

Technical Information

Ball Type Check Valve
Series D04B2

CV

Check
Valves

General Description

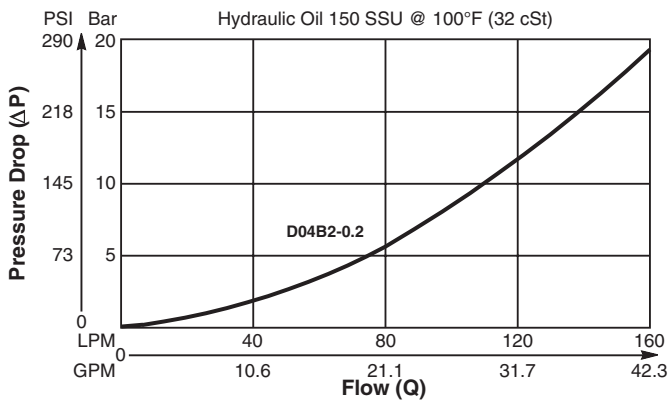
Ball Type Check Valve. For additional information see Technical Tips on pages CV1-CV4.

Features

- Low leakage - less than 3 drops/min.
- Ball type construction for cost effective design
- Single and dual pilot pistons available to create pilot to open check
- Range of cracking pressures available
- Good contamination tolerance
- All external parts zinc plated

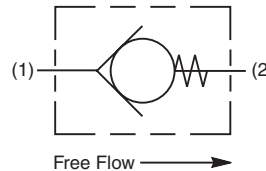
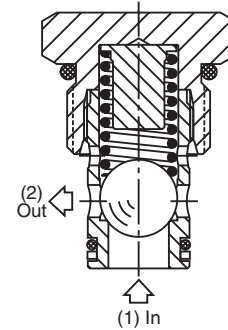
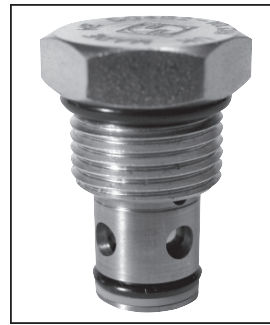
Performance Curve

Pressure Drop vs. Flow (Through cartridge only)

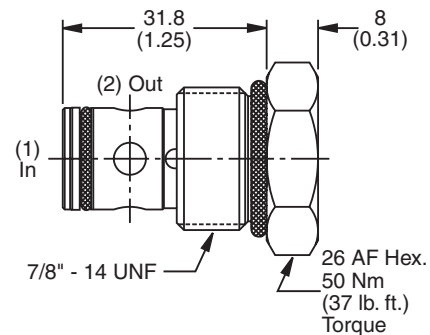


Specifications

Rated Flow	160 LPM (42 GPM)
Nominal Flow @ 7 Bar (100 PSI)	90 LPM (24 GPM)
Maximum Inlet Pressure	420 Bar (6000 PSI)
Leakage at 150 SSU (32 cSt)	3 drops/min.
Cartridge Material	Steel operating parts, hardened steel ball.
Operating Temp. Range/Seals	-40°C to +93.3°C (Nitrile, Buna-N) (-40°F to +200°F) -31.7°C to +121.1°C (Fluorocarbon) (-25°F to +250°F)
Fluid Compatibility/Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO code 16/13, SAE Class 4 or better
Approx. Weight	.08 kg (.18 lbs.)
Cavity	C10-2 (See BC Section for more details)



Dimensions Millimeters (Inches)



Ordering Information

D04B2Ball Type
Check ValveCracking
Pressure

Seals

Body
MaterialPort
Size

Code	Cracking Pressure
0.0	0.0 Bar (0 PSI)
0.2	0.2 Bar (3 PSI) Std.
1.0	1.0 Bar (15 PSI)
2.1	2.1 Bar (30 PSI)
3.4	3.4 Bar (50 PSI)
6.9	6.9 Bar (100 PSI)
10.0	10.0 Bar (145 PSI)
15.0	15.0 Bar (217 PSI)

Code	Seals / Kit No.
N	Nitrile, Buna-N / (SK30516N-1)
V	Fluorocarbon / (SK30516V-1)

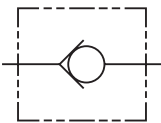
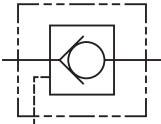
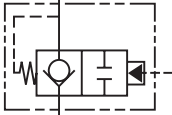
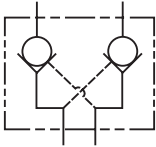
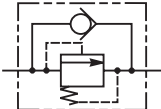
Code	Body Material
Omit	Steel
A	Aluminum

Code	Port Size	Body Part No.
Omit	Cartridge Only	
4P	1/4" NPTF	(B10-2-*4P)
6P	3/8" NPTF	(B10-2-*6P)
8P	1/2" NPTF	(B10-2-*8P)
6T	SAE-6	(B10-2-*6T)
T6T	SAE-6	(B10-2-T6T)†
8T	SAE-8	(B10-2-*8T)
T8T	SAE-8	(B10-2-T8T)†
6B	3/8" BSPG	(B10-2-6B)†

* Add "A" for aluminum, omit for steel.
† Steel body only.

Contents

Check Valves

	SERIES	CAVITY	DESCRIPTION	FLOW LPM/GPM	PRESSURE BAR/PSI	PAGE NO.
	STANDARD CHECKS					
	D1A060	2U	Check Valve Insert, Ball Type	145/38	420/6000	CV5
	D1B125	2C	Check Valve Insert, Ball Type	500/132	420/6000	CV6
	D0WB2	CAV0W-2	Cartridge Check, Ball Type	3.5/0.9	420/6000	CV7
	D02B2	C08-2	Cartridge Check, Ball Type	45/12	420/6000	CV8
	CVH081P	C08-2	Cartridge Check, Poppet Type	38/10	350/5000	CV9
	CVH103P	C10-2	Cartridge Check, Poppet Type	60/16	350/5000	CV10
	D04B2	C10-2	Cartridge Check, Ball Type	160/42	420/6000	CV11
	CVH121P	C12-2	Cartridge Check, Poppet Type	121/32	350/5000	CV12
	D06B2P	C16-2	Cartridge Check, Poppet Type	280/74	420/6000	CV13
	CVH161P	C16-2	Cartridge Check, Poppet Type	226/60	350/5000	CV14
	CVH201P	C20-2	Cartridge Check, Poppet Type	303/80	350/5000	CV15
	CVH104P	C10-2	Cartridge Check, Poppet Type 2 to 1 Flow Path	19/5	350/5000	CV16
	D06C2	C16-2	Cartridge Check, Poppet Type 2 to 1 Flow Path	500/132	420/6000	CV17
	PILOT OPERATED CHECKS					
	CP084P	C08-3	Single P.O. Check, Pilot on Port 1	19/5	207/3000	CV18
	CPH104P	C10-3	Single P.O. Check, Pilot on Port 1	30/8	350/5000	CV19
	CPH124P	C12-3	Single P.O. Check, Pilot on Port 1	75/20	350/5000	CV20
	PP02SP		Single P.O. Check Package, Steel Body	40/11	420/6000*	CV21-CV22
	PP04SP		Single P.O. Check Package, Steel Body	135/36	420/6000*	CV23-CV24
	PP06SP		Single P.O. Check Package, Steel Body	340/90	420/6000*	CV25-CV26
	D4A020	53-1	Single P.O. Check, Pilot on Port 3	30/8	420/6000	CV27
	D4A040	68-1	Single P.O. Check, Pilot on Port 3	60/16	420/6000	CV28
	D2K1	T11A	Single P.O. Check, Pilot on Port 3	70/19	350/5000	CV29
	D3B125	3C	Single P.O. Check, Pilot on Port 3	150/40	420/6000	CV30
	CPC101P	C10-3	Pilot to Close Check, Pilot on Port 3	20/5	420/6000	CV31
	DUAL PILOT OPERATED CHECKS					
	CPD084P	C08-4	Dual P.O. Check Cartridge	19/5	207/3000	CV32
	PP02DP		Dual P.O. Check Package, Steel Body	40/11	420/6000*	CV33-CV34
	PP04DP		Dual P.O. Check Package, Steel Body	135/36	420/6000*	CV35-CV36
	PP06DP		Dual P.O. Check Package, Steel Body	340/90	420/6000*	CV37-CV38
	CHECK WITH RELIEF					
	D04F2	C10-2	Check With Thermal Relief, Relieving Port 2 to 1	130/40	420/6000	CV39

*Rated to 207 Bar/3000 PSI with Aluminum Body.

CV

Check
Valves

SH

Shuttle
Valves

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Load/Motor
Controls

FC

Flow
Controls

PC

Pressure
Controls

LE

Logic
Elements

DC

Directional
Controls

MV

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Valves

SV

Solenoid
Valves

PV

Proportional
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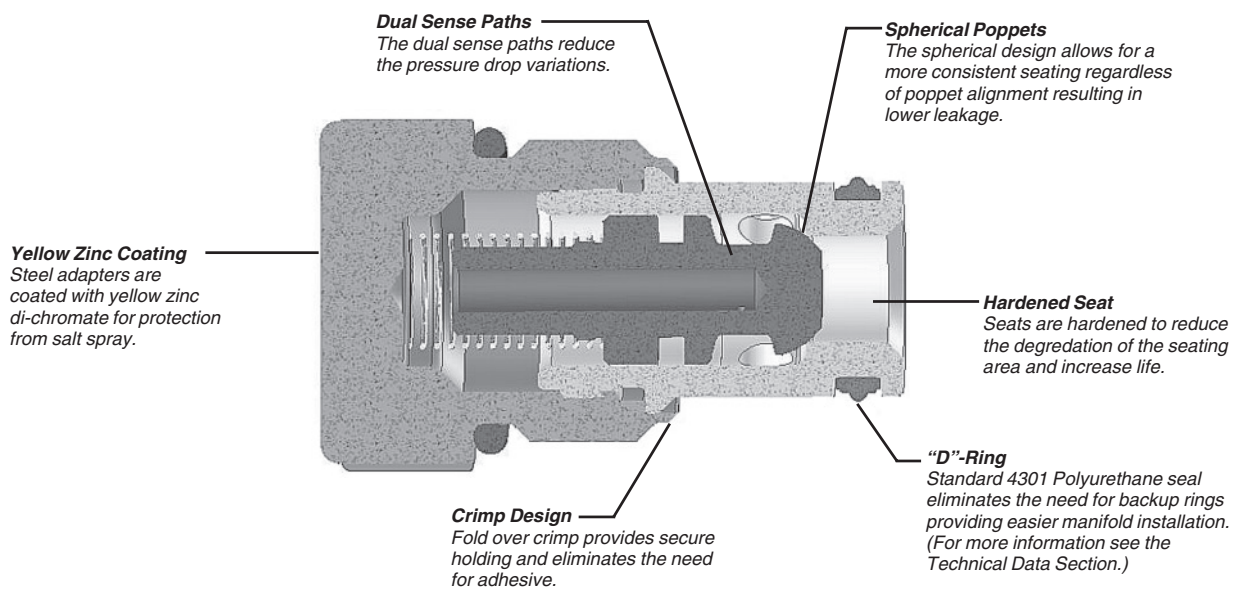
Technical
Data**INTRODUCTION:**

This technical tips section is designed to help familiarize you with the Parker line of Check Valves. In this section we present the products that are new to this catalog as well as some design features of our checks valves. In addition, we present common options available to help you in selecting products for your application. Finally we give a brief synopsis of the operation and applications of the various product offered in this section.

NEW PRODUCTS:

There are several new additions and product improvements to our Check Valve product line.

Here are just some of the general design features and advantages to the "Winner's Circle" check valve.

**COMMON OPTIONS:**

Since check valves and shuttles are fairly simple components, there are very few options. Here are the standard options you will find.

Seals: The Winner's Circle products feature a standard 4301 Polyurethane "D"-Ring. The "D"-Ring eliminates the need for backup rings. The majority of the products are available in Nitrile or Fluorocarbon Seals. You should match the seal compatibility to the temperature and fluid being used in your application.

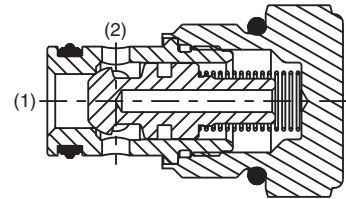
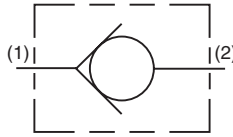
Crack Pressure: Parker offers a number of standard crack pressure options for each valve. Check the model code pages for these options. The crack pressure is defined as the minimum amount of pressure that is needed to unseat the poppet. In pilot operated check applications, you may want to go with a slightly higher cracking pressure to keep the piston weight, friction, and drag from accidentally unseating the poppet.

Pilot Piston Seal: On the pilot piston style pilot operated check valves, Parker offers the option to place a seal on the piston to reduce the leakage across the piston. **Note:** Sealing the pilot piston does not decrease the leakage across the poppet. In other words, if you are trying to reduce the leakage from the actuator port, sealing the piston will not help. While most applications do not require a seal on the piston, it can be advantageous in applications with very small pump flows where the lost fluid would have a high impact on actuator speed.

PRODUCT TYPES / APPLICATIONS

Check Valve - Poppet Type

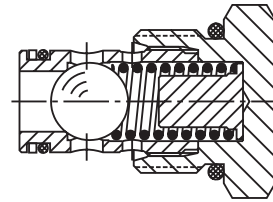
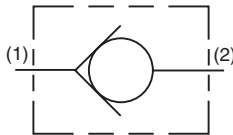
Check valves are poppet style elements that allow free flow in one direction while preventing flow in the reverse direction. They can be used to isolate portions of a hydraulic circuit or to provide a free flow path around a restrictive valve.



OPERATION - Pressure on the inlet (port 1) of the check valve creates a force against the poppet, pushing it off its seat and permitting free flow to port 2. Reverse flow through the check is blocked by the poppet.

Check Valve - Ball Type

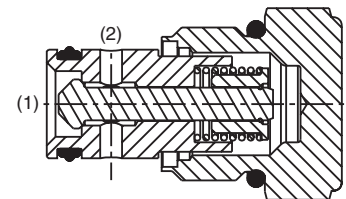
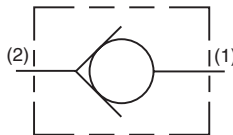
Ball type check valves are check valves that use a hardened steel ball to seal against the valve seat as opposed to a poppet. They are simple in their design and provide low leakage over the life of the system.



OPERATION - Pressure on the inlet (port 1) of the check valve creates a force on the steel ball pushing it off of its seat and permitting free flow to port 2. Reverse flow through the check is blocked by the steel ball on the seat.

Side to Nose Check Valve

Side to nose check valves are a special type of check valve where the free flow path is from the side of the cartridge valve to the nose. They functionally are the same as the standard check valve. Side to nose check valves are occasionally used by manifold designers to simplify the flow path design of their blocks.



OPERATION - Pressure on the inlet (port 2) of the check valve creates a force against the poppet, pushing it off its seat and permitting free flow to port 1. Reverse flow through the check is blocked by the poppet.

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Valves

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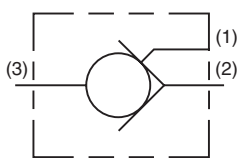
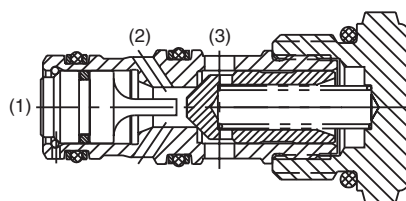
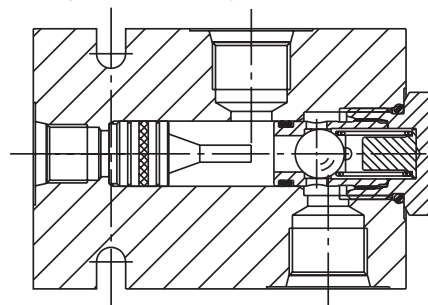
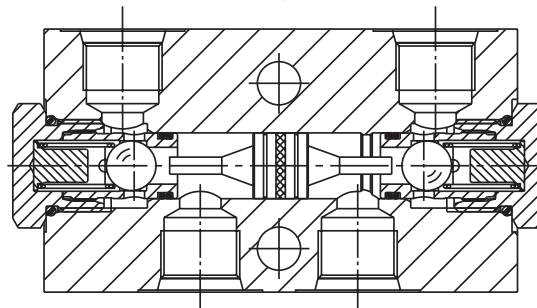
Bodies &
Cavities

TD

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Technical Tips**Check Valves****CV**Check
Valves**SH**Shuttle
Valves**LM**Load/Motor
Controls**FC**Flow
Controls**PC**Pressure
Controls**LE**Logic
Elements**DC**Directional
Controls**MV**Manual
Valves**SV**Solenoid
Valves**PV**Proportional
Valves**CE**Coils &
Electronics**BC**Bodies &
Cavities**TD**Technical
Data**Pilot Operated Check Valve**

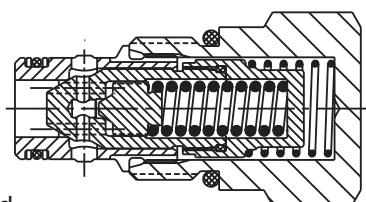
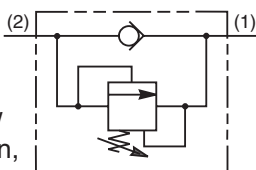
Pilot operated check valves (also referred to as P.O. check valves), are check valves which can be opened by an external pilot pressure. Thus, P.O. checks, block flow in one direction, like standard check valves, but can be released once an adequate pilot pressure is applied. Free flow is allowed in the reverse direction. P.O. checks are often used to positively lock a dual acting cylinder. There are two types of pilot operated check valves; threaded cartridge style and pilot piston style. These valves work best when used in conjunction with a control valve that vents the valve ports to tank when centered.

**Cartridge Style P.O. Check Valve****Single Pilot Piston Style P.O. Check Valve****Dual Pilot Piston Style P.O. Check Valve**

OPERATION - In the absence of adequate pilot pressure, the poppet remains seated preventing flow from the actuator port (port 3) to the valve port (port 2). Once adequate pilot pressure is applied at the pilot port (port 1), the internal pilot piston unseats the check poppet permitting flow from port 3 to port 2. The amount of pressure needed at port 1 to unseat the check valve is determined by the pilot ratio of the pilot piston to the poppet seat diameter. If you have a pilot operated check valve with a 3:1 ratio pilot piston, then you would need a pilot pressure at port 1 that is 1/3 of the pressure being checked at port 3 plus the spring. For example, if you had 3000 psi on port 3 and a 5 psi spring and a 3:1 pilot ratio, it would take 1002 psi $[(3000 \text{ psi} + 5 \text{ psi}) / 3]$ to release the check valve. Free flow is permitted from the valve port (port 2) to the cylinder port (port 3).

Check Valve With Thermal Relief

The check valve with thermal relief performs the same function as a standard check valve. It allows free flow in one direction. In the opposite direction, it performs as a normal check valve preventing flow, while also venting excess pressure caused by the thermal expansion of fluid. This type of valve can be used with an external pilot piston to provide a pilot operated valve that will vent trapped pressure due to thermal expansion. These valves work best when used in conjunction with a control valve that vents the valve ports to tank when centered.



OPERATION - The check valve is a guided poppet design. As the pressure on the inlet exceeds the spring rate, the poppet is pushed off of its seat allowing flow to pass. Once the pressure on the inlet side drops below the spring force, the spring then pushes the poppet back on its seat blocking flow from the outlet to the inlet of the check valve. If the pressure on the outlet side of the check valve (when it is in a load holding function) rises (through thermal expansion), the direct acting relief will vent the excess pressure caused by the thermal expansion to the inlet side of the check.

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SH Shuttle Valves
LM Load/Motor Controls
FC Flow Controls
PC Pressure Controls
LE Logic Elements
DC Directional Controls
MV Manual Valves
SV Solenoid Valves
PV Proportional Valves
CE Coils & Electronics
BC Bodies & Cavities
TD Technical Data



Technical Information

Technical Data

CVCheck
Valves**SH**Shuttle
Valves**LM**Load/Motor
Controls**FC**Flow
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Cavities**TD**Technical
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INTRODUCTION

In this section you will find a variety of technical information pertinent to general hydraulics as well as cartridge valve technology.

HYDRAULIC FORMULAS

Below are a few of the common hydraulic formulas to assist you in calculating the requirements for your system:

$$\text{Voltage} = \text{Current} \times \text{Resistance}$$

$$\text{Flow} = \text{Volume} \div \text{Unit of Time}$$

$$\text{Pressure} = \text{Force} \div \text{Area}$$

$$\text{Horsepower} = \text{Flow} \times \text{Pressure} \div (1714 \times \text{Efficiency})$$

$$\text{Hydraulic power (kW)} = \frac{\Delta p \text{ (Bar)} \times \text{flow rate (LPM)}}{600}$$

where Δp = pressure drop

$$\text{Hydraulic power (HP)} = \frac{\Delta p \text{ (PSI)} \times \text{flow rate (GPM)}}{1714}$$

RATINGS & TESTING

All Parker cartridge valve products have been performance tested with the results shown on the individual valve catalog pages. The performance data shown represents typical operation characteristics of the product. In addition, our valves are endurance tested. Validation is conducted by testing or similarity in designs.

Note: Not every cartridge option is endurance tested. In other words, one three way spool is endurance tested, and the others are assumed by similarity.

TEMPERATURE RATINGS

Product operating limits are broadly in the range -30°C to 150°C (-20°F to 300°F) but satisfactory operation within the specification may not be accomplished. Leakage and response will be affected when used at temperature extremes and it is the user's responsibility to determine acceptability at these levels.

Seals used in these products generally have the following temperature limitations:

Nitrile (Buna N) -30°C to 100°C (-20°F to 210°F)

Fluorocarbon -20°C to 150°C (-4°F to 300°F)

Hytrell -54°C to 135°C (-65°F to 275°F)

GTPFE -30°C to 150°C (-20°F to 300°F)

VISCOSITY

Catalog data is from tests conducted on mineral oil at a viscosity of 30 cSt (140 SSU) using an ISO VG:46 test fluid.

Product should ideally be used at viscosities in the range of 15 to 50 cSt (80 to 230 SSU).

Product will perform with reduced efficiency in the ranges, 5 to 15 cSt (42 to 80 SSU) and 50 to 500 cSt (230 to 2300 SSU). These extreme conditions must be evaluated by the user to establish suitability of the product's performance.

PRESSURE RATINGS

Unless otherwise stated, all Parker cartridges have a continuous duty pressure ratings as shown in the catalog. All pressure ratings are based on the cartridge valve only. Exposure to elevated pressures may affect the performance and fatigue life of the product. The material chosen for the body or carrier may affect the pressure rating we recommend. Parker does not recommend the use of cartridge valves in aluminum bodies at pressures above 207 bar (3000 psi).

THERMAL SHOCK

It is unreasonable to expect product to withstand rapid temperature changes - this could affect both performance and life and care should be taken to protect the product from such situations.

SERVICE & COMPONENTS

One of the advantages of integrated hydraulic circuits is their serviceability. Should a valve need to be replaced for any reason, a user only needs to unscrew the valve from the manifold and screw the replacement into the cavity. As such, there are few replacement parts available for the Parker cartridge products. As with any hydraulic system, the operator should bleed off any trapped pressure and consult machine service manuals prior to service. Parker does not offer any service parts for internal components, but external components such as coils, knobs, and seals are available.

LIMITATIONS IN USE

Parker cartridge valves are designed for a wide variety of industrial and mobile applications. Despite their flexibility, Parker Hannifin does not recommend or support the use of our cartridge valves in any on highway or aerospace applications. We also do not recommend our products for use in the transport of explosive products or in hazardous environments.

SEAL MATERIAL SELECTION

You should match the seal compatibility to the temperature and fluid being used in your application. Parker offers three seal materials to meet your application requirements. Parker's standard material is a 4301 Polyurethane RESILON™ material "D"-Ring. We also offer Fluorocarbon and Nitrile seals. A brief synopsis of each seal material is given below to help you choose the best seal for your application.

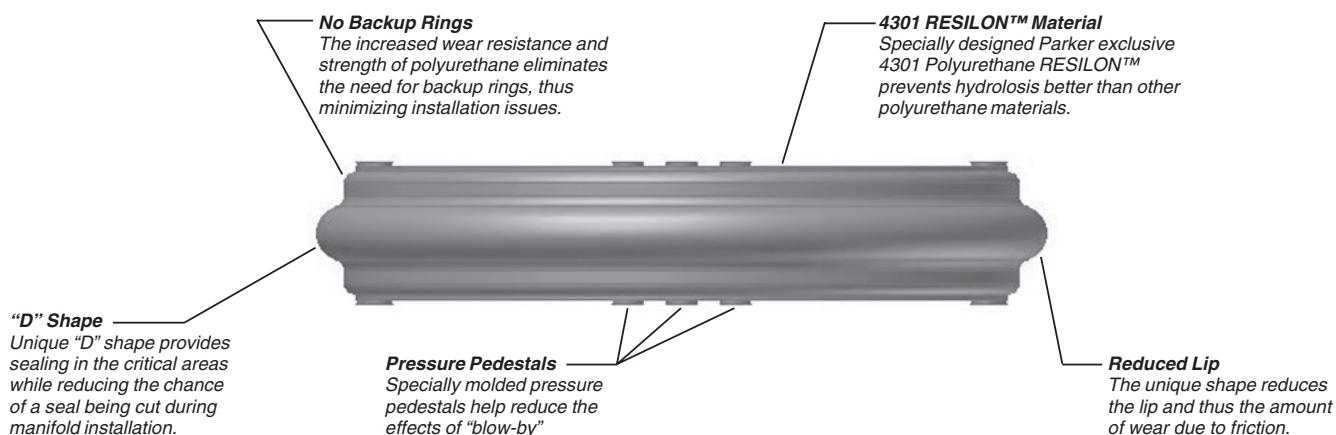
"D"-Ring (4301 Polyurethane RESILON™ Material)

The "D"-Ring is the standard seal material on the Winner's Circle threaded cartridge valves. The "D"-Ring is molded of a special 4301 Polyurethane RESILON™. Polyurethane materials exhibit better wear resistance and tensile strength than standard Nitrile or Fluorocarbon material. In addition, it has an excellent resistance to compression set. This increased strength eliminates the need for back-rings and simplifies installation.

The 4301 compound is a Parker exclusive material designed to prevent hydrolysis at high temperatures.

Thus, the "D"-Ring outperforms standard polyurethane o-rings, especially when using high water content fluids at elevated temperatures. The "D"-Ring is compatible with most water-glycol, water/oil emulsions, and high grade petroleum based hydraulic fluids at temperatures between -45°C to +93°C (-50°F to +200°F)

The unique shape of the Parker "D"-Ring also provides a variety of design advantages. The seal is molded into a "D" shape where the seal is higher in the middle and lower on the ends. This prevents the seal edge from folding over on a corner inside the manifold during installation. In addition, this design has a minimal lip, thus, friction is reduced. Another unique feature of the "D"-Ring is its symmetrical design, resulting in no performance degradation from the reverse direction, or worry of backward installation. The "D"-Ring is also equipped with "pressure pedestals" to reduce the effects of "blow-by" common in reverse cycling. The pressure pedestals increase the sealing capability of the "D"-Ring, by reducing the radial pressure forces that compress the sealing face of the o-ring. The drawing below depicts the shape and highlights the features.



Nitrile

Nitrile o-rings are also compatible with most water-glycol, water/oil emulsions, and high grade petroleum based hydraulic fluids. Parker only recommends Nitrile o-rings for temperatures between -40°C to +93°C (-40°F to +200°F). Nitrile o-rings do require a full back-up ring, or two half back-ups.

Fluorocarbon

Fluorocarbon o-rings are compatible with most phosphate ester fluids and phosphate ester blends. Parker only recommends Fluorocarbon seals for temperatures between -32°C to +121°C (-25°F to +250°F). Fluorocarbon o-rings do require a full back-up ring, or two half back-ups.

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Technical Data

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CVCheck
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Controls**MV**Manual
Valves**SV**Solenoid
Valves**PV**Proportional
Valves**CE**Coils &
Electronics**BC**Bodies &
Cavities**TD**Technical
Data

HYDRAULIC FLUIDS

Parker recommends using top-quality mineral based or synthetic hydraulic fluids with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt) at 38°C (100°F). The absolute viscosity range 80 to 1000 SSU (16 to 220 cSt.). Fluids should have high anti-wear characteristics and be treated to protect against oxidation.

HYDRAULIC FILTRATION

Hydraulic systems that include Parker valves should be carefully protected against fluid contamination. The proper cleanliness level for Parker cartridge valves should be maintained at an ISO cleanliness level of 18/16/13.

75% of all system failures are a direct result of contamination. Contamination interferes with four functions of hydraulic fluids.

1. To act as an energy transmission medium.
2. To lubricate internal moving parts of components.
3. To act as a heat transfer medium.
4. To seal clearances between moving components.

A properly selected filter will provide adequate protection and reduce operating cost. This is achieved by increasing the expected life of the valves and reducing the cost of maintenance and repairs. Operation will be smoother and more precise.

There is no direct correlation between using a specific ISO cleanliness classification. Numerous other variables should be considered such as particulate ingestion, actual flow through filters, and filter location.

A number of interrelated system factors combine to determine proper media and filter combinations. To accurately determine which combination is ideal for your system, all these factors need to be accounted for. With the development of filtration sizing software such as Parker inPHorm, this information can be used to compute the optimal selection. In many instances the information available may be limited. In these cases, "rules of thumb" based on empirical data and proven examples are applied to get an initial starting point.

APPLICATION OF PRODUCT

CAUTION - It is important to note that the Parker Hydraulic Cartridge Systems Division makes a variety of valves, many of which fit into the same cavity. However, their functionality may differ considerably from one valve type to another. **Accordingly fit interchangeability does not necessarily mean form or function interchangeability.** Users should ensure that the appropriate valve is installed in the cavity by cross checking the part number stamped on the valve with that published in approved service literature or in the installation drawing.

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3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

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12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91-P



CV

Check
Valves

SH

Shuttle
Valves

LM

Load/Motor
Controls

FC

Flow
Controls

PC

Pressure
Controls

LE

Logic
Elements

DC

Directional
Controls

MV

Manual
Valves

SV

Solenoid
Valves

PV

Proportional
Valves

CE

Coils &
Electronics

BC

Bodies &
Cavities

TD

Technical
Data