

CEFIL'AIR® PNEUMATIC SEALS

10525 16x18 15 2,5 4
10526 16x18 15 1,5 2
10527 22x19 5 2,5 2
10529 27x21 7 2 5
14 13 15 2,5 4
14 19 5 21,5 2
22 20 5 22,5 2
27 22 2 23,5 6



H1 ou H

B1



Garlock

SEALING TECHNOLOGIES®



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.

CEFIL'AIR® PNEUMATIC SEALS

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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

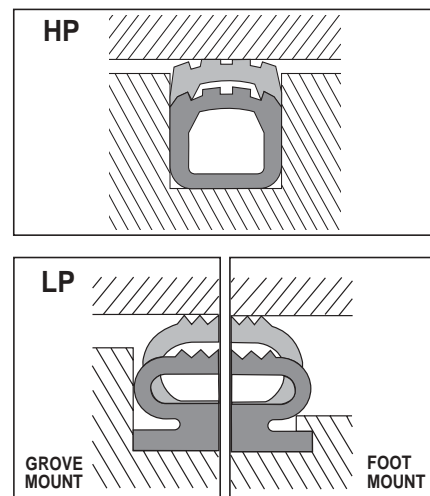
CEFIL'AIR® pneumatic seals are either molded or manufactured from extruded profiles that are joined together by a molded joint. The molded joint ensures uniform wall thickness while restricting stress at the joint, and provides substantial flexibility. The HP and LP are the standard profiles; however, 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.)

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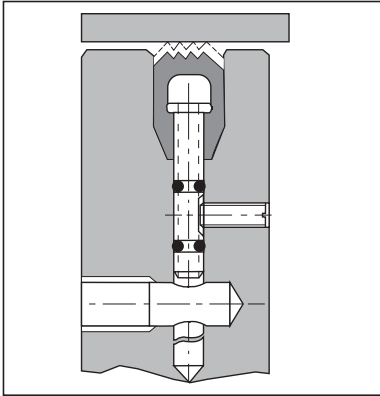
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APPLICATIONS

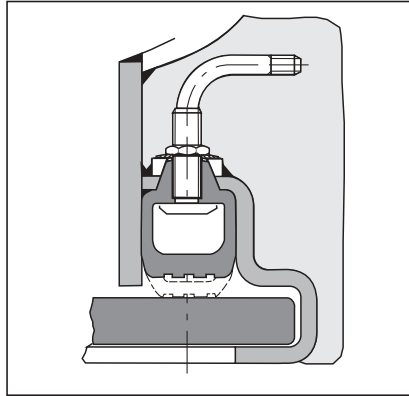
CEFIL'AIR® seals are used throughout many industries, including:

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

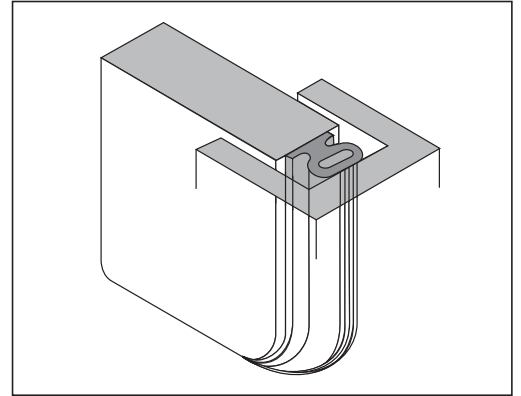
Examples of Sealing



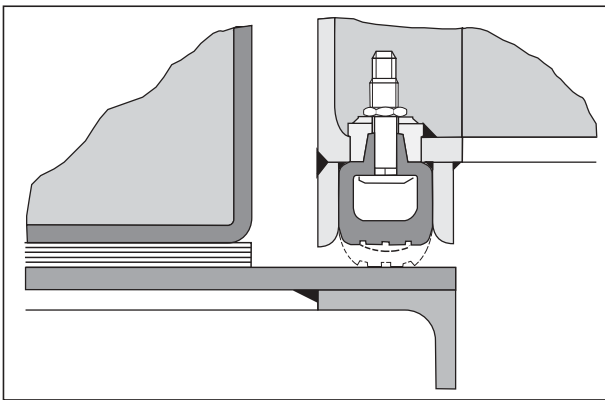
Mobile Bulkhead Seal using Profile No. 514



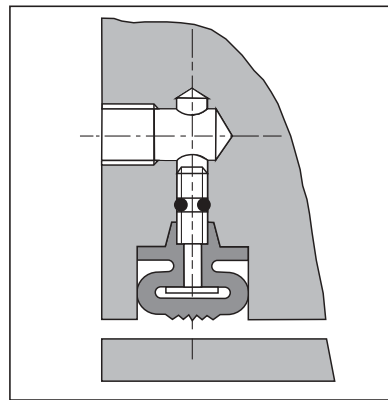
Sterilizer Door Seal using Profile No. 369



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

WARNING:

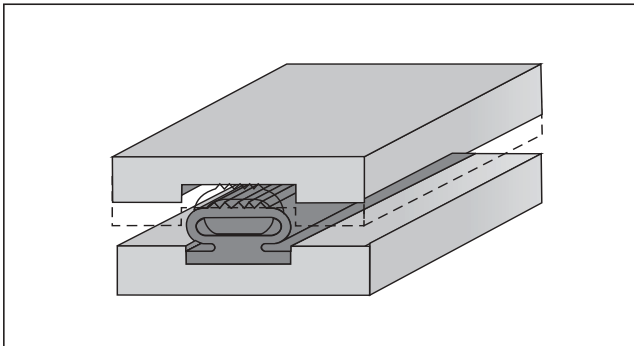
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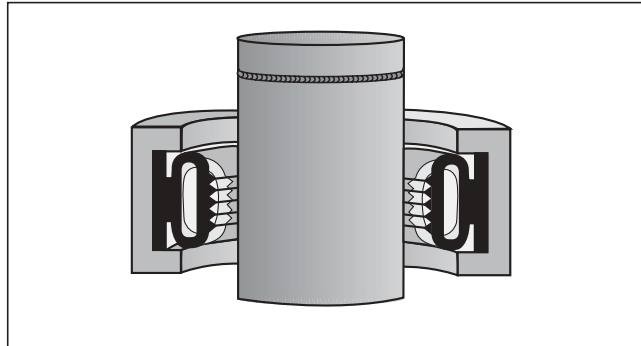
Examples of Handling

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

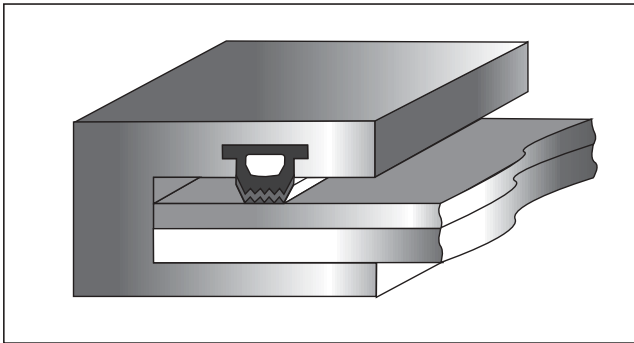
Lifting



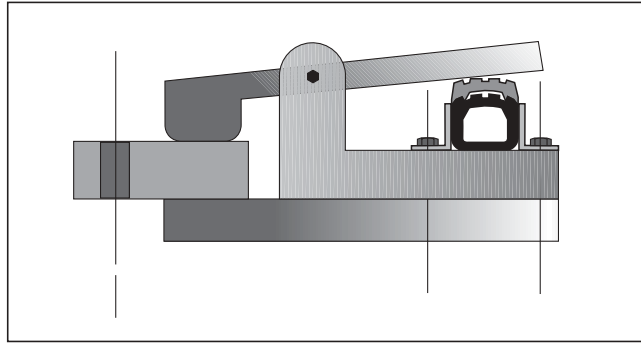
Holding



Pressing



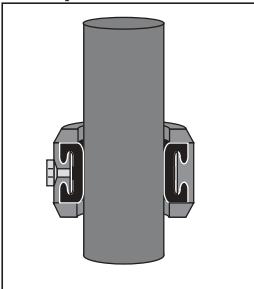
Clamping



Other Applications

Small Seals

Principle

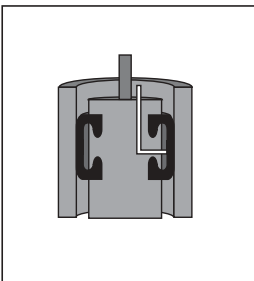
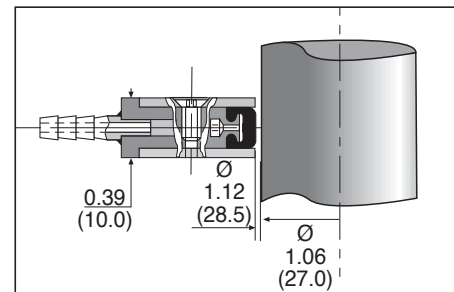


Locking on shaft

Application: Handling of cylindrical pieces

Locking on shaft

cartridge mounting (minimum height occupied)

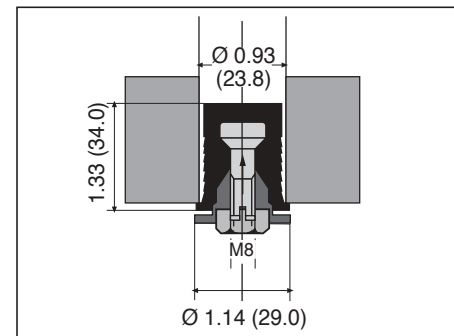


Hole tightening

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

End plugs for tubes

Example: Mechanical expansion

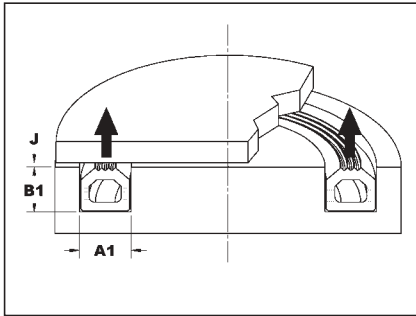


TYPES OF EXPANSION BASED ON INSTALLATION

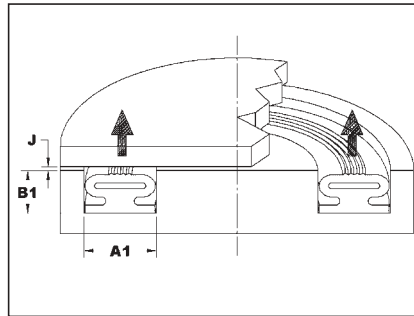
Axial Expansion (Arrangement I)

The working pressure P_i is normal.

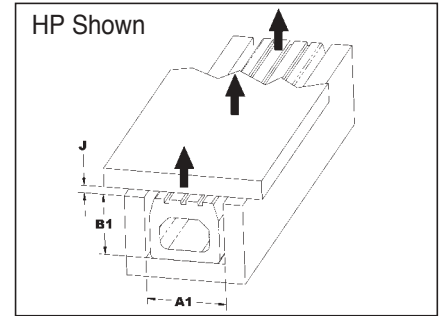
HP Profiles



LP Profiles

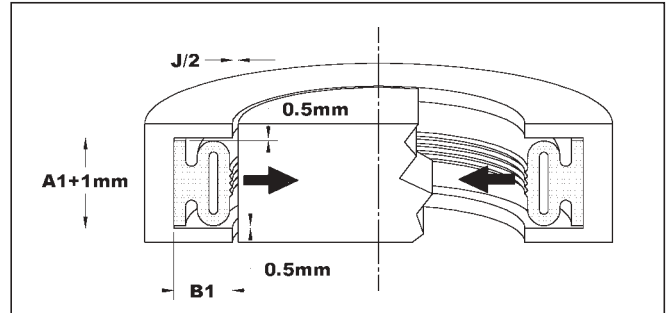
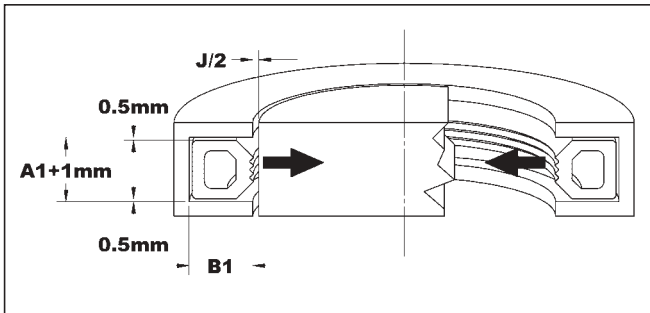


Straight Length can be HP or LP



Internal Radial Expansion (Arrangement II)

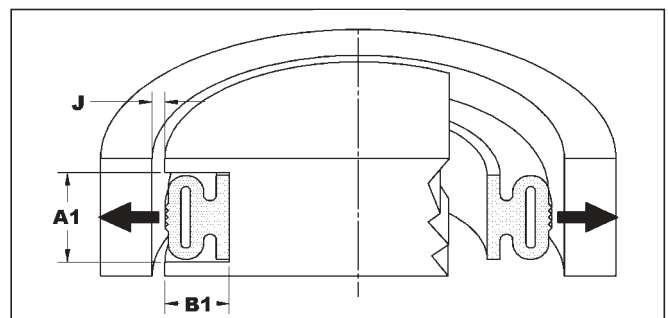
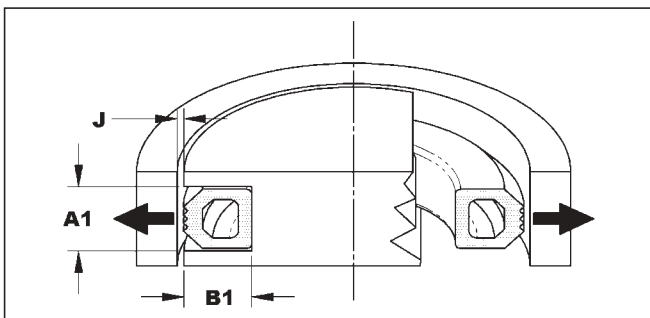
The working pressure P_i is 20 to 30% greater than the normal pressure.



NOTE: The $A1 + 1$ Clearance and the $J/2$ "Half Gap" Dimension is necessary due to the seal mounting in this arrangement (Compression of the seal material).

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).

Combination - Consult Garlock

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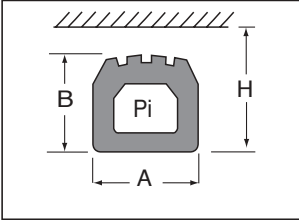
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STANDARD HP PROFILES

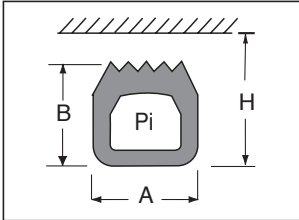
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Production

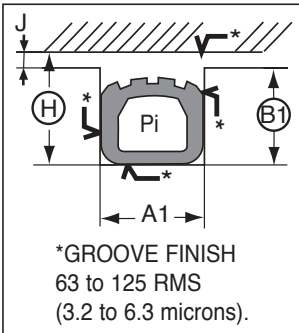
Grooved Profile



Corrugated Profile



Assembly and Housing Dimensions



Grooved Profiles				Housings				Pi Pressure max. psi (bar)
Profile No. Silicone	Profile No. SBR	A inches (mm)	B inches (mm)	A1 inches (mm)	B1 inches (mm)	H inches (mm)	J max. inches (mm)	
		Tol: See Pg #17		Tol: +0.02 ⁻⁰ (0.5-0)				
339	10035	0.62 (16)	0.47 (12)	0.62 (16)	0.51 (13)	0.59 (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)

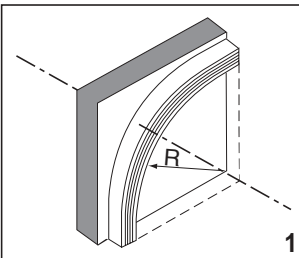
Corrugated Profiles				Housings				Pi Pressure max. psi (bar)
Profile No. Silicone	Profile No. SBR	A inches (mm)	B inches (mm)	A1 inches (mm)	B1 inches (mm)	H inches (mm)	J max. inches (mm)	
		Tol: See Pg #17		Tol: +0.02 ⁻⁰ (0.5-0)				
415	10102	0.25 (6.5)	0.19 (5)	0.25 (6.5)	0.21 (5.5)	0.25 (6.5)	0.05 (1.5)	14.5 (1)
512	-	0.55 (14)	0.39 (10)	0.55 (14)	0.43 (11)	0.51 (13)	0.09 (2.5)	58.0 (4)
639	-	0.62 (16)	0.55 (14)	0.62 (16)	0.61 (15.5)	0.62 (17.5)	0.09 (2.5)	72.5 (5)
603	10177	0.78 (20)	0.78 (20)	0.78 (20)	0.84 (21.5)	0.94 (24)	0.11 (3)	87.0 (6)
514	10351	0.82 (21)	0.94 (24)	0.82 (21)	1.02 (26)	1.14 (29)	0.13 (3.5)	101.5 (7)
529	-	2.12 (54)	1.57 (40)	2.12 (54)	1.65 (42)	1.88 (48)	0.25 (6.5)	145.1 (10)

Assembly

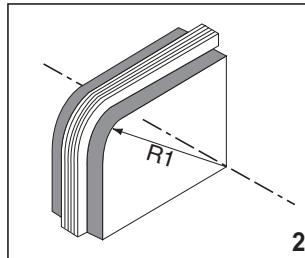
Seals in the retracted (deflated) position are protected within the groove (B1 > B). The clearance, "J" (gap), can be reduced to zero, allowing the two parts to make contact without their movements being hindered by the seal (B1 = H).

Curve Radii (between 2 straight lengths)

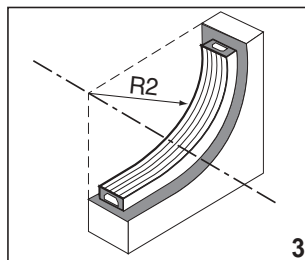
Axial



External Radial



Internal Radial



NOTES:

- 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.
- 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.
- For profiles other than silicone, increase above values of R, R1 and R2 by 20%.
- Please consult our technical department for small sized circular seals.

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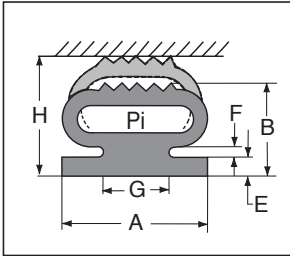
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Standard HP Profiles						
Profile No. Silicone	Profile No. SBR	A inches (mm)	B inches (mm)	R min. inches (mm)	R1 min. inches (mm)	R2 min. inches (mm)
		See Note #3				
339	10035	0.62 (16)	0.47 (12)	1.37 (35)	1.57 (40)	1.57 (40)
347	10036	0.62 (16)	0.70 (18)	1.37 (35)	2.16 (55)	2.55 (65)
356	10041	0.86 (22)	0.74 (19)	1.96 (50)	1.57 (40)	1.77 (45)
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)	2.75 (70)	2.95 (75)	3.34 (85)
415	10102	0.25 (6.5)	0.19 (5)	0.59 (15)	0.78 (20)	0.78 (20)
512	-	0.55 (14)	0.39 (10)	1.18 (30)	1.37 (35)	1.37 (35)
639	-	0.62 (16)	0.55 (14)	1.37 (35)	1.57 (40)	1.57 (40)
603	10177	0.78 (20)	0.78 (20)	3.14 (80)	2.16 (55)	2.36 (60)
514	10351	0.82 (21)	0.94 (24)	3.14 (80)	2.16 (55)	2.75 (70)
529	-	2.12 (54)	1.57 (40)	3.34 (85)	4.72 (120)	5.90 (150)

STANDARD LP PROFILES

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.

Production



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

Please consult our technical department for small sized circular seals.

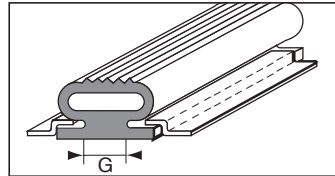
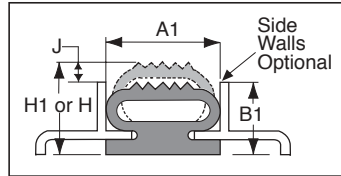
Profile No. Silicone	Profile No. SBR	A inches (mm) Tol: See Pg #17	B inches (mm)	Housings inches (mm)			Dimensions inches (mm)				Pi Pressure max (psi bar)
				A1 +0.07*-0 (+2-0)	B1 ± 0.07* (± 2)	H1*	H	E	F	G	
921	10152	1.18 (30)	0.79 (20)	1.18 (30)	0.87 (22)	1.18 (30)	0.98 (25)	0.16 (4)	0.16 (4)	0.47 (12)	43.5 (3)
704	10118	1.57 (40)	1.06 (27)	1.57 (40)	1.14 (29)	1.57 (40)	1.38 (35)	0.20 (51)	0.20 (5)	0.59 (15)	43.5 (3)
736	10211	2.36 (60)	1.38 (35)	2.36 (60)	1.50 (38)	2.36 (60)	1.97 (50)	0.23 (6)	0.23 (6)	0.98 (25)	43.5 (3)
828	10126	3.54 (90)	2.17 (55)	3.54 (90)	2.36 (60)	3.54 (90)	2.95 (75)	0.31 (8)	0.31 (8)	1.18 (30)	43.5 (3)
-	10094	5.12 (130)	2.76 (70)	5.12 (130)	3.15 (80)	5.12 (130)	3.94 (100)	0.59 (15)	0.39 (10)	1.57 (40)	43.5 (3)
-	10170	5.91 (150)	3.15 (80)	5.91 (150)	3.54 (90)	5.91 (140)	4.33 (110)	0.65 (16.5)	0.47 (12)	1.57 (50)	43.5 (3)

* Dimension "H1" corresponds to the maximum expansion of the seal. It is **not** recommended to keep the seal inflated continually to this height.

If the LP Profile is placed into a housing or has a sidewall, Dim J=H-B1.

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.



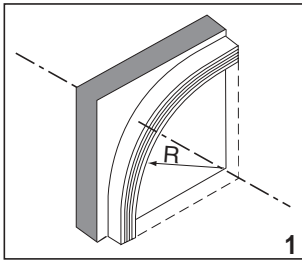
The "foot/base" of the LP seal **MUST** be secured at all times with a fixture/clamp. The radii of the standard LP profile seals

must be maintained by quadrants in the groove of each side ("G").

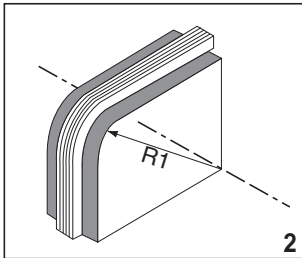
NOTE: Other restraint fixtures can be designed and considered by the individual user at his discretion.

Curve Radii (between 2 straight lengths)

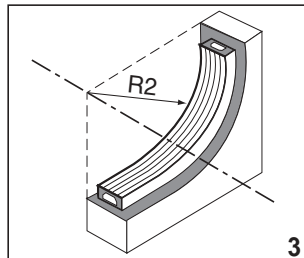
Axial



External Radial



Internal Radial



Standard LP Profiles						
Profile No. Silicone	Profile No. SBR See Note #3	A inches (mm)	B inches (mm)	R min. inches (mm)	R1 min. inches (mm)	R2 min. inches (mm)
921	10152	1.18 (30)	0.79 (20)	3.94 (100)	2.76 (70)	3.15 (80)
704	10118	1.57 (40)	1.06 (27)	4.72 (120)	3.15 (80)	3.54 (90)
736	10211	2.36 (60)	1.38 (35)	6.69 (170)	3.54 (90)	4.13 (105)
828	10126	3.54 (90)	2.17 (55)	14.96 (380)	11.81 (300)	13.78 (350)
-	10094	5.12 (130)	2.76 (70)	29.13 (740)	18.11 (460)	25.60 (650)
-	10170	5.91 (150)	3.15 (80)	39.37 (1000)	22.05 (560)	27.56 (700)

NOTES:

- 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.
- 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.
- For profiles other than silicone, increase above values of R, R1 and R2 by 20%.
- Please consult our technical department for small sized circular seals.

END PLUGS

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 the seal and to prevent tearing caused by expansion (see figures 4 and 5).

Figure 1 - Retracted End (Standard)

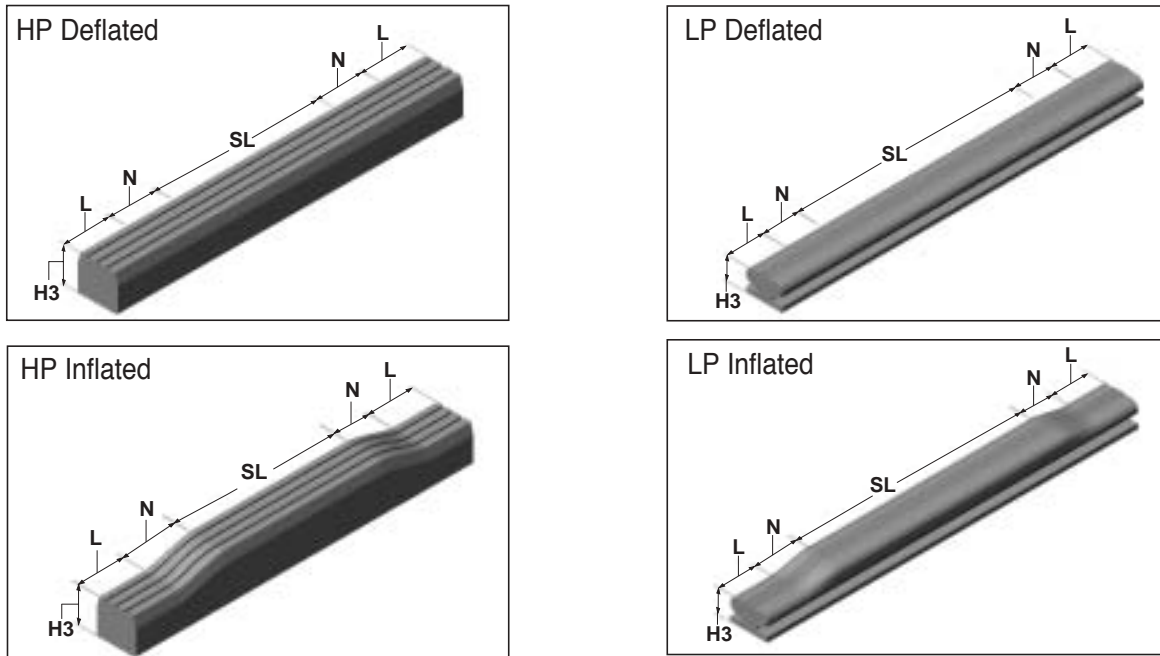
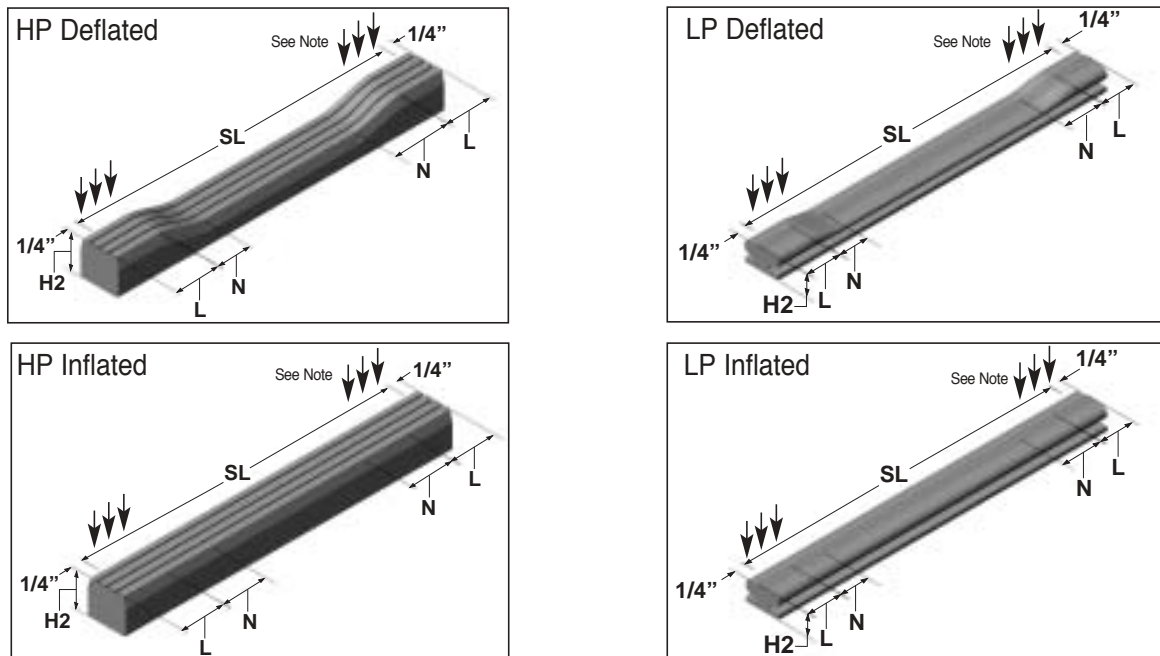


Figure 2 - Expanded End (For HP Profiles that require expanded end, call for assistance).

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

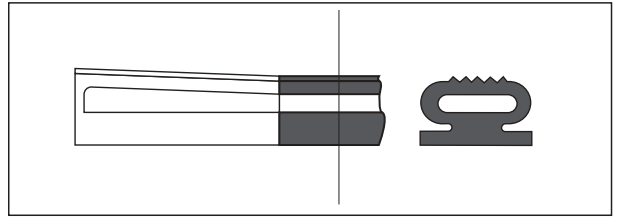
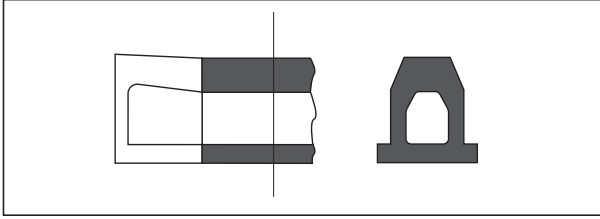


END PLUGS

Figure 3 - Special End Plugs (Expandable)

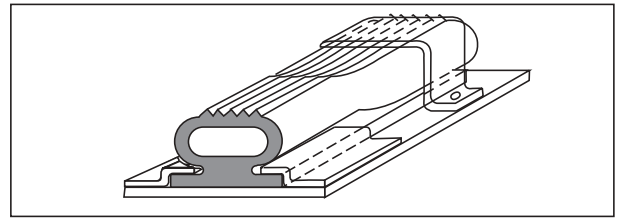
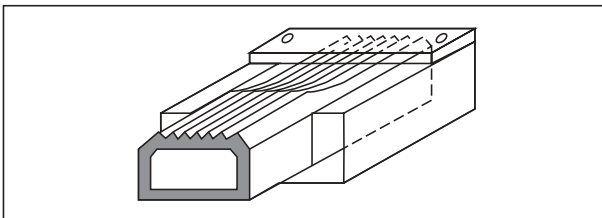
For specific applications which require expansion almost all along the seal we can produce at your request “EXPANDABLE END PLUGS”.

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							
Profile No. Silicone	Profile No. SBR	A inches (mm)	B inches (mm)	H2 inches (mm)	H3 inches (mm)	L inches (mm)	N inches (mm)
921	10152	1.18 (30)	0.78 (20)	0.98 (25)	0.86 (22)	0.78 (20)	0.59 (15)
704	10118	1.57 (40)	1.06 (27)	1.37 (35)	1.14 (29)	0.98 (25)	0.78 (20)
736	10211	2.36 (60)	1.37 (35)	1.96 (50)	1.49 (38)	1.57 (40)	1.18 (30)
828	10126	3.54 (90)	2.16 (55)	2.95 (75)	2.36 (60)	2.36 (60)	1.77 (45)
-	10094	5.11 (130)	2.75 (70)	3.93 (100)	3.14 (80)	3.14 (80)	2.55 (65)
-	10170	5.90 (150)	3.14 (80)	4.33 (110)	3.54 (90)	3.93 (100)	3.154 (80)

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.

Standard HP Profiles							
Profile No. Silicone	Profile No. SBR	A inches (mm)	B inches (mm)	H2 inches (mm)	H3 inches (mm)	L inches (mm)	N inches (mm)
339	10035	0.62 (16)	0.47 (12)	0.59 (15)	0.51 (13)	0.62 (16)	0.19 (5)
347	10036	0.62 (16)	0.70 (18)	0.84 (21.5)	0.76 (19.5)	0.62 (16)	0.19 (5)
356	10041	0.86 (22)	0.74 (19)	0.88 (22.5)	0.80 (20.5)	0.86 (22)	0.23 (6)
443	10039	1.02 (26)	0.74 (19)	0.92 (23.5)	0.80 (20.5)	1.02 (26)	0.27 (7)
405	10042	1.06 (27)	0.82 (21)	1.02 (26)	0.90 (23)	1.06 (27)	0.27 (7)
627	10175	1.37 (35)	1.02 (26)	1.33 (34)	1.14 (29)	1.37 (35)	0.35 (9)
369	10217	1.37 (35)	1.25 (32)	1.77 (45)	1.37 (35)	1.37 (35)	0.35 (9)
415	10102	0.25 (6.5)	0.19 (5)	0.25 (6.5)	0.21 (5.5)	0.25 (6.5)	0.07 (2)
512	-	0.55 (14)	0.39 (10)	0.51 (13)	0.43 (11)	0.55 (14)	0.19 (5)
639	-	0.62 (16)	0.55 (14)	0.68 (17.5)	0.61 (15.5)	0.62 (16)	0.15 (4)
603	10177	0.78 (20)	0.78 (20)	0.94 (24)	0.84 (21.5)	0.78 (20)	0.19 (5)
514	10351	0.82 (21)	0.94 (24)	1.14 (29)	1.02 (26)	0.82 (21)	0.23 (6)
529	-	2.12 (54)	1.57 (40)	1.88 (48)	1.65 (42)	2.12 (54)	0.55 (14)

WARNING:

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FITTINGS AND VALVES

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

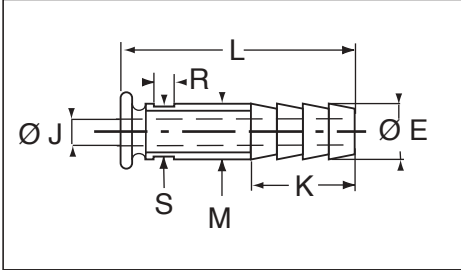
NOTE: CEFIL'AIR® pneumatic seals require that all connections to fittings be located at the bottom of grooves or at the ends of straight length seals. It is not recommended to locate fittings in the curved section of radii curved seals.

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

Standard Fittings - Metric*

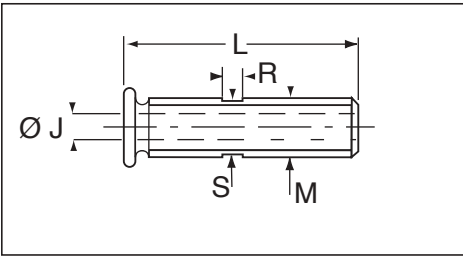
*Imperial available upon request

REC (Hose Barb)



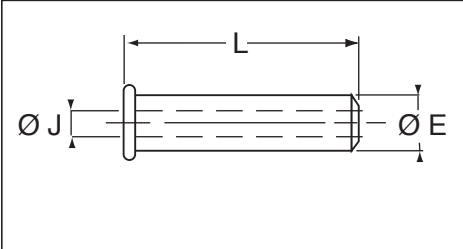
ØE	4	6	8	10	12
M	M6	M8	M10	M12	M14
ØJ	1.5	3	5	6	6
K	12	16	16	20	20
L	30/35	30/35	40/45	40/50	50/60
	40/50	40/50	50/60	60/70	70/80
S x R	5 x 6	6 x 6	8 x 8	10 x 8	11 x 8

REF (Threaded)



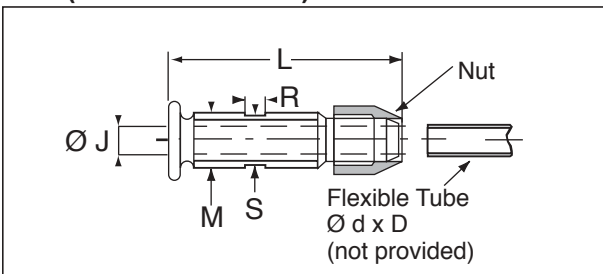
M	M4	M6	7.65x0.79	M8	1/8 G	M10	1/8 NPT	M12	1/4 G	M14	M16
ØJ	1.2	3	3	3	5	5	5	6	6	6	8
L	15/20	15/20	20/25	15/20	20/25	20/25	20/25	20/25	20/25	30/35	40/45
	25/30	25/30	30/35	25/30	30/35	30/35	30/35	30/35	30/35	40/45	50/60
	35/40	35/40	40/50	35/40	40/50	40/50	40/50	40/50	40/50	50/60	70/80
	50	50	60	50/60	60/70	60/70	60/70	60/70	60/70	70/80	90/100
S x R	3 x 4	5 x 6	6 x 6	6 x 8	8 x 8	8 x 8	8 x 8	10 x 8	10 x 8	11 x 8	13 x 10

REL (Plain CLAMP)



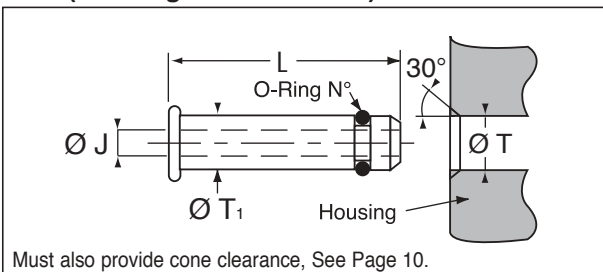
ØE	4	6	8	10	12	14	16
ØJ	1.5	3.4	3.4	5	6.8	6.8	8.5
L	15/20	15/20	20/25	25/30	30/35	35/40	45/50
	25/30	25/30	30/35	35/40	40/45	45/50	60/70
	40	35/40	40/50	45/50	50/60	60/70	80/90
		50		60	70	80	

REP (Quick Connection)



M	M10	M12	M14
ØJ	3	5	7
d x D	4 x 6	6 x 8	8 x 10
L	12	50/60	60/70
	50/60	70/80	80/90
	70		
S x R	8 x 8	10 x 6	12 x 8

RJO (Housing or Hole Mount)



ØT ₁	4	6	8	10	12	14
ØT	4H8	6H8	8H8	10H8	12H8	14H8
ØJ	1	1.5	2	4	5	6.8
OringN°	11018	15001	15004	15006	15007	15008
L	15/20	15/20	15/20	20/25	25/30	35/40
	25/30	25/30	25/30	30/35	35/40	45/50
	40	35/40	35/40	40/45	45/50	60/70
		50	50	50/60	60/70	80

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).

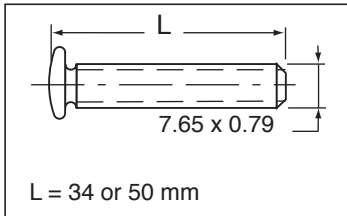
FITTINGS AND VALVES

Special Fittings

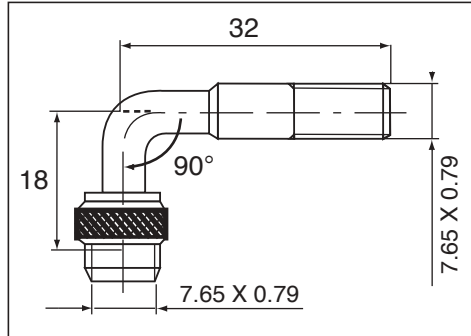
We can manufacture any type of fitting to meet your specific requirements. Please contact our technical department.

Standard Valves

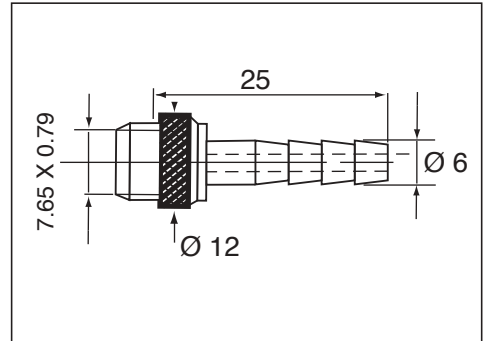
CVL (SAE Schrader Valve)



RED (Elbow for CVL)



REB (Convert CVL or RED to Hose Barb - No Return Valve)

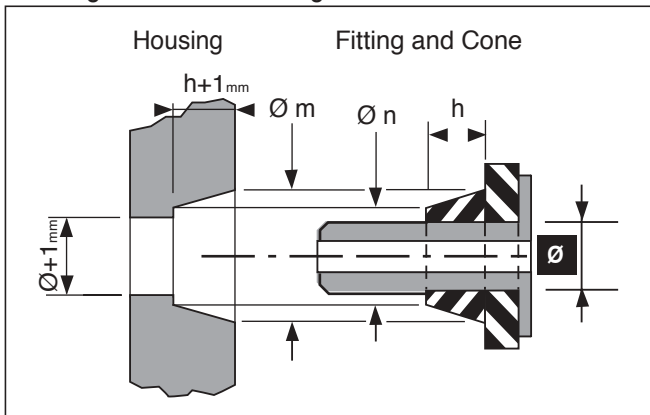


MOLDED CONES

Standard Sizes*

* For all other sizes, please contact us.

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 Ø 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.

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

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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).

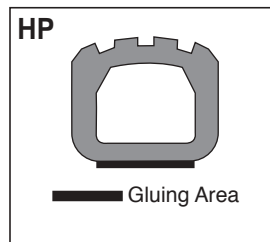


Diagram 1

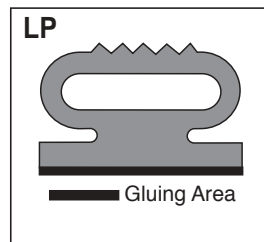


Diagram 2

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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ASSEMBLY CONDITIONS

Preparing 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.

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.

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.

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.

Elastomers	Ref	Durometer (TOL = ± 5)	Temp. Range	Properties
Styrene-Butadiene SBR	1 A 60	60	-4°F (-20°C) to +212°F (+100°C)	Good resistance to: <ul style="list-style-type: none"> • Water • Demineralized water • Air • Diluted acids and bases • Ketones Abrasion resistance
Chloroprene¹ CR	4 B61 K	60	-4°F (-20°C) to +230°F (+110°C)	Same as SBR, but with better resistance to ultra-violet rays and ozone. Low resistance to grease.
Butyl¹ IIR	5 B 60	65	-4°F (-20°C) to +248°F (+120°C)	Good resistance to: <ul style="list-style-type: none"> • Diluted acids and bases • Ketones Very low permeability
Ethylene Propylene¹ EPDM/EPM	6 B 65	65	-22°F (-30°C) to +302°F (+150°C)	Good resistance to: <ul style="list-style-type: none"> • Water, steam and atmospheric conditions Low resistance to hydrocarbon
Silicone Q	C 65 M	56	-130°F (-90°C) to +482°F (+250°C)	Good resistance to: <ul style="list-style-type: none"> • Dry and humid heat • Steam pressure ≤ 6 bars • Cold Very low oil resistance Does not age
Fluorosilicone¹ MFQ	C 65 M/F	56	-85°F (-65°C) to +392°F (+200°C)	Same as silicone Good resistance to <ul style="list-style-type: none"> • Aromatic hydrocarbons • Chlorinated solvents
VITON®¹ FKM	3 E 65	65	-4°F (-20°C) to +356°F (+180°C)	Good resistance to: <ul style="list-style-type: none"> • Chlorinated solvents • Aromatics • Strong acids and bases

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.

The total applied load "Fj" for the seal on the moving panel will be determined using the formula:

$$F_j = (P_i \times K_j) \times LD$$

P_i = Internal pressure of the seal in bars

LD = Developed length of the seal in cm

K_j = Coefficient of unit contact surface

Profile No.	512	339	347	356	443	405	627	369	415	639	603	514	529	921	704	736	828	10094	10170
K _j	1.0	1.2	1.2	2.0	2.2	2.3	3.0	3.0	0.7	1.2	1.6	1.6	5.0	0.8	1.5	2.5	3.0	4.2	5.0
P _i	4	4	4	6	6	6	8	8	1	5	6	7	10	3	3	3	3	3	3

Example of Calculation:

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

$$F_j = (P_i \times K_j) \times \pi \times \varnothing^*$$

$$= (2 \times 1.2) \times (3.14 \times 150\text{cm}) = 1.130 \text{ da.N}$$

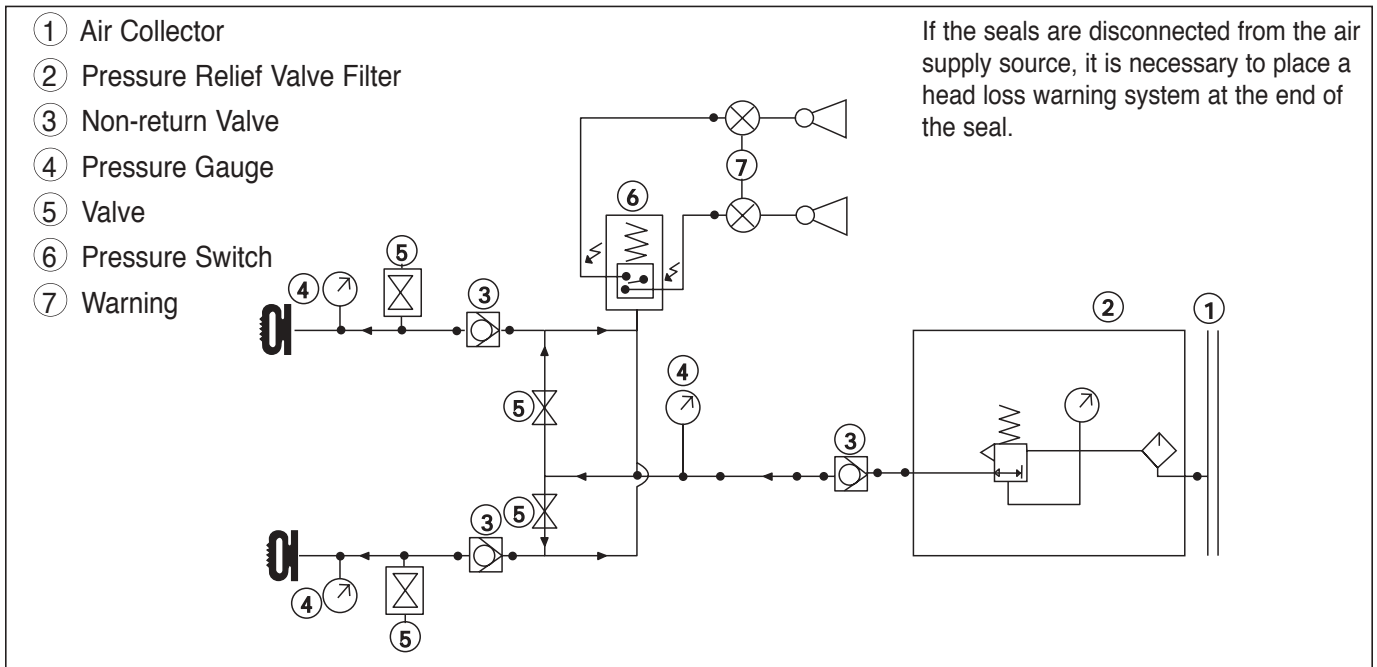
*Øm = mean diameter of seal
(da.N to lb. force mult by 2.248089)

Supply of Motive Fluid

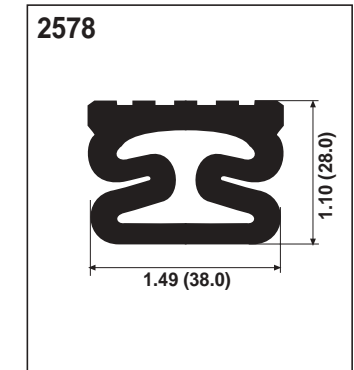
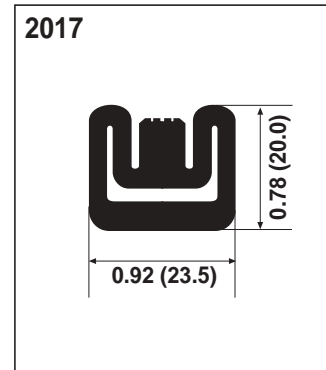
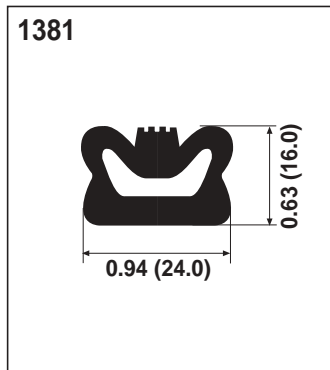
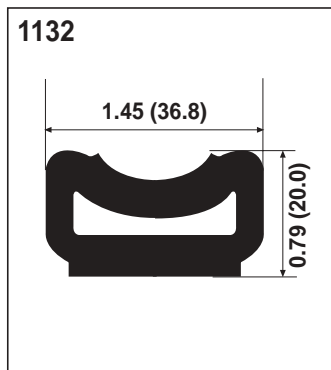
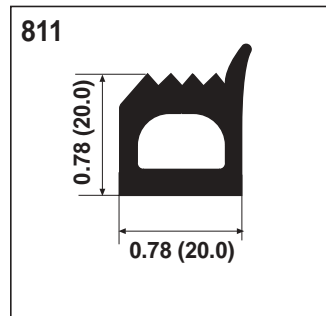
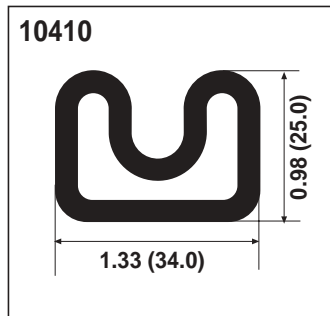
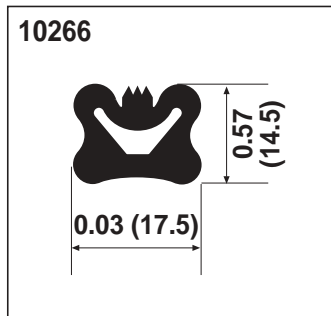
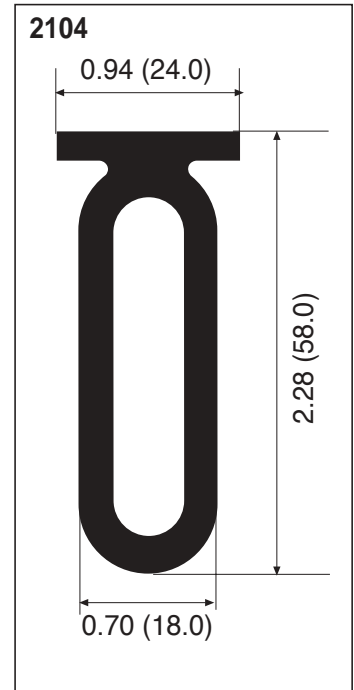
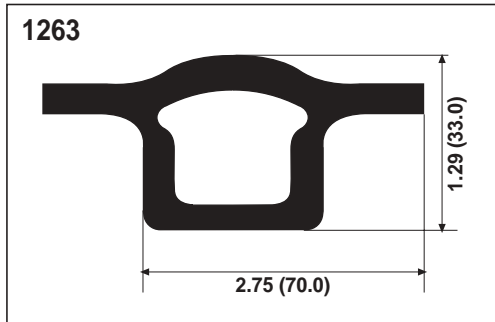
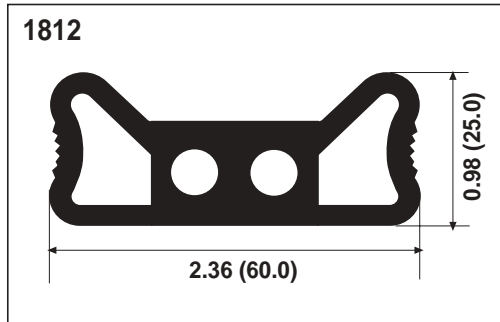
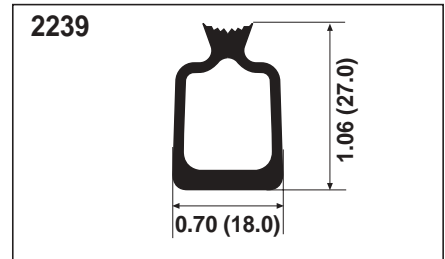
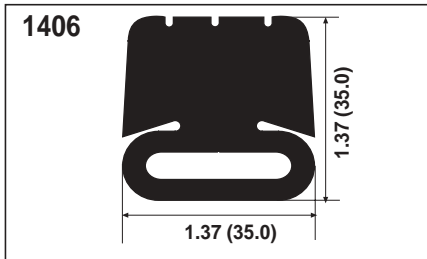
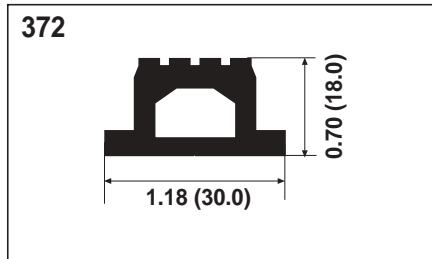
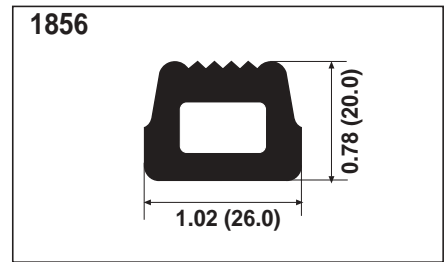
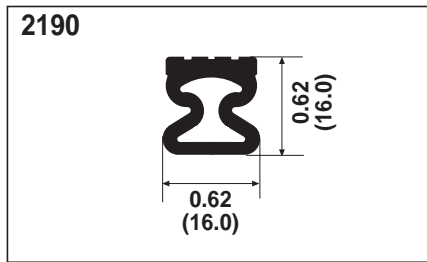
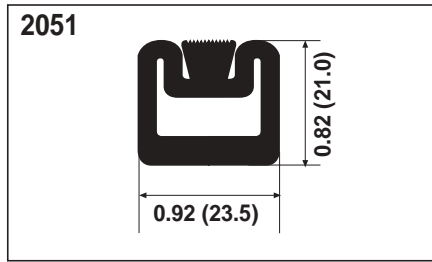
CEFIL'AIR® pneumatic seals can be expanded with air, neutral gas and also water. However, it is necessary to provide a constant flow and pressure. All seals must

be connected to a regulator to avoid overpressurizing (see diagram below).

Typical sketch of double cofferdam seal (Standard LP).



OTHER PROFILE EXAMPLES



HELPFUL INFORMATION

Cross Section Table

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

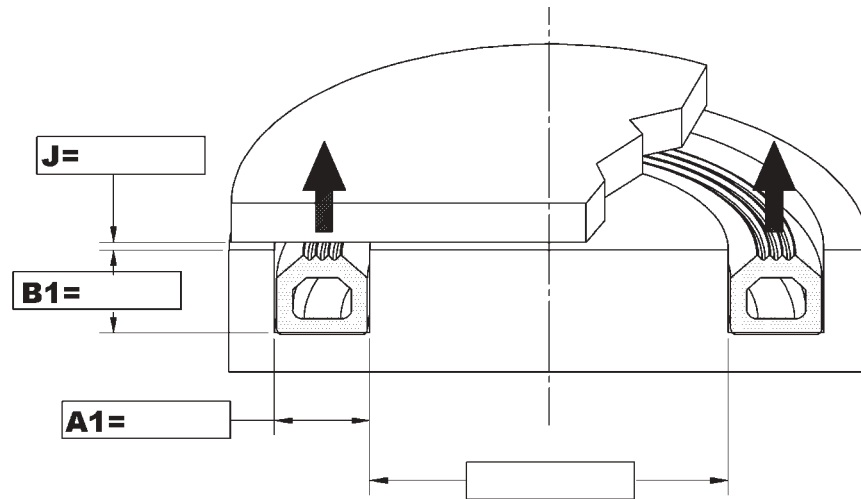
Dimensions in Inches (in Millimeters)				
Above	Up To	Precision (\pm) (Std for Most Profiles)	Commercial (\pm) (Some Large LP Profiles)	Non-Critical (\pm)
0	0.100 (2.5)	0.010 (0.25)	0.014 (0.35)	0.016 (0.4)
0.100 (2.5)	0.160 (4)	0.014 (0.35)	0.016 (0.4)	0.020 (0.5)
0.160 (4)	0.250 (6.3)	0.016 (0.4)	0.020 (0.5)	0.028 (0.7)
0.250 (6.3)	0.390 (10)	0.020 (0.5)	0.028 (0.7)	0.031 (0.8)
0.390 (10)	0.630 (16)	0.028 (0.7)	0.031 (0.8)	0.040 (1)
0.630 (16)	0.980 (25)	0.031 (0.8)	0.040 (1)	0.051 (1.3)
0.980 (25)	1.570 (40)	0.040 (1)	0.051 (1.3)	0.063 (1.6)
1.570 (40)	2.480 (63)	0.051 (1.3)	0.063 (1.6)	0.079 (2)
2.480 (63)	3.940 (100)	0.063 (1.6)	0.079 (2)	0.098 (2.5)

WARNING:

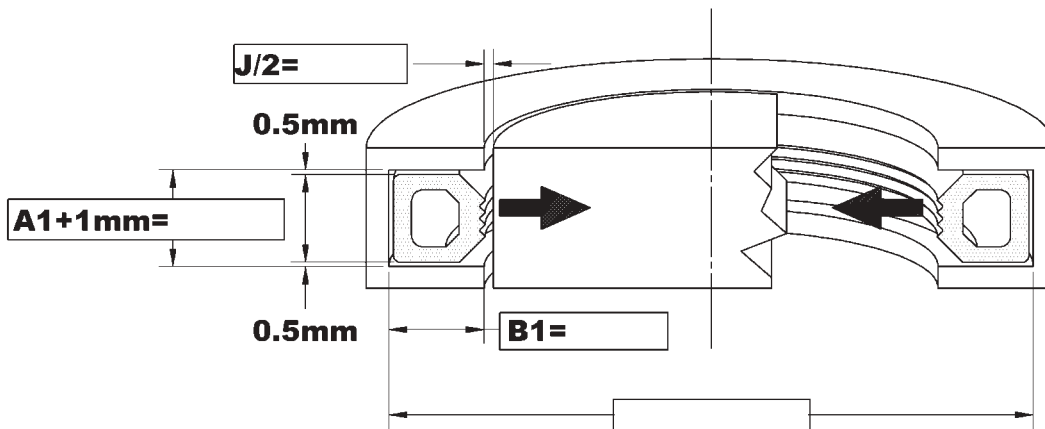
Properties/applications shown throughout this brochure are typical. Your specific application should not be under taken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property 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.

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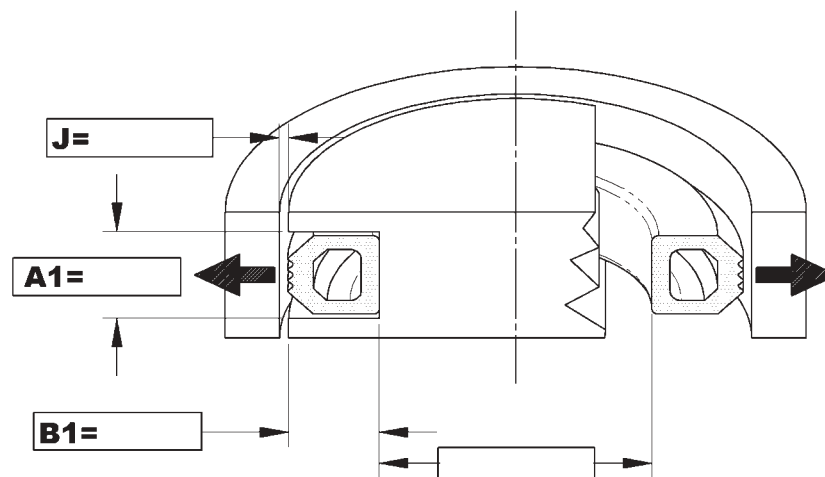
Circular Seal, Axial



Circular Seal, Internal Radial

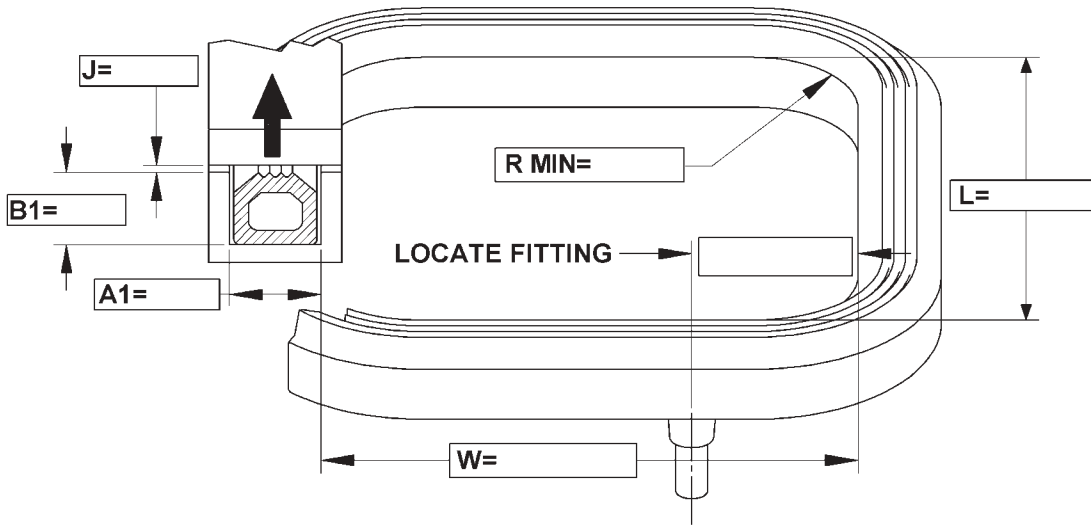


Circular Seal, External Radial

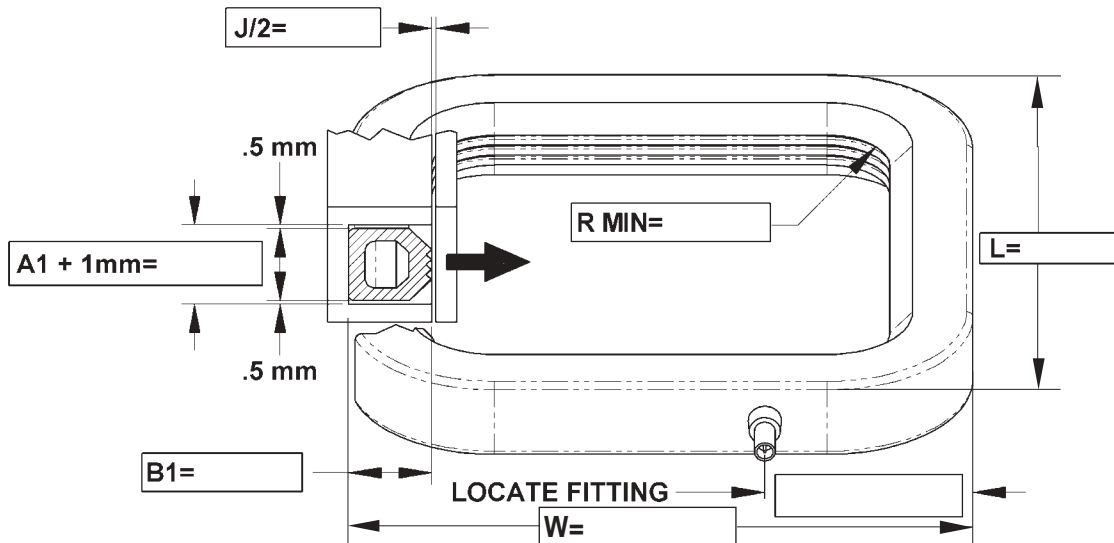


CEFIL'AIR® DIMENSION PICTURE

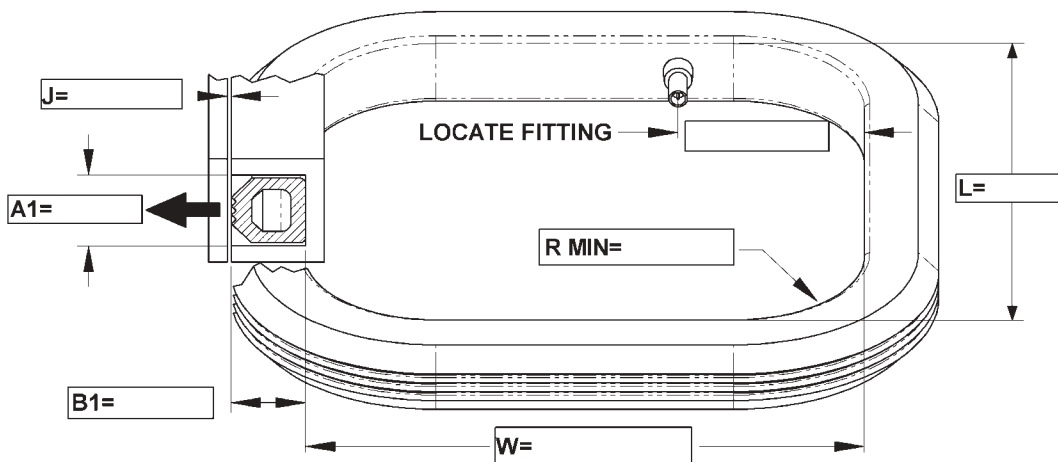
Rectangular Seal, Axial



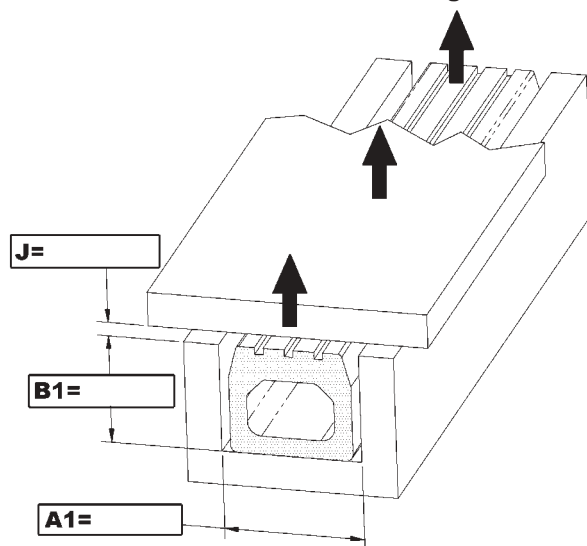
Rectangular Seal, Internal Radial



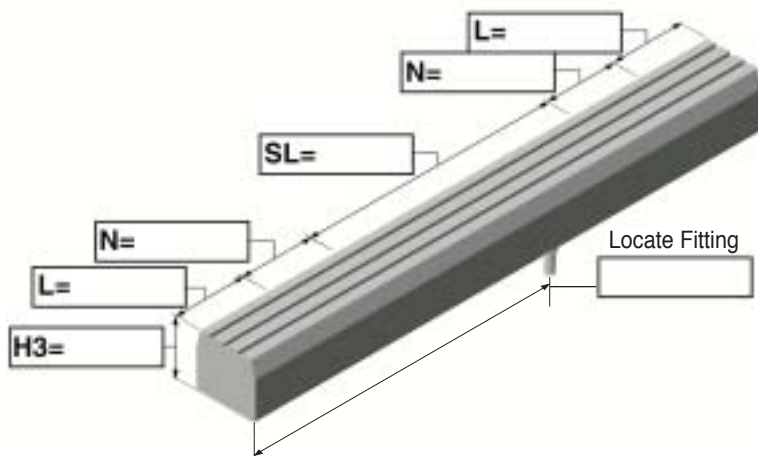
Rectangular Seal, External Radial



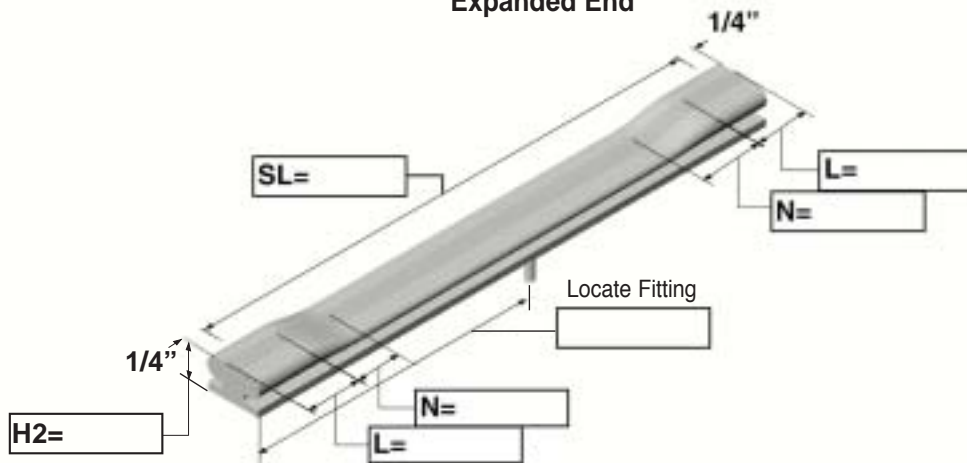
Straight Length Seal, Axial - Reference the catalog for seal end descriptions



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:

- ISO9002:2002 registration for Industrial Gasketing, Industrial Packing, KLOZURE® Oil Seals, Bearing Protectors, Expansion Joints, Hydraulic Components, Mechanical Seals, and Industrial Rubber Products.
- A global network of stocking Authorized Garlock Distributors.
- Factory sales representatives and applications engineers available for problem solving when and where it is needed.
- Toll-free 800 telephone and FAX numbers for immediate product information.
- In-plant surveys of equipment and processes, providing the customer with recommendations to identify and eliminate sealing and packing problems before they start.
- 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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Garlock Sealing Technologies® is an EnPro Industries company.



ISO 9001:2000
Cert. #001762

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