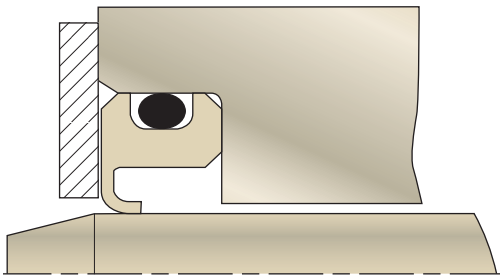
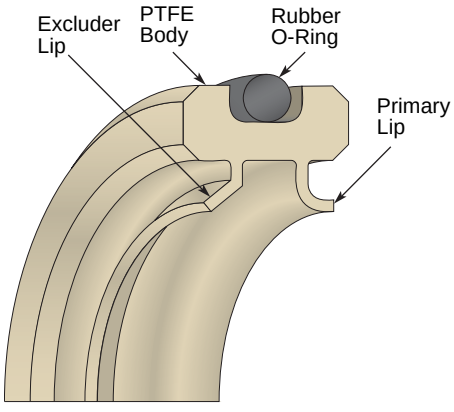
FlexiLip™ Rotary Seals Introduction

Contents

FlexiLip



FlexiLip Application



FlexiLip Components

What Is a FlexiLip and How Does It Work?

The Parker FlexiLip is a rotary lip seal that features an ID lip that seals dynamically on a shaft and an elastomeric O-ring on its OD to seal statically in a bore. Since the lip is not spring energized, the radial lip contact forces are lower than a rotary FlexiSeal, which allows the seal to function at much higher surface speeds (up to 5000 sfpm).

The seals are manufactured from a wide variety of PTFE composites and other machinable plastic materials. Standard O-ring choices are fluorocarbon, silicone, nitrile and EPDM. This broad foundation of standard O-ring and PTFE materials can be tailored to suit nearly all applications. Standard and Non-standard FlexiLip profiles are precision machined to fit inch-fractional and metric gland geometries. The FlexiLip design is extremely versatile because the seal is machined from a molded PTFE sleeve. Standard tooling and programs are used to manufacture seals efficiently by eliminating setup and programming time. FlexiLip seals are used in demanding applications where the operating conditions exceed the capabilities of elastomeric seals.

Applications

The FlexiLip's versatility makes it suitable for a wide range of applications including:

- Motors
- Gear Boxes
- Pumps
- Bearings
- Compressors
- Cryogenics
- Rolls
- Extruders
- Valves
- Blowers
- Spindles
- Robotics
- Mixers

Markets

FlexiLip's low tooling costs and rapid prototyping capability make the FlexiLip an appealing choice for customers in a variety of markets including:

- Aerospace
- Automotive
- Chemical Process
- Appliances
- Machine Tools
- Marine
- Medical
- Pharmaceutical
- Military
- Heavy Machinery
- Pulp & Paper
- Hydraulic
- Food Processing
- Electronic
- Oil & Gas
- Steel Mill
- Plastics

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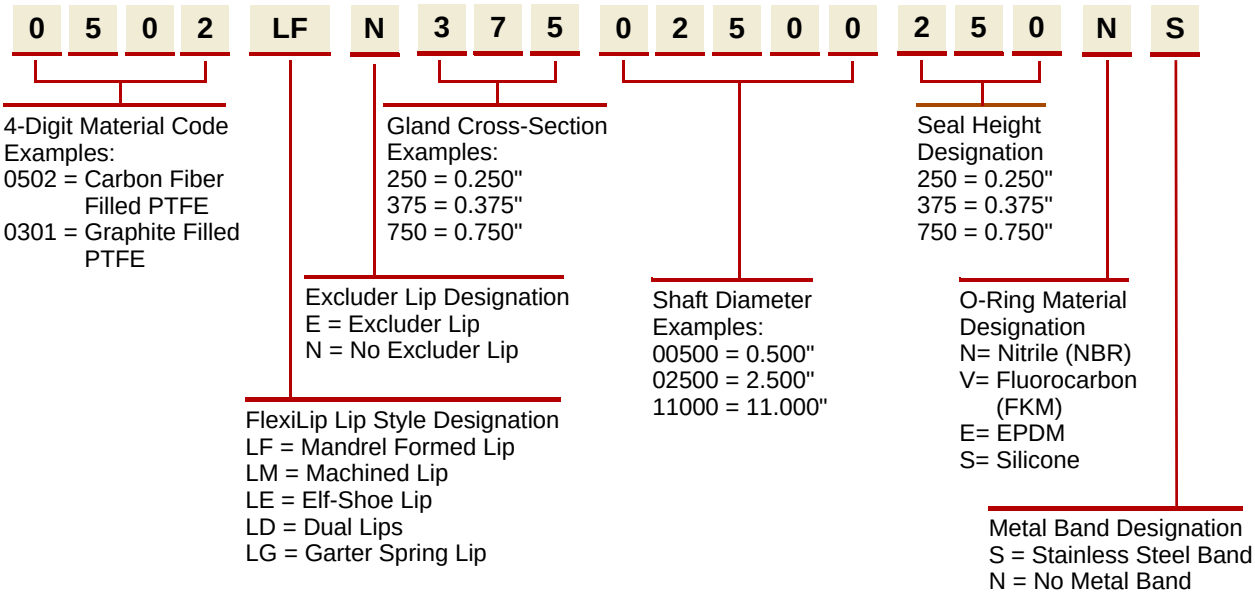
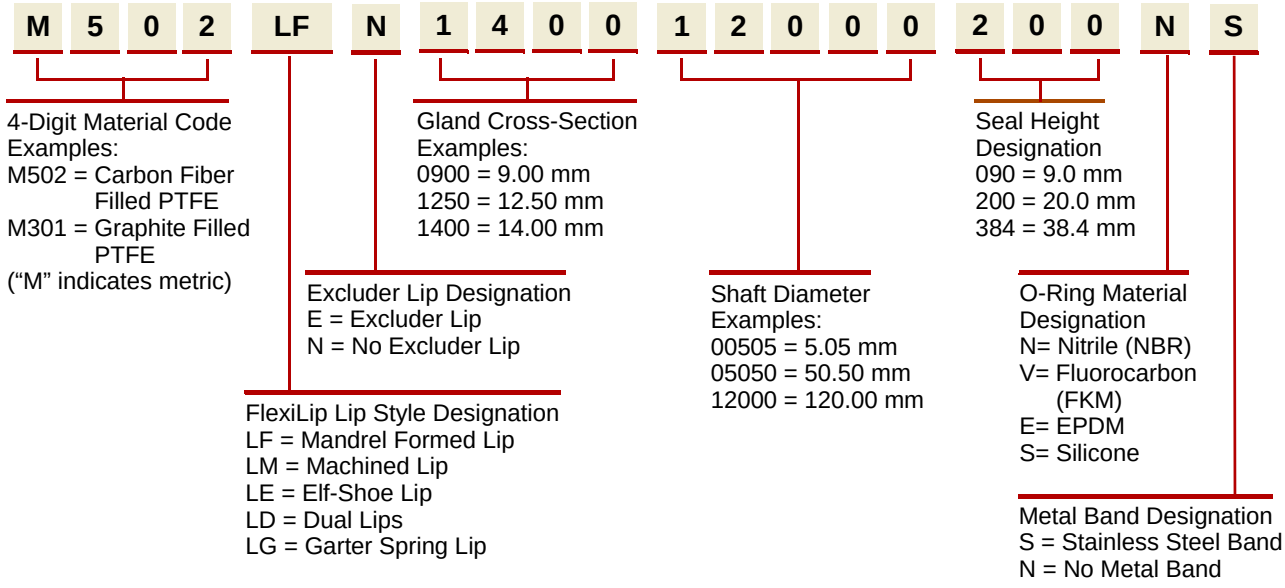
Part Number Nomenclature — FlexiLip

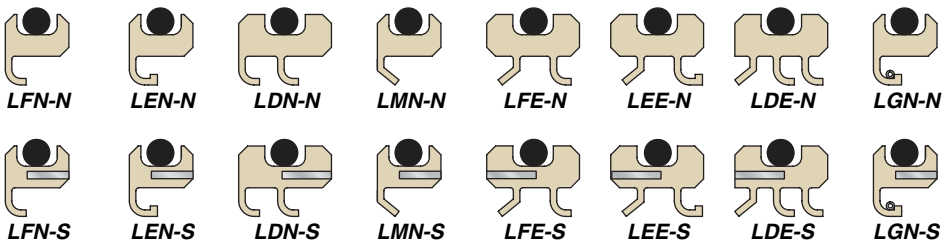
Table 8-1. FlexiLip Part Number Nomenclature

English



Metric





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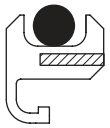
Choosing the Right Design

From Gland Dimensions to Part Number

Step 1 — Choose profile. Choose the best profile for your application from the decision tree and table on **Pages 8-7** through **8-9**, and place the 4-character profile description into the part number as shown here in this example.



Choice: LEN-S Profile
xxxx**LEN**xxxxxxxxxxxx**S**

Step 2 — Choose material. Choose the best material for the application and place the 4-digit material code into the part number as shown here:

Choice: 0502 — Carbon Fiber Filled PTFE
0502LENxxxxxxxxxxxxS

Step 3 — Choose O-ring material. Choose the best O-ring material after considering the chemicals and temperatures it will be exposed to. Consult the *Parker O-Ring Handbook* (ORD 5700A/US section II) as a general reference and choose the most appropriate material family. Place in the part number as shown here:

Choice: Fluorocarbon O-ring (V code)
0502LENxxxxxxxxxxx**V**S

Step 4 — Fill in the size portion of the part number. Choose the optimal size of the part based on the limitations of the cross-section and diameter (**Page 8-9**) and place into the part number as shown:

Choice: 1.500" shaft x 2.000" bore x 0.500" bore depth

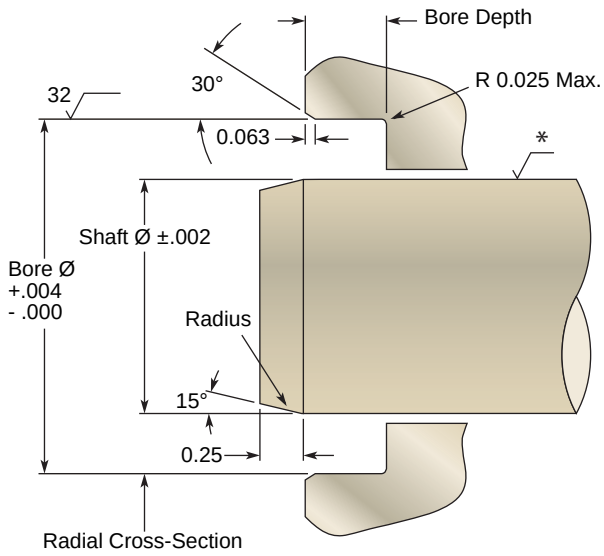
Calculate Radial Cross-Section and input into part number:

(2.000" Bore – 1.500" Shaft) / 2 = 0.250"
0502LEN**250**xxxxxxxxVS

Input shaft diameter into part number:
0502LEN250**01500**xxxVS

Find minimum seal width from **Page 8-9** and input into part number. Minimum seal width is always the most economical, but you can choose any width between the minimum recommended seal width and the actual bore depth. In this case you could choose any width between 0.250" and 0.500".

Minimum seal width = 0.250"
0502LEN25002000**250**VS



*Note: For more specific information on surface finish refer to **Table 2-6** on **Page 2-9**.

From Part Number to Gland Dimensions

Step 1 — Extract shaft dimensions from part number:

0502LEN375**02125**736VS

02125 = 2.125" shaft diameter
For 2.125" shaft tolerance = ±.002" from drawing above.

Step 2 — Extract bore diameter from part number:

0502LEN**37502125**736VS

375 = 0.375" cross-section
bore Ø = shaft Ø + (2 x cross-section)
bore Ø = 2.125" + (2 x 0.375) = 2.875"
For 2.875" bore, tolerance = +.004/-.000 from drawing above.

Step 3 — Extract bore depth from part number:

0502LEN37502125**736**VS

736 = 0.736" seal height
min. bore depth = seal height + 0.010"
min. bore depth = 0.736" + 0.010" = 0.746"

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Table 8-2. Part Number Examples

	Profile	Shaft Dia.	Bore Dia.	Min. Bore Depth	O-ring Material
0204LEN43703624375EN	LEN-N	2.750 ± .002"	3.624 + .004/-.000"	0.385"	EPDM
0301LDE50105550525VS	LDE-S	4.548 ± .002"	5.550 + .004/-.000"	0.535"	Fluorocarbon
M127LGN09106620140SS	LGN-S	48.0 ± .08 mm	66.2 + .16/-0 mm	14.25 mm	Silicone
M615LFE12516000200NN	LFE-N	135.0 ± .0 8 mm	160.0 + .16/-0 mm	20.25 mm	Nitrile

FlexiLip Installation

Proper installation tools and techniques must be used to install the seal without damaging the critical sealing areas.

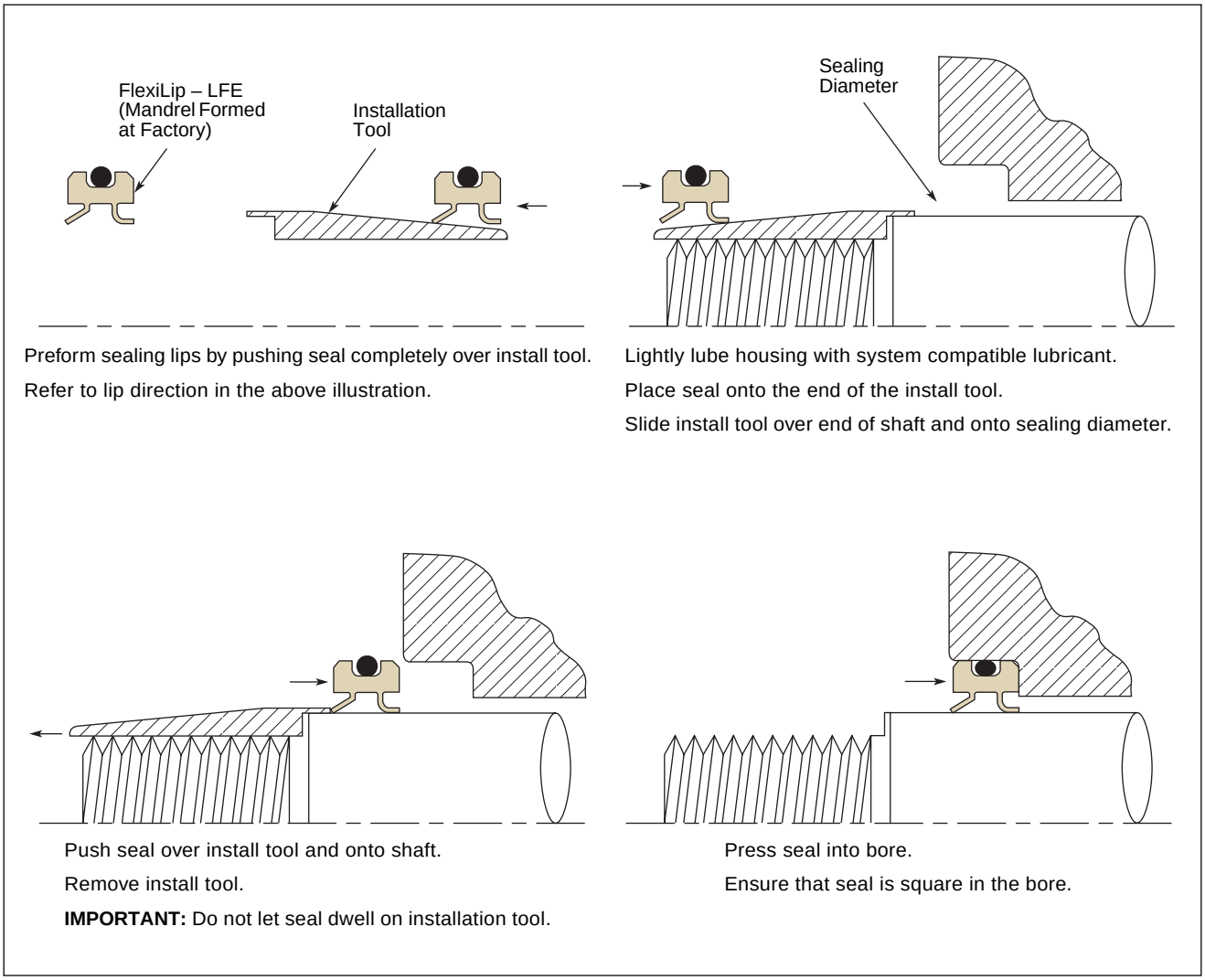

Figure 8-1. FlexiLip Installation

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FlexiLip Installation Tool

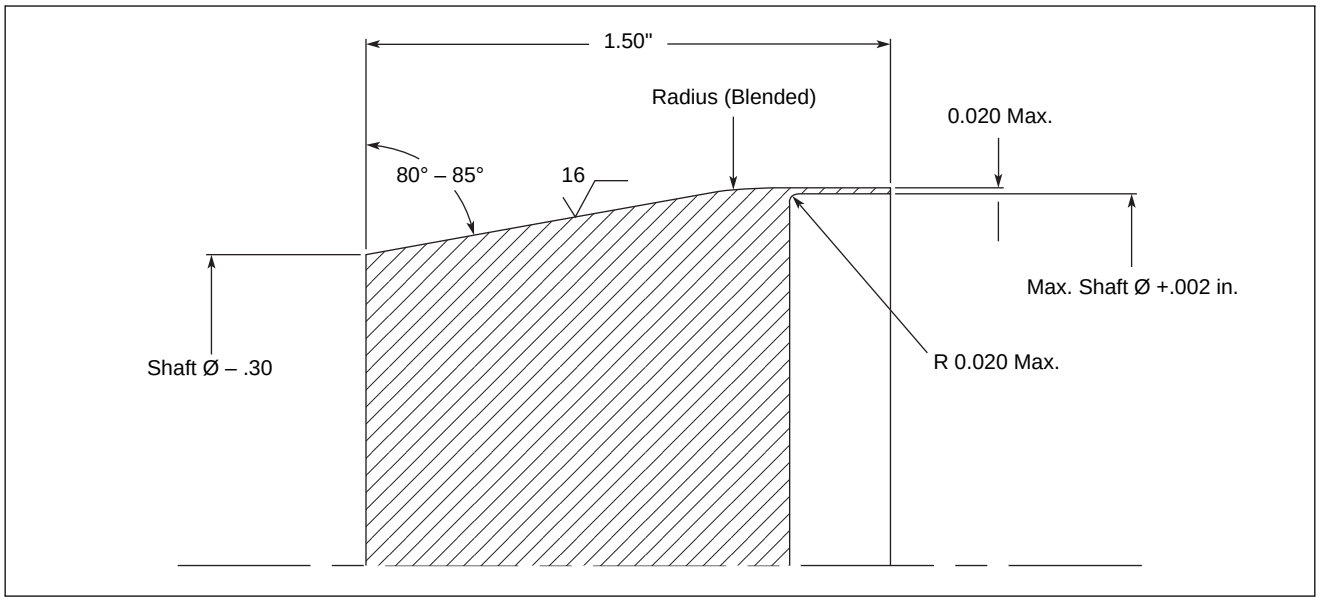
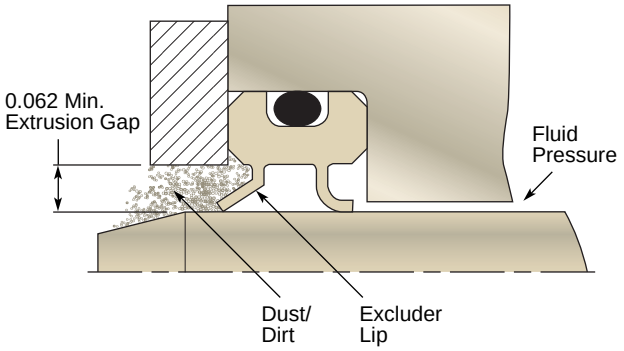
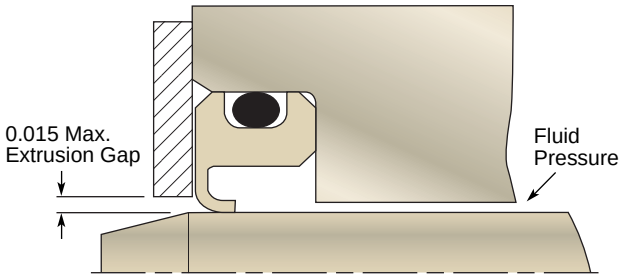


Figure 8-2. Installation Tool Dimensions

Hardware Notes

Each FlexiLip profile is given a standard pressure rating in **Table 8-3** to aid the user in the selection of the most appropriate profile for an application. These pressure ratings are based on the assumptions that there is a large extrusion gap as shown in the first illustration and that the temperature at the gap is less than 300 °F. Tightening the extrusion gap to around 0.015" on non-excluder lip profiles can double or triple the pressure rating for the seal. The extrusion gap for profiles with excluder lips must be at least 0.062" to allow the excluder lip to extend beyond the outside of the seal envelope if necessary. Reducing the extrusion gap does not improve the pressure rating of a seal with an excluder lip.





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Common Materials Used in this Product

The most popular fillers for FlexiLip products are graphite, fiberglass/ molybdenum disulfide, carbon fiber and mineral.

A complete listing of material properties and limitations appears on **Page 3-4**. Feel free to contact the EPS division PTFE Engineering Team at (801) 972-3000 for more guidance on material selection.

0301 — Graphite Filled

Since graphite is often used as a lubricant, it does not significantly increase the coefficient of friction of PTFE when used as a filler. The low friction allows the compound to be used when both shaft speed and pressure are high. Graphite also is chemically inert which enables its use in corrosive medias.

0615 — Proprietary Low Wear PTFE

This proprietary filled PTFE offers low wear and friction properties, used in general applications where long life is required. Not recommended for applications with abrasive media.

0204 — Molybdenum Disulfide and Fiberglass Filled

Molybdenum disulfide increases the hardness of the seal surface while decreasing friction. It is normally used in small proportions combined with other fillers such as glass. MoS_2 is also inert towards most chemicals.

0512 — Carbon Fiber Filled

Carbon fiber lowers creep, increases flex and compressive modulus and raises hardness. Coefficient of thermal expansion is lowered and thermal conductivity is higher for compounds of carbon fiber filled PTFE. Ideal for automotive applications in shock absorbers and water pumps.

0127 — Mineral Filled

Mineral is ideal for high temperatures and offers low abrasion to soft surfaces. PTFE with this filler can easily be qualified to FDA and other food-grade specifications.

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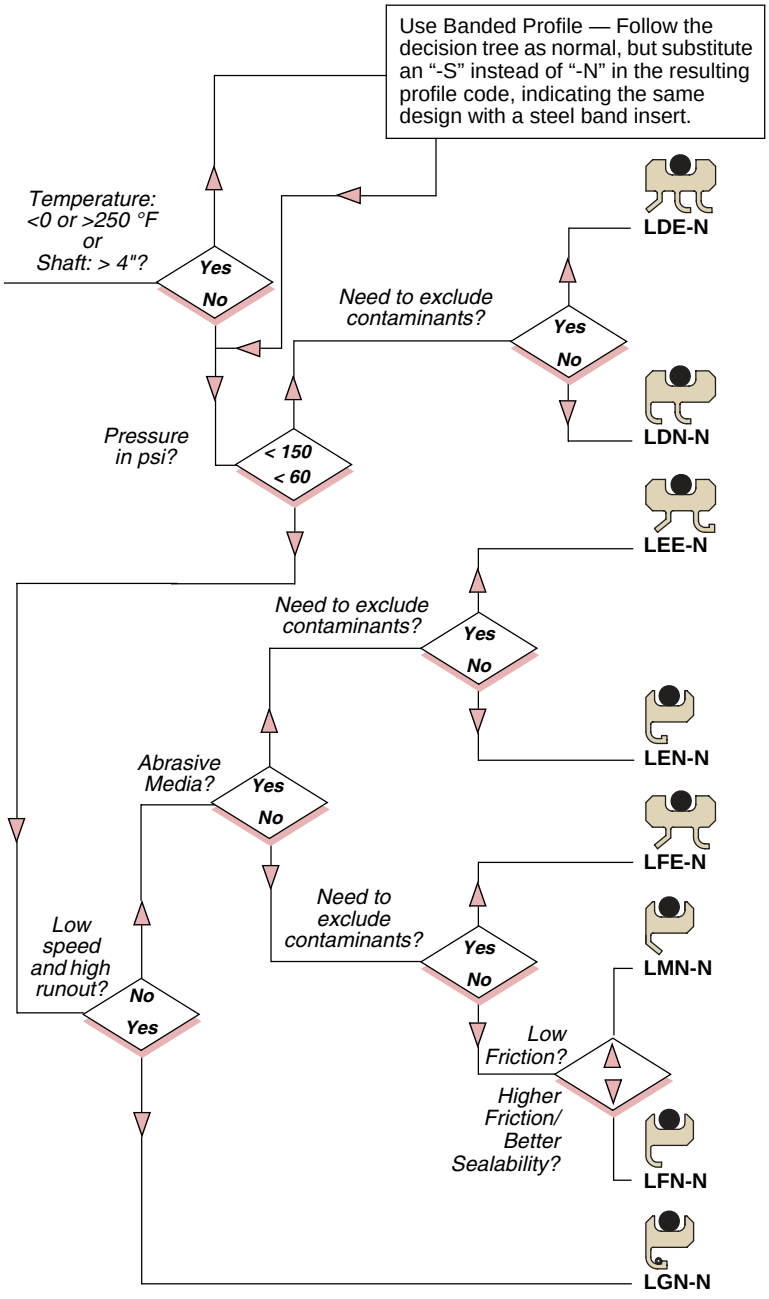
The key application considerations that help in the selection of the right FlexiLip profile are operating temperature, media abrasiveness, pressure, external contamination, friction requirements, shaft diameter and Total Indicator Runout (TIR).

Total Indicator Runout (TIR) is how far the shaft is misaligned with the bore during rotation. This is fully characterized in the general engineering section on **Page 2-19**. Only one FlexiLip profile is able to handle continuous service with runout conditions up to 0.020"; the LGN-N (or the LGN-S with the steel band). Keep in mind that the faster a shaft spins, the less TIR the seal can withstand.

If the temperatures are extreme or if the shaft is over 4 inches in diameter, Parker recommends using a profile with a stainless steel band inserted into the side for dimensional stability during thermal cycling. This standard design can be called out by switching the "-N" for a "-S" in the profile code (and the part number).

These decision trees are to be used as an engineering guide only. Often several other parameters must be considered to optimize seal design. Contact Parker's PTFE Engineering Team for confirmation of your choice or further recommendations. Parker also recommends that any seal be tested in the application conditions before releasing for production.

Decision Trees



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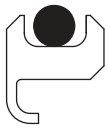
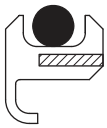
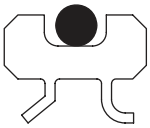
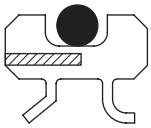
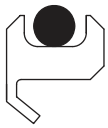
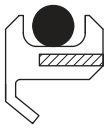
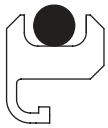
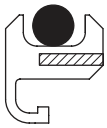
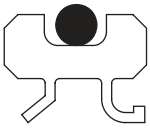
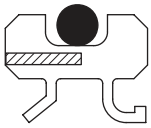
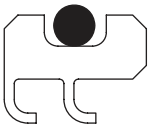
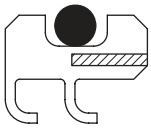
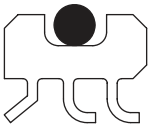
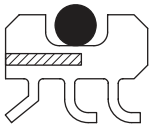
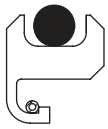
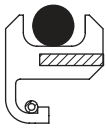
Profiles

Table 8-3. Product Profiles

Standard Profile	Banded Profile*	Features	Recommended Applications
LFN-N 	**LFN-S** 	Formed Primary Lip	Multipurpose Seal
LFE-N 	**LFE-S** 	Formed Primary Lip w/ Excluder Lip	Multipurpose Seal
LMN-N 	**LMN-S** 	Machined Primary Lip	Low Friction
LEN-N 	**LEN-S** 	Elf-Toe Primary Lip	Abrasive Media
LEE-N 	**LEE-S** 	Elf-Toe Primary Lip w/ Excluder Lip	Abrasive Media
LDN-N 	**LDN-S** 	Dual Primary Lips	Oil Seal — Flooded, Severe Splash
LDE-N 	**LDE-S** 	Dual Primary Lips w/ Excluder Lip	Oil Seal — Flooded, Severe Splash
LGN-N 	**LGN-S** 	Primary Lip Energized with Garter Spring	0.010" > TIR > 0.005"

*Metal Banded — 301 Stainless Steel. For use when temperature is <0 or >250 °F or shaft diameter ≥4.000".
**Consult engineering for shaft diameters that are outside the range of our standards.
***Seals that are retained with an extrusion gap smaller than 0.020" will go to higher pressures than listed. Consult EPS Division Engineering.

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