Garlock Sealing Technologies

The demands of modern applications make the choice of the right sealing product an important consideration, both in the design of new equipment and in choosing the new products which will replace those no longer suitable.

This brochure provides some typical examples of appropriate applications, but is not limited to be a warranty of performance. All specific uses of sealing products require independent study and specific evaluation for suitability.

Garlock will provide the technical assistance of its applications engineers, who will give you specific recommendations. Please consult us. We are ready to help you make the right choice. Choosing the wrong sealing product can result in property damage and/or serious personal injury. Do not rely on the general criteria, which may not suit your application as well as one that Garlock Engineering can help you choose. Reliability and service to our customers is what the Garlock name means.

Let us help you choose the right product for your application.

Inflatable Seals You Can Depend On

Garlock Inflatable Seals are manufactured in completely modernized facilities. Tight quality controls are used to assure product conformance to specifications and uniformity that results in unvarying performance on the job. Garlock is registered to ISO-9002-94 standards and is audited by the Nuclear Procurement and Issues Committee (NUPIC).

Today's environmental concerns demand positive seals. Garlock Inflatable Seals provide that assurance, and perform with proven reliability. Whether your industry is chemical processing, hydrocarbon processing, power generation, pulp and paper, microelectronics or transportation, Garlock inflatable seals are the logical choice.

For products not listed in this catalog, contact Garlock at 1-800-448-6688.
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INTRODUCTION

The most effective technique for sealing between surfaces which move in relation to one another is the CEFIL'AIR® pneumatic seal. CEFIL'AIR® seals expand and retract to provide a secure, reliable seal that can hold, position, or handle objects in a wide range of applications.

As a result of its patented design, modern manufacturing techniques, and the most advanced elastomers, CEFIL'AIR® seals can be used in a multitude of sealing, handling and holding applications.

CEFIL'AIR® seals withstand temperatures from -148°F (-100°C) to +482°F (+250°C) and pressures from 7 to 150 psi (0.5 to 10.4 bar) in a variety of liquid or gaseous media.

MANUFACTURING

CEFIL'AIR® pneumatic seals are either molded or manufactured from extruded profiles that are joined together by a molded joint. The molded joint ensures uniform wall thickness while restricting stress at the joint, and provides substantial flexibility. The HP and LP are the standard profiles; however, other profiles and elastomers are available for special sealing, locking, gripping, and handling applications.

OPERATION

CEFIL'AIR® seals are homogeneous elastomeric seals with a high modulus of elasticity and considerable tensile strength. The seals are designed to be fitted into grooves and are restricted to low pressures to prevent bursting. They expand and retract with the pressurization and deflation of the seal within a groove. The exact groove and gap dimensions are critical in designing and producing the correct seal for your application.

CEFIL'AIR® HP (high pressure) seals must be captive in slots or grooves within the specified dimensions. Never pressurize or inflate a seal when any one face of the groove is open.

CEFIL'AIR® LP (low pressure) seals are secured by their base and work freely outside the confines of a groove. However, the maximum pressure cannot be applied until their contact face (grooved/toothed side) is against the item to be sealed.

NOTE: For applications that may call for a textile or aramid fiber reinforced seal, please contact our technical department. (Also refer to other profile examples on page 16.)

WARNING:
Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury. Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing. While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications subject to change without notice. This edition cancels all previous issues. Subject to change without notice.
APPLICATIONS

CEFIL'AIR® seals are used throughout many industries, including:

<table>
<thead>
<tr>
<th>Aerospace:</th>
<th>Doors/hatchways, wind tunnels, jet engine test cells, cockpit canopies</th>
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<tbody>
<tr>
<td>Pulp/Paper:</td>
<td>Suction rolls, doctor blade bladders, slitters, scorers</td>
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<td>Telecommunications:</td>
<td>Semiconductor processing, filters, actuators, washers, robotics, optics</td>
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<td>Transportation:</td>
<td>Door seals for high speed trains, transport containers</td>
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<tr>
<td>Marine:</td>
<td>Portholes, elevator platforms, cargo hatches, propeller shaft maintenance</td>
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<tr>
<td>Textile Industry:</td>
<td>Clamping, door seals for pressure chambers</td>
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<tr>
<td>Primary Metals:</td>
<td>Door seals, doctor blades, continuous casting process, furnace seals</td>
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<td>Medical:</td>
<td>Sterilizers, clean rooms, optics, robotics</td>
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<tr>
<td>Chemical Processing:</td>
<td>Processing equipment, mixers, hoppers, blenders, chutes, valves</td>
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<td>Food Processors:</td>
<td>Door seals, mixers, robotics, conveyor brakes, dryers, autoclaves</td>
</tr>
<tr>
<td>Pharmaceutical:</td>
<td>Mixers, robotics, autoclaves, ovens, clean rooms</td>
</tr>
<tr>
<td>Nuclear:</td>
<td>Access doors, cofferdams, pool gates, nozzle dams</td>
</tr>
</tbody>
</table>

Examples of Sealing

- Mobile Bulkhead Seal using Profile No. 514
- Sterilizer Door Seal using Profile No. 369
- Seal for Cooling Pond Cofferdam using Profile No. 10094
- Seal on Isothermal Bulkhead using Profile No. 369
- Nuclear Power Station Sealing Door using Profile No. 10093

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Examples of Handling

CEFIL’AIR® pneumatic seals can also be used for moving, handling, or clamping particularly fragile or complex geometric objects. (see diagrams below)

Lifting

Holding

Pressing

Clamping

Other Applications

Small Seals

Principle

Locking on shaft
Application: Handling of cylindrical pieces

Locking on shaft
cartridge mounting
(minimum height occupied)

Hole tightening
Application: Handling hollow pieces (tube, bottle, etc.)

End plugs for tubes
Example: Mechanical expansion
TYPES OF EXPANSION BASED ON INSTALLATION

Axial Expansion (Arrangement I)
The working pressure $P_i$ is normal.

Internal Radial Expansion (Arrangement II)
The working pressure $P_i$ is 20 to 30% greater than the normal pressure.

External Radial Expansion (Arrangement III)
The working pressure $P_i$ is normal or 15 to 25% higher.

The above expansions are valid for circular seals provided that the radii $R$, $R_1$, and $R_2$ are adhered to (see pages 5 and 6).

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If your application requires maximum seal expansion with maximum internal seal pressure OR your application is 50% of the material temp rating - Please review your application with Garlock.

Curved Radii (between 2 straight lengths)

**Axial**

**External Radial**

**Internal Radial**

**Assembly**

Seals in the retracted (deflated) position are protected within the groove (B1 > B). The clearance, “J” (gap), can be reduced to zero, allowing the two parts to make contact without their movements being hindered by the seal (B1 = H).

**Notes:**

1. To obtain maximum expansion and retraction efficiency of the CEFIL’AIR® pneumatic seals for door/hatchway applications, the minimum curve radii in the corners must be adhered to, as shown in diagrams 1, 2 and 3.

2. The curve radii chart and illustrations define the value of “R” according to the position of the curve in relation to the direction of expansion.

3. For profiles other than silicone, increase above values of R, R1 and R2 by 20%.

4. Please consult our technical department for small sized circular seals.

**Standard HP Profiles**

**Profile No. Silicone** | **Profile No. SBR** | **A (inches) (mm)** | **B (inches) (mm)** | **R min. (inches) (mm)** | **R1 min. (inches) (mm)** | **R2 min. (inches) (mm)**
---|---|---|---|---|---|---
339 | 10035 | 0.62 (16) | 0.47 (12) | 1.37 (35) | 1.57 (40) | 1.57 (40)
347 | 10036 | 0.62 (16) | 0.70 (18) | 1.37 (35) | 1.57 (40) | 2.16 (55) | 2.55 (65)
356 | 10041 | 0.86 (22) | 0.74 (19) | 1.96 (50) | 2.16 (55) | 2.55 (65)
443 | 10039 | 1.02 (26) | 0.74 (19) | 1.96 (50) | 2.36 (60) | 2.55 (65)
405 | 10042 | 1.06 (27) | 0.82 (21) | 1.96 (50) | 2.55 (65) | 3.34 (85)
627 | 10175 | 1.37 (35) | 1.02 (26) | 2.75 (70) | 2.75 (70) | 2.95 (75)
369 | 10217 | 1.37 (35) | 1.25 (32) | 1.37 (35) | 1.77 (45) | 0.41 (10.5) | 116.0 (8)
529 | - | 2.12 (54) | 1.57 (40) | 1.88 (48) | 0.25 (6.5) | 145.1 (10)

**Tol:** See Pg #17

**Standard HP Profiles**

<table>
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<tr>
<th>Grooved Profiles</th>
<th>Housings</th>
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<td><strong>Profile No. Silicone</strong></td>
<td><strong>Profile No. SBR</strong></td>
</tr>
</tbody>
</table>
---|---|---|---|---|---|---|---|---|---|
339 | 10035 | 0.62 (16) | 0.47 (12) | 0.62 (16) | 0.51 (13) | 0.50 (15) | 0.09 (2.5) | 58.0 (4)
347 | 10036 | 0.62 (16) | 0.70 (18) | 0.62 (16) | 0.76 (19.5) | 0.84 (21.5) | 0.09 (2.5) | 58.0 (4)
356 | 10041 | 0.86 (22) | 0.74 (19) | 0.86 (22) | 0.80 (20.5) | 0.88 (22.5) | 0.09 (2.5) | 87.0 (6)
443 | 10039 | 1.02 (26) | 0.74 (19) | 1.02 (26) | 0.80 (20.5) | 0.92 (23.5) | 0.13 (3.5) | 87.0 (6)
405 | 10042 | 1.06 (27) | 0.82 (21) | 1.06 (27) | 0.90 (23) | 1.02 (26) | 0.13 (3.5) | 87.0 (6)
627 | 10175 | 1.37 (35) | 1.02 (26) | 1.37 (35) | 1.14 (29) | 1.33 (34) | 0.21 (5.5) | 116.0 (8)
369 | 10217 | 1.37 (35) | 1.25 (32) | 1.37 (35) | 1.37 (35) | 1.77 (45) | 0.41 (10.5) | 116.0 (8)

**Tol:** +0.02”-0 (0.5-0)

**Specifications subject to change without notice.**
If your application requires maximum seal expansion with maximum internal seal pressure OR your application is 50% of the material temp rating - Please review your application with Garlock.

Assembly

Dimension “B” corresponds to the seal in the retracted (idle) position. When the seal is subjected to a pressure of 22 psi, H1 (maximum height) is obtained. Dimension “H” is the recommended value; however, intermediate values between “B” and “H” can be used.

The “foot/base” of the LP seal MUST be secured at all times with a fixture/clamp. The radii of the standard LP profile seals must be maintained by quadrants in the groove of each side (“G”).

NOTE: Other restraint fixtures can be designed and considered by the individual user at his discretion.

Curve Radii (between 2 straight lengths)

Axial

External Radial

Internal Radial

NOTES:
1. To obtain maximum expansion and retraction efficiency of the CEFIL' AIR pneumatic seals for door/hatchway applications, the minimum curve radii in the corners must be adhered to, as shown in diagrams 1, 2, and 3.
2. The curve radii chart and illustrations define the value of “R” according to the position of the curve in relation to the direction of expansion.
3. For profiles other than silicone, increase above values of R, R1 and R2 by 20%.
4. Please consult our technical department for small sized circular seals.

Housings

Dimensions

Standard LP Profiles

NOTES:

Production

NOTES: Other profiles are available, see page 16 for a few samples.

Please consult our technical department for small sized circular seals.

Assembly

Dimension “B” corresponds to the seal in the retracted (idle) position. When the seal is subjected to a pressure of 22 psi, H1 (maximum height) is obtained. Dimension “H” is the recommended value; however, intermediate values between “B” and “H” can be used.

The “foot/base” of the LP seal MUST be secured at all times with a fixture/clamp. The radii of the standard LP profile seals must be maintained by quadrants in the groove of each side (“G”).

NOTE: Other restraint fixtures can be designed and considered by the individual user at his discretion.

NOTES:
1. To obtain maximum expansion and retraction efficiency of the CEFIL‘AIR’ pneumatic seals for door/hatchway applications, the minimum curve radii in the corners must be adhered to, as shown in diagrams 1, 2, and 3.
2. The curve radii chart and illustrations define the value of “R” according to the position of the curve in relation to the direction of expansion.
3. For profiles other than silicone, increase above values of R, R1 and R2 by 20%.
4. Please consult our technical department for small sized circular seals.

Assemble
CEFIL’AIR® seals are also available in straight lengths. The seals are manufactured by plugging each end with a solid plug. Because the ends of the seal are solid, this portion of the seal can not expand or retract. Technical assistance is available to determine if the “plugged” ends of the seal are to be in the retracted or expanded, or expandable state (see figures 1, 2 and 3).

If Retracted or Expanded End is chosen, it is necessary to provide flanges or end plates to hold the seal and to prevent tearing caused by expansion (see figures 4 and 5).

**Figure 1 - Retracted End (Standard)**

**Figure 2 - Expanded End** (For HP Profiles that require expanded end, call for assistance).

NOTE: Use when mating surface compresses the end of the seal.
END PLUGS

Figure 3 - Special End Plugs (Expandable)
For specific applications which require expansion almost all along the seal we can produce at your request "EXPANDABLE END PLUGS".

For Example: Sliding door applications, split seal rings (seal around a shaft and seal is removable).

PLEASE CONSULT OUR TECHNICAL DEPARTMENT

Figures 4 and 5 - Flange or Retaining Plate

The end plugs must not be outside the support flanges or retaining plates under any circumstances (see above).

### Standard LP Profiles

<table>
<thead>
<tr>
<th>Profile No.</th>
<th>Profile No. SBR</th>
<th>A (inches (mm))</th>
<th>B (inches (mm))</th>
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<th>H3 (inches (mm))</th>
<th>L (inches (mm))</th>
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### Standard HP Profiles

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<td>1.65 (42)</td>
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NOTES:
1. Dimension “L” represents the length of the solid end plug.
   Dimension “N” represents the transition between the solid end plug and the portion of the seal that will expand.
   Sealing does not occur within the “L” and “N” dimensions.
   Dimension “SL” represents the sealing length or the available length to handle (lifting, holding, pressing, clamping).
   Technical assistance is available in determining the proper lengths required.

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Our standard fittings and valves are manufactured from brass; other materials are available upon request (bronze, stainless steel, etc.).

Standard Fittings - Metric*

*Imperial available upon request

**NOTE:** CEFIL'AIR® pneumatic seals require that all connections to fittings be located at the bottom of grooves or at the ends of straight length seals. It is not recommended to locate fittings in the curved section of radii curved seals.

S x R = Wrench Flat
1/8 G, 1/4 G = British Std Pipe Thread
7.65 x 0.79mm = Std SAE Schrader Thread

---

**REC (Hose Barb)**

<table>
<thead>
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<td>10 x 8</td>
<td>11 x 8</td>
</tr>
</tbody>
</table>

**REF (Threaded)**

<table>
<thead>
<tr>
<th>ØE</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>M4</td>
<td>M6</td>
<td>M8</td>
<td>1/8 G</td>
<td>1/4 G</td>
</tr>
<tr>
<td>ØJ</td>
<td>1.2</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>L</td>
<td>15/20</td>
<td>15/20</td>
<td>20/25</td>
<td>20/25</td>
<td>20/25</td>
</tr>
<tr>
<td></td>
<td>25/30</td>
<td>25/30</td>
<td>30/35</td>
<td>30/35</td>
<td>30/35</td>
</tr>
<tr>
<td></td>
<td>35/40</td>
<td>40/50</td>
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<td>40/50</td>
<td>40/50</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>60</td>
<td>60/70</td>
<td>80/70</td>
<td>90/100</td>
</tr>
<tr>
<td>S x R</td>
<td>3 x 4</td>
<td>5 x 6</td>
<td>6 x 6</td>
<td>8 x 8</td>
<td>8 x 8</td>
</tr>
</tbody>
</table>

**REL (Plain CLAMP)**

<table>
<thead>
<tr>
<th>ØE</th>
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<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>M4</td>
<td>M6</td>
<td>M8</td>
<td>1/8 G</td>
<td>1/4 G</td>
<td>M12</td>
<td>M14</td>
</tr>
<tr>
<td>ØJ</td>
<td>1.2</td>
<td>3.4</td>
<td>3.4</td>
<td>5</td>
<td>6.8</td>
<td>6.8</td>
<td>8.5</td>
</tr>
<tr>
<td>L</td>
<td>15/20</td>
<td>15/20</td>
<td>20/25</td>
<td>25/30</td>
<td>30/35</td>
<td>35/40</td>
<td>45/50</td>
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<tr>
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<td>25/30</td>
<td>30/35</td>
<td>40/45</td>
<td>45/50</td>
<td>50/60</td>
<td>60/70</td>
</tr>
<tr>
<td></td>
<td>35/40</td>
<td>40/50</td>
<td>40/50</td>
<td>50/60</td>
<td>60/70</td>
<td>80/70</td>
<td>90/90</td>
</tr>
<tr>
<td>S x R</td>
<td>8 x 8</td>
<td>8 x 8</td>
<td>10 x 6</td>
<td>12 x 8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REP (Quick Connection)**

**RJO (Housing or Hole Mount)**

**NOTE:** RJO fitting can have a flat for a set screw. In all cases it is necessary to be very careful during assembly because of the O-ring (30° chamfer on sharp edges).
FITTINGS AND VALVES

Special Fittings

We can manufacture any type of fitting to meet your specific requirements. Please contact our technical department.

Standard Valves

CVL (SAE Schrader Valve)  RED (Elbow for CVL)  REB (Convert CVL or RED to Hose Barb - No Return Valve)

MOLDED CONES

Standard Sizes*

CEFIL'AIR® molded cones provide maximum bonding between the fittings and the seal itself.

NOTES:
1. For REC, REF, REP fittings, and CVL valves, consider the size of the thread part (M) as of the connection. In case of intermediate value (inch dimensions) take the next larger cone.
2. For demanding uses of silicone CEFIL'AIR® pneumatic seals, we recommend first sandblasting the face surface and then applying an adhesive primer prior to application of adhesive.

<table>
<thead>
<tr>
<th>Ø</th>
<th>0.15 (4)</th>
<th>0.15 (4)</th>
<th>0.23 (6)</th>
<th>0.31 (8)</th>
<th>0.39 (10)</th>
<th>0.47 (12)</th>
<th>0.55 (14)</th>
<th>0.62 (16)</th>
<th>0.70 (18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>0.23 (6)</td>
<td>0.31 (8)</td>
<td>0.47 (12)</td>
<td>0.55 (14)</td>
<td>0.82 (21)</td>
<td>0.94 (24)</td>
<td>1.02 (26)</td>
<td>1.10 (28)</td>
<td>1.18 (30)</td>
</tr>
<tr>
<td>n</td>
<td>0.19 (5)</td>
<td>0.23 (6)</td>
<td>0.39 (10)</td>
<td>0.47 (12)</td>
<td>0.55 (14)</td>
<td>0.62 (16)</td>
<td>0.70 (18)</td>
<td>0.78 (20)</td>
<td>0.86 (22)</td>
</tr>
<tr>
<td>h</td>
<td>0.07 (3)</td>
<td>0.15 (4)</td>
<td>0.23 (6)</td>
<td>0.23 (6)</td>
<td>0.39 (10)</td>
<td>0.39 (10)</td>
<td>0.47 (12)</td>
<td>0.47 (12)</td>
<td>0.47 (12)</td>
</tr>
</tbody>
</table>

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**INSTALLATION**

**Preparation of Grooves and Contact Face Surface Finish**

Prior to any installation of a CEFIL'AIR® seal, the groove must be inspected to ensure that it is free from grit, roughness, weld splatter, flash, or any sharp edges. It is recommended to brush the groove with a wire brush, followed by degreasing with a suitable solvent.

Rolled steel is suitable for the grooves, however, any deposits or scale must be removed. Any welds must be flush with the other groove surfaces.

A good surface finish is necessary to effect a good seal, especially the portion of the equipment that comes in direct contact with the sealing surface of the CEFIL'AIR® seal. (Call technical department for surface finish information-ref page #6).

For demanding uses of silicone CEFIL'AIR® pneumatic seals, we recommend first sandblasting the face surface and then applying an adhesive primer prior to application of adhesive.

**Preparing the Seal for Installation**

For this process, we recommend the use of a general purpose adhesive applied directly to the metal once it has been thoroughly degreased and is free from rust or scale.

HP seals must be secured with adhesive in the bottom of the groove only. Avoid the use of any adhesive on the lateral parts of the seal (see diagram 1).

LP seals must be secured at all times with a fixture/clamp. If an adhesive is necessary, apply only to the base of the seal (see diagram 2).

**Seal Installation**

**NOTE:** CEFIL'AIR® seals must not be inflated prior to or during installation. Remove valve (if necessary) from fitting.

1. The pressure fitting must first be inserted into the housing of the groove. (Tighten the nut last)

2. After positioning the seal, it must be pressurized in order to seat properly into the groove. Observe seal condition upon inflation, i.e: is seal perfectly captive on all four sides?

3. If the seal is glued, it may be necessary to leave the seal pressurized to aid in drying or vulcanization of the adhesive. It is possible to deflate the seal to finish installation but do not reinflate until glue is dry.

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Preparation of the Pressure Fitting for Installation

The housing “hole” must correspond to the dimensions of the molded conical portion of the fitting of the seal. In the case of threaded fittings (REC, REF, REP, CVL), tightening must be moderate during installation to avoid destroying the elastomer-to-metal bond of the fitting.

Positioning the Pressure Fitting

CEFIL’AIR® pneumatic seals require that all connections to fittings be located at the bottom of grooves or at the ends of straight length seals. It is not recommended to locate fittings in the curved section of radii curved seals. If an installation requires a lateral pressure supply, then elbow fittings or a special construction may be necessary. Please consult our technical department.

Working Conditions

External Pressure at the Seal

CEFIL’AIR® seals are designed to provide a tight seal when pressurized. The pressure media (air, water, or a neutral gas) is supplied from an external source. When pressurized, the seal will expand either to the outside of a pressurized enclosure or towards the inside of a vacuum enclosure.

A. Pressurized Enclosures

With an internal pressure created by gas or a controlled atmosphere, the strength is directly linked to the clearances, deformation of the contact faces and the pressurization of the seal.

In these applications, it is always necessary to reduce dimension “J” to a minimum (see page 6). Minimizing this gap will reduce the risk of radially and axially installed seals from expanding outward instead of up toward the face of the equipment. The external pressure on the seal “PE” is taken as a ratio of 0.7 to 0.8 the internal pressure “Pi” of the CEFIL’AIR® seal, but with limitations established in the tables on pages 6 & 7.

B. Vacuum Enclosures:

It is possible to supply CEFIL’AIR® seals that can withstand a limited amount of vacuum; please consult our technical department.

Internal Pressure of the Seal

CEFIL’AIR® seals that are not properly installed in equipment must not be subjected to pressures equal to or greater than 12 to 22.5 psi (0.8 to 1.5 bar), depending on the profile.

The maximum pressure applied to the seal depends on the clearance between the supporting frame and moving panel (see tables on pages 6 & 7). Decreasing the clearance (gap), will allow higher pressures.

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# TYPES OF ELASTOMERS

CEFIL'AIR® seals are primarily produced from Silicone and SBR, which offer high mechanical properties. Although these are high performance materials, they are not suitable for some applications, therefore other elastomers are available.

<table>
<thead>
<tr>
<th>Elastomers</th>
<th>Ref</th>
<th>Durometer (TOL = ± 5)</th>
<th>Temp. Range</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Styrene-Butadiene</strong></td>
<td>1 A 60</td>
<td>60</td>
<td>-4°F (-20°C) to +212°F (+100°C)</td>
<td>Good resistance to: • Water • Demineralized water • Air • Diluted acids and bases • Ketones Abrasion resistance</td>
</tr>
<tr>
<td><strong>Chloroprene</strong></td>
<td>4 B61 K</td>
<td>60</td>
<td>-4°F (-20°C) to +230°F (+110°C)</td>
<td>Same as SBR, but with better resistance to ultraviolet rays and ozone. Low resistance to grease.</td>
</tr>
<tr>
<td><strong>Butyl</strong></td>
<td>5 B 60</td>
<td>65</td>
<td>-4°F (-20°C) to +248°F (+120°C)</td>
<td>Good resistance to: • Diluted acids and bases • Ketones Very low permeability</td>
</tr>
<tr>
<td><strong>Ethylene Propylene</strong></td>
<td>6 B 65</td>
<td>65</td>
<td>-22°F (-30°C) to +302°F (+150°C)</td>
<td>Good resistance to: • Water, steam and atmospheric conditions Low resistance to hydrocarbon</td>
</tr>
<tr>
<td><strong>Silicone</strong></td>
<td>C 65 M</td>
<td>56</td>
<td>-130°F (-90°C) to +482°F (+250°C)</td>
<td>Good resistance to: • Dry and humid heat • Steam pressure ≤ 6 bars • Cold Very low oil resistance Does not age</td>
</tr>
<tr>
<td><strong>Fluorosilicone</strong></td>
<td>C 65 M/F</td>
<td>56</td>
<td>-85°F (-65°C) to +392°F (+200°C)</td>
<td>Same as silicone Good resistance to • Aromatic hydrocarbons • Chlorinated solvents</td>
</tr>
<tr>
<td><strong>VITON</strong></td>
<td>3 E 65</td>
<td>65</td>
<td>-4°F (-20°C) to +356°F (+180°C)</td>
<td>Good resistance to: • Chlorinated solvents • Aromatics • Strong acids and bases</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Profiles not kept in stock, produced on special request. (Please contact our technical department).
2. This information if for a quick reference only, please contact our technical department for recommendations based on your specific application.

VITON is a registered trademark of DuPont Dow Elastomers.

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CALCULATIONS AND SUPPLY

Application Force Calculations

CEFIL’AIR® seals are retracted even with a residual internal pressure. The pressure necessary for expansion varies depending on the application and the profile used.

In the majority of cases, the minimum operating pressure is 22.5 psi (1.5 bar); this corresponds to an application force proportional to a unit of contact surface.

<table>
<thead>
<tr>
<th>Profile No.</th>
<th>512</th>
<th>339</th>
<th>347</th>
<th>356</th>
<th>443</th>
<th>405</th>
<th>627</th>
<th>369</th>
<th>415</th>
<th>639</th>
<th>603</th>
<th>514</th>
<th>529</th>
<th>921</th>
<th>704</th>
<th>736</th>
<th>828</th>
<th>10094</th>
<th>10170</th>
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</thead>
<tbody>
<tr>
<td>Kj</td>
<td>1.0</td>
<td>1.2</td>
<td>1.2</td>
<td>2.0</td>
<td>2.2</td>
<td>2.3</td>
<td>3.0</td>
<td>3.0</td>
<td>0.7</td>
<td>1.2</td>
<td>1.6</td>
<td>1.6</td>
<td>5.0</td>
<td>0.8</td>
<td>1.5</td>
<td>2.5</td>
<td>3.0</td>
<td>4.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Pi</td>
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<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>8</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Example of Calculation:

For a CEFIL’AIR® seal with profile number 347, mean diameter 1500 mm used with internal pressure Pi = 2 bars

Fj = (Pi x Kj) x π Ø* = (2 x 1.2) x (3.14 x 150cm) = 1.130 da.N

*Øm = mean diameter of seal (da.N to lb. force mult by 2.248089)

Supply of Motive Fluid

CEFIL’AIR® pneumatic seals can be expanded with air, neutral gas and also water. However, it is necessary to provide a constant flow and pressure. All seals must be connected to a regulator to avoid overpressurizing (see diagram below).

Typical sketch of double cofferdam seal (Standard LP).

If the seals are disconnected from the air supply source, it is necessary to place a head loss warning system at the end of the seal.
## Cross Section Table

### Standard European Cross-Section Tolerances for Extruded Seals: (NF T 47001 - December 1971)

<table>
<thead>
<tr>
<th>Dimensions in Inches (in Millimeters)</th>
<th>Above</th>
<th>Up To</th>
<th>Precision (±) (Std for Most Profiles)</th>
<th>Commercial (±) (Some Large LP Profiles)</th>
<th>Non-Critical (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0.100</td>
<td>0.010 (2.5)</td>
<td>0.014 (0.35)</td>
<td>0.016 (0.4)</td>
</tr>
<tr>
<td></td>
<td>0.100</td>
<td>0.160</td>
<td>0.014 (4)</td>
<td>0.016 (0.4)</td>
<td>0.020 (0.5)</td>
</tr>
<tr>
<td></td>
<td>0.160</td>
<td>0.250</td>
<td>0.016 (6.3)</td>
<td>0.020 (0.5)</td>
<td>0.028 (0.7)</td>
</tr>
<tr>
<td></td>
<td>0.250</td>
<td>0.390</td>
<td>0.020 (10)</td>
<td>0.028 (0.7)</td>
<td>0.031 (0.8)</td>
</tr>
<tr>
<td></td>
<td>0.390</td>
<td>0.630</td>
<td>0.028 (16)</td>
<td>0.031 (0.8)</td>
<td>0.040 (1)</td>
</tr>
<tr>
<td></td>
<td>0.630</td>
<td>0.980</td>
<td>0.031 (25)</td>
<td>0.040 (1)</td>
<td>0.051 (1.3)</td>
</tr>
<tr>
<td></td>
<td>0.980</td>
<td>1.570</td>
<td>0.040 (40)</td>
<td>0.051 (1.3)</td>
<td>0.063 (1.6)</td>
</tr>
<tr>
<td></td>
<td>1.570</td>
<td>2.480</td>
<td>0.051 (63)</td>
<td>0.063 (1.6)</td>
<td>0.079 (2)</td>
</tr>
<tr>
<td></td>
<td>2.480</td>
<td>3.940</td>
<td>0.063 (100)</td>
<td>0.079 (2)</td>
<td>0.098 (2.5)</td>
</tr>
</tbody>
</table>

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Date: | e-mail address(es): |
---|---
Your name: | Company name: | Tel: | Fax: |
Sales office: | Rep name: | Tel: | Fax: |
Date quote required: | Qty of seals required (prototype): | Qty of seals required / month: |

Application Description:

- Sealing
- Handling (Lifting, Holding, Pressing, Clamping)

CEFIL'AIR exposed to:

- Pressure across seal: psi
- Required force (if handling): lbf

Pressure media inside seal:

- Air
- Nitrogen
- Water
- Other:

Frequency of inflation: 
Duration of inflation: 

Temperature at the seal: °F

- HP
- LP
- Development
- Custom
- Profile number:

Stock materials:

- Q (Silicone)
- SBR (Styrene-Butadiene)

Non-stock materials:

- CR (Chloroprene)
- IIR (Butyl)
- EPDM/EPM
- MFQ (Fluorosilicone)
- FKM (Viton®)

Shape:

- Circular Seal
- Rectangular Seal
- Combination (Call to explain)

Expansion:

- Axial
- Internal Radial
- External Radial

See Dimension Picture (next pages) and enter data from Catalog for new applications OR your existing seal/available area. HP in a groove shown — LP may be foot-mounted. *If profile is selected, verify the minimum radius from the Catalog.*

**Straight Length Seal**

See Dimension Picture & enter data from Catalog for new applications OR your existing seal / available area.

Note: SL = length to be sealed or available length to handle (lifting, holding, pressing, clamping)

- Retracted end *(Standard)*
- Expanded end (See Catalog for description; call for details on HP profiles)
- Expandable end (See Catalog for description; call for details)
- Fitting in the end plug (Note: Molded Cone shown below is not required)
- Fitting in the foot (Enter distance required to fitting or valve on the Dimension Picture)

Fitting:

- REC
- REF
- REL
- REP
- RJO

Diameter: 
Length:

Valve:

- CVL, Length 34mm
- 50mm
- Optional for CVL valve: RED elbow
- REB conversion to hose barb

Material:

- Brass (standard)
- Stainless steel
- Other

Cone: The housing must accept the cone. If you choose a RJO fitting, the equipment must also have a chamfer to avoid tearing the o-ring.

Sketch: (Also attach equipment drawing and/or picture of application if possible.)

![Sketch](image-url)
Rectangular Seal, Axial

Rectangular Seal, Internal Radial

Rectangular Seal, External Radial
Straight Length Seal, Axial - Reference the catalog for seal end descriptions

Retracted End

Expanded End
More than just great products...

Beyond offering you the widest available range of products for packing and sealing, Garlock enhances the value of its products with technical services and comprehensive training programs:

- The most sophisticated and most comprehensive test facilities available.
- Technical field seminars on all Garlock products.
- Factory-sponsored product training programs, including hands-on seminars, to ensure that Garlock representatives and their distributor personnel are the best in the industry.
- Technical Bulletins to keep you up-to-date on product enhancements and changes.

Customers who specify Garlock fluid sealing products get, at no extra cost, the high quality support needed to run a profitable operation.

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