

Rotary Seal Design Guide



Catalog EPS 5350/USA



ROTARY SEALS





WARNING:

Failure, improper selection or improper use of the products and/or systems described herein or related items can cause death, personal injury or property damage.

For safe and trouble-free use of these products, it is important that you read and follow the Parker Seal Group Product Safety Guide. This Safety Guide can be referenced and downloaded free of charge at www.parkerseals.com and can be ordered, without charge, as Parker Publication No. PSG 5004 by calling 1-800-C-PARKER.

This document, along with other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors, provides product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the products or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through his or her own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met. The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

OFFER OF SALE

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance are governed by the provisions stated on the separate page of this document entitled "Offer of Sale."

Rotary Seal Design Guide Table of Contents

Introduction

1

Engineering

2

Materials

3

Product Offering

4

Clipper® Oil Seals

5

Parker Oil Seals

6

Shaft Sleeves

7

ProTech™ Bearing Isolators

8

FlexiLip™

9

FlexiCase™

10

FlexiSeal® Rotary

11

V-Seals and Excluders

12

See Appendices A through J for:

- Design Action Request Form
- Rotary Lip Seal Inch Size
- Rotary Lip Seal Metric Sizes
- Solid to Split Seal Calculator Inch & Metric
- Sleeve & V-Seal Sizes
- ProTech™ Sizes Inch & Metric
- Conversions — Size/Speed/Temp.
- Chemical Compatibility
- Interchange
- Other Parker EPS Products



Parker Hannifin Corporation
EPS Division
Toll Free: (800) 233-3900

www.parkerseals.com

Rotary Seal Design Guide Appendix

Design Action Request Form

A

Rotary Lip Seal Inch Sizes

B

Rotary Lip Seal Metric Sizes

C

Solid to Split Seal Calculator

D

Sleeve & V-Seal Sizes

E

ProTech™ Sizes Inch & Metric

F

Conversions — Size/Speed/Temp.

G

Chemical Compatibility

H

Interchange

I

Other Parker EPS Products

J



Parker Hannifin Corporation
EPS Division
Toll Free: (800) 233-3900

www.parkerseals.com

Other Parker EPS Products

Catalog EPS 5350/USA

Parker EPS Division

Parker EPS Division designs and manufactures engineered elastomeric, polymeric and plastic seals and sealing systems for dynamic applications. EPS Division has a worldwide sealing network consisting of manufacturing locations in Utah, Texas, New York, Illinois and Baja, Mexico; and more than 200 distributor and service center locations in nine countries.

Catalog Services

EPS Division's catalogs and technical bulletins are available through Parker's Catalog Services. To order catalogs and have them shipped directly, call 1-800-C-PARKER, or send your requests via e-mail to: catalogs@parker.com.

Technical Support

Parker product engineers are available to address temperature, pressure, gland design, surface finish and all other seal design considerations, and can often optimize an existing design or propose cost-effective alternatives. Our in-house test and R&D laboratories enable us to quickly develop and perform appropriate test protocols for our customers.



Rod Seals

Parker is the premiere manufacturer of quality rod sealing products both in standard inch as well as metric sizes, in a wide range of urethane and traditional elastomer compounds.

See: Catalog EPS 3800 & 5225



Piston Seals

Parker is pleased to provide a diverse offering of piston seal profiles to suit a broad range of applications. Various cap materials extend service to a broad range of application pressures and temperatures.

See: Technical Bulletins EPS 5212, 5206, 5238, 5301, 5302



Rod Wipers & Scrapers

Parker is the leading manufacturer of rod wipers and scrapers in a variety of geometries to suit any rod application. Parker's rod wipers are offered in a wide range of urethanes as well as traditional elastomers in standard inch and metric sizes.

See: Catalog PPD 3600



U-Cup Seals

Parker's U-cup seals are compact and versatile. Varying lip design configurations coupled with the broad range of available Parker materials mean versatility in U-cup sealing, both in hydraulic and pneumatic applications.

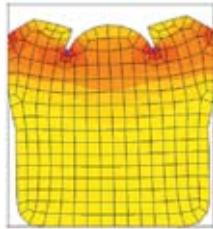
See: Catalog PPD 5225

03/03/06



Finite Element Analysis & Seal Design Optimization

Using sophisticated Finite Element Analysis (FEA) software, Parker engineers can analyze critical design information, such as stress concentration, heat transfer, fluid flow and electromagnetic properties of new and existing seal geometry. This streamlines tooling and production processes, and helps ensure the selection of the right material and geometry for your application. Using FEA technology, our engineers can determine:



FEA plot of a Parker Seal geometry under compression

- Deformation (deformed shape)
- Volume/void ratios, gland fill %
- Stress distribution
- Load - Deflection
- Stability analysis
- Friction force
- Thermal effects
- Material evaluation
- Seal life prediction



Wear Rings and Bearings

Parker is pleased to offer a complete line of MolyGard™, WearGard™ and PTFE wear rings and bearing products to fit any application. Expertise in both engineered hard plastics and in

PTFE makes Parker the global leader for reciprocating bearing materials. By incorporating premium material blends with precision machining tolerances (down to ± .001"), Parker meets the full spectrum of needs, from heavy duty hydraulic cylinders operating under the highest temperatures and pressures to pneumatic applications requiring low friction, long life and self-lubrication.

See: Catalog EPS 5276



Integrated Piston Assembly

Parker's Integrated Piston combines the piston, bearing and seal into a self-contained package for low, medium and high pressure hydraulic cylinder applications.

See: Catalog EPS 5220



ProTech Bearing Isolators

ProTech bearing isolators are the ultimate in bearing protection with unitized, two-piece, non-contact design. ProTech provides zero lubricant leakage and total exclusion of contaminants.

See: Catalog EPS 5275



PTFE Seals: FlexiSeal®, FlexiLip™, and FlexiCase™

Parker manufactures a wide range of PTFE seals to meet the unique temperature, chemical and low friction requirements of high-performance systems. Products are available in standard inch, metric and custom designs.

See: Catalog EPS 5340

About Parker Hannifin Corporation

Catalog EPS 5350/USA

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 1,200 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 more than 400,000 customers worldwide.

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.



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 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).

03/03/06



The items described in this document are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in this document, when communicated to Parker Hannifin Corporation, its subsidiary or any authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgements, 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 invoice of the items purchased hereunder. Seller reserves the right to charge interest on all past due amounts. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided in 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 at the time of delivery. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. 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 OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

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 HEREUNDER, 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 quantities 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 modification 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 without limitation, dies, fixtures, molds and patterns, acquired to manufacture 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, confidential 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 amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefor 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 (hereinafter "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 the Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including 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, place 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. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

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 circumstances 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. Any special requirements for items to be provided by Seller hereunder including without limitation; compliance with military specifications, special documentation, or testing requirements, must be communicated to Seller in writing at the time the items are first requested. Any such requests that are communicated to Seller after preparation to manufacture an item has commenced may result in additional charges for rework or remanufacture of the item.

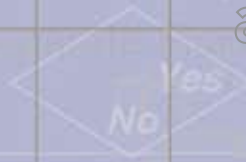
13. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations 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 more than two (2) years after the cause of action accrues.



General
Service

Chemical
Service

Pressure > 5 psi?



anything **Parker**
Possible.™

**Parker Hannifin Corporation, Seal Group
North America**

Engineered Polymer Systems Division

Salt Lake City Operations and Headquarters
2220 South 3600 West
Salt Lake City, UT 84119 USA
Ph: 801-972-3000
Fax: 801-973-4019

Nacogdoches Operations
403 Industrial Drive
Nacogdoches, TX 75963 USA
Ph: 936-560-8900
Fax: 936-560-8998
Toll Free: 1-800-233-3900

Marion Operations
3967 Buffalo Street
Marion, NY 14505 USA
Ph: 315-926-4211
Fax: 315-926-4498

Chicago Operations
2565 Northwest Parkway
Elgin, IL 60123 USA
Ph: 847-783-4300
Fax: 847-783-4301

Asia

Parker Hannifin Motion & Control (Shanghai) Co., Ltd
280 Yanqiao Road, Jin Qiao Export Processing Zone
Shanghai, China 201206
Ph: (+86) 21 2899 5181
Fax: (+86) 21 5834 8975

Parker Hannifin Corporation

Corporate Office
6035 Parkland Blvd.
Cleveland, OH 44124-4141 USA
Ph: 216-896-3000
Fax: 216-896-4000

1-800-C-PARKER
www.parkerseals.com

Europe

Germany

Parker Hannifin GmbH & Co. KG
Prädifa - Packing Division
Postfach 1641
D74321 Bietigheim-Bissingen
Ph: (+49) 7142 351-0
Fax: (+49) 7142 351-293

Italy

Parker Hannifin S.p.A.
Via. Priv. Archimede, 1
I-20094 Corsico (MI)
Ph: (+39) 02 - 4 51 92 -1
Fax: (+39) 02 - 4 47 93 40

France

Parker Hannifin SA
17 Rue des Buchillons
ZI du Mont-Blanc - BP. 524
F-74112 Annemasse-Cédex
Ph: (+30) 10 - 5 15 11 11
Fax: (+30) 10 - 5 15 11 12

Belgium

Parker Hannifin, Advanced Products, NV
Rupelweg 9
Boom, B-2850 Belgium
Ph: (+32) 3 880 81 50
Fax: (+32) 3 888 48 62

Your Authorized Parker Seal Distributor

