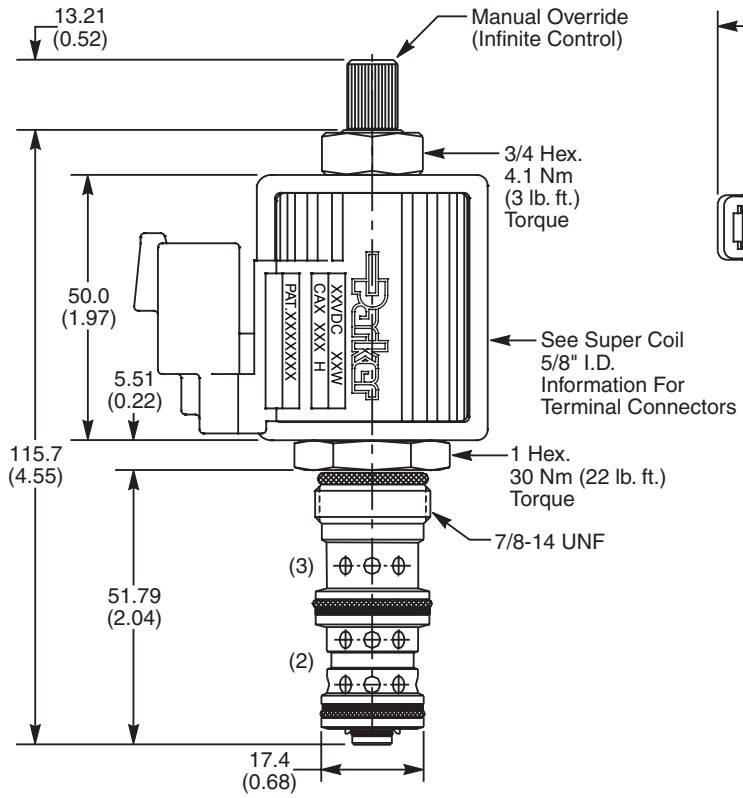
Flow Regulation (Measured 75% of Rated Current)

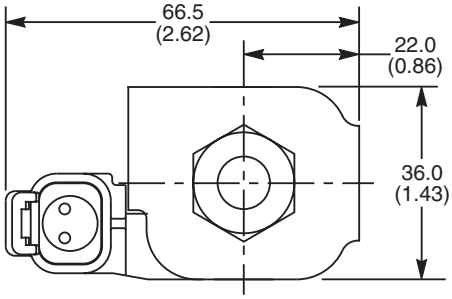


Pressure Drop vs. Flow



Dimensions Millimeters (Inches)





Ordering Information

JP04C	21			N	L
10 Size Proportional Valve	Style	Override Option	Filter Screen	Seals	Flow Variation

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 5/8" Super-Coil (CA series), for ordering information.

Code	Style (Maximum Regulated Flow)
21	Standard ('SS' Coil) 30 LPM (8 GPM)
21	High Flow ('SP' Coil) 36 LPM (9.5 GPM)

Code	Override Option
0	Not Required
5	Infinite Control M.O.

Code	Filter Screen
0	Not Available
1	60 Mesh Screen on Port 2

Code	Seals
N	Nitrile

Code	Flow Variation
L	Low Variation (±7% of Rated Flow)

Kit	Part Number
Nitrile Seal	SK30106N-1
Fluorocarbon Seal	SK30106V-1

Order Bodies Separately See section BC

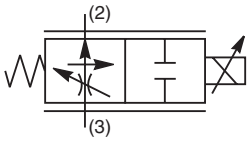
LB10	553	S
Line Body	Porting	Body Material

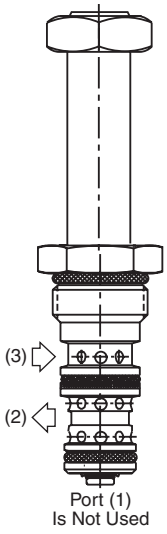
Code	Porting
553	1/2" SAE

Code	Body Material
S	Steel (5000 PSI)

General Description

2 Way, Normally Open, Proportional Flow Regulator Valve. Pressure Compensated.
For additional information see Technical Tips on pages PV2-PV5.





Features

- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.
- Nonmagnetic spool and housing assembly
- Factory-adjusted low variation option (Model "L") is available for applications where low variation of flow from valve to valve is essential at a given current.

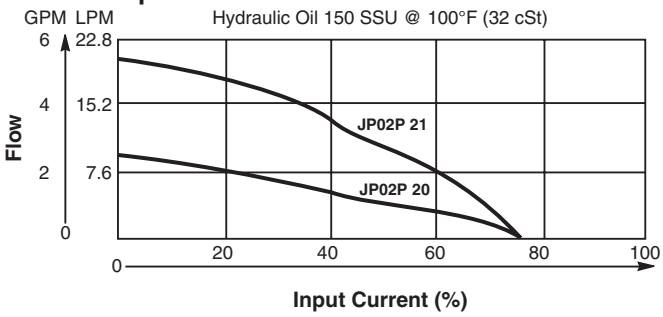
Specifications

Rated Flow	**20** 9.5 LPM (2.5 GPM) Standard ('SS' Coil) **21** 19 LPM (5 GPM) High Flow ('SP' Coil)
Maximum Input Pressure at Port 2	210 Bar (3000 PSI)
Minimum Pressure Differential	**20** 10.3 Bar (150 PSI) Standard **21** 20.7 Bar (300 PSI) High Flow
Maximum Internal Leakage	570 cc (35 cu. in.) @ 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	<3%
Cracking Pressure	25% of Input Signal
Variation of Flow @ 35% of Rated Current	**Model "L"** ±7% Of Rated Flow
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.08 kg (0.17 lbs.)
Cavity	C08-3 (See BC Section for more details)

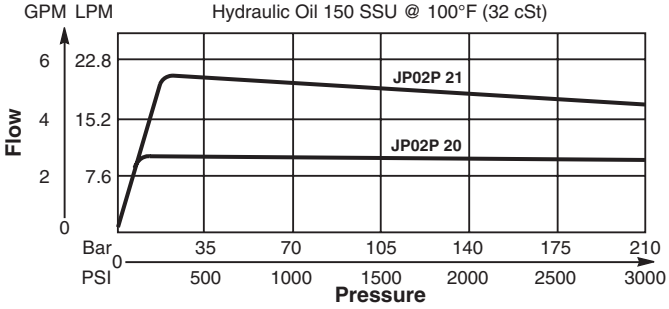
Performance Curves

▲PWM Current Regulator Recommended

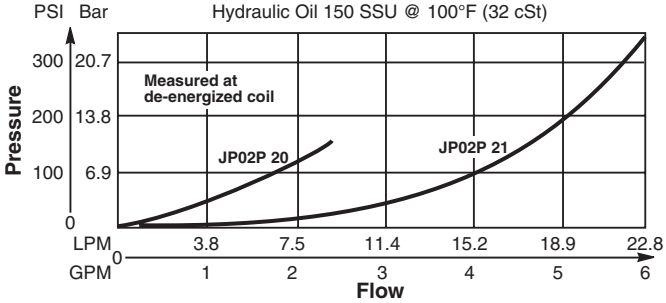
Flow vs. Input Current



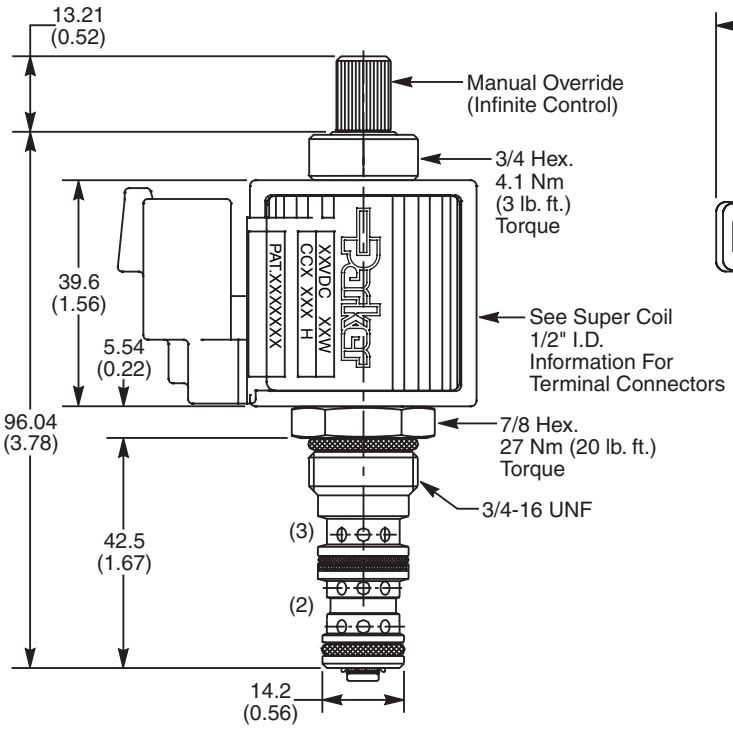
Flow Regulation (Measured 75% of Rated Current)

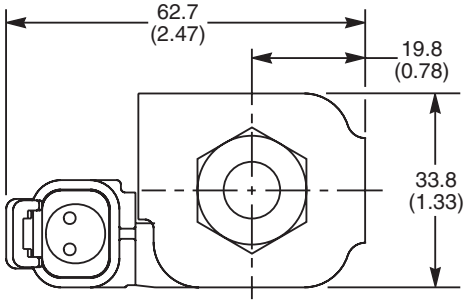


Pressure Drop vs. Flow



Dimensions Millimeters (Inches)





Ordering Information

JP02P				N	L
08 Size Proportional Valve	Style	Override Option	Filter Screen	Seals	Flow Variation

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Style (Maximum Regulated Flow)
20	Standard ('SS' Coil) 9.5 LPM (2.5 GPM)
21	High Flow ('SP' Coil) 19 LPM (5 GPM)

Code	Override Option
0	Not Required
5	Infinite Control M.O.

Code	Filter Screen
0	Not Available
1	60 Mesh Screen on Port 2

Code	Seals
N	Nitrile

Code	Flow Variation
L	Low Variation (±7% of Rated Flow)

Kit	Part Number
Nitrile Seal	SK30105N-1
Fluorocarbon Seal	SK30105V-1

Order Bodies Separately
See section BC

B08	–	3	–	6T
08 size		3-Way Cavity		Port Size

Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

General Description

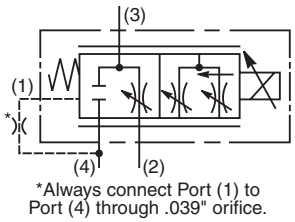
3 Way, Normally Closed, Proportional Flow Regulator Valve. Pressure Compensated. For additional information see Technical Tips on pages PV2-PV5.

Features

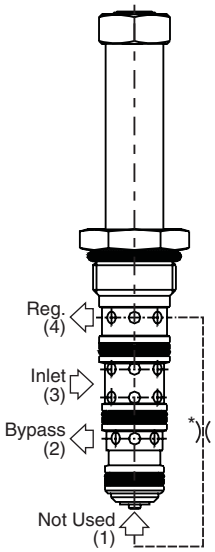
- Analog proportional pressure compensated flow control valve regulates flow proportionally to the input solenoid current
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.
- Nonmagnetic spool and housing assembly
- Factory-adjusted low variation option (Model "L") is available for applications where low variation of flow from valve to valve is essential at a given current.

Specifications

Rated Inlet Flow	60 LPM (16 GPM)
Rated Regulated Flow	**31** 26 LPM (7 GPM) Standard ('SS' Coil) **31** 30 LPM (8 GPM) High Flow ('SP' Coil)
Maximum Input Pressure at Port 3	210 Bar (3000 PSI)
Minimum Pressure Differential	**31** 13.8 Bar (200 PSI) Standard **31** 20.7 Bar (300 PSI) High Flow
Maximum Internal Leakage	780 cc (46 cu. in.) @ 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	7%
Opening Point	**Standard** 21% of Nominal Amperage **High Flow** 17% of Nominal Amperage
Variation of Opening Point	**Model "L"** ±20% of Amperage
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.14 kg (0.31 lbs.)
Cavity	4C (See BC Section for more details)



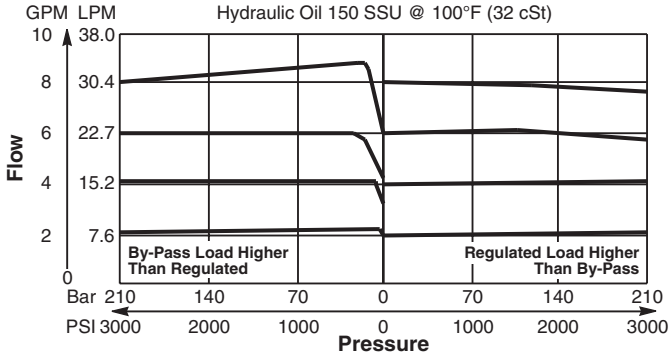
*Always connect Port (1) to Port (4) through .039" orifice.



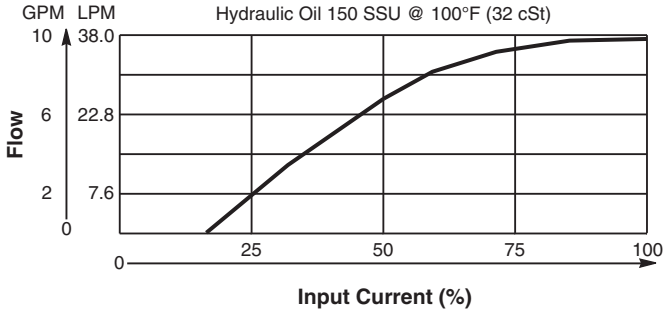
Performance Curves

▲PWM Current Regulator Recommended

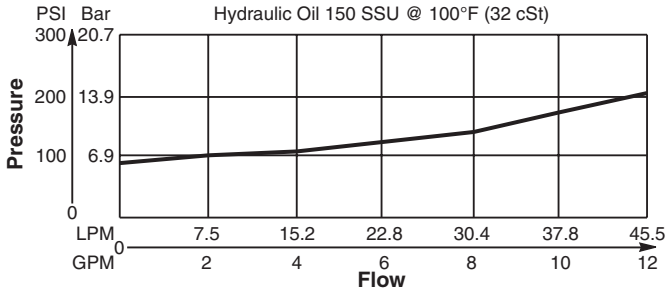
Pressure Compensation of Regulated Flow (Port 4)



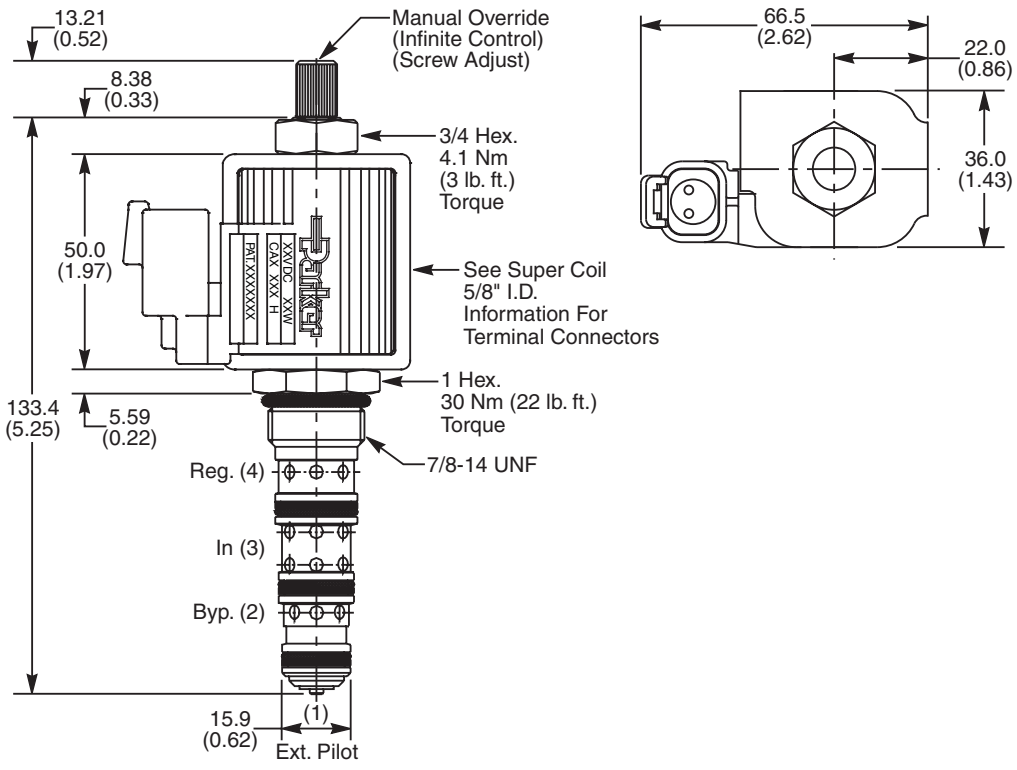
Regulated Flow vs. Input Current Stabilized



Pressure Drop vs. Flow at Coil Fully Energized



Dimensions Millimeters (Inches)



Ordering Information

JP04C	31		0	N	L
10 Size Proportional Valve	Style	Override Option	Filter Screen	Seals	Flow Variation

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 5/8" Super-Coil (CA series), for ordering information.

Code	Style (Maximum Regulated Flow)
31	Standard ('SS' Coil) 26 LPM (7 GPM)
31	High Flow ('SP' Coil) 30 LPM (8 GPM)

Code	Override Option
0	Not Required
5	Screw Adjust (Infinite Control)

Code	Filter Screen
0	Not Available

Code	Seals
N	Nitrile

Code	Flow Variation
L	Low Variation (±7% of Rated Flow)

Kit	Part Number
Nitrile Seal	SK30082N-1
Fluorocarbon Seal	SK30082V-1

Order Bodies Separately
See section BC

LB10	562	S
Line Body	Porting	Body Material

Code	Porting
562	1/2" SAE Steel (5000 PSI)

General Description

4 Way, 3 Position, Proportional Directional Control Valve. Closed Center Spool. For additional information see Technical Tips on pages PV2-PV5.

Features

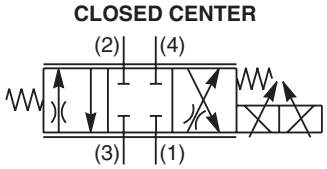
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.

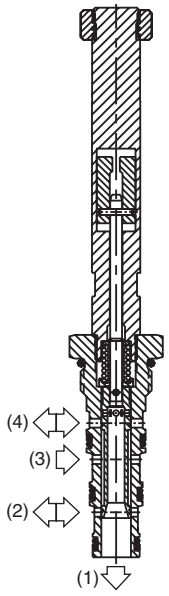
Specifications

Operating Pressure	**Ports 2, 3 and 4** 350 Bar (5000 PSI) **Port 1** 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	<6%
Cracking Flow	25% to 30% of Input Signal
Variation of Flow	±15% @ 75% of Nominal Current and Constant ΔP Maintained by Pressure Compensator
Port to Port Leakage	10 cu. in/min @ 3000 PSI
Step Response Time at 75% of Amps	On 50 ms Off 40 ms
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.15 kg (0.34 lbs.)
Cavity	C08-4 (See BC Section for more details)

Typical Performance

SPOOL TYPE AND FLOW	RATED FLOW AT 75% OF NOMINAL CURRENT LPM - (GPM)		SUPER COIL TYPE		Compensator ΔP Bar (PSI)
	'a' SOLENOID PUSH P to A, B to T	'b' SOLENOID PULL P to B, A to T	PUSH	PULL	
51 Standard	13.3 - (3.5)	17 - (4.5)	SP	SP	15 (220)
	11.4 - (3.0)	15.2 - (4.0)	SS	SS	15 (220)
52 High Flow	21 - (5.5)	17 - (4.5)	SP	SP	20 (290)
	17.4 - (4.5)	13 - (3.5)	SP	SP	15 (220)

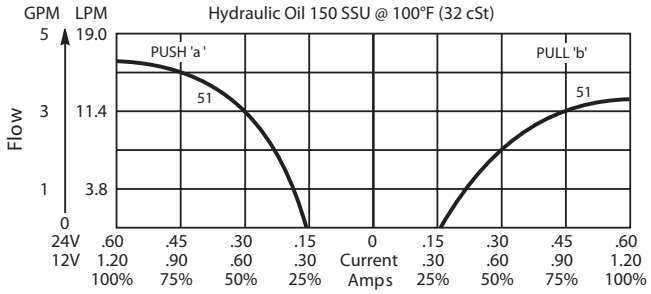




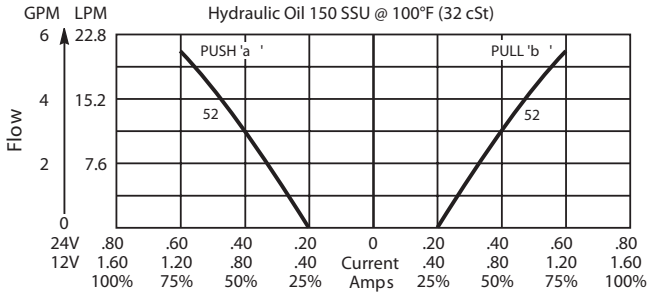
Performance Curves

▲PWM Current Regulator Recommended

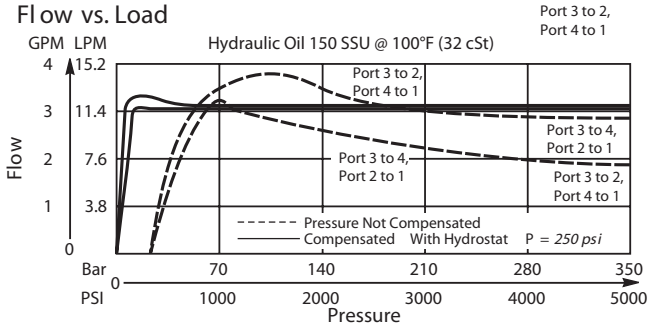
51L With 5 Bar, 75 PSI Compensator
51 With 15 Bar, 220 PSI Compensator and SS Coil



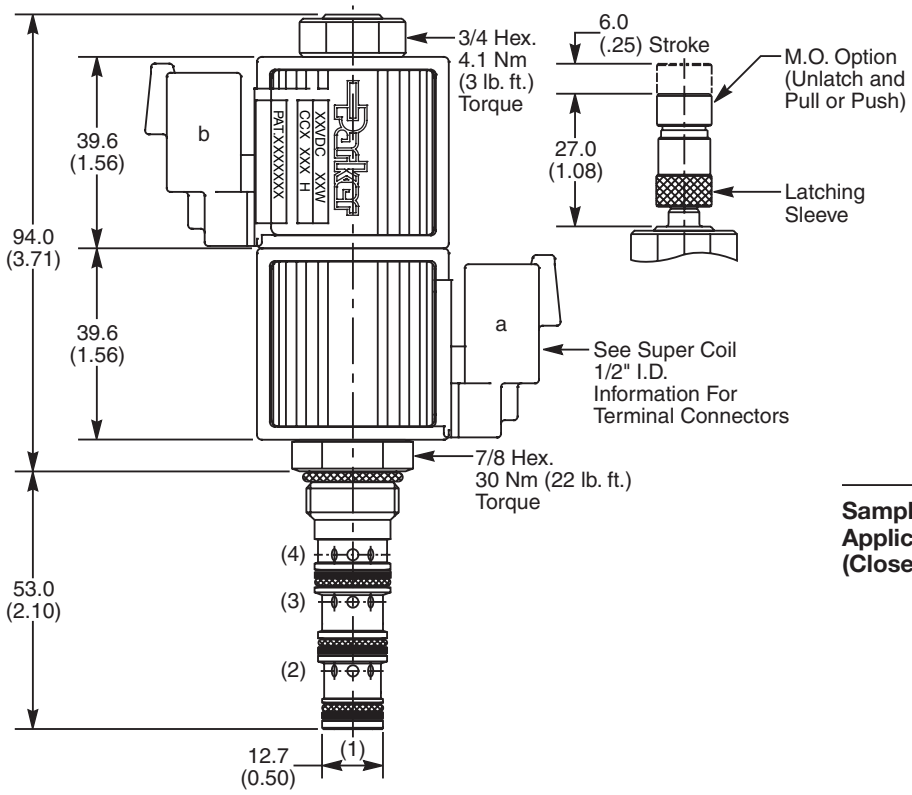
52 With 20 Bar, 290 PSI Compensator and SP Coil

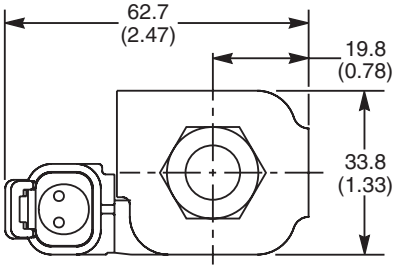


Flow vs. Load

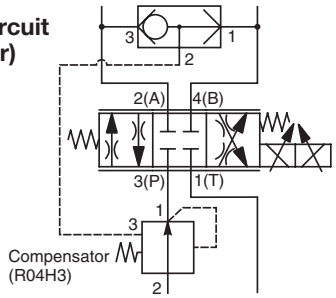


Dimensions Millimeters (Inches)





Sample Application Circuit (Closed Center)



Ordering Information

GP02			N
08 Size Proportional Valve	Style	Override Option	Seals

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Style - Floating Center (Flow Pressure and Performance)
51	Standard
52	High Flow

Code	Seals
N	Nitrile

Code	Override Option
0	Not Required
1	Manual Override

Order Bodies Separately
See section BC

B08	–	4	–	6T
08 size		4-Way Cavity		Port Size

Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

Kit	Part Number
Nitrile Seal	SK30078N-1
Fluorocarbon Seal	SK30078V-1

General Description

4 Way, 3 Position, Proportional Directional Control Valve. Floating Center Spool. For additional information see Technical Tips on pages PV2-PV5.

Features

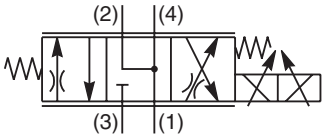
- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.

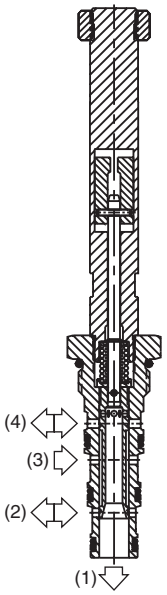
Specifications

Operating Pressure	**Ports 2, 3 and 4** 350 Bar (5000 PSI) **Port 1** 210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	<6%
Cracking Flow	25% to 30% of Input Signal
Variation of Flow	±15% @ 75% of Nominal Current and Constant ΔP Maintained by Pressure Compensator
Port to Port Leakage	10 cu. in/min @ 3000 PSI
Step Response Time at 75% of Amps	On 50 ms Off 40 ms
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.15 kg (0.34 lbs.)
Cavity	C08-4 (See BC Section for more details)

Typical Performance

SPOOL TYPE AND FLOW	RATED FLOW AT 75% OF NOMINAL CURRENT LPM - (GPM)		SUPER COIL TYPE		Compensator ΔP Bar (PSI)
	'a' SOLENOID PUSH P to A, B to T	'b' SOLENOID PULL P to B, A to T	PUSH	PULL	
53 Standard	14 - (3.8)	15 - (4.0)	SP	SP	10 (150)
	9 - (2.5)	10 - (2.7)	SS	SS	5 (75)
54 High Flow	17 - (4.5)	19 - (5.0)	SP	SP	20 (290)
	15 - (4.0)	15 - (4.0)	SS	SS	15 (220)

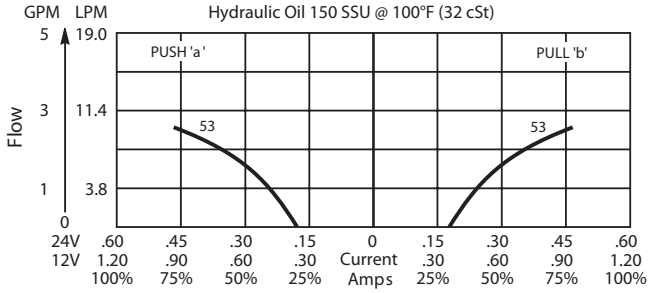




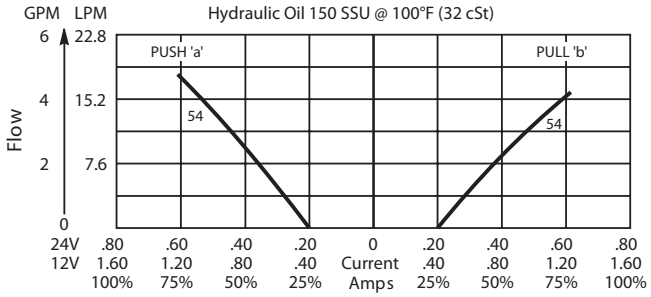
Performance Curves

▲PWM Current Regulator Recommended

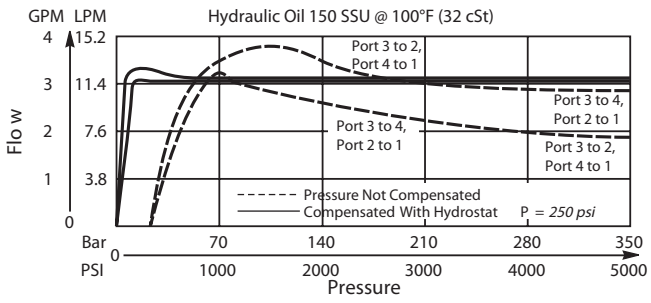
53 and 53L With 5 Bar, 75 PSI Compensator and SS Coil



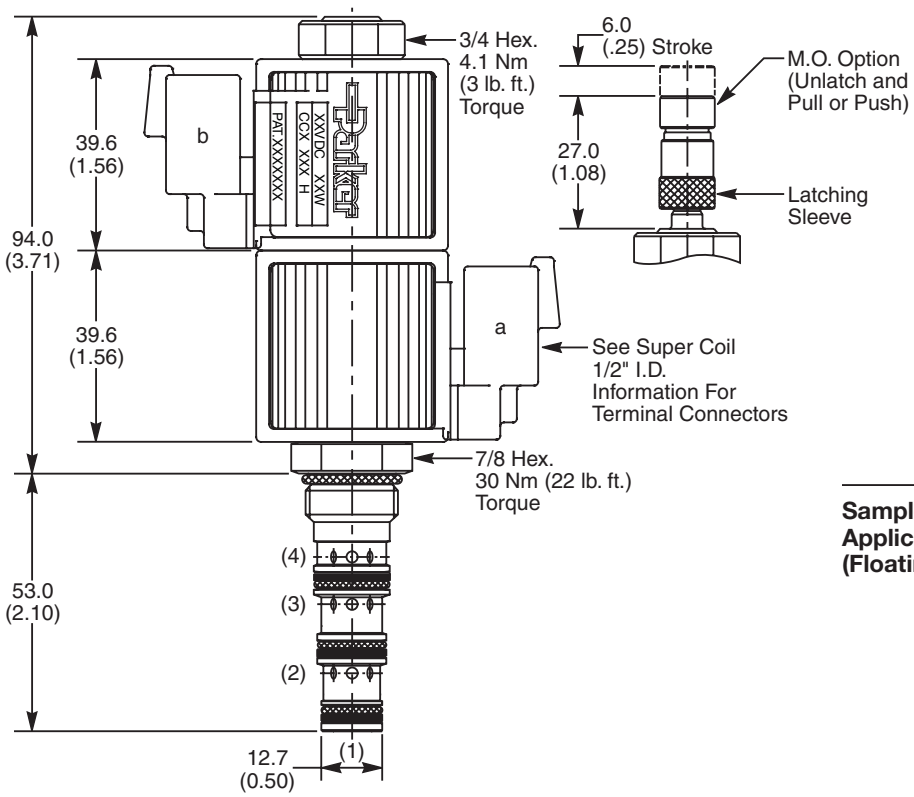
54 With 20 Bar, 290 PSI Compensator and SP Coil

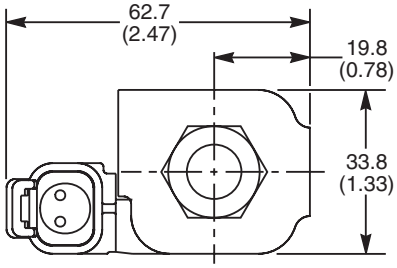


Flow vs. Load

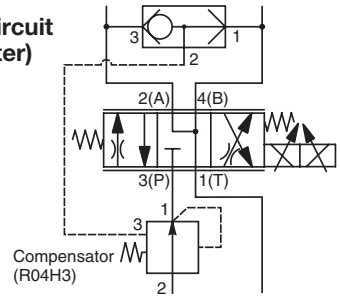


Dimensions Millimeters (Inches)





Sample Application Circuit (Floating Center)



Ordering Information

GP02			N
08 Size Proportional Valve	Style	Override Option	Seals

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 1/2" Super-Coil (CC series), for ordering information.

Code	Style - Floating Center (Flow Pressure and Performance)
53	Standard
54	High Flow

Code	Override Option
Omit	Not Required
1	Manual Override

Code	Seals
N	Nitrile

Order Bodies Separately
See section BC

B08	–	4	–	6T
08 size		4-Way Cavity		Port Size

Code	Porting / Body Material
6T	SAE-6 / Steel (5000 PSI)

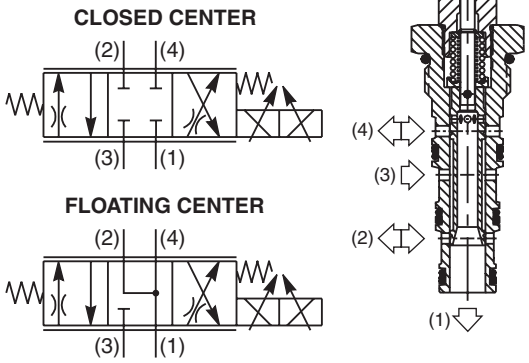
Kit	Part Number
Nitrile Seal	SK30078N-1
Fluorocarbon Seal	SK30078V-1

General Description

4 Way, 3 Position, Proportional Directional Control Valve. Closed Center or Floating Center Spool. For additional information see Technical Tips on pages PV2-PV5.

Features

- One piece cartridge housing ensures internal concentricity
- Coil: Waterproof, hermetically sealed, requires no O'Rings; Symmetrical coil can be reversed without affecting performance.
- All external parts zinc plated

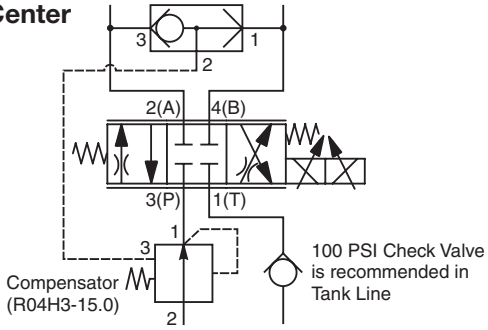


Specifications

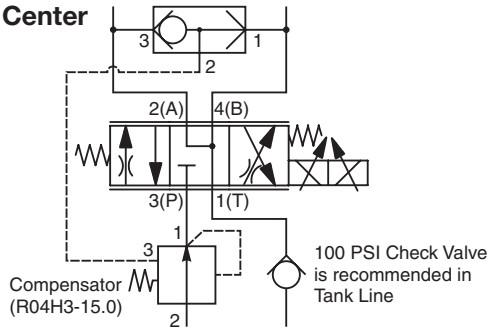
Operating Pressure	210 Bar (3000 PSI)
Hysteresis @ 100 Hz PWM	<6%
Cracking Flow	25% to 30% of Input Signal
Variation of Flow	±15% @ 75% of Nominal Current and Constant ΔP Maintained by Pressure Compensator
Port to Port Leakage	10 cu. in. @ 3000 PSI
Step Response Time at 75% of Amps	On 50 ms Off 40 ms
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-37°C to +93°C ("D"-Ring) (-35°F to +200°F) -34°C to +121°C (Nitrile) (-30°F to +250°F) -26°C to +204°C (Fluorocarbon) (-15°F to +400°F)
Fluid Compatibility/ Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO-4406 18/16/13, SAE Class 4
Approx. Weight	0.28 kg (0.57 lbs.)
Cavity	C10-4 (See BC Section for more details)

Sample Application Circuit

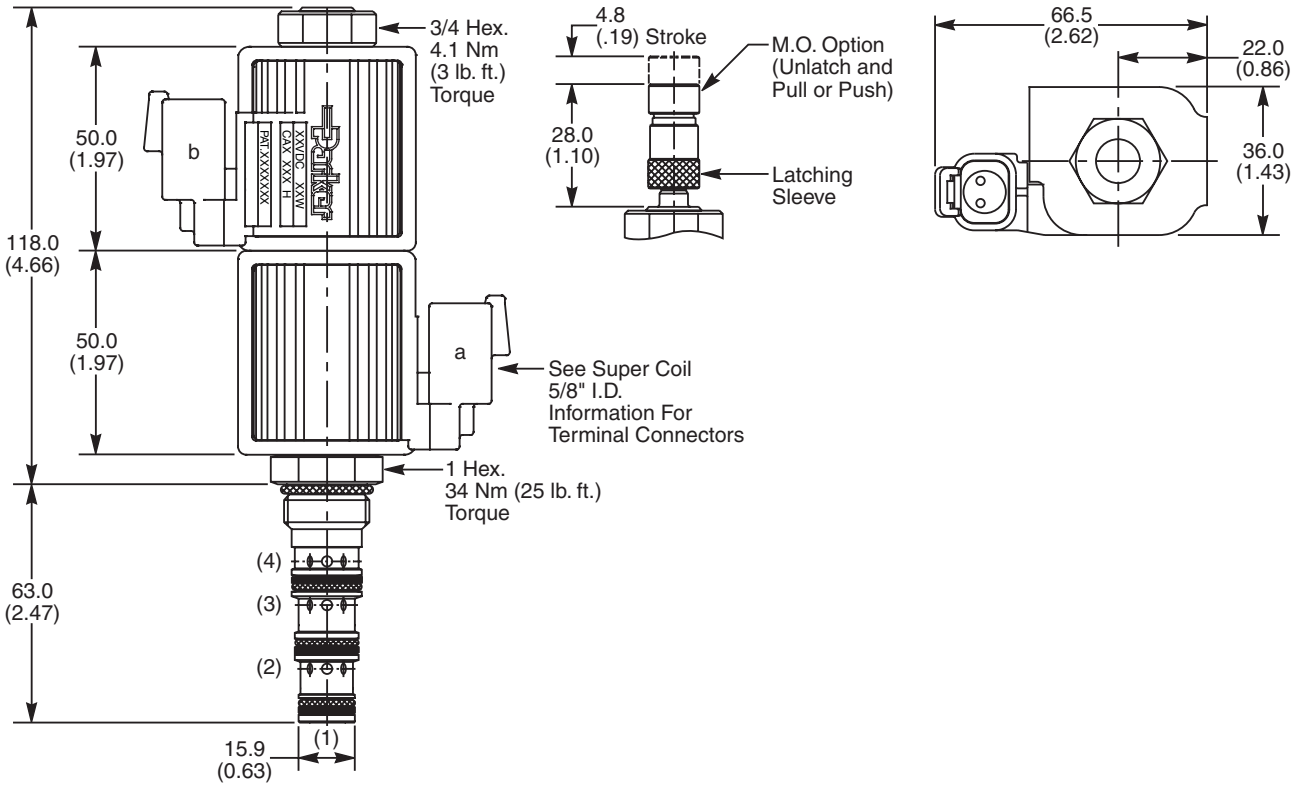
Closed Center



Floating Center



Dimensions Millimeters (Inches)

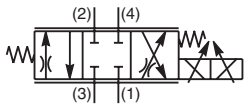
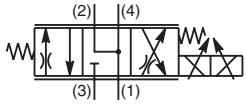


Ordering Information

DSP105		
10 Size Proportional Valve	Style	Override Option

Highlighted represents preferred options that offer the shortest lead times. Other options may be available, but at extended lead times.

Coil(s) sold separately. Please see section CE of this catalog, 5/8" Coil (CA series), for ordering information.

Code	Style
C1	
C4	

Code	Override Options
Omit	None
M	Push/Pull

Code	Seals
Omit	"D"-Ring

Kit	Part Number
D-Ring Seal	SK10-4
Nitrile Seal	SK10-4
Fluorocarbon Seal	SK10-4V

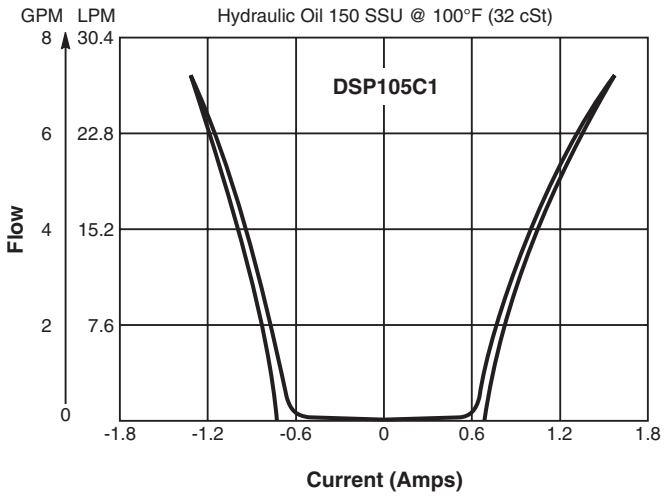
Order Bodies Separately
See section BC

B10	–	4	–	8T
10 size		4-Way Cavity		Port Size

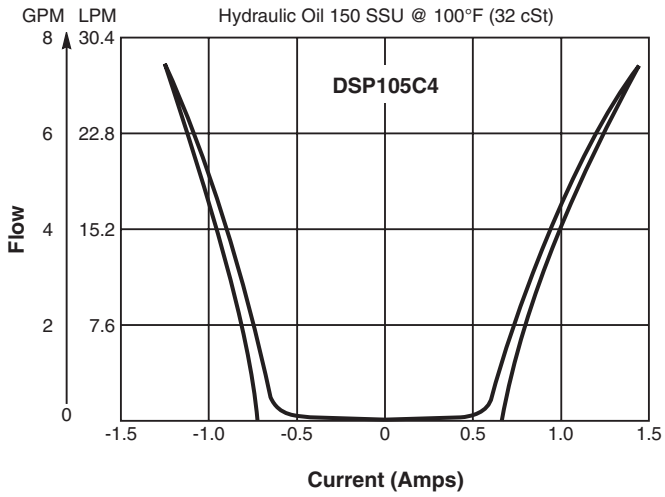
Code	Porting / Body Material
8T	SAE-6 / Steel (5000 PSI)

▲PWM Current Regulator Recommended

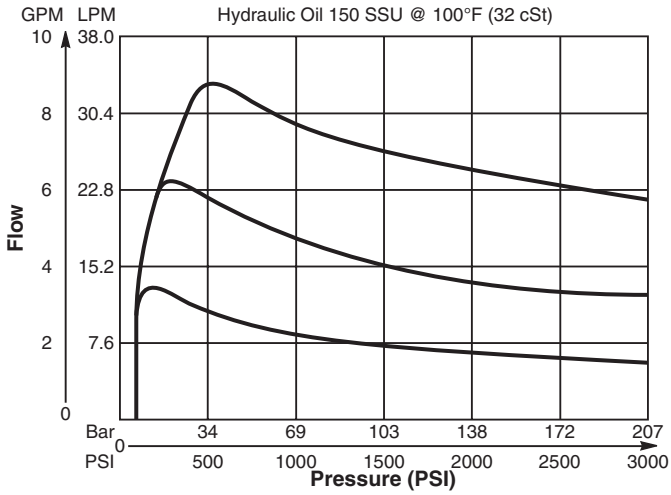
C1 With 15 Bar, 220 PSI Compensator and SP Coil



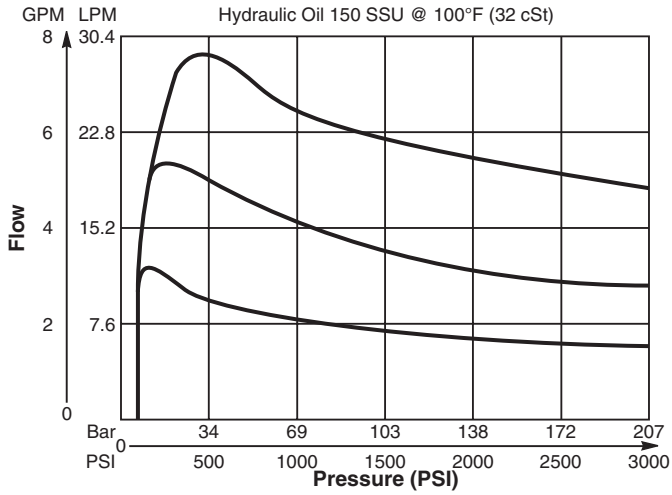
C4 With 15 Bar, 220 PSI Compensator and SP Coil



Pressure Compensation Pull Coil Inlet to Work Port



Pressure Compensation Push Coil Inlet to Work Port



C1 Spool Port 3 to 4