

## ProTech Labyrinth Seals

### Unique Solutions For Extended Bearing Life

#### PROBLEM: PREMATURE BEARING FAILURE

Bearings are at risk whenever seals allow lubricant leakage or contaminant intrusion into the housing. Until now, there has been no comprehensive solution.

##### Partial Solutions

Standard radial lip seals are an acceptable solution for most shafts sealing requirements; however, they have two drawbacks in some applications. First, standard radial lip oil seals are designed for one-way performance. They keep lubricants in, but they do not keep contaminants out. Second, they ride on the shaft causing wear on both the shaft and the seal. Eventually, this causes lubricant leakage.

Even though labyrinth seals were developed to address these problems, they have performance weaknesses. Not only are many labyrinth seals costly and complicated, they also allow some contamination to reach lubricants. (See extreme testing information to follow.) The use of metal in labyrinth seals results in costly designs, close tolerances, and difficult installations. Some manufactures offer two-piece, non-unitized labyrinth seals. However with one exception, unitized labyrinth seals have at least three components and up to four O-Rings.

#### SOLUTION: PROTECH LABYRINTH SEALS

JM Clipper uniquely designed ProTech to protect bearings with zero lubricant leakage and total exclusion of contaminants. Only ProTech is based on a simple, unitized, two-piece PTFE design with only two O-Rings. Only ProTech has four unique designs that provide outstanding performance and lower cost.



## Multiple ProTech Designs

ProTech labyrinth seals are available in four designs to meet virtually all application requirements – standard flanged design, non-flanged design, multi-port design and split pillow block design. In addition, JM Clipper offers other special designs for specific applications. For example, we have stepped-shaft designs generally found on electric motors and some pumps.

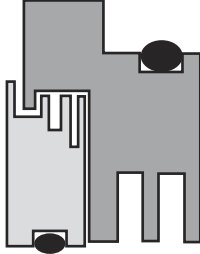
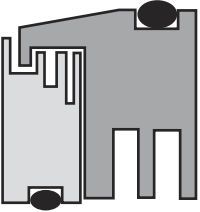
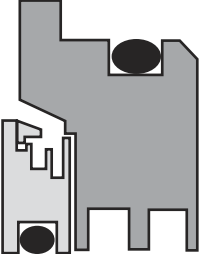
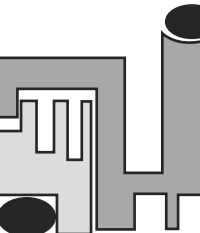
## Benefits of Simplified Design

Compared to past approaches, the simple design of ProTech provides important efficiencies:

- Fewer working components
- Significantly lower cost
- Easy installation
- Accommodates greater shaft misalignment and eccentricity – up to 0.020" TIR
- Easier to retrofit in standard bore housings
- Self aligning
- Requires no lubrication
- Non contact means no wear and no heat build up
- Tested for total exclusion of contaminants
- Tested for zero oil leakage

## Additional Benefits of PTFE Construction

- Chemical resistance
- Foreign materials will not stick to the seal
- Low density reduces both initial torque consumption and dynamic balance problems
- Non-sparking

	<p><b>Flanged</b> – General purpose sealing in flanged design. PTFE material. Excludes heavy water spray and dry contaminants from the bearing cavity. Retains grease and oil splash (oil level must be below inboard oil drain-back or non-flooded).</p>
	<p><b>Non-flanged</b> – Specifically designed for flush mount applications. General purpose sealing in non-flanged design. PTFE material. Excludes heavy water spray and dry contaminants from the bearing cavity. Retains grease and oil splash (oil level must be below inboard oil drain-back or non-flooded).</p>
	<p><b>Multi Port</b> – For use in applications where drain port cannot be fixed at six o'clock position. PTFE material. Excludes heavy water spray and dry contaminants from the bearing cavity. Retains grease and oil splash (oil level must be below inboard oil drain-back or non-flooded).</p>
	<p><b>Pillow Block</b> – Solid seal design for sealing split pillow block bearings. PTFE material. Excludes heavy water spray and dry contaminants from the bearing cavity. Retains grease and oil splash (oil level must be below inboard oil drain-back or non-flooded).</p>

## ProTech Designs

### Design Breakthrough

The standard ProTech is a single-port expulsion design with an external flange or a flush-mount design. In addition, ProTech is available in a multi-port expulsion design for applications in which orientation is a problem.

Standard Operation Parameters – Flanged and Non – Flanged Designs

A – Shaft Tolerances = +/- .002" (+/- .05mm)

B – Bore Tolerances = +/- .002" (+/- .05mm)

C - Cavity Width

D – Seal Into Bore Depth

E – Seal Width

F – Overall Diameter (B +  $\_$ " )

Shaft Size	Flanged Design		Non-Flanged
	Seal Depth Into Bore(D)**	Seal Width (E)	Seal Width (D) = (E)
.5" (13mm) to 1.375" (35mm)	.312" (8mm)	.688" (17mm)	.563" (14mm)
1.376" (35mm) to 2.125" (54mm)	.375" (10mm)	.750" (19mm)	.563" (14mm)
2.126" (54mm) to 4.0" (102mm)	.438" (11mm)		
.815" (21mm)	.563" (14mm)		
Over 4.0" (102mm)	.438" (11mm)	.815" (21mm)	.625" (16mm)

\* The depth & before & bore dimension will equal the total width of the seal.

\*\* Standard design only.

**Total Eccentricity:** .020" TIR (0.51mm)

**Shaft Speed:** Up to 5,000 fpm

**Pressure:** 0 psi

**Temperature Range:** -40 degrees to 250 degrees F  
(-40 degrees to 121 degrees C)

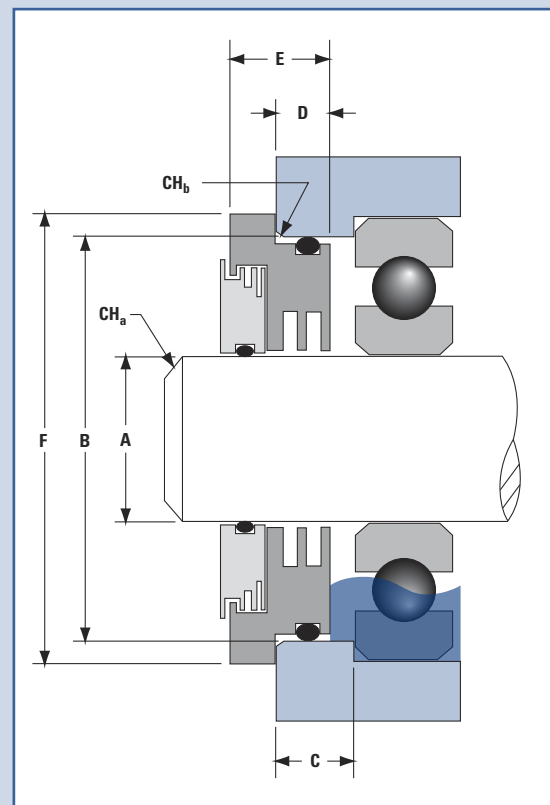
**Chamfer Width – Cha:** .032" to .063" (0.81mm-1.6mm)

**Bore Width – CHb:** .032" to .063" (0.81mm - 1.6mm)

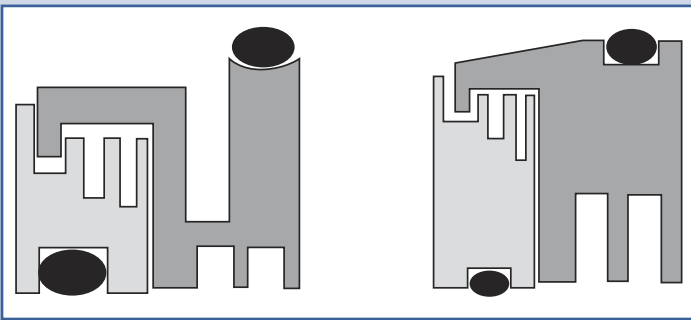
**Compatibility:** Compatible with most bore and shaft materials

### FLANGED DESIGN

- Single expulsion port
- External flange
- Non-contact



SPLIT PILLOW BLOCK DESIGN	NON-FLANGED DESIGN
• Meets manufacturers' specifications	• Single Port
• Successfully tested for taconite	• Less space required outside bore
• Accommodates variations in casting tolerances	• Non-Contact



ProTech Standard Sizes	
Minimum Standard Shaft Size:	.500" (12.5mm) and up
Maximum Standard Shaft Size *:	6.0" (152mm)
Standard Cross Section:	.312" (8MM) to .750" (19mm)
For Shaft Diameters Over 4":	.438" (11mm) to .750" (19mm)
Non-Flange Cross Section:	.375" (10mm) to .750" (19mm)
Standard Seal Width:	.688" (17mm) to .815" (21mm) Varies with shaft size
Minimum Extension into Bore:	.312" (8mm) nominal

\*Note: Special sizes are available.

## ProTech Material Availability

Graphite-reinforced PTFE  
Mineral-reinforced PTFE

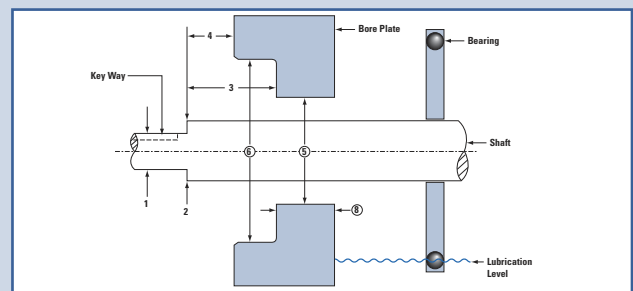
## EQUIPMENT MODIFICATION

If housing modification is required, this is the recommended bore selection process:

- Range of standard bore selection:  
Smallest=shaft diameter + 0.625"  
Largest = shaft diameter + 1.500"
- Example – Standard bore dimensions for a 2" shaft:  
Smallest= 2" + 0.625" = 2.625"  
Largest = 2" + 1.500" = 3.500"
- Choose a bore dimension between 2.625" and 3.500". We recommend a 3.000" bore.
- Specify on drawings to machine bore to 3.000" +/- .002".
- Correct ProTech part number to order is LSE-2000-3000-1-1

## Ordering a Seal

- Measure a shaft, bore, and gland length.
- Note any deviations from these dimensions outside the bore (i.e. shaft step down or housing counter bore).
- Provide dimensional descriptions and distance from the end of the housing.
- A small sketch would be helpful.



- ① Step shaft diameter (if applicable)
- ② Seal Shaft diameter
- ③ Location of step from CB housing (if applicable)
- ④ Location of step from end of housing (if applicable)
- ⑤ Bore Diameter
- ⑥ Counter bore diameter (if applicable)
- ⑦ Counter bore depth (if applicable) = ③ minus ④
- ⑧ Gland depth

## Extreme Testing

Laboratory testing has significant advantages over field-testing. The lab effectively compresses time and more easily explores limits. Before ProTech saw its first field test, we put it through laboratory tests that were far more severe than seals ever encountered in the field. ProTech has also been tested by an independent lab.

ProTech and competitive seals were subjected to three extreme in-house tests with ProTech clearly the seal of choice.

### 1. Oil Leakage Test

ProTech and other seals were subjected to critical oil seal testing using a test machine built to SAE J110 standards. One hundred-hour tests were conducted with severe oil splash.

### 2. Water Exclusion Test

The test was modified by mounting five nozzles at various positions relative to the exterior of the seal to simulate a most severe external house down. Using water at pressures of 30 to 62 psi, these nozzles individually sprayed each seal from a distance of 3" in both a static mode and while the shafts rotated at various speeds up to 3525 rpm. The nozzles tried to force water past the seal for nearly two hours.

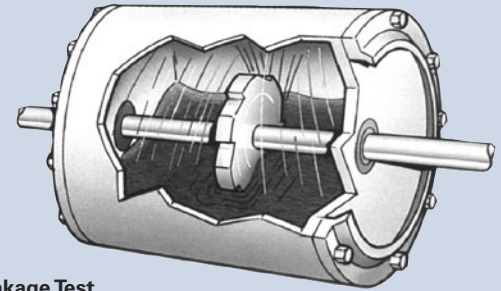
### 3. Dust Exclusion Test

The test machine was modified with an enclosed chamber containing a large quantity of fine dust and sand which was vigorously agitated with the chamber attached to the outside of each seal area. The equipment operated at speed up to 3525 rpm for a period of 70 hours in an environment that was literally a dense dust storm.

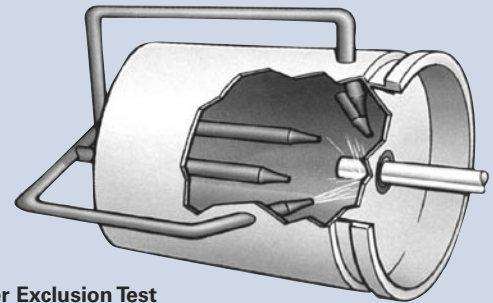
ProTech was the only seal that passed all three torture tests. After lab testing, it was ready to confirm its performance superiority in field trials.

### Severe-Duty Electric Motor Applications

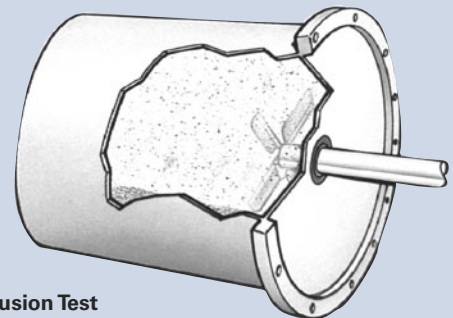
Based on outside testing, ProTech meets IEEE-841 standards and exceeds under IP-56



Oil Leakage Test



Water Exclusion Test



Dust Exclusion Test

## Extreme Test Results:

Material Expulsion Method: Design Type: Brand:	PTFE Single-Port 2-Pc. Unitized JM Clipper	Brass Single-Port 2-Pc. Non-Unitized Brand A	PTFE Multi-Port 3-Pc. Unitized Brand B	Brass Single-Port 3-Pc. Unitized Brand C
<b>Oil Leak Test</b>	<b>Pass</b>	<b>Fail</b>	<b>Pass</b>	<b>Fail</b>
<b>Water Pressure Test</b>	<b>Pass</b>	<b>Fail</b>	<b>Fail</b>	<b>Fail</b>
<b>Dust Test</b>	<b>Pass</b>	<b>Pass</b>	<b>Fail</b>	<b>Fail</b>

CHARACTERISTICS	FEATURES	BENEFITS
<p>The patented, unitized design of JM Clipper ProTech seal has many unique features not found in other labyrinth seals. Pro Tech is a custom-blended reinforced PTFE seal made to perform in high speed, high temperature, and chemical environments. Because of its non-contact design and PTFE construction, the equipment experiences negligible energy loss.</p> <p>ProTech can replace standard radial lip oil seals when performance and reliability are critical. In addition, ProTech can be made for a wide range of industrial applications.</p> <p>ProTech is available in multiple designs to meet specific design requirements and geometry constraints.</p>	<p><b>PTFE Materials</b></p> <p><b>Non-Contact Design</b></p> <p><b>Two-Piece Unitized</b></p> <p><b>Greatest Axial Movement in Industry</b></p> <p><b>Fluorelastomer O-Rings</b></p> <p><b>Multiple PTFE Compounds</b></p> <p><b>No Lubrication Required</b></p> <p><b>High Shaft Speeds</b></p> <p><b>Precision-Machined Seal</b></p> <p><b>Available With or Without Flange</b></p> <p><b>Single and Multiple Expulsion Ports</b></p> <p><b>Exceeds IEEE-841</b></p> <p><b>New Split Pillow Block Design</b></p>	<ul style="list-style-type: none"> <li>• Chemical resistant</li> <li>• Lower seal cost</li> <li>• Provides alternative materials for specific applications</li> <li>• Low coefficient of friction and low heat build up</li> <li>• Virtually no torque consumption</li> <li>• Will not wear out or groove shafts</li> <li>• Complete exclusion of dust and water</li> <li>• Zero oil leakage</li> <li>• Fewer components</li> <li>• Reduces a major factor causing labyrinth seal leakage</li> <li>• Static elastomer seal for the most severeservices</li> <li>• Pulp and paper</li> <li>• Petrochemical</li> <li>• Food Service</li> <li>• Can run dry because of non-contact design</li> <li>• Operates far beyond shaft speed limits of standard radial lip seals</li> <li>• Liberal specifications for shaft and bore finish resulting in low shaft cost</li> <li>• Allows retrofit of most bore and shaft combinations</li> <li>• No tooling charges</li> <li>• Provides labyrinth sealing in restricted gland width</li> <li>• Available in multiple port if directional installation is a problem</li> <li>• Provides premium bearing protection on severe-duty electric motors</li> <li>• Meets split pillow block OEM specifications</li> </ul>

**ProTech Materials**

ProTech's standard reinforced PTFE construction provides a wide range of operating capabilities including high or low temperatures and extreme chemical environments. The addition of other PTFE fillers extends the capability to special designs and services with enhanced physical properties. Two examples are large-diameter seals and food service requirements.

**Quality**

ProTech is manufactured in our modern plastics facility in New York State where the entire process from raw materials to finished product is tightly controlled. The highest quality and absolute consistency from lot to lot are assured by:

- Our many years of experience manufacturing goods
- The use of only first-grade virgin PTFE resins
- A very sophisticated system for controlling the critical sintering process
- Our special CNC production equipment