Series VL
Air Cylinders for Valve Actuation

Catalog HY08-0947-1/NA
April, 2004

■ Bore Sizes 2” through 24”
■ Pressure Rated 150 PSI Air
■ Factory Tested
■ Standard Temperature Rating
  -10°F to +165°F
Warning

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**Features/Benefits**

**Piston Seal** –
Two Nitrile lipseals, 2 - 5" and 16 - 24" bores. Wear bands provided on the 16 - 24" bores.

**Piston** –
One piece, nodular iron

**Cylinder Body** –
Chrome plated steel tube.

**Piston Rod** –
Medium carbon steel, 100,000 PSI minimum yield material, chrome plated

**Steel Head and Cap**

**Removable Rod Gland** –
Heavy duty rod bearing with Nitrile rod seal/wiper, 3¼ - 24" bores. (Removable glands are not provided for the 2 and 2½" bores.)

**Tie Rods** –
100,000 P.S.I. minimum yield strength with rolled threads.
How to Order Series VL Air Cylinders for Valve Actuation

How to Order Code

<table>
<thead>
<tr>
<th>Bore Size</th>
<th>Mounting Style</th>
<th>Series</th>
<th>Port</th>
<th>Common Modifications</th>
<th>Piston Rod Number</th>
<th>Rod End Thread Style</th>
<th>Stroke</th>
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<td>U</td>
<td>V</td>
<td>S</td>
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- **Bore Size**: Specify. See Table 1 for available bore sizes.
- **Mounting Style**: Specify TB for double rod cylinders.
- **Series**: Specify VL.
- **Port**: Specify U = NPTF.
- **Common Modifications**: Specify an “S” for all Special Modifications.
- **Piston Rod Number**: Specify Rod Number 1.
- **Rod End Thread Style**: Specify E for cap welded lifting eye. ONLY IF REQUIRED.
- **Stroke**: Specify in inches. Show symbol “X” just ahead of stroke length.

Available Options

- Individual Rod Seal and Rod Wiper
- Stainless Steel Piston Rods
- Spring Extend or Retract
- Double Rod End Style
- Hi-Temp Seals (Fluorocarbon rated to 250°F)
- Water Service
- Lifting Eyes
  - Tie rod mount (ordered as an accessory)
  - Welded on cap face
Table 1 – Dimensional Table

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<th>KK STYLE 9</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>LA</th>
<th>W</th>
<th>Y</th>
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<th>BB CAP</th>
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*Based upon rod buckling calculation at 100 PSI operating pressure.

**MAX STROKE**

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<td>77</td>
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**Special** Thread Style 3

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 3” and give desired dimensions for KK, A and LA. If otherwise special, furnish dimensioned sketch.
### Table 2 – Lifting Eyes

<table>
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<tr>
<th>BORE</th>
<th>DD THREAD</th>
<th>HEIGHT</th>
<th>THREADED LIFTING EYE CAPACITY (lbs/eye)</th>
<th>THREADED LIFTING EYE PART NUMBER</th>
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* Tolerance of -0%, +5%; when assembling the cylinder, be sure to torque the tie rods evenly.

### Table 3 – Tie Rod Torque

<table>
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<th>TIE ROD NUT TORQUE(^*) (Steel Tube) (ft-lbs/N-m)</th>
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* Tolerance of -0%, +5%; when assembling the cylinder, be sure to torque the tie rods evenly.

### Table 4 – Cylinder Weight Chart

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<th>BORE</th>
<th>ROD DIA.</th>
<th>Weight at zero stroke with steel tube (lbs)</th>
<th>Weight per in. stroke with steel tube (lbs)</th>
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Parker Safety Guide for Selecting and Using Pneumatic Cylinders and Their Accessories

WARNING: ❘ FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF CYLINDERS AND THEIR RELATED ACCESSORIES CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

Before selecting or using Parker cylinders or related accessories, it is important that you read, understand and follow the following safety information.

User Responsibility
Due to very wide variety of cylinder applications and cylinder operating conditions, Parker does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to Parker's design guide lines and do not necessarily meet the design guide lines of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

Seals
Part of the process of choosing a cylinder is the selection of seal compounds. Before making this selection read the Operating Fluids and Seals information in the Application Engineering Data section of the current 0106 or 0900P catalogs, or contact our engineering department.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

Piston Rods
Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendation for the maximum cylinder stroke found in Dimensional Table 1 of this catalog. The suggested maximum stroke in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member. On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinder which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

Port Fittings
Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

\[
\text{operating pressure} \times \frac{\text{effective cap end area}}{\text{effective rod end piston area}}
\]

Contact your connector supplier for the pressure rating of individual connectors.

Cylinder Modifications or Repairs
Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at Parker locations or by Parker certified facilities. It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.
Storage, Installation, Mounting Recommendations, and Cylinder Troubleshooting

Storage
At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

1. Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

2. Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

3. Port protector plugs should be left in the cylinder until the time of installation.

4. If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

Installation

1. Cleanliness is an important consideration, and Parker Hannifin cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

2. Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3. Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

Mounting Recommendations

Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

Cylinder Trouble Shooting

External Leakage

1. Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

2. Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

3. Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Internal Leakage

1. With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Replace piston seals as required.

2. What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

Cylinder Fails to Move the Load

1. Pneumatic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

2. Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

3. Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

Erratic or Chatter Operation

1. Excessive friction at gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

2. Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

3. Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.
Air Cylinders for Valve Actuation
Series VL

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221 Helicopter Circle
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Fax: (800) 869-9886

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Fax: (800) 323-0105

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Tel.: (770) 819-3400
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Offer of Sale

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1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller’s products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer’s acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller’s acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer’s assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer’s offer. Acceptance of Seller’s products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof thereafter until paid in full. Any claims by Buyer for omissions or shortages in a shipment shall be waive unless Seller receives notice thereof within 30 days after Buyer’s receipt of the shipment.

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.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. THIS WARRANTY COMPRIS THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HERUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERA-

5. Limitation of Remedy: SELLER’S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER’S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HERUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quan-
ties and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modi-
fication or cancellation shall be at Seller’s discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including but not limited to dies, fixtures, molds and patterns, acquired to manu-
facture items sold pursuant to this contract. Such special tooling shall be and remain Seller’s property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer’s Property: Any designs, tools, patterns, materials, drawings, confi-
dential information or equipment furnished by Buyer, or any other items which become Buyer’s property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller’s possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the prices for the items sold. Buyer agrees to pay all such taxes or to reim-
burse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity for Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (herein-
after “Intellectual Property Rights”). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller’s obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions includ-
ing all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller’s obligations by reason of circum-
cstances beyond the reasonable control of Seller (hereinafter Events of Force Majeure). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller’s control.

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 represen-
tations 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.
About Parker Hannifin Corporation
Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our company has the largest distribution network in its field, with over 7,500 distributors serving nearly 400,000 customers worldwide.

Parker’s Charter
To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

Product Information
North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

The Aerospace Group
is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.

The Climate & Industrial Controls Group
designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.

The Fluid Connectors Group
designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.

The Seal Group
designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.

The Hydraulics Group
designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.

The Filtration Group
designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

The Automation Group
is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.

The Instrumentation Group
is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.