

# Pneumatic seals

**CEFIL'AIR®**



29	1002	16x12	16	13	15	2,5	4
47	1003	16x18	16	19	15	1,5	2
56	1002	22x19	22	15	22,5	2	
65	1002	27x21	27	23	15	6	
12	16	18	15	2,5	4		
8	16	19	15	21,5	2		
19	22	20	15	22,5	2		
21	27	23	26	3,5	6		



**Garlock**  
Sealing Technologies  
CEFILAC

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## DESCRIPTION

### INTRODUCTION

When faced with the problem of sealing between parts which move in relation to one another and capable of being connected and disconnected at will, the easiest, safest and most effective technique is to use pneumatic seals.

"CEFILAIR<sup>®</sup>" seals, which are expanded and retracted by a pneumatic process, have been designed to meet these multiple applications.

Within the scope of these types of seals, the "CEFILAIR<sup>®</sup>", as a result of its patented design employing modern

techniques and the most advanced elastomers, brings wider possibilities of use.

As they can satisfy the highest demands of temperatures from - 100°C to + 250/280° C, as well as pressures from 10<sup>-1</sup> to 10<sup>-3</sup> mm Hg to several bar, in the presence of varied atmospheres or fluids, "CEFILAIR<sup>®</sup>" pneumatic seals can be used in all sectors of industry including advanced techniques and scientific research.

### APPLICATIONS

"CEFILAIR<sup>®</sup>" pneumatic seals are fitted in the following cases where sealing, handling, or locking is required :

- movable cofferdam bulkheads ;
- storage containers ;
- transport containers ;
- leaktight panels (naval, aerospace industry) ;
- nuclear vessels (equipment or personnel chambers) ;
- isothermal chambers ;
- clean rooms
- sliding or quick-locking doors (autoclaves, sterilisers) ;
- centrifugal filters (access doors and drainage hoppers) ;
- aircraft access doors ;
- cockpit canopies ;
- portholes ;
- cofferdams ;
- pneumatic conveyors (bagging hoppers, valve gates) ;
- phonic isolation ;
- .....

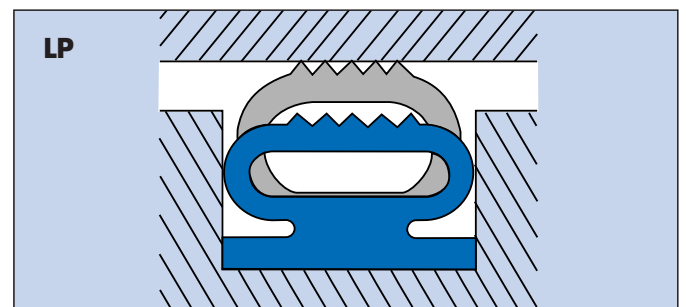
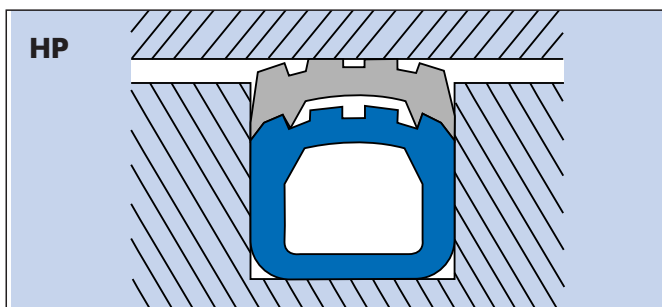
### OPERATION

CEFILAIR<sup>®</sup> seals have no textile reinforcement or expansion system. Their expansion, like their retraction, is obtained through the combined effects of the walls of the seal forming elastic arms.

The seals, which are produced from elastomers with a high modulus of elasticity and considerable elongation and fitted in grooves, are restricted to low work rates, as a result, they are protected against risks of bursting and therefore it is necessary to observe the fitting dimensions without fail (table, pages 4 - 5).

*Comment :* "CEFILAIR<sup>®</sup> HP" pneumatic seals must be captive in slots or grooves closed on all four faces in accordance with the specified dimensions. **You are strongly recommended not to pressurise or use the seals when one of the faces of the groove is open.**

On the other hand, "CEFILAIR<sup>®</sup> LP" seals can be secured by their base and work freely. However, the maximum pressure cannot be applied until their contact face (toothed side) is against the item to be sealed.



**For specific uses which need reinforced manufacturing (textiles, high performances aramid fibers) or expanded profiles see pages 14 and 15 and please contact our technical department.**

### MANUFACTURE

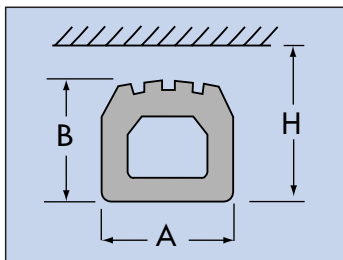
"CEFILAIR<sup>®</sup>" pneumatic seals are produced by joining an extruded or moulded profile. This connection is made by CARBONE LORRAINE, eliminating the need for any excess thicknesses and ensuring perfect continuity while restricting stresses in the joint as much as possible.

This method provides substantial flexibility with regard to the geometry of the sections. Two types of standard profiles and a series of different profiles for use in numerous applications, i.e. **sealing, locking or gripping during automatic handling** have been created.

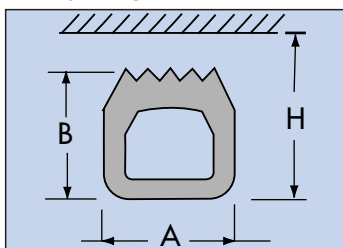
**PRODUCTION**

(1) Tolérances E2 NF - T 47001

**Grooved profile**



**Corrugated profile**

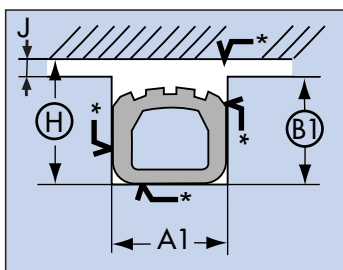


Profiles			Housings				
Ref No silicone	Ref No SBR	A x B (1)	+ 0,5 + 0 A1	+ 0,5 + 0 B1	+ 1 + 0 H	J maxi*	Pi maxi
339	10035	16 x 12	16	13	15	2,5	4
347	10036	16 x 18	16	19,5	21,5	2,5	4
356	10041	22 x 19	22	20,5	22,5	2,5	6
443	10039	26 x 19	26	20,5	23,5	3,5	6
405	10042	27 x 21	27	23	26	3,5	6
627	10175	35 x 26	35	29	34	5,5	8
369	10217	35 x 32	35	35	45	10,5	8

415	10102	6,5 x 5	6,5	5,5	6,5	1,5	1
512		14 x 10	14	11	13	2,5	4
639		16 x 14	16	15,5	17,5	2,5	5
603	10177	20 x 20	20	21,5	24	3,0	6
514	10351	21 x 24	21	26	29	3,5	7
529		54 x 40	54	42	48	6,5	10

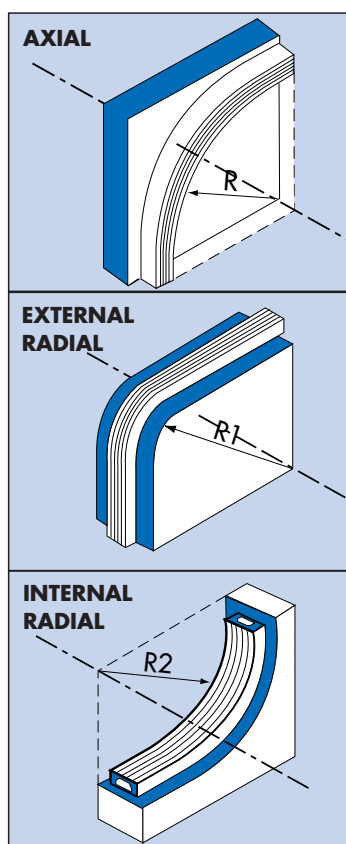
\* Expansion of the seal to verify in keeping with information on page 7.

**ASSEMBLY**



In the retracted position, the seal is contracted and protected in its groove ( $B1 > B$ ). The clearance "J" can be reduced to zero when the two parts are in contact, without their movements being hindered by the seal ( $B1 = H$ ).

(\*)  $\sqrt{Ra}$  3,2 à 6,3. standard N8 (see page 9).



**CURVE RADII (between 2 straight length).**

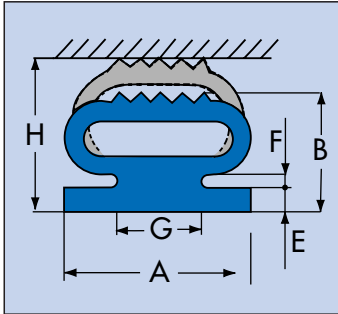
STANDARD HP PROFILES					
Réf. No Silicone	Réf. No SBR	A x B	R mini	R1 mini	R2 mini
339	10035	16 x 12	35	40	40
347	10036	16 x 18	35	55	65
356	10041	22 x 19	50	40	45
443	10039	26 x 19	50	60	65
405	10042	27 x 21	50	65	85
627	10175	35 x 26	70	70	75
369	10217	35 x 32 R	70	75	85
415	10102	6,5 x 5	15	20	20
512		14 x 10	30	35	35
639		16 x 14	35	40	40
603	10177	20 x 20	80	55	60
514	10351	21 x 24	80	55	70
529		54 x 40	85	120	150

In order to obtain the full expansion and retraction of "CEFIL'AIR<sup>®</sup>" pneumatic seals, guaranteeing their maximum efficiency, the minimum curve radii in the corners must be adhered to. The opposite diagrams define the value of "R" according to position of the curve in relation to the direction of the expansion.

Note : For profiles other than silicone, increase the above values R/R1/R2 by 20 %.

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

PRODUCTION



Ref. No silicone	Ref. No SBR	A x B (1)		Housings		Dimensions					
				A1 <sup>+2</sup> / <sub>0</sub>	B1 <sup>±2</sup>	H1(2)	H	E	F	G	Pi <sub>maxi</sub>
921	10152	30	20	30	22	30	25	4	4	12	3
704	10118	40	27	40	29	40	35	5	5	15	3
736	10211	60	35	60	38	60	50	6	6	25	3
828	10126*	90	55	90	60	90	75	8	8	30	3
—	10094	130	70	130	80	130	100	15	10	40	3
—	10170	150	80	150	90	140	110	16,5	12	50	3

- Other forms of seals can be produced. (see page 15).
- The dimensions of the dies available may be supplied on request.

(1) Tolérances E2 NFT 47001.

(2) Dimension "H1" corresponds to the maximum expansion of the seal **cannot be used in a continuous manner.**

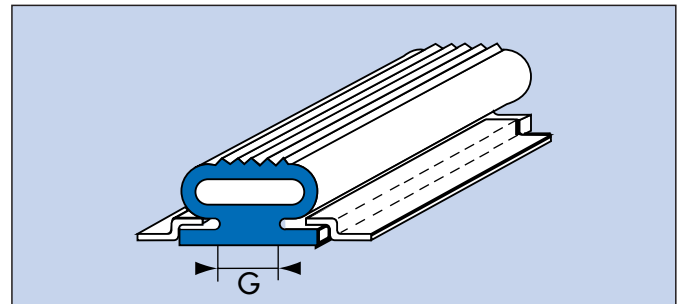
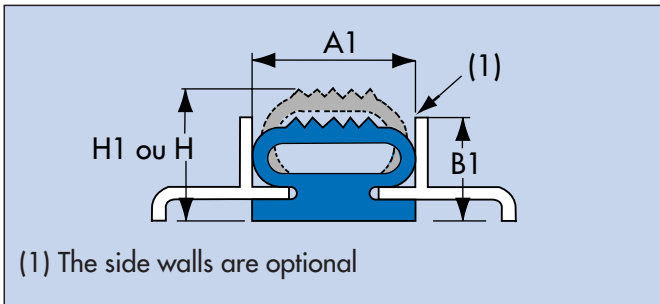
\* Profile 10126 E = 12 mm.

ASSEMBLY

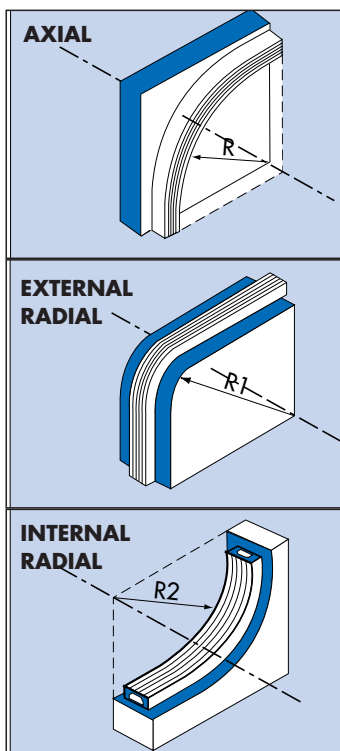
Dimension "B" corresponds to the seal in the idle position. When it is subjected to a pressure of 1,5 bar (seal in free position), H1 (maximum height) is obtained. Dimension H is the **normal working value**, intermediate values can also be used between B and H.

The foot must, without fail, be secured at the side when the seal is subjected to an external pressure acting on its side. Specially in the axial position, the standard LP "CEFILAIR®" seals must be maintained in the radii by quadrants in the groove "G" of each side.

Fixings examples :



Note : Other fixing systems can be considered ; they are left up to the user's initiative and are to be supplied by him.



CURVE RADII (between 2 straight lengths)

STANDARD LP PROFILES						
Ref. No Silicone	Ref. No SBR	A x B		R mini	R1 mini	R2 mini
921	10152	30	20	100	70	80
704	10118	40	27	120	80	90
736	10211	60	35	170	90	105
828	10126	90	55	380	300	350
—	10094	130	70	740	460	650
—	10170	150	80	1000	560	700

Nota : For profiles other than silicone, increase the above values R/R1/R2 by 20 %.

Please consult our technical department for small sized circular seals.

In order to obtain the full expansion and retraction of "CEFILAIR®" pneumatic seals, guaranteeing their maximum efficiency the minimum curve radii in the corners must be adhered to. Th opposite diagrams define the value of "R" according to th position of the curve in relation to the direction of the expansion.

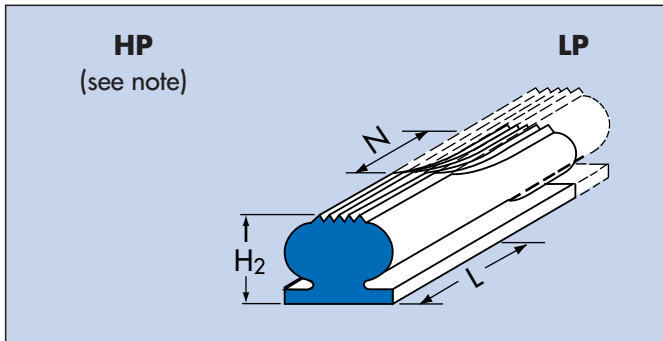
## END PLUGS

Elements in straight lengths may be obtained by plugging the ends, using "solid" end plugs. In this case, the plugged parts are neutralised, as neither expansion or contraction can occur.

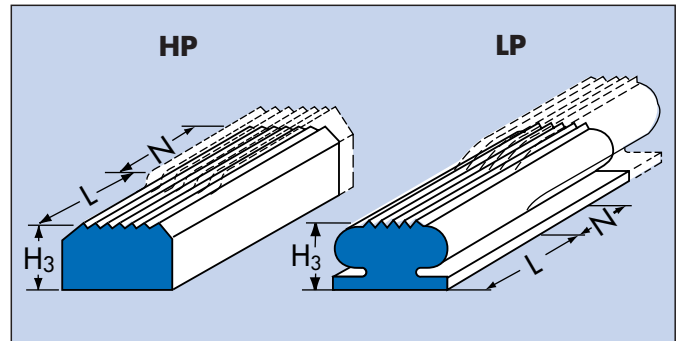
In this arrangement, the most suitable form for the desired application will be chosen, either by plugging the

expanded seal or plugging the retracted seal. When using either solution, it is necessary to provide flanges or end plates to hold the seal and to prevent tearing caused by expansion of the seal (see fig. 5).

### Type with expanded end (figure 4)



### Type with retracted end (figure 3)



**Note :** For HP profiles it is not always possible to manufacture expanded end plugs by joining of rubber inside of the profile, so we can mould an additional part

of rubber outside of the profile to obtain the height required. (between H3 and H2).

#### STANDARD HP PROFILES

Réf. No Silicone	Réf. No SBR	A x B	H <sub>2</sub>	H <sub>3</sub>	L	N
339	10035	16 x 12	15	13	16	5
347	10036	16 x 18	21,5	19,5	16	5
356	10041	22 x 19	22,5	20,5	22	6
443	10039	26 x 19	23,5	20,5	26	7
405	10042	27 x 21	26	23	27	7
627	10175	35 x 26	34	29	35	9
369	10217	35 x 32 R	45	35	35	9
415	10102	6,5 x 5	6,5	5,5	6,5	2
512		14 x 10	13	11	14	5
639		16 x 14	17,5	15,5	16	4
603	10177	20 x 20	24	21,5	20	5
514	10351	21 x 24	29	26	21	6
529		54 x 40	48	42	54	14

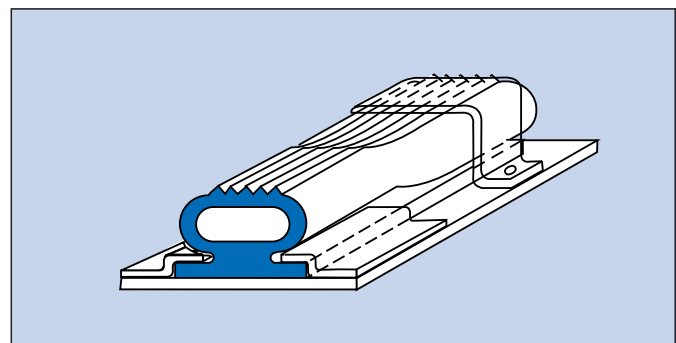
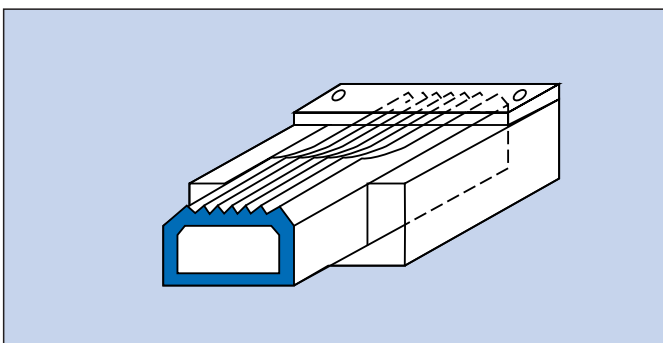
#### STANDARD LP PROFILES

Ref. No Silicone	Ref. No SBR	A x B	H <sub>2</sub>	H <sub>3</sub>	L	N
921	10152	30   20	25	22	20	15
704	10118	40   27	35	29	25	20
736	10211	60   35	50	38	40	30
828	10126	90   55	75	60	60	45
—	10094	130   70	100	80	80	65
—	10170	150   80	110	90	100	80

**Note :** The dimension N represents the intermediate part between the seal and the end plug which cannot come into contact with the face to be sealed. The efficiency of the seal is only obtained beyond L + N.

**These parts must not be outside the support faces under any circumstance.**

### Flange or retaining plate (figure 5)

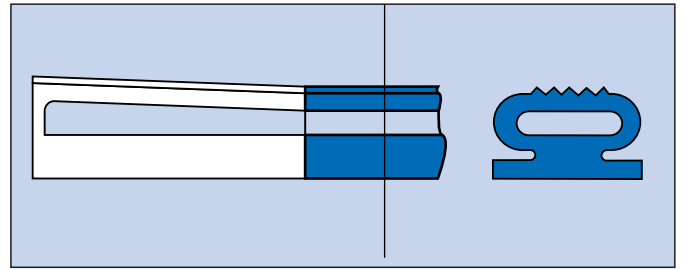
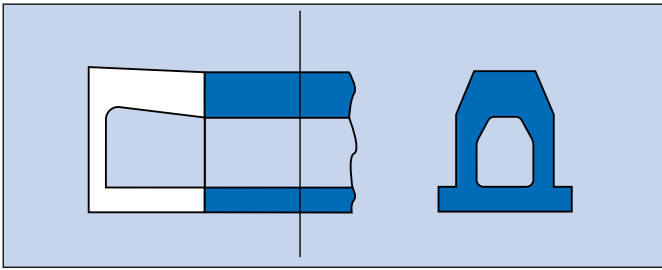


## END PLUGS

Special end plugs : "Expandable"  
For specific applications required expansion almost all

along the seal we can produce at your request  
"EXPANDABLE END PLUGS".

Examples :

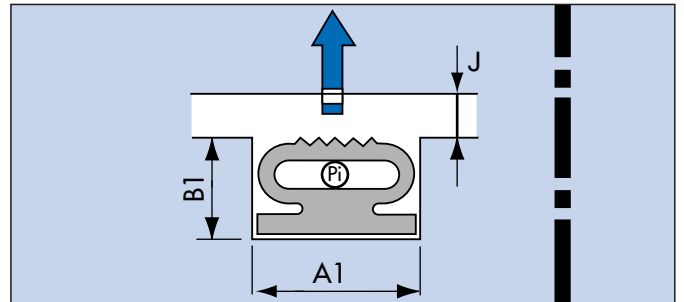
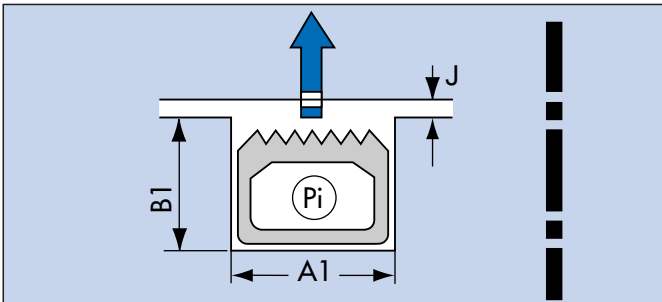


**PLEASE CONSULT OUR TECHNICAL DEPARTMENT**

## DEFINITION OF SEAL ACCORDING TO DIRECTION

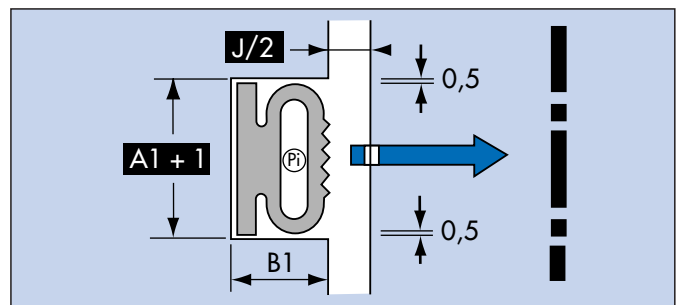
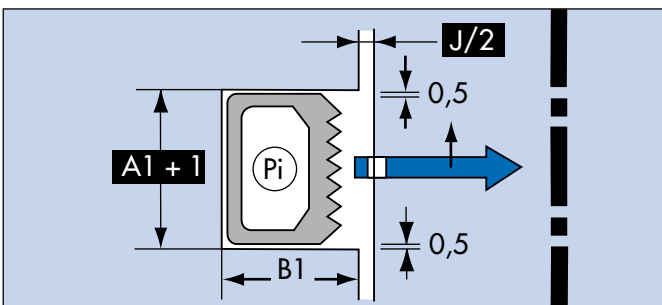
### AXIAL EXPANSION (ARRANGEMENT I)

The working pressure  $P_i$  is normal



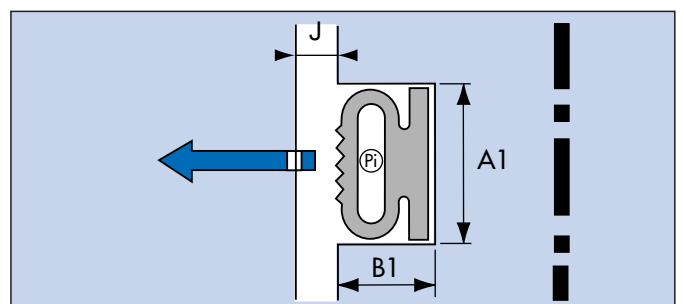
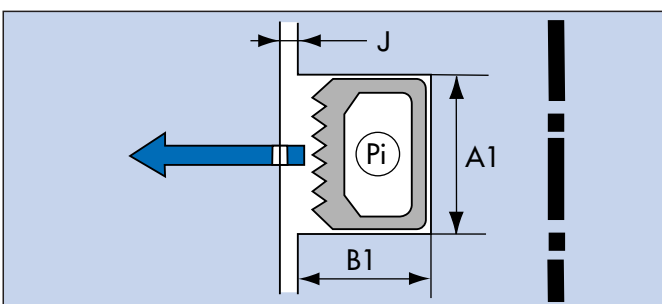
### INTERNAL RADIAL EXPANSION (ARRANGEMENT II)

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.



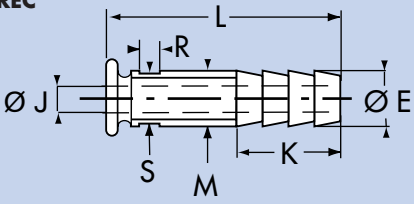
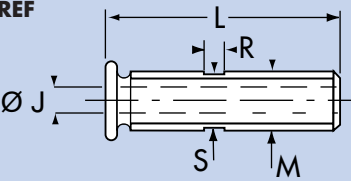
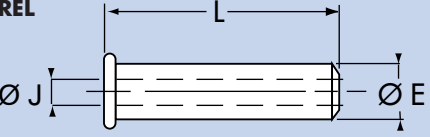
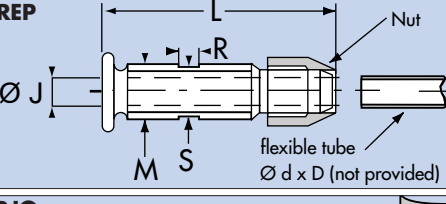
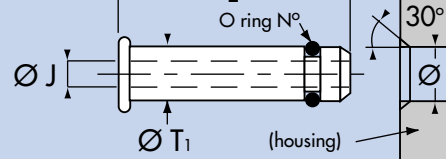
The circular arrangements I, II and III are therefore valid for shaped seals provided the radii  $R$ ,  $R_1$  and  $R_2$  are adhered to page 4 and 5.

## FITTINGS AND VALVES

Our standard fittings and valves are manufacture in brass.

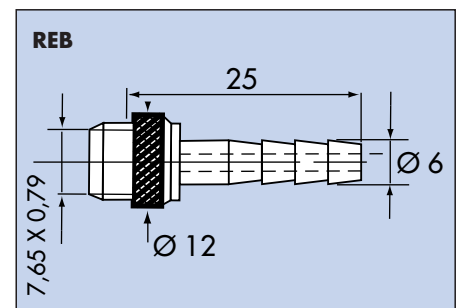
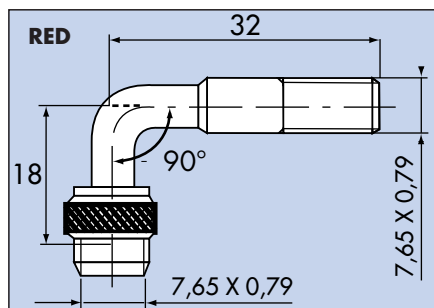
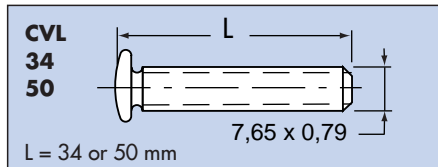
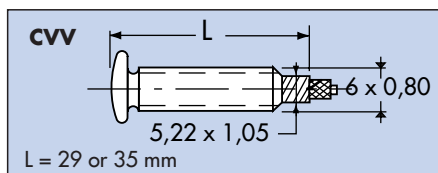
We can also produce fittings in any other material (bronze, stainless steel, etc...)

### STANDARD FITTINGS

<b>REC</b>		$\varnothing E$	4	6	8	10	12						
		M	M6	M8	M10	M12	M14						
		$\varnothing J$	1,5	3	5	6	6						
		K	12	16	16	20	20						
		L	30/35 40/50	30/35/40 50/60	40/45/50 60/70/80	40/50/60 70/80/60	50/60/70 80/90/100						
		SxR	5x6	6x6	8x8	10x8	11x8						
<b>REF</b>		M	M4	M6	7,6,5x0,79	M8	1/8 G	M10	1/8 NPT	M12	1/4 G	M14	M16
		$\varnothing J$	1,2	3	3	3	5	5	5	6	6	6	8
		L	15/20/25 30/35/40 50	15/20/25 30/35/40 60	20/25/30 35/40/50 50/60	15/20/25 30/35/40 60/70	20/25/30 35/40/50 60/70	20/25/30 35/40/50 60/70	20/25/30 35/40/50 60/70	20/25/30 35/40/50 60/70	20/25/30 35/40/50 70/80	30/35/40 45/50/60 70/80	40/45/50 60/70/80 90/100
		SxR	3x4	5x6	6x6	6x8	8x8	8x8	8x8	10x8	10x8	11x8	13x10
<b>REL</b>		$\varnothing E$	4	6	8	10	12	14	16				
		$\varnothing J$	1,5	3,4	3,4	5	6,8	6,8	8,5				
		L	15/20/25 30/40	15/20/25 30/35/40 50	20/25/30 35/40/50	25/30/35 40/45/50 60	30/35/40 45/50/60 70	35/40/45 50/60/70 80	45/50/60 70/80/90				
<b>REP</b>		M					M10	M12	M14				
		$\varnothing J$					3	5	7				
		dxD					4x6	6x8	8x10				
		L					50/60/70	50/60/70 80	60/70/80 90				
		SxR					8x8	10x8	12x8				
<b>RJO</b>		$\varnothing T_1$	4	6	8	10	12	14					
		$\varnothing T$	4H8	6H8	8H8	10H8	12H8	14H8					
		$\varnothing J$	1	1,5	2	4	5	6,8					
		Oring N°	11018	15001	15004	15006	15007	15008					
		L	15/20/25 30/40	15/20/25/30 35/40/50	15/20/25/30 35/40/50	20/25/30/35 40/45/50/60	25/30/35/40 45/50/60/70	35/40/45/50 60/70/80					

Note : RJO fitting can be provided with a locking screw which is perpendicular to the blind hole.  
In all cases it is necessary to be very careful during assembly because of the O ring (chamfers 30° sharp edges...)

### STANDARD VALVES



RED elbow fittings and REB fittings can only be fitted to CVL valves.

	CVV	CVL	RED	REB
<b>Non return valves</b>	yes	yes	yes	no

### SPECIAL FITTINGS

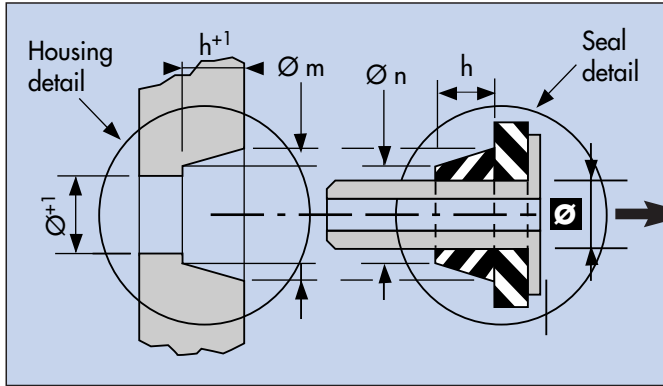
In addition to standard fittings, we can manufacture any type of specific fitting to your requirement.  
For example : armed or wrapped flexible fittings which can

be directly connected to your installation (PLEASE CONTACT OUR TECHNICAL DEPARTMENT).



## MOULDED CONES

### MOULDED CONES (STANDARD SIZES) <sup>(1)</sup>



For a maximum binding (Metal/rubber) "CEFIL'AIR®" pneumatic seals are equipped with a moulded cone or the foot of pressure connection according to diameter of these (Fitting or valve).

Ø	4	4	6	8	10	12	14	16	18
m	6	8	12	14	21	24	26	28	30
n	5	6	10	12	14	16	18	20	22
h	3	4	6	6	10	10	12	12	12

Note : For REC, REF, REP fittings, and CVL and CVV valves consider the size of the thread part (M) as  $\emptyset$  of the connection. In case of intermediate value (inch dimensions) take the next larger cone.  
 (1) (For all other sizes, please contact us).

## ASSEMBLY CONDITIONS

### SURFACE FINISH

The parts of the seals in contact must have a good surface finish ; this applies, in particular, to the part to be sealed on the side in contact with the seal.

For the grooves, as-rolled sheet is perfectly suitable, but any deposits or scale must be removed.

Welds must be made flush.

The mean roughness obtained by machining (lathe, mill,

planer, etc.) must not be less than the value of 0,8 to 1,6 microns Ra (L.C.A. Rugotest, standard N6 - N7). However, for a unit intended for applications where high performances will not be required, 3,2 microns Ra will be permissible (standard N8, L.C.A. Rugotest). Transverse scratches and local damage to the bearing surfaces to be sealed are prohibited.

### PREPARATION OF GROOVES AND CONTACT FACE

Before any operation is performed, a check must be made to ensure that the groove taking the seal is free from roughness : grit or weld spatter, flash or projections and

sharp edges. Brushing with a wire brush, followed by degreasing with a suitable solvent is recommended.

### INSTALLATION

1/ - The seal must be absolutely free from internal pressure at the time of fitting. If the valve is equipped with its mechanism, this must be removed throughout the time necessary for this operation.

3/ In order to fit the seal correctly, it is necessary to pressurise it immediately after positioning it in the glued groove, while observing the operation recommendations, i.e. perfectly captive on its four faces.

2/ - The operation of fitting the seal in the groove must start, without fail, by positioning the pressure connexion (fittings or valve) in the housing, but without fixing it mechanically, as this operation is the last to be done.

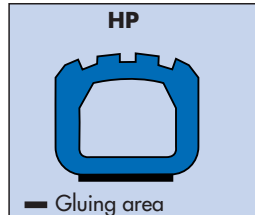
4/ It is possible to leave the "CEFIL'AIR®" seal pressurised throughout the time necessary for drying or vulcanizing the adhesives ; it is also possible, after a short drying time, to retract it in order to complete the setting operation. However, it must only be moved after the bond is fixed completely.

## ASSEMBLY CONDITIONS

### FIXING THE SEALS

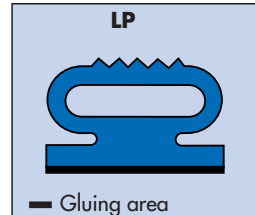
Although "CEFIL'AIR®" pneumatic HP seals can be fitted in grooves without any form of retention, it is preferable to glue them to the bottom of the grooves. For this operation, we recommend the use of our **general-purpose** adhesive "Céfilgrip" which is to be applied directly to the metal when it has been thoroughly degreased and is free from rust or scale.

**HP seals must be secured by the part opposite that of the seal (bottom of groove only), avoiding the use of any adhesives on the lateral parts.**



For arduous uses of silicone "CEFIL'AIR®" pneumatic seals we recommend to prepare the fixing face by sandblasting and employment of adhesion primer :

( Metallic faces → 4094 ) + silicone mastic  
( other surfaces → MB ) CAF N° 1



**LP seals will preferably be fixed mechanically, but, if an adhesive is necessary, only the fixing heel must be used.**

### FIXING THE PRESSURE CONNECTION

The housing hole needs to have a conical part according to indications on page 9, to receive the rubber moulded cone of the seal. In the case of threaded connections (REC, REF, REP, CVL and CVV) tightening must be moderate and during this operation it is absolutely necessary to maintain the connection to avoid destroying THE ELASTOMER TO METAL BOND.

### POSITION OF PRESSURE CONNECTION

"CEFIL'AIR®" pneumatic seals conception requires that connections be located at the bottom of grooves or at the end of seals (straight length). When seals have radii curves it is preferable to avoid connections located in the curved area. If the equipment around the seal for assembly or other reasons requires a lateral supply, it is possible to use elbow fittings or special constructions (please consult our technical department).

## WORKING CONDITIONS

### EXTERNAL PRESSURE AT THE SEAL

"CEFIL'AIR®" seals are designed to provide tightness when the enclosure formed is pressurised. In this case, they are stressed by a force which is applied externally to the seal and which tends to force it either towards the outside of the pressurised enclosure or towards the inside of a vacuum enclosure.

#### a) Pressurised 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 pressurisation of the seal.

In these applications, it is always necessary **to reduce dimension "J" to a minimum**, restricting the surface to which the pressure of the enclosure will be applied, in

order to reduce the radial component or, depending on the arrangement, the axial component, as far as possible as this tends to force the seal outwards.

Generally speaking, the external pressure on the seal "PE" is taken as a ratio of 0,7 to 0,8 of the internal pressure "Pi" of the "CEFIL'AIR®" seal, but with the limits laid down in the table concerning profiles (pages 4-5).

#### b) Vacuum enclosures

The condition of the surfaces in contact, as well as the completion of the assembly operation, make it possible for "CEFIL'AIR®" seals to withstand a vacuum of  $10^{-3}$  Torr (dynamic vacuum).

### INTERNAL PRESSURE OF THE SEAL

**When free, "CEFIL'AIR®" seals must not be subjected to pressure  $\geq 0,8$  to  $1,5$  bar (according to the type of profile).**

When fitted in a groove, they are perfectly leaktight at an internal pressure 1,25 to 1,45 times the pressure to seal.

The maximum pressure which the seals can withstand depends on the clearance between the supporting frame and moving panel (see the tables of profiles pages 4-5). The pressure can be higher when there is very little clearance.

## TYPES OF ELASTOMERS

"CEFIL'AIR®" pneumatic seals are mainly produced from elastomers with high mechanical properties : silicone and SBR.

Although these are high performance materials, the mixes are not suitable for all applications, and consequently, other elastomers are also used.

Elastomers	Ref.	$\Delta$ Sh	Temp. range °C	Properties
<b>Styrene - Butadiene</b> <b>SBR</b>	1 A 60	60	-20 +100	Good resistance to : - water, - demineralised water, - air, - diluted acids and bases, - ketones. Abrasion-resistant.
<b>Chloroprène (1)</b> <b>CR</b>	4 B61K	60	-20 +110	<b>Ditto SBR</b> But with better resistance to ultraviolet rays and ozone. Low resistance to grease.
<b>Butyl (1)</b> <b>IIR</b>	5 B 60	65	-20 +120	Good resistance to : - Diluted acides and bases. - Ketones. - Very low permeability.
<b>Ethylène Propylène (1)</b> <b>EPDM/EPM</b>	6 B 65	65	-30 +150	Good resistance to : - water, steam and atmospheric conditions Low resistance to hydrocarbon.
<b>Silicone</b> <b>Q</b>	C 65 M	56	-90 +250	Good resistance to : - Dry and humid heat - Steam P ≤ 6 bars - Cold - Very low oil resistance - Does not age
<b>Fluorosilicone (1)</b> <b>MFQ</b>	C 65 M/F	56	-65 +200	<b>Ditto Silicone.</b> With good resistance to aromatic hydrocarbons. Chlorinated solvents.
<b>Viton® (1)</b> <b>FKM</b>	3 E 65	65	-20 +180	Good resistance to : - Chlorinated solvents. - Aromatics. - Strong acids and bases.

(1) Profiles not kept in stock, produced on special request. (Please contact our technical department).

*Note :* This information represents broad outlines for use. Reservations must be made regarding application according to temperature, exposure and service life.  
**Due to the relative permeability of elastomers** (in contact with air or gas) notably for silicone it is

necessary to provide regulation for this type of inflation. It is also possible to use other fluids (water, oil ...) **to prevent elastomer gas permeability.** (Please contact our technical department).

**APPLICATION FORCE (CALCULATIONS)**

“CEFIL’AIR®” seals are retracted even with a residual internal pressure. Their expansion occurs above the latter and brings the contact and sealing face against the moving part. The pressure necessary for expansion varies a little over a whole range of arrangements and depending on the profiles used.

In the majority of cases, the minimum operating pressure is 1,5 bar ; this corresponds to an application force proportional to a unit 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<sub>i</sub> = Internal pressure of the seal in bar

LD = Expanded length of the seal in cm

K<sub>j</sub> = Coefficient of unit contact surface

Réf.	512	339	347	356	443	405	627	369	415	639	603	514	529	921	704	736	828	10094	10170
K <sub>j</sub>	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 <sub>i</sub>	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 N° 347, mean diameter 1500 mm used with internal pressure  
P<sub>i</sub> = 2 bars

$$F_j = (P_i \times K_j) \times \pi \varnothing^{(1)}$$

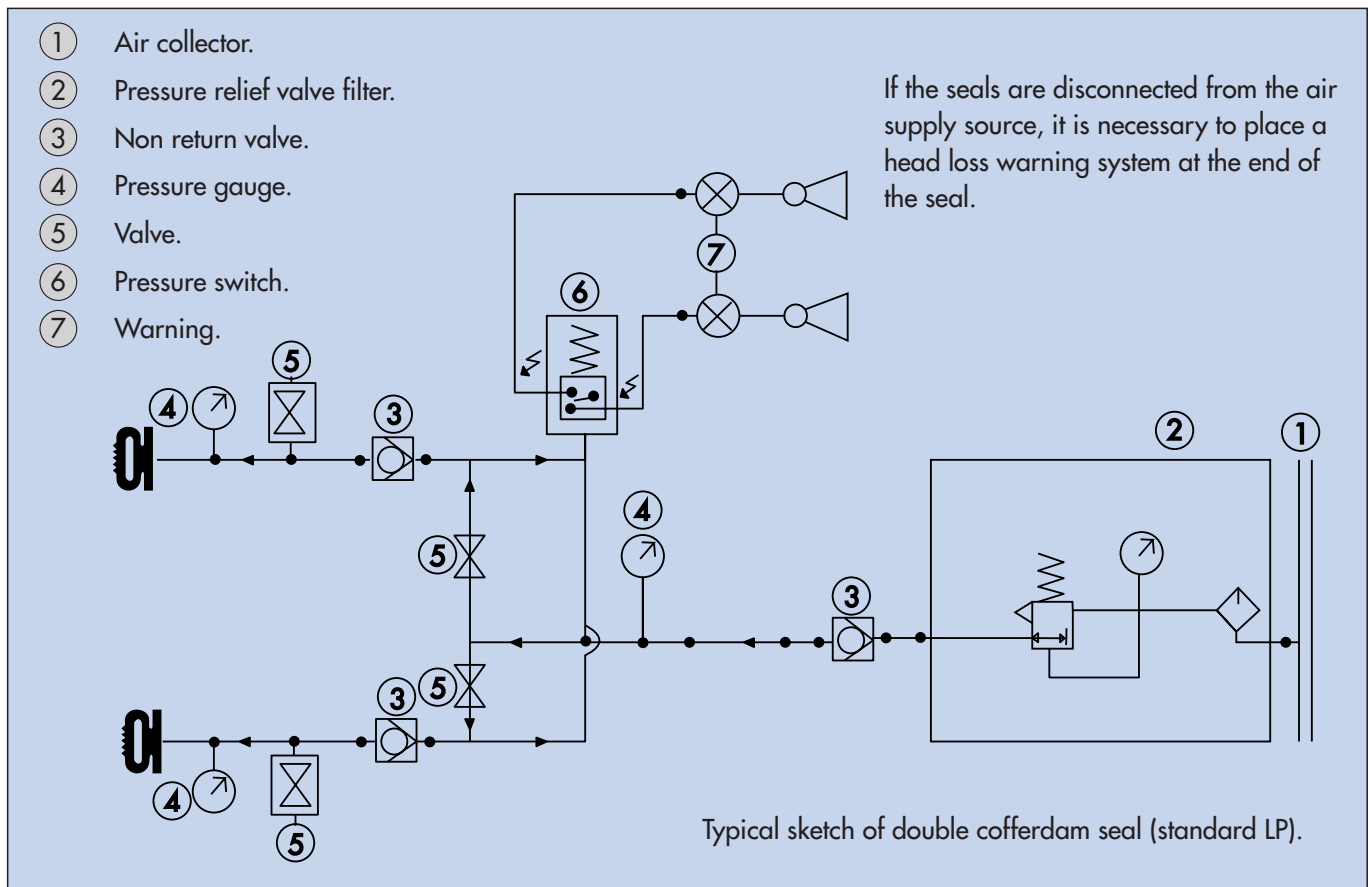
$$= (2 \times 1,2) \times (3,14 \times 150 \text{ cm}) = 1.130 \text{ da.N}$$

(1) Ø<sub>m</sub> = mean diameter of seal

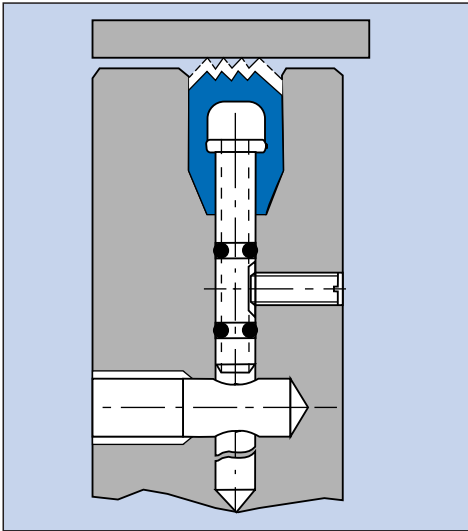
**SUPPLY OF MOTIVE FLUID**

“CEFIL’AIR®” pneumatic seals can be supplied either with air or neutral gas and also with water. However, it is necessary to provide a constant supply which

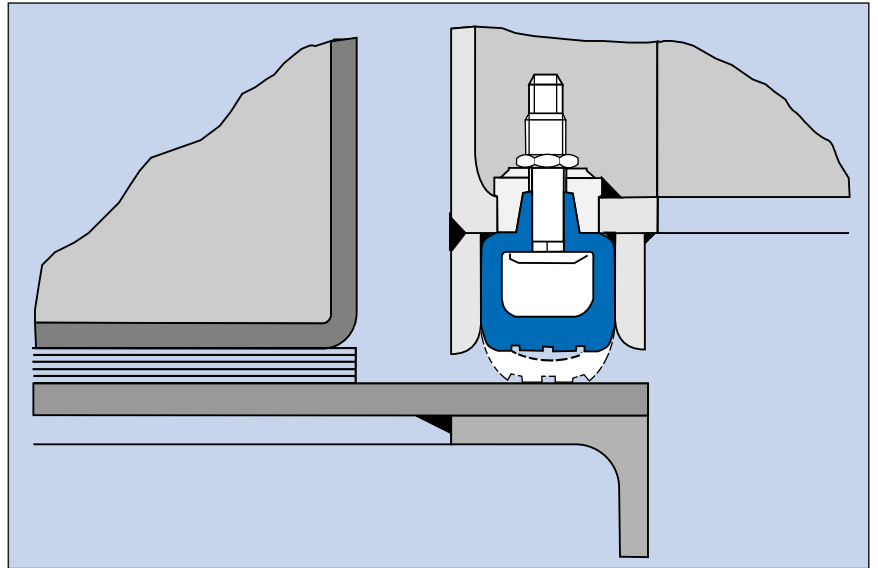
must be guaranteed by pressure regulator to avoid overpressures.



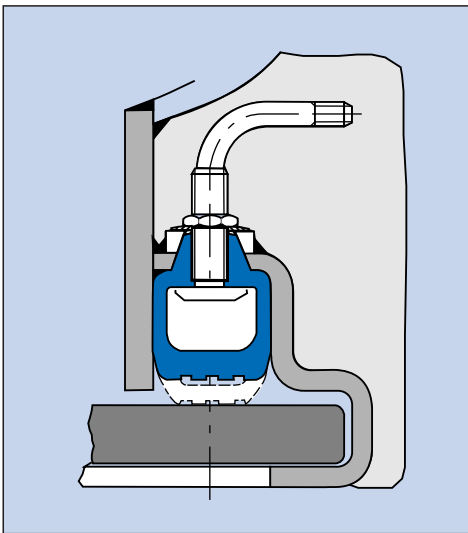
**EXAMPLES OF APPLICATION : "Sealing"**



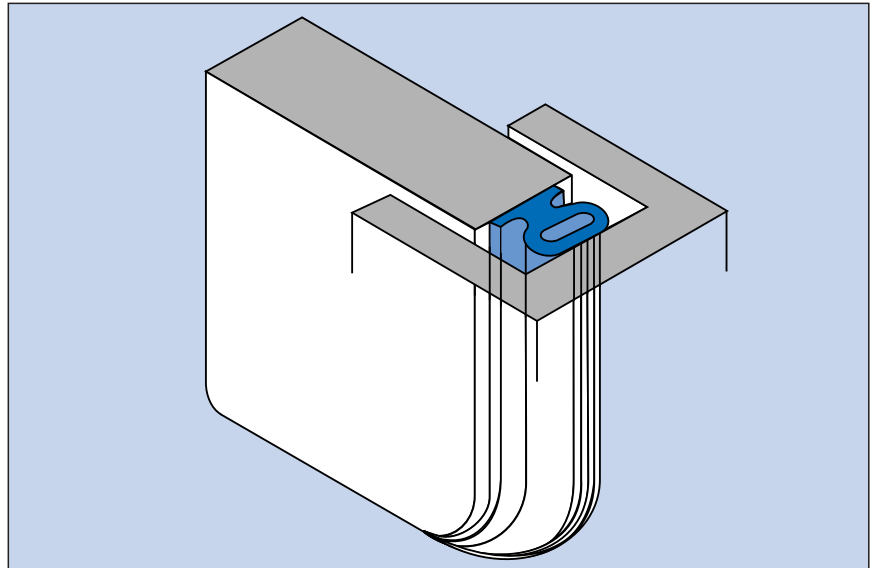
**MOBILE BULKHEAD SEAL USING PROFILE REF. 514**



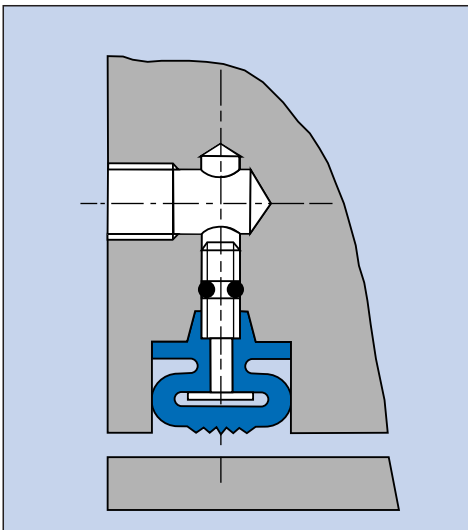
**SEAL ON ISOTHERMAL BULKHEAD USING PROFILE REF. 369**



**STERILISER DOOR SEAL USING PROFILE REF. 369**



**SEAL FOR COOLING POND COFFERDAM USING PROFILE REF. 10094.**



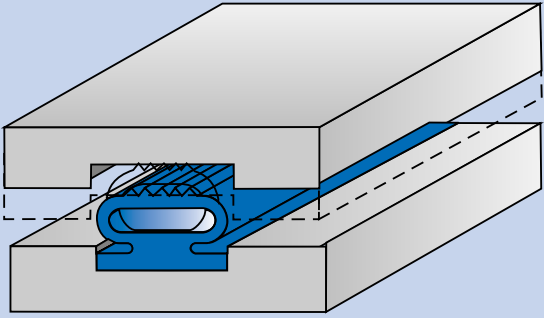
**NUCLEAR POWER STATION SEALING DOOR USING PROFILE REF. 10093.**

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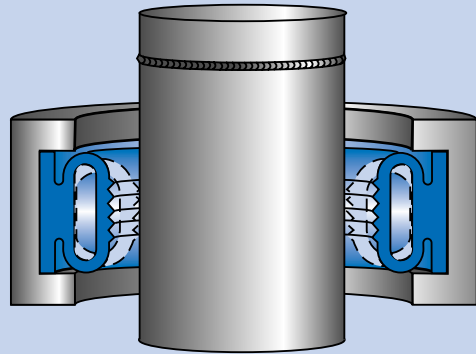
## EXAMPLES OF APPLICATIONS : "Handling"

"CEFIL'AIR®" pneumatic seals can also be used for the moving, handling, holding or clamping, particularly for fragile or complex geometry objects. (see following sketch).

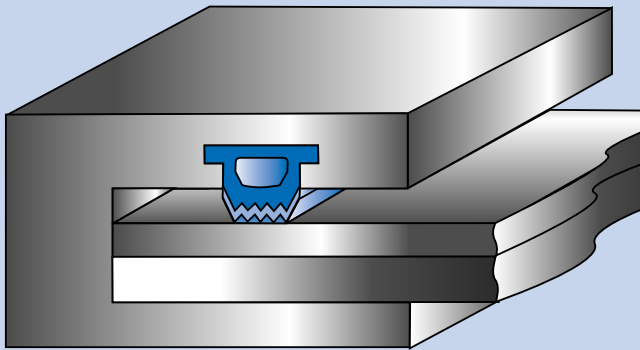
TO LIFT



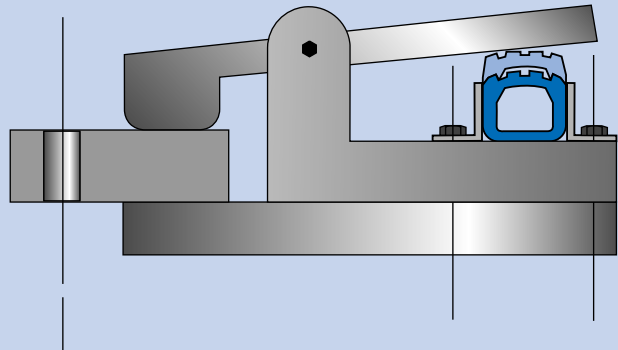
TO HOLD



TO PRESS

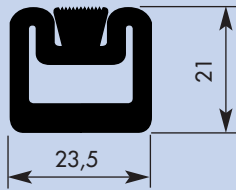


TO CLAMP

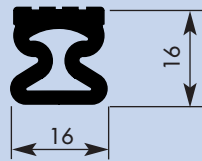


## OTHER EXAMPLES OF PROFILES

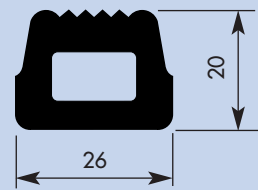
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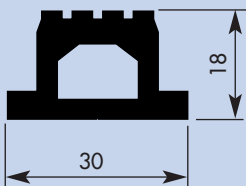
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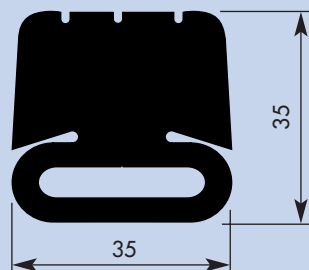
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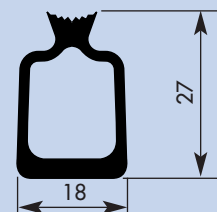
372



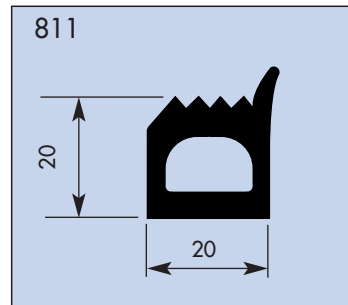
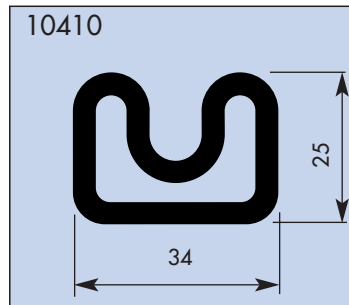
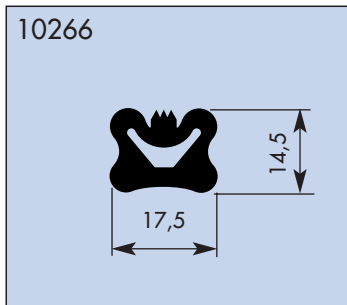
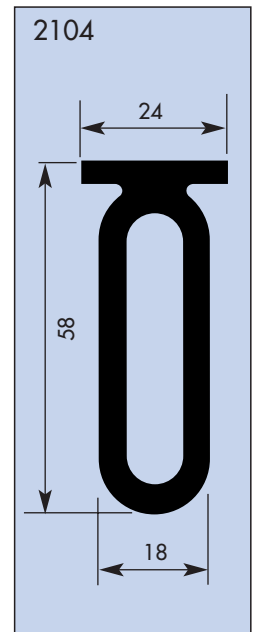
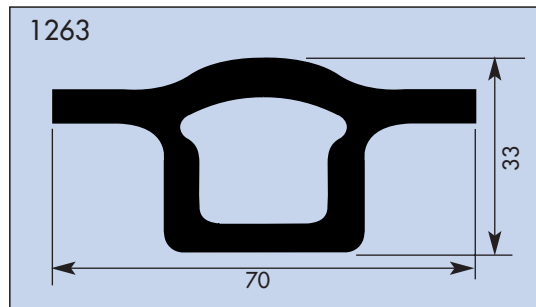
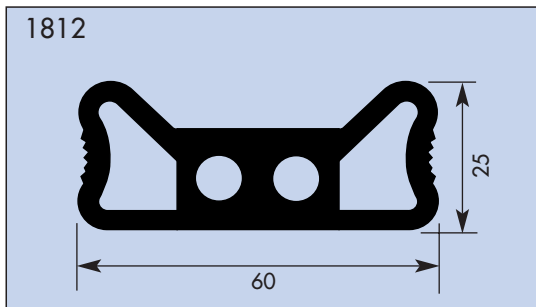
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2239



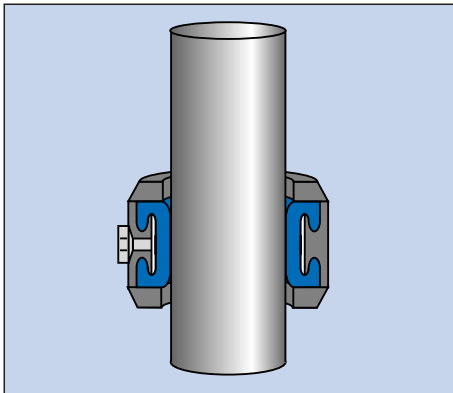
## OTHER EXAMPLES OF PROFILES



## OTHER APPLICATIONS

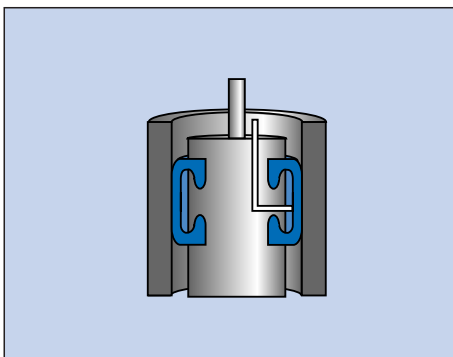
### SMALL SIZE SEALS

#### Principle



#### Locking on shaft

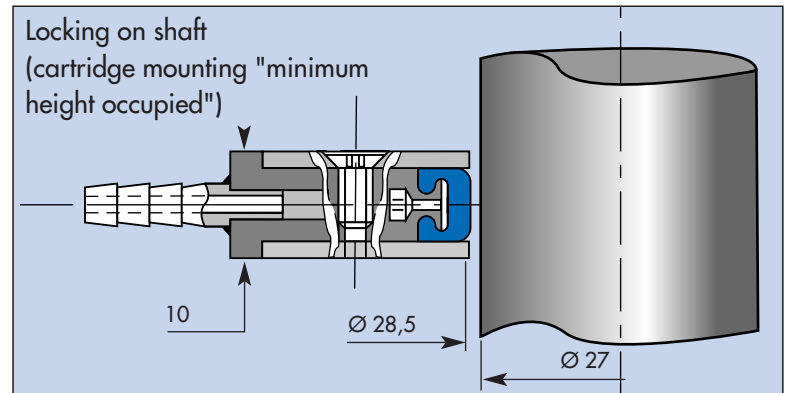
Application : Handling of cylindrical pieces



#### Hole tightening

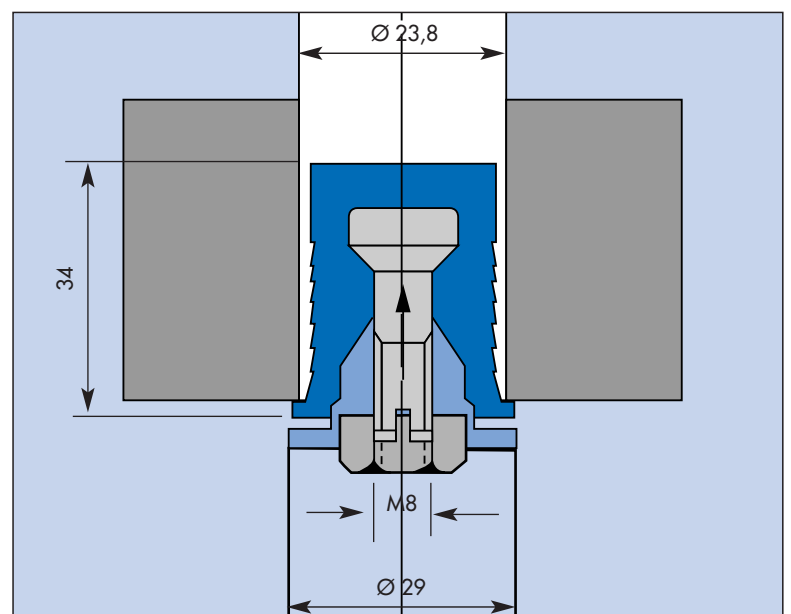
Application : Handling hollow pieces (tube, bottle...)

#### Examples :



### END PLUGS FOR TUBE

Example : "Mechanical expansion"



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