



OmnilipTM

rotary shaft seals

Table of Contents

Introduction	1
Seal Nomenclature	2
Materials/How To Order Seals	3
OmniLip™ Seals	4
DynaLip® Lip Seal	5
Gland Dimensions	6
PV Value	7
Hardware Design	8
Hardware Variations	9
Seal Installation	10
Application Data Form For OmniLip™ & DynaLip®	11
Comments/Sketches	12

Introduction



Saint-Gobain Performance Plastics' Polytetrafluoroethylene "PTFE" Lip Seal, or OmniLip™, was introduced in the early 1970's. The seals were designed to bridge the gap between conventional elastomer lip seals and mechanical face seals. Hostile environments such as extreme temperatures, aggressive media, high surface speeds, high pressures, and lack of lubrication previously forced the designer to specify the expensive and complicated mechanical face seals. Our OmniLip™ seal provides the designer with a significant improvement in performance over elastomer lip seals at a much lower cost than the mechanical face seal.

Saint-Gobain Performance Plastics' ISO 9001 North American and European facilities manufacture OmniLip™ seals in materials and sizes suited for most rotating equipment. Due to our unique manufacturing capabilities, we are able to quickly supply the geometry and material which best meets your requirements. This is accomplished by utilizing modern computer-controlled equipment, flexible tooling and the stocking of semi-finished components.

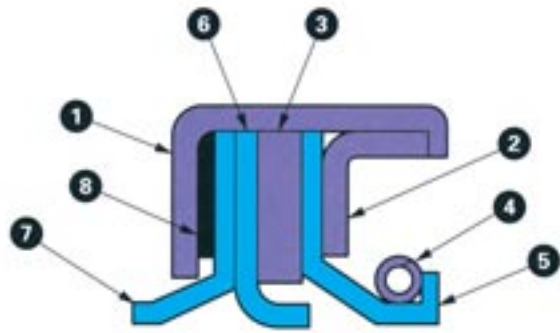
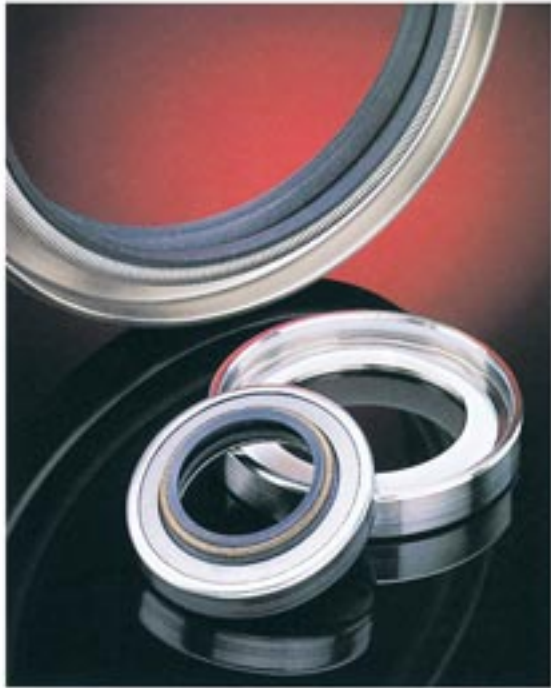
OmniLip™ seals solve difficult applications which are not addressed by conventional elastomer seals. OmniLip™ seals exceed the performance of elastomer lip seals in the following areas:

- **Greater chemical resistance**
- **Lower friction**
- **Capable of surface speeds to +30 m/s**
- **Works to temperature extremes (-20°C to 200°C)**
- **Has extended seal life in dry or abrasive media**
- **Handles pressure in excess of 3,5 MPa**
- **Large diameter capability with custom designs available**

..... *Successful Applications*

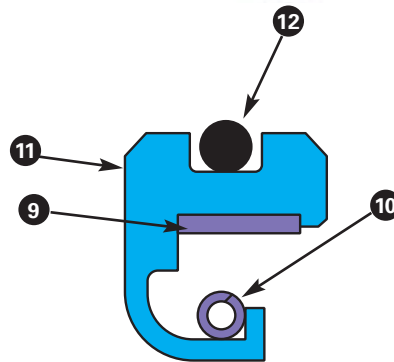
- Hydraulic motors and pumps
- Chemical pumps
- Rotary compressors
- Rotary unions
- Vacuum pumps
- Blowers
- Drilling and tapping spindles
- High-speed gearboxes
- Crankshafts of engines and compressors
- Robotics
- Pharmaceutical and food processing equipment
- Mixers
- Chemical processing equipment
- Actuators
- Alternators and generators
- Encoders
- Radar and thermal optical devices
- Electric motor shafts

OmniLip™ and DynaLip® Nomenclature



OmniLip™ Seal

1. Outer case*
2. Inner case*
3. Washer*
4. Extension spring (Stainless steel 302)
5. Primary element*
6. Secondary element*
7. Dust excluder*
8. Gasket (FKM)



DynaLip® Seal

9. Metal support ring*
10. Extension spring (Stainless steel 302)
11. Seal material*
12. O-Ring (FKM)

*See page 3 for material selection

Materials

Saint-Gobain Performance Plastics proprietary seal materials are compounded and processed for optimum seal performance in a wide variety of sealing environments. The materials listed below are the most commonly recommended compounds and are suitable for most applications. These are all low friction materials which have substantially higher PV ratings (Pressure x Velocity) than elastomer materials. Estimated torque requirements or wear life data is not provided since all application variables must be considered before making such calculations. If an estimate on



















seal life is desired, or if your applications require seals with a low or controlled torque, please complete the Application Data Form on page 11.

If your application exceeds -20°C to 200°C range, complete the Application Data Form on Page 11 which will enable our engineers to select proper custom design

..... *How To Order OmniLip™ & DynaLip®*

<p>Seal Type See Page 4-5</p> <p>Gland Dimensions See Page 6</p> <p>Material Code (Sealing Element) See Page 3</p> <p>Case or Support Ring Material Code* See Page 3</p> <p>For Type 68, 78, 69 and 79 add groove width (68-79X90X10-10XX)</p>	<p>Part Number Example: 10 - 10 x 22 - 03 M1</p>
<p>*(Always XX for DynaLip® which do not have metal support cases.)</p> <p>For standard part numbers, secondary and/or dust lip is always Fluoroloy SL.</p>	<p>NOTE: <i>If it is not clear which seal design is appropriate, please complete the Application Data Form on Page 11 and fax or mail to the attention of Saint-Gobain Performance Plastics Sealing Technology Center.</i></p>

Material Code	Name and Description	Application Details
Sealing Lip Materials		
03	Fluoroloy® SL Black color	Standard material for secondary elements and dust excluders. Good general purpose material for heat and wear resistance. Performs well on shaft surfaces with moderate hardness. Good in both lubricated and non-lubricated medias (good wear resistance).
N6	Fluoroloy® 907 Black color	Extreme wear-resistant material for use in high-speed applications in wet and lubricated environments. Excellent material for use in oil. Requires a shaft hardness of 55 HRC minimum.
10	Fluoroloy® K Tan color	Superior heat and wear resistance. Non-abrasive to running shaft surfaces. Recommended for limited lubrication or non-lubricated applications where running temperatures exceed 180°C. Not recommended for use in steam or water (fair wear resistance).
36	Fluoroloy® 36 Gray color	Best wearing material in hydraulic oil. Requires a hardened shaft surface of 55HRC for best performance. May cause excessive shaft scoring on soft metals or flash chrome (excellent wear resistance).
72	Fluoroloy® 72 White color	Meets FDA requirements. Suitable for soft shafts such as 316 stainless steel (fair wear resistance).
Metal Case or Support Ring Materials		
M1	Low-carbon steel	Used for outer case, inner case and washers. Low cost. Limited corrosion resistance. Recommended for cast iron or steel seal housings.
M2	Aluminum Alloy	Lightweight material used for outer case, inner case and washers. Low cost. Limited corrosion resistance. Recommended for aluminum or magnesium alloy seal housings.
M3	Stainless steel 304	Used for outer case, inner case, washers, spring and support ring. Good corrosion resistance. Recommended for stainless steel seal housings.
M4	Stainless steel 316	Used for outer case, inner case, washers, and support ring. Excellent corrosion resistance. Recommended for stainless steel seal housings.


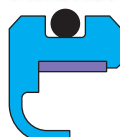

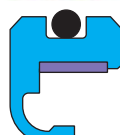

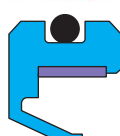

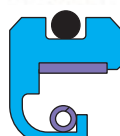


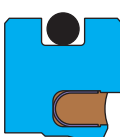
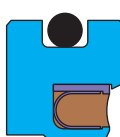
Seal Type	Seal Type	Application Details
Series 10 	Series 11 	<p>Series 10 and 11 are economical OmniLip™ seal designs employed in a wide range of applications. They are used in lubricated and non-lubricated environments. They can be used at shaft speeds to 25 m/s in lubricated media and pressures to 0,7 MPa. Typical applications are: gear boxes and environmental seals.</p>
Series 20 	Series 21 	<p>Series 20 and 21 are modifications of Series 10 and 11 which offer longer life and improved sealing of gasses and abrasive media due to their higher lip load. They also offer additional runout capability. They can operate at speeds, pressure and PV as noted in Series 10 and 11. Recommended shaft hardness of 55 HRC or greater when operating at the higher PV limits. Typical applications are: gear boxes, submersible pumps/motors, and mixers.</p>
Series 30 	Series 31 	<p>Series 30 and 31 incorporate a threaded sealing lip which pumps the media away from the seal. These designs should only be used in lubricating media. These designs offer long life and positive sealing at shaft speeds to 30 m/s. They should not be used for pressures greater than 0,1 MPa. They are designed for clockwise shaft rotation when viewed from the atmosphere side. Typical applications are: engine crank case seals and spindles.</p>
Series 40 	Series 41 	<p>Series 40 and 41 are the same as Series 30 and 31 except they are designed for a counter-clockwise shaft rotation when viewed from the atmosphere side.</p>
Series 50 	Series 51 	<p>Series 50 and 51 offer low torque and long life. They can be used at shaft speeds to 30 m/s, but are not recommended for pressures greater than 0,2 MPa. Due to their light lip loading, these designs should not be used where a leak-tight seal is required. They are an excellent environmental seal. Typical applications are: dust/dirt excluders, spindle and conveyer seals.</p>
Series 60 	Series 61 	<p>Series 60 and 61 incorporate spring loading which improves sealing where shaft runout or bore/shaft misalignment exist. These designs offer positive sealing during long term storage. They can be used at shaft speeds to 10 m/s and pressures to 0,7 MPa. Typical applications are: mixers, gear boxes and augers.</p>
Series 70 	Series 71 	<p>Series 70 and 71 are designed for pressures up to 3,5 MPa lubricating media, speeds up to 20 m/s. Typical applications are: hydraulic motors, pumps, hydrostatic transmissions and other high pressure hydraulic equipment.</p>
Series 80 	Series 81 	<p>Series 80 and 81 incorporate a threaded primary sealing lip with a standard secondary sealing lip. This series is designed for sealing lubricating media at high speeds to 25 m/s and pressures up to 1,5 MPa at stillstand or during short periods. They are designed for clockwise shaft rotation viewed from the atmosphere side. Typical applications are: air compressors, refrigeration compressors and vacuum pumps.</p>
Series 90 	Series 91 	<p>Series 90 and 91 are the same as series 80 and 81 except they are designed for a counter-clockwise shaft rotation when viewed from the atmosphere side.</p>

NOTE: The indicated pressure and speed values are for orientation purposes only. The limiting PV (Media Pressure in MPa x Surface Velocity in m/s) needs to be considered. See further information on page 7.

DynaLip® Lip Seal

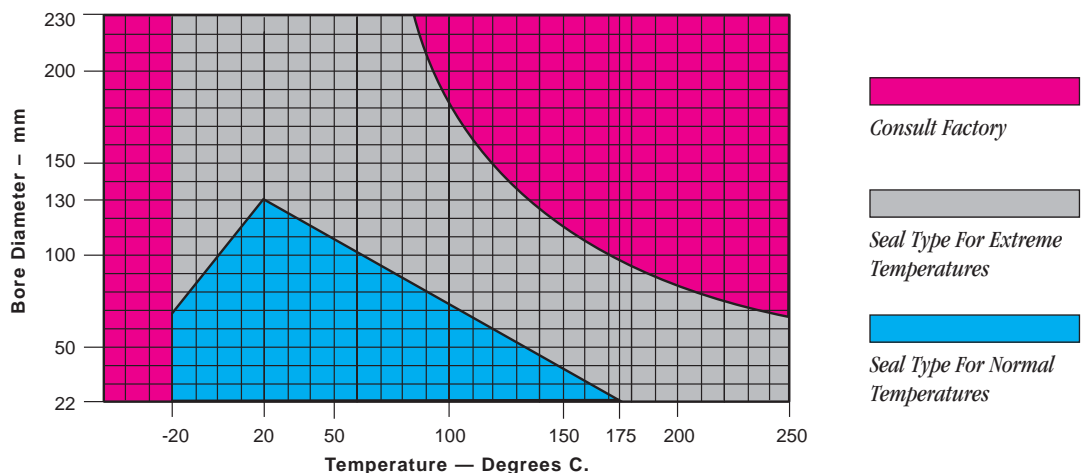
DynaLip® provides similar performance to the OmniLip™ seal but is more economical in smaller quantities. Because the seal has a soft surface on the OD, the seal will not damage the housing and can easily be installed and removed. Due to the seal's soft sealing on the OD, it is recommended that the seal be retained in the gland as shown on page 9.

DynaLip® designed for extreme temperatures utilize a metallic support ring to minimize temperature's effect on the seal. The DynaLip® seal selection chart below provides a guide on whether this metallic support is required.

Seal Type For NORMAL Temperatures	Seal Type For EXTREME Temperatures	Application Details
Series 13 	Series 14 	Series 13 and 14 are economical DynaLip® designs employed in a wide range of applications. They are used in lubricated and non-lubricated environments. They can be used at shaft speeds to 25 m/s in lubricated media and pressures to 0,5 MPa. Typical applications are: gear boxes and environmental seals.
Series 23 	Series 24 	Series 23 and 24 offer improved sealing of gasses and abrasive media due to their higher lip load. They also offer additional runout capability. They can operate at speeds and pressure as noted in Series 13 and 14. Recommended shaft hardness of 55 HRC. Typical applications are: gear boxes, submersible pumps/motors, and mixers.
Series 53 	Series 54 	Series 53 and 54 offer low torque and long life. They can be used at shaft speeds up to 30 m/s. They are not recommended for pressures greater than 0,2 MPa. Due to light lip loading, this design should not be used where a leak tight seal is required. They are excellent environmental seals. Typical applications are: dust/dirt excluders, spindle and conveyer seals.
Series 63 	Series 64 	Series 63 and 64 incorporate spring loading which improves sealing where shaft runout or bore/shaft misalignment exist. These designs offer positive sealing during long term storage. They can be used at shaft speeds to 10 m/s and pressures to 0,5 MPa. Typical applications are: mixers, gear boxes and augers.
Series 68 	Series 78 	Series 68 and 78 are designed for higher pressure and low speed applications where better tightness is required. The U-spring ensures positive load on the sealing lip. Temperature changes are better compensated. Standard spring material is Elgiloy®. The OD O-Ring energiser is an FKM material.
Series 69 	Series 79 	Series 69 and 79 are silicon-filled 68 and 78 designs, for food applications and those applications where solidification of the medium could interfere with the spring function. Standard silicon filling is red, the spring is made of Elgiloy®.

See note on page 4.

DynaLip® Seal Selection Chart



Gland Dimensions

Nom. Shaft Dim.	Nom. Bore B Dim.	Seal WidthW Dim.
8	22	7
	24	
	26	
9	22	7
	24	
	26	
10	22	7
	24	
	26	
11	22	7
	26	
12	24	7
	28	
	30	
14	28	7
	30	
	35	
15	26	7
	30	
	32	
	35	
16	28	7
	30	
	32	
	35	
17	28	7
	30	
	32	
	35	
	40	
18	30	7
	32	
	35	
	35	
20	40	7
	32	
	35	
	40	
	47	
22	35	7
	40	
	47	

Nom. Shaft Dim.	Nom. Bore B Dim.	Seal WidthW Dim.
24	35	7
	37	
	40	
	47	
	47	
25	40	7
	42	
	47	
	52	
26	37	7
	42	
	47	
28	40	7
	47	
	52	
	52	
30	40	7
	42	
	47	
	52	
	62	
32	45	7
	47	
	52	
35	47	7
	50	
	52	
36	62	8
	47	
	50	
	52	
38	62	8
	52	
	55	
	62	
40	52	7
	55	
	60	
	62	
	72	
42	55	8
	60	
	62	
	62	
	72	

Nom. Shaft Dim.	Nom. Bore B Dim.	Seal WidthW Dim.
45	60	8
	62	
	65	
	72	
	72	
48	62	8
	65	
	72	
50	65	8
	68	
	72	
	80	
52	68	8
	72	
	70	
55	72	8
	80	
	85	
	10	
56	70	8
	72	
	80	
	85	
58	72	8
	80	
60	75	8
	80	
	85	
	10	
62	80	8
	85	
	10	
63	85	10
	90	
65	85	10
	90	
	100	
68	90	10
	100	
70	90	10
	100	
72	95	10
	100	
75	95	10
	100	

Nom. Shaft Dim.	Nom. Bore B Dim.	Seal WidthW Dim.
78	100	10
	100	
80	100	10
	110	
85	110	12
	120	
90	110	12
	120	
95	120	12
	125	
100	120	12
	125	
	130	
105	130	12
	140	
110	130	12
	140	
115	140	12
	150	
120	150	12
	160	
125	150	12
	160	
130	160	12
	170	
135	170	15
	140	
145	175	15
	150	
150	180	15
	160	
160	190	15
	170	
170	200	15
	180	
180	210	15
	190	
190	220	15
	200	
200	230	15
	230	

The shaft and bore diameters are based on the standard DIN 3760. Saint-Gobain Performance Plastics can manufacture non-standard sizes also. Contact the Saint-Gobain Performance Plastics Sealing Technology Center at +32 (3) 4582828.

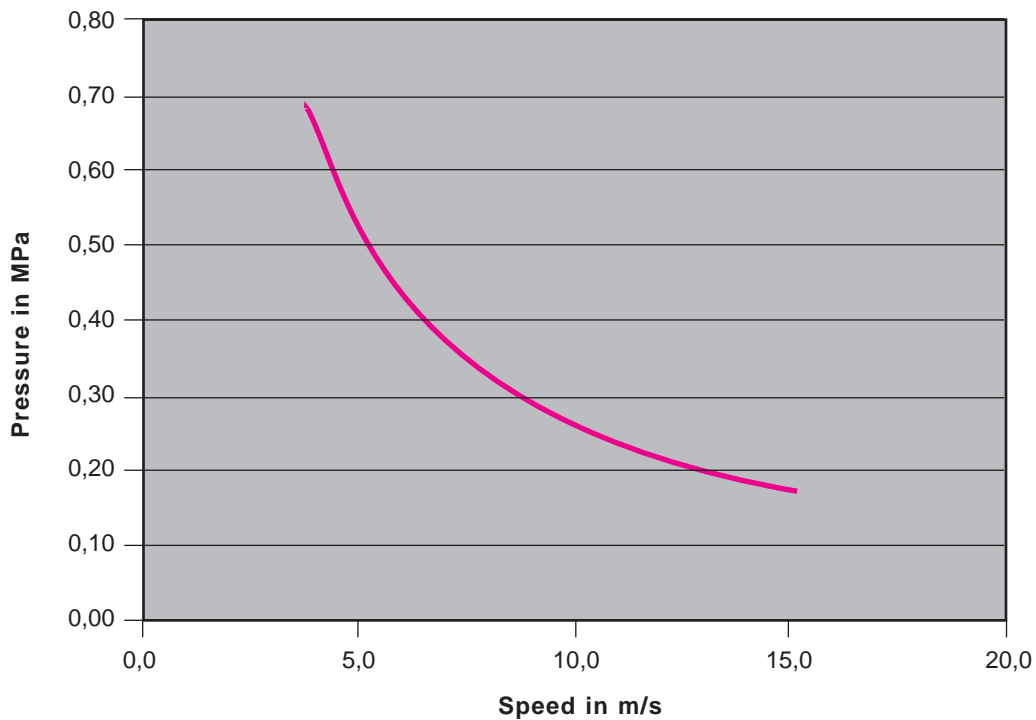
PV Value

(Media Pressure in MPa X Surface Velocity in m/s)

The PV value of a compound is the product of the unit load P (MPa) on the projected area and the surface velocity V (m/s). Intermittent service, reciprocating motion, cooling and design innovations permit PTFE compounds to operate at much higher PV values than the limit established using continuous rotary motion. The max PV or limiting PV is reached when the temperature generated by the friction escalates.

As stated before, cooling and lowering the coefficient of friction by means of lubrication can increase the limiting PV. Since so many application parameters have an impact on the max. or limiting PV, each application should be performance-tested to verify the seal life and other seal related properties.

Typical Limiting PV Chart



Hardware Design

SHAFT MATERIAL & HARDNESS

- Cast iron or hardenable steel is preferred.
- Shaft hardness of 40 to 58 HRC is recommended for low to moderate hydraulic oil pressure (0-1,5 MPa). A higher hardness range of 58 to 65 HRC for high pressure hydraulic oil, abrasive or non-lubricating medias, or high speed applications 15 m/s and above.

BORE MATERIAL

- Cast iron, steel, aluminum and other commonly used metallic and nonmetallic materials are acceptable. Plastics are only acceptable for DynaLip® seals.

SHAFT SURFACE ROUGHNESS

- The seal contact surface of a plunge ground shaft should be finished to a surface roughness of 0,2 to 0,4 $\mu\text{m Ra}$ and be free from machining leads.

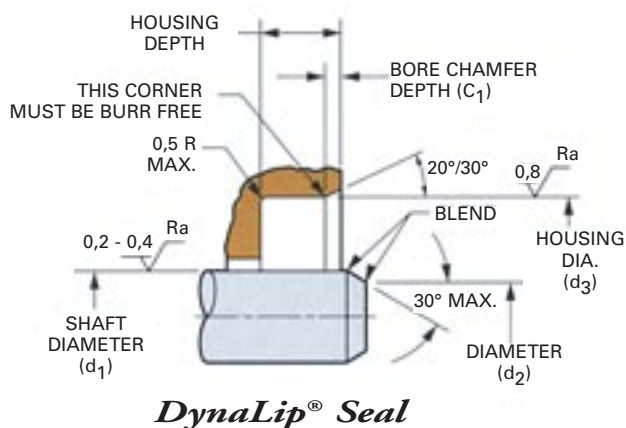
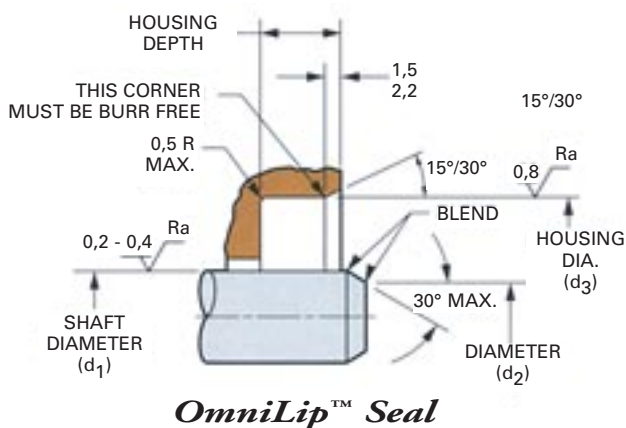
BORE SURFACE ROUGHNESS

- A bore finish of approximately 0,8 $\mu\text{m Ra}$ or smoother should be maintained to assure proper sealing.

SHAFT LEAD-IN CHAMFER

- The shaft should be provided with a lead-in chamfer with a diametral difference of d_1-d_2 and be free from burrs, sharp corners or rough machining marks.

..... Housing And Shaft Recommendations



SHAFT LEAD-IN CHAMFER

d_1	d_1-d_2
Up to 10	1,5 min.
11 to 20	2,0 min.
21 to 30	2,5 min.
31 to 40	3,0 min.
41 to 50	3,5 min.
51 to 70	4,0 min.
71 to 100	4,5 min.
101 to 130	5,0 min.
131 to 180	6,0 min.
181 to 210	6,5 min.

BORE TOLERANCE: H8

SHAFT TOLERANCE: h11

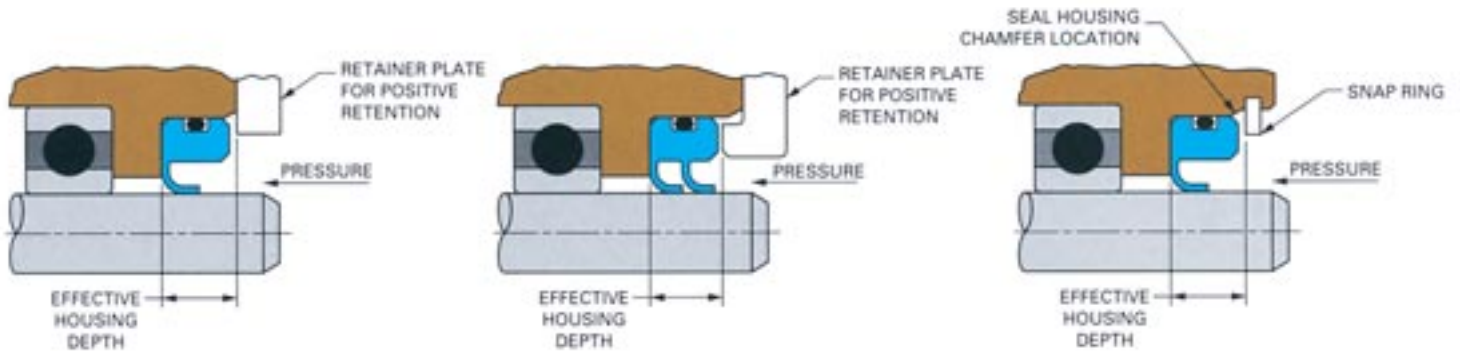
BORE LEAD-IN CHAMFER (DYNALIP® ONLY)

Housing Diameter Sizes	Bore Chamfer C_1
Up to 100	1,5/2,0
100 to 200	2,1/2,5

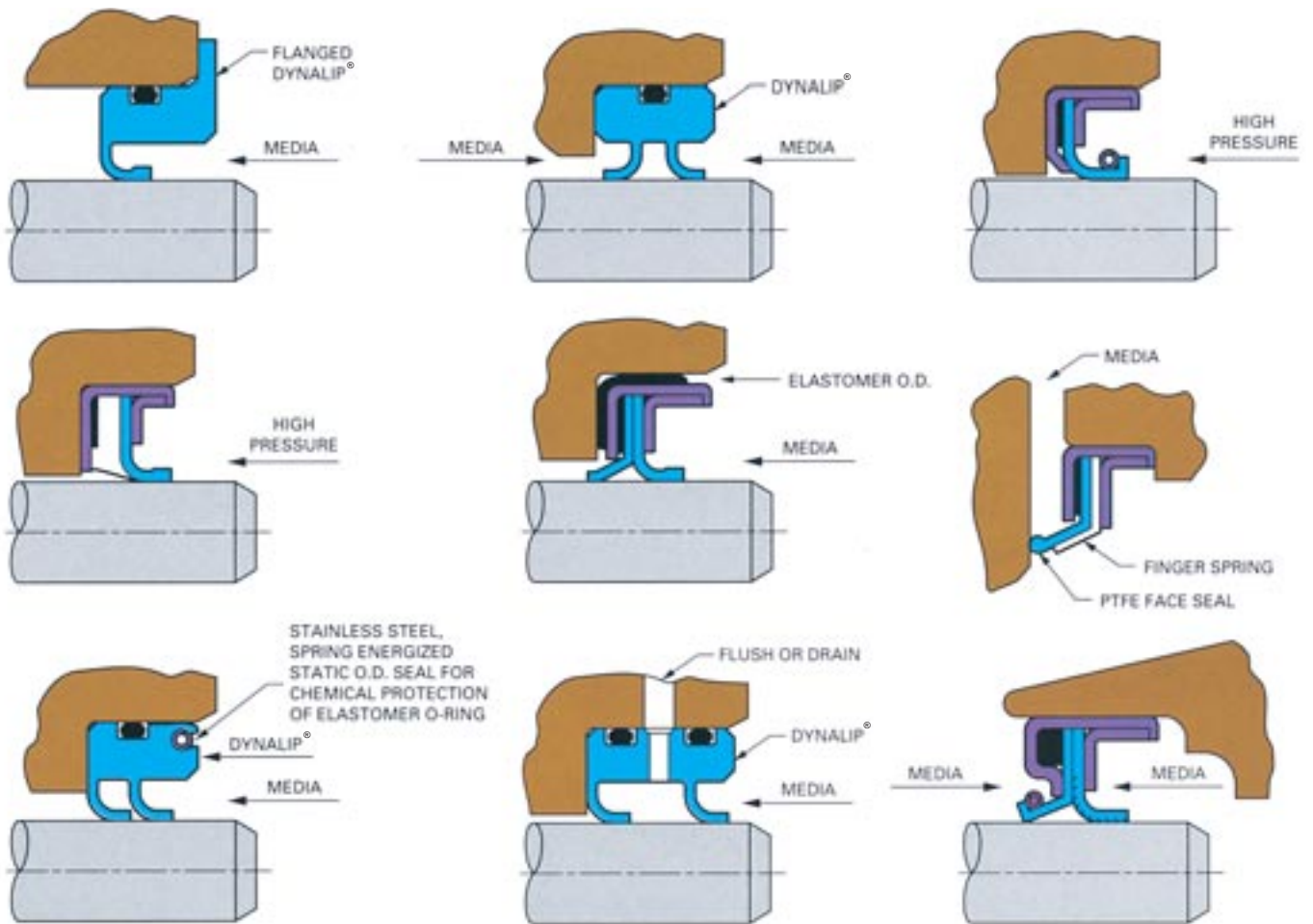
Hardware Variations

SEALING LIP EXTENSION

- OmniLip™ seals incorporating two sealing lips, or a dust excluder, may have seal lip extensions as shown. This must be considered when designing a seal gland.



..... Non-Standard Seal Configurations



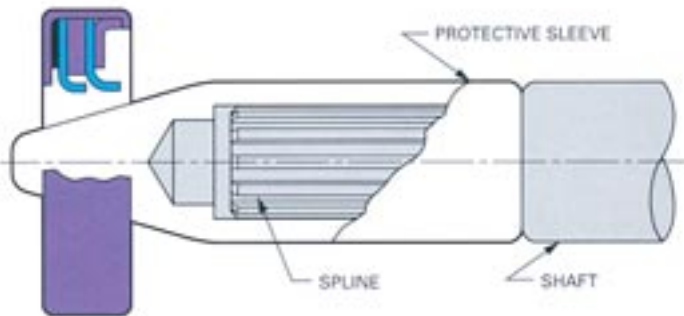
Seal Installation

Care must be taken not to damage the sealing lip during the installation of the shaft through the seal. It is much easier to install the seal if the shaft enters the seal from the atmosphere side. If this is not possible, or if the seal must be installed on a shaft which has a keyway or splines, please

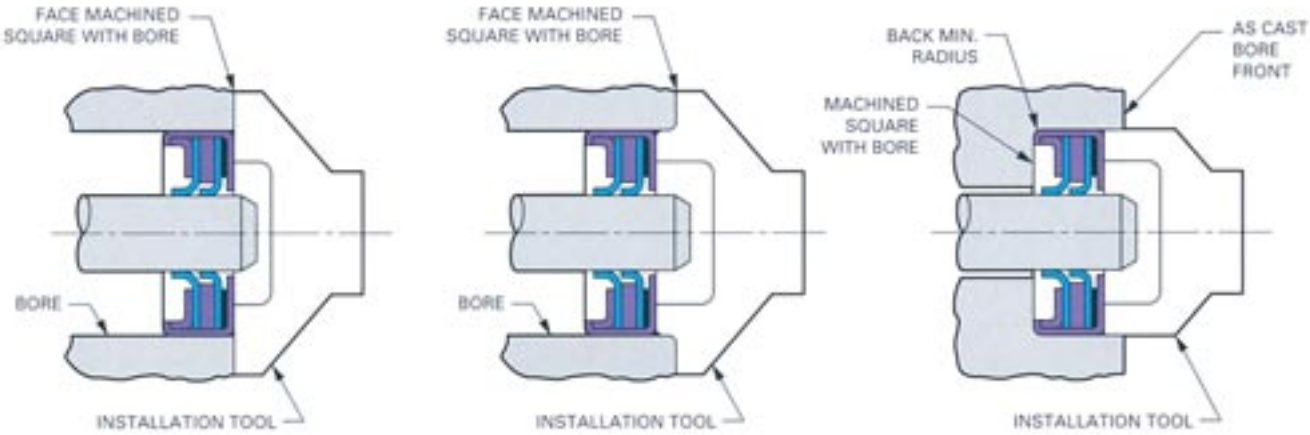
contact the factory. We can help with the design and manufacture of simple tooling to assure that the seal is installed without damage. OmniLip™ seals and DynaLip® seals should be pressed into the bore evenly. A tool, as shown below, simplifies this operation.

..... *Installation Tooling*

Care is essential in the installation of OmniLip™ & DynaLip® seals onto the shaft. If sufficient chamfer (below I.D. of seal lip element) is not possible, and/or if lip must pass over spline or keyway, a tapered installation sleeve (shown at right) is necessary. Sleeve design information is available on request.



..... *Press Fit Tools*



Application Data Form for OmniLip™ and DynaLip® Seals

Fax this form to Saint-Gobain Performance Plastics Sealing Technology Center at +32 (3) 4582669

Company Name		Individual name	
Street Address		Title	Phone number
City	State	Zip code	Fax number
E-Mail		Project Name	

Application Information and Conditions

Device to be sealed _____

Number of units/year _____ Number of seals/unit _____

Type of motion: Rotary Oscillating Reciprocating Static

Media/Fluid _____

Amount in seal area: Full head Half Shaft Splash

Operating pressure (units) _____ Proof pressure (units) _____ Burst pressure (units) _____

Temperature (units): High _____ Low _____ Operating _____

RPM _____

Direction of shaft rotation (as viewed from air side or low pressure side of seal): () CW () CCW

Allowable leakage (define units) _____

Friction torque (units): _____ Breakaway _____ Running _____

Life requirement _____

Duty cycle _____

Type of seal evaluation: Bench Field Both Explain _____

Hardware Data

Can gland hardware be changed? _____

Bore DIA (include TOL.) _____ Shaft DIA (include TOL.) _____

Bore depth _____ X-section _____

Bore/shaft misalignment (T.I.R.) _____ Shaft runout (T.I.R.) _____

Material: Bore _____ Shaft _____

Finish: Bore _____ Shaft _____

Hardness: Bore _____ Shaft _____

Direction in which rod/shaft enters element: () Air side or low pressure side () Media side

Will sealing element be required to make contact with keyway, spline, etc.? Yes No

If "Yes" explain: _____

Is installation tooling required? Yes No Saint-Gobain Performance Plastics to design Supply

Other High Performance Sealing Products

Saint-Gobain Performance Plastics has long been known for advanced sealing solutions. We have more than three decades of experience with PTFE, plus a full range of high performance plastics and elastomers.

Our specialty is engineered sealing devices including OmniSeal® seals (spring energized PTFE seals) and elastomeric hydraulic seals.

As the world's leader in OmniLip™, DynaLip®, and OmniSeal® seals, we bring you the advantages of our latest production technology for timely and cost-effective answers to your most critical sealing applications.

We welcome the opportunity to help you achieve the best technical and economical solutions for your sealing requirements. For a complete list of products offered or specific requirements call our Sealing Technology Center at +32 (3) 4582828.



Spring Ring II



OmniGasket



OmniSeal® 103A



OmniSeal® RP II



OmniSeal® 1100A



Boss Seal



			INJECTION MOLDING	AGRICULTURAL PLASTICS	NORGLIDE® BEARINGS	NORSLIDE®	OMNILIP™	OMNISEAL®	MELDIN®	RULON®	RAM EXTRUSION	MACHINED & MOLDED COMPONENTS
EUROPE												
* Saint-Gobain Performance Plastics Pampus GmbH Willich • Germany	Phone: (49) 2154 600 Fax: (49) 2154 60310				•	•					•	•
* Saint-Gobain Performance Plastics N.V. Kontich • Belgium	Phone: (32) 34 58 28 28 Fax: (32) 34 58 26 69	•					•	•	•	•	•	•
Saint-Gobain Performance Plastics Asti Nanterre • France	Phone: (33) 1490 70205 Fax: (33) 1490 69762				•	•						
Saint-Gobain Performance Plastics Agrate Brianza (Mi) • Italy	Phone: (39) 03 96 50 070 Fax: (39) 03 96 52 736	•			•	•	•	•	•	•		
Saint-Gobain Performance Plastics Espana, S.A. Barcelona • Spain	Phone: (34) 93 682 8138 Fax: (34) 93 682 8143				•	•						
* Saint-Gobain Performance Plastics Espana, S.A. Logrono • Spain	Phone: (34) 94 14 86 035 Fax: (34) 94 14 37 095	•					•	•	•	•		•
NORTH AMERICA												
* Saint-Gobain Performance Plastics Corporation Wayne, New Jersey • USA	Phone: (1) 973-696-4700 Fax: (1) 973-696-4056				•	•						•
* Saint-Gobain Performance Plastics Corporation Bristol, Rhode Island • USA	Phone: (1) 401-253-2000 Fax: (1) 401-253-1755	•							•	•	•	•
* Saint-Gobain Performance Plastics Corporation Mundelein, Illinois • USA	Phone: (1) 847-949-0850 Fax: (1) 847-949-0198									•		•
* Saint-Gobain Performance Plastics Corporation Garden Grove, California • USA	Phone: (1) 714-995-1818 Fax: (1) 714-688-2701						•	•				•
Saint-Gobain Performance Plastics Corporation Iztapalapa • Mexico	Phone: (5) 256-132-814	•			•	•			•	•		
SOUTH AMERICA												
* Saint-Gobain (Bearing & Wear Technology) Ceramicas Industrias Ltda. (Agricultural Plastics) Vinhedo-SP • Brazil	Phone: (55) 19 3876 8153 Phone: (55) 19 3876 8070 Fax: (55) 19 3876 8077	•	•	•	•	•	•	•	•	•		
ASIA												
* Saint-Gobain Norton KK Nagano • Japan	Phone: (81) 266 79 6400 Fax: (81) 266 70 1001	•	•	•	•	•	•	•	•	•		
* Saint-Gobain Performance Plastics Korea Co., Ltd. Seoul • South Korea	Phone: (82) 25 08 82 00 Fax: (82) 25 54 15 50	•	•	•	•	•	•	•	•	•		
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