

# SPRING ENERGIZED SEALS

Technical documentation



# Spring energized seals

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## PART NUMBERING

M04320-5H01-0106

M : Metric dimension

04320 : Groove dimension in mm (432.0)\*

5 : Seal cross-section

H01 : Seal type, Helicoil spring

01 : Jacket material code 01

06 : Spring material CR-Co-Ni

\* Always indicate groove dimension.  
5 digits, accuracy 1/10 mm

\* Always Outside diameter

\* **Exception**, for outside face seals the indicated groove dimension is the Inside Groove dimension.

# Spring energized seals

## COMPANY - Products

**Spring Energized Seals (SES)** are machined in a U-shaped form, from PTFE, PTFE compounds and other high performance polymers.

The outer shape and the inner shape vary, depending on the application and the metal energizer which is selected for the application.

Spring Energized Seals are available with a variety of spring elements, each carefully selected to meet the specific demands of the service conditions.

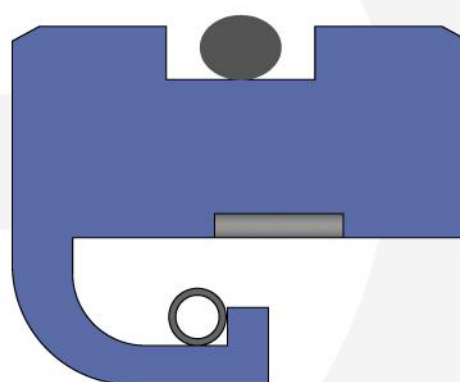
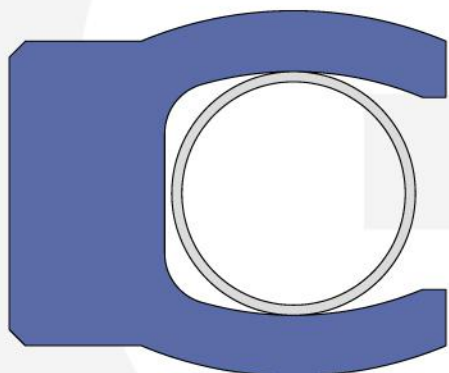
High temperature applications require different spring loads than cryogenic applications. For low friction applications both seal design and spring selection are equally important.

The special formulated PTFE compounds, allow the Spring Energized Seals to operate successfully in temperature ranges from almost - 270°C up to plus 300°C. They are also inert to virtually all chemicals except molten alkali metals, fluorine gas at high temperature and chlorine trifluoride. To maintain this

high level of corrosion resistance, the energising elements are fabricated from stainless steels such as 1.4401 , Cr-Co-Ni alloys such as Elgiloy® and Phynox, Hastelloy® and others.

Depending on the application, also elastomer O rings can be used as an energiser. For lower temperature NBR or FKM can be selected. For higher temperatures Silicon or FFKM can be used.

**Lipseals** are specially developed for rotary application where Spring Energized Seals would generate too much friction and heat because of the relatively high load spring. The function of the **Lipseals** is based on the tension in the seal lip only. For special applications however a garter spring is used for low but positive control on the lip. Lipseals are machined from the same high performance PTFE compounds as the Spring Energized Seals. Sealing on the bore side is done with an elastomer O ring. For applications with higher temperature a metal insert is applied to prevent the seal from shrinking. The outer elastomer O ring can be replaced by a Spring Energized Seal.

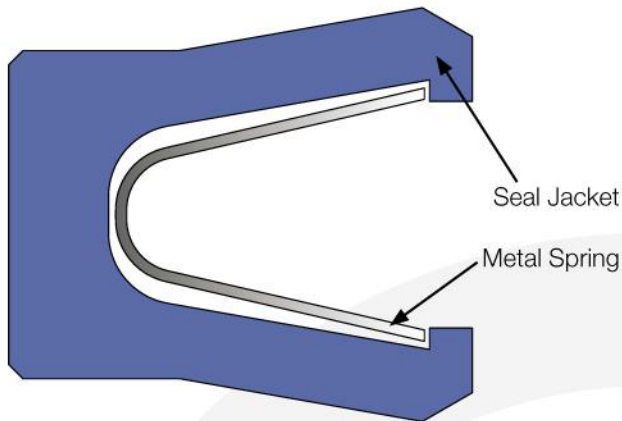


Special designs and dimensions not covered in this catalogue can be manufactured, according to your or our designs

If your application requires a special solution, we invite you to send complete details for review and recommendations by our technical department

# Spring energized seals

## Spring Energized Seals Components



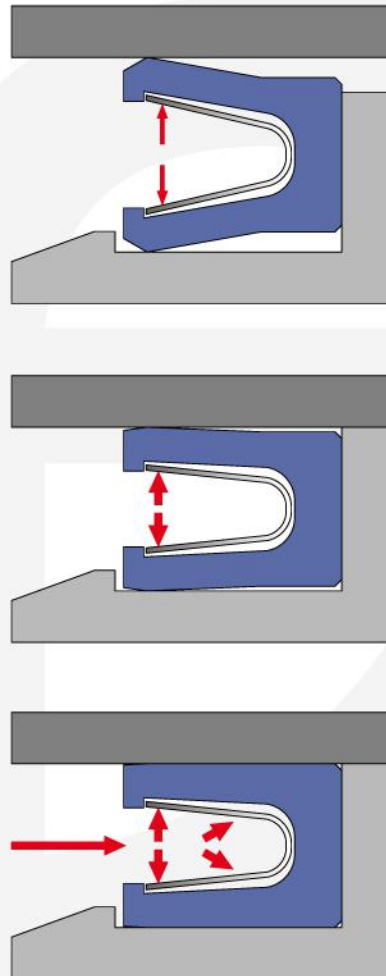
A Spring Energized PTFE Seal consists of an outer jacket, precision machined from PTFE or a filled PTFE or another suitable fluoropolymer. The jacket partially encapsulates a corrosion resistant and resilient metal spring. Small retainers at the front side of the spring cavity locks the spring in the seal.

## Function

At installation the seal lips and the metal spring are compressed. The seal lips have little resistance against the compression, but the spring exercises a load high enough to press the seal lips against the seal faces.

Fully compressed in the seal groove, the spring exercises its maximum load and will here by create positive sealing in a wide temperature range.

In addition with the spring load, the system pressure will add extra load on seal lips and create thereby a higher seating load. The seal will also be pushed against the opposite side of the seal groove.



# Spring energized seals

## SURFACE FINISH

The mating surface or counter surface for the spring Energized seal has a huge impact on the seal performance. Too rough finish can create leak paths and will also wear out the seal too fast.

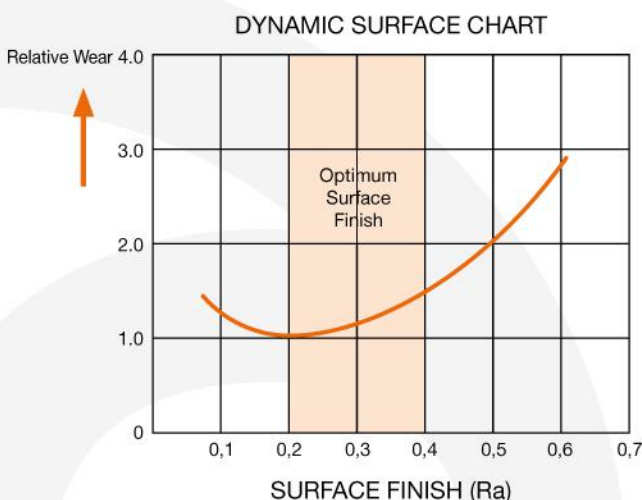
For dry running applications, both reciprocating or rotating it is advised to use a surface finish between 0,2 and 0,4 Ra with no peaks and a flat surface area of minimum 50%. This topographic structure will allow the transfer of PTFE particles into the surface and thereby

creating a thin PTFE film. This film reduces friction and thereby wear.

For lubricated applications it is advised to machine similar surface finish. In this case the fluid will create a lubrication film and wear will be greatly reduced compared with dry running applications.

For gas tight seals both mating surfaces shall have the best possible finish, regardless whether the application is static or dynamic.

MEDIUM	SURFACE FINISH	
	DYNAMIC	STATIC
Cryogenic Fluids Helium Gas Hydrogen Gas	0,1 to 0,2 Ra N2 - N3	0,1 to 0,2 Ra  0,15 to 0,3 Ra
Air Nitrogen Gas Argon Gas Natural Gas Fuel	0,15 to 0,3 Ra N3 - N4	0,15 to 0,3 Ra
Water Hydraulic Oil Crude Oil	0,2 to 0,4 Ra N3 - N5	0,2 to 0,4 Ra



## HARDNESS

The hardness of dynamic surfaces is very important. Too soft materials can result in parts of the groove material breaking loose and embedding in the seal surface. If this happens it will destroy the initial good

surface very rapidly. The ideal hardness for demanding applications is about 60 HRC. Abrasive media may require additional surface treatments, to increase the wear resistance.

## ASSEMBLY

Spring Energized Seals cannot be stretched as elastomer seals. Therefore the use of split grooves in piston and rod applications is always desirable. If assembly in a closed groove is unavoidable, consult our technical staff.

Assembly of Spring Energized Seals over sharp corners, keyways and so on should be avoided. A leading edge or chamfer shall be foreseen for shafts when entering into the assembled seal. If the seal is piston mounted then a chamfer shall be foreseen at the leading edge.

# Spring energized seals

## SEALS MATERIALS

### Jacket materials

PN CODE	Fluorten CODE	CODE Description	Colour	Application	Temp. Range	Coef. Friction	Relative Wear
1	F10-01	<b>VIRGIN PTFE**</b>	White	Static and dynamic applications, suitable only for light to moderate conditions. Low resistance to heat and wear but low gas permeability and discrete cryogenic properties. <b>Approvals: Norsok M710. FDA compliant.</b>	-260 °C +280 °C	0,09	1
2	F10-02	<b>MODIFIED PTFE**</b>	White	Improved version of the above material: better permeability (lower porosity), higher mechanical characteristics, lower deformation under load, better elasticity. <b>Approvals: Norsok M710. FDA compliant.</b>	-260 °C +280 °C	0,09	1
3	F10-04	PTFE/Glass/ MoS2	Grey	Good wear resistance. The presence of MoS2 reduce the coefficient of friction, the anti-sticking behavior. The MoS2 and the special low porosity glass fibers can improve the typical porosity of standard glass filled compounds.	-200 °C +220 °C	0,08	10
4	F10-06	MODIFIED FILLED PTFE	Black	Low filled modified PTFE. Excellent wear resistance, also dry running conditions.	-150 °C +280 °C	0,1	30
5	F10-08	POLYMER FILLED MODIFIED PTFE	Brown	Excellent wear resistance, also dry running conditions. Both rotating and reciprocating movements. Hard shaft material not required.	-200 °C +280 °C	0,12	35
6	F10-09	POLYMER FILLED MODIFIED PTFE	Tan	Low filled modified PTFE. Self lubricating material, optimal friction and wear properties, even at high temperature. Good for soft mating materials as it doesn't create wear on metals. Good for rotary and dynamic applications in general. Also good for food service.	-240 °C +300 °C	0,13	30
7	F10-12	UHMW-PE	White	Extreme wear resistance material (low temperature conditions). Excellent cryogenic properties. <b>FDA compliant.</b>	-270 °C +95 °C	0,2	50
8	F10-13	FEP	White	Excellent cryogenic properties. Often used as <b>STATIC</b> sealing material in oxygen applications.	-270 °C +220 °C	0,18	1
9	F10-14	PCTFE	White	Excellent material for moderate dynamic applications under cryogenic temperatures.	-270 °C +150 °C	0,15	20
10	F10-15	<b>PEEK Natural**</b>	Brown	High load resistance, also at elevated temperatures. Used as backup ring material both in radial and face seals. <b>Approvals: Norsok M710. FDA compliant.</b>	-200 °C +310 °C	0,25	20
11	F10-16	<b>PEEK CF**</b>	Black	High load resistance, also at elevated temperatures. Used as backup ring material both in radial and face seals. <b>Approvals: NORSOK M710.</b>	-160 °C +310 °C	0,15	20
12	F10-17	Polyamide	White	Used for back up and seals material	-70 °C +150 °C	0,35	50
13	F10-18	<b>PEEK FE**</b>	Brown	Lubricated PEEK. <b>Approvals: Norsok M710. FDA compliant.</b>	-160 °C +310 °C	0,25	25
14	F10-20	<b>PEEK FC30**</b>	Black	Lubricated and wear resistance PEEK. <b>Approvals: NORSOK M 710.</b>	-270 °C +310 °C	0,25	25
15	F10-21	<b>MODIFIED FILLED PTFE**</b>	Black	High filled modified PTFE. Excellent wear resistance, also dry running conditions. <b>Approvals: NORSOK M 710.</b>	-200 °C +310 °C	0,20	25
16	F10-22	<b>MODIFIED FILLED PTFE**</b>	White	High filled modified PTFE. Excellent wear resistance, also dry running conditions. <b>Approvals: NORSOK M 710.</b>	-270 °C +280 °C	0,10	30

Material marked (\*\*) are Norsok M 710 approved.

Special materials available on demand in according to applications, if required.

# Spring energized seals

## SEALS MATERIALS

### Spring materials

CODE NO.	Material Description	Seal Type				
		H01 - H10	U01 - U10	V01 - V10	W09 - W10	L1 - L8
						
01	Aisi 316 1.4401	standard	standard	standard	standard	standard
02	Double coiled Aisi 316	available	n.a.	n.a.	n.a.	n.a.
03	Inconel 718 2.4668	n.a.	n.a.	n.a.	n.a.	n.a.
04	Aisi 302	n.a.	n.a.	n.a.	standard	n.a.
05	CR-Co Alloy UNS R30003	standard	standard	standard	standard	standard
06	Double coiled UNS R30003	available	n.a.	n.a.	n.a.	available
07	17/7 PH 1.4568	n.a.	n.a.	n.a.	n.a.	n.a.
08	Hastelloy C-276 2.4602	on request	n.a.	n.a.	n.a.	n.a.
09	FKM O ring	available	n.a.	n.a.	n.a.	available
10	NBR O ring	available	n.a.	n.a.	n.a.	available
11	Silicon Filled	available	available	available	n.a.	n.a.
12	Spring + Silicon	n.a.	available	available	n.a.	n.a.
13	EPDM O ring	available	n.a.	n.a.	n.a.	available

Double coiled only as of cross section "3" or 1/8 inch  
Other materials on request

Hastelloy® C276 is a trademark of the Haynes Int. Comp.

# Spring energized seals

## STANDARD DESIGNS TYPE H01 UP TO H10

### RADIAL SEALS



Type 'H01' General purpose seal for shafts and pistons. Available cross-section 1/16" up to 1".



Type 'H02' As type 'H01', but with increased heel thickness for high pressure.



Type 'H03' As type 'H01', but with scraper at the ID.



Type 'H04' As type 'H03', but with increased heel thickness



Type 'H05' As type 'H01', but with scraper at the OD.



Type 'H06' As type 'H05', but with increased heel thickness

### RADIAL FLANGED SEALS



Type 'H07' As type 'H01', but with flange at the OD. Prevents the seal from rotating. Also assists in sealing the OD-side.



Type 'H08' As type 'H07', but with scraper at the ID.

### IN- and OUTSIDE PRESSURE FACE SEALS



Type 'H09' Inside face seal for internal pressure.



Type 'H10' Outside face seal for external pressure.

### PART NUMBER EXAMPLE

M02540-4H03-0104

M : Metric dimension and type

02540 : Diameter OD groove, accuracy 1 decimal\*

4 : Cross section 3/16

H03 : Type

01 : Jacket material, see page 6

04 : Spring material, see page 7

### \*VERY IMPORTANT

Diameter is outside diameter for type H01 up to H09.  
Inside diameter for type H10.

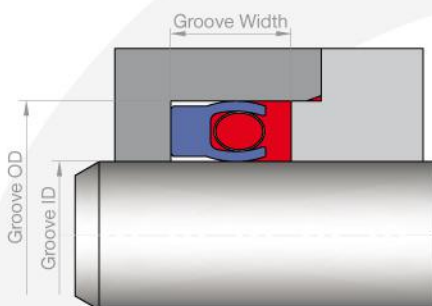
See the 'Application data form' on page 20/21, and send it to our technical service department.



# Spring energized seals

**Groove Dimensions Type H01-H02-H03-H04-H05-H06-H07-H08**

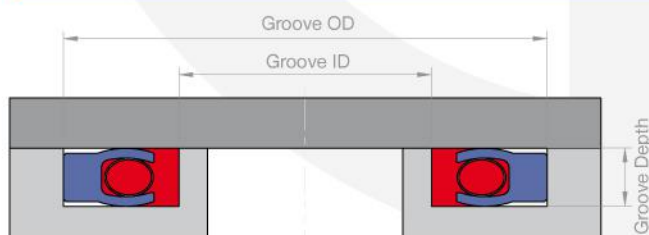
Cross section	Cross Section	Groove OD = Groove ID	Groove width Type	Groove widthType	Flange OD = Groove ID	Flange depth	Length Chamfer
Code	Size	All types	H01-03-05	H02-04-06-07-08	Type H07-H08	Type H07-H08	Type H07-H08
1	1/16	+ 2,85/2,95	2,4	3,8	+ 6,80	0,40	0,80
2	3/32	+ 4,50/4,60	3,6	4,6	+ 8,60	0,60	0,90
3	1/8	+ 6,15/6,25	4,8	6,0	+ 11,00	0,70	1,30
4	3/16	+ 9,45/9,55	7,1	8,5	+ 16,80	0,80	1,80
5	1/4	+ 12,10/12,20	9,5	12,1	+ 23,20	1,20	2,30
6	3/8	+18,75/18,85	13,5	15,80	+ 31,00	1,60	3,30


**Seal type 'H01' up to 'H10'**

The Spring Energized Seal type 'H01' up to 'H10' features average up to high spring loads. Excellent for static and low speed applications. The higher spring load also results in a better tightness when sealing gas or low viscosity fluids. Because of the helicoil spring this seal can easily be changed to fit non standard cross-sections. Assembly in a closed groove design is rather easy. Contact our technical service department for more information.

**Groove Dimensions Type H09-H10**

Cross section	Cross Section	Inside Face type 'H09'	Outside Face type 'H10'	type 'H09' - 'H10'
Code	Size	Groove OD = Groove ID	Groove ID = Groove OD	Groove depth
1	1/16	+ 4,80	- 4,80	1,40/1,45
2	3/32	+ 7,20	- 7,20	2,25/2,30
3	1/8	+ 9,60	- 9,60	3,00/3,10
4	3/16	+ 14,20	- 14,20	4,70/4,80
5	1/4	+ 19,00	- 19,00	6,00/6,10
6	3/8	+ 30,00	- 30,00	9,50/9,60


**Seal type 'H01' up to 'H10'**

Available diameters : 2 mm ID up to + 2 meter  
 Cross-sections : 1,25 mm up to 25 mm

See min. dia. for face seals on page 15  
 Available with chamfered heel and special back up to seal high pressure and high temperatures.

# Spring energized seals

## STANDARD DESIGNS TYPE U01 UP TO U10

### RADIAL SEALS



Type 'U01' General purpose seal for shafts and pistons. Available cross-section 1/16" up to 1/4".



Type 'U02' As type 'U01', but with increased heel thickness for high pressure.



Type 'U03' As type 'U01', but with scraper at the ID.



Type 'U04' As type 'U03', but with increased heel thickness



Type 'U05' As type 'U01', but with scraper at the OD.



Type 'U06' As type 'U05', but with increased heel thickness

### RADIAL FLANGED SEALS



Type 'U07' As type 'U01', but with flange at the OD. Prevents the seal from rotating. Also assists in sealing the OD-side.



Type 'U08' As type 'U07', but with scraper at the ID.

### IN- and OUTSIDE PRESSURE FACE SEALS



Type 'U09' Inside face seal for internal pressure.



Type 'U10' Outside face seal for external pressure.

### PART NUMBER EXAMPLE

M02540-4U05-0104

- M : Metric dimension and type
- 02540 : Diameter OD groove, accuracy 1 decimal\*
- 4 : Cross section 3/16
- U05 : Type
- 01 : Jacket material, see page 6
- 04 : Spring material, see page 7

### \*VERY IMPORTANT

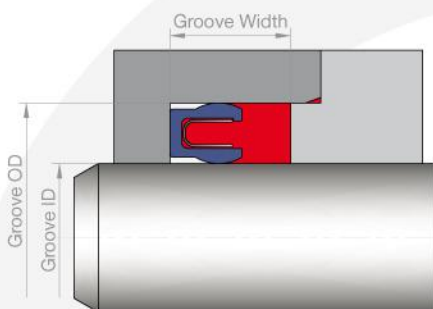
Diameter is outside diameter for type U01 up to H09.  
Inside diameter for type U10.

See the 'Application data form' on page 20/21, and send it to our technical service department.

# Spring energized seals

**Groove Dimensions Type U01-U02-U03-U04-U05-U06-U07-U08**

Cross section	Cross Section	Groove OD = Groove ID	Groove width Type	Groove widthType	Flange OD = Groove ID	Flange depth	Length Chamfer
Code	Size	All types	U01-03-05	U02-04-06-07-08	Type U07-U08	Type U07-U08	Type U07-U08
1	1/16	+ 2,85/2,95	2,4	3,8	+ 6,80	0,40	0,80
2	3/32	+ 4,50/4,60	3,6	4,6	+ 8,60	0,60	0,90
3	1/8	+ 6,15/6,25	4,8	6,0	+ 11,00	0,70	1,30
4	3/16	+ 9,45/9,55	7,1	8,5	+ 16,80	0,80	1,80
5	1/4	+ 12,10/12,20	9,5	12,1	+ 23,20	1,20	2,30

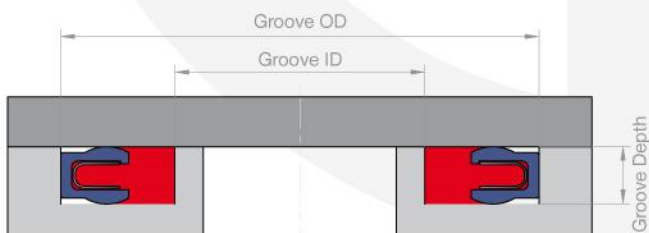


### Seal Type 'U01' up to 'U10'

The Spring Energized Seal type 'U01' up to 'U10' combines optimum tightness with extreme low friction. Best choice for high speed rotary and reciprocating applications. Polished mating surfaces guarantees excellent tightness when sealing gas or low viscosity fluids. By changing the lip thickness, this seal can be designed for non standard groove dimensions. Assembly in a closed groove is possible. Contact our technical service department for more information.

**Groove Dimensions Type U9-U10: Inside and Outside Face Seals**

Cross section	Cross Section	Inside Face type U9	Outside Face type U10	type U09 - U10
Code	Size	Groove OD = Groove ID	Groove ID = Groove OD	Groove depth
1	1/16	+ 4,80	- 4,80	1,40/1,45
2	3/32	+ 7,20	- 7,20	2,25/2,30
3	1/8	+ 9,60	- 9,60	3,00/3,10
4	3/16	+ 14,20	- 14,20	4,70/4,80
5	1/4	+ 19,00	- 19,00	6,00/6,10



### Seal type 'U01' up to 'U10'

Available diameters : 2 mm ID up to + 2 meter  
 Cross-sections : 1,25 mm up to 25 mm

See min. dia. for face seals on page 15  
 Available with chamfered heel and special back up to seal high pressure and high temperatures.

# Spring energized seals

## STANDARD DESIGNS TYPE V01 UP TO V10

### RADIAL SEALS



Type 'V01' General purpose seal for shafts and pistons. Available cross-section 1/16" up to 1/4".



Type 'V02' As type 'V01', but with increased heel thickness for high pressure.



Type 'V03' As type 'V01', but with scraper at the ID.



Type 'V04' As type 'V03', but with increased heel thickness



Type 'V05' As type 'V01', but with scraper at the OD.



Type 'V06' As type 'V05', but with increased heel thickness

### RADIAL FLANGED SEALS



Type 'V07' As type 'V01', but with flange at the OD. Prevents the seal from rotating. Also assists in sealing the OD side.



Type 'V08' As type 'V07', but with scraper at the ID.

### OUT- and INSIDE PRESSURE FACE SEALS



Type 'V09' Inside face seal for internal pressure.



Type 'V10' Outside face seal for external pressure.

### PART NUMBER EXAMPLE

M02540-4V01-0104

- M : Metric dimension and type
- 02540 : Diameter OD groove, accuracy 1 decimal\*
- 4 : Cross section 3/16
- V01 : Type
- 01 : Jacket material, see page 6
- 04 : Spring material, see page 7

### \*VERY IMPORTANT

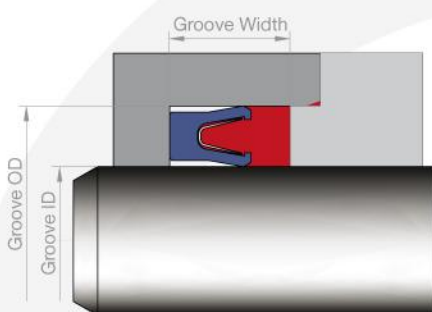
Diameter is outside diameter for type V01 up to V09.  
Inside diameter for type V10.

See the 'Application data form' on page 20/21, and send it to our technical service department.

# Spring energized seals

**Groove Dimensions Type V01-V02-V03-V04-V05-V06-V07-V08**

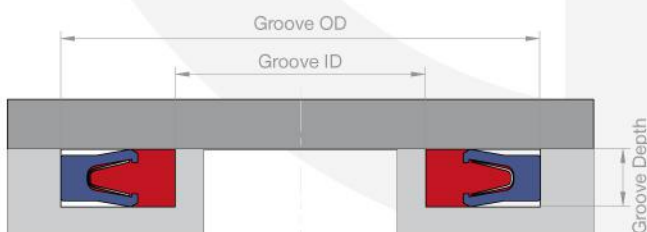
Cross section	Cross Section	Groove OD = Groove ID	Groove width Type	Groove widthType	Flange OD = Groove ID	Flange depth	Length Chamfer
Code	Size	All types	V01-03-05	V02-04-06-07-08	Type V07-V08	Type V07-V08	Type V07-V08
1	1/16	+ 2,85/2,95	2,4	3,8	+ 6,80	0,40	0,80
2	3/32	+ 4,50/4,60	3,6	4,6	+ 8,60	0,60	0,90
3	1/8	+ 6,15/6,25	4,8	6,0	+ 11,00	0,70	1,30
4	3/16	+ 9,45/9,55	7,1	8,5	+ 16,80	0,80	1,80
5	1/4	+ 12,10/12,20	9,5	12,1	+ 23,20	1,20	2,30


**Seal type 'V01' up to 'V10'**

The Spring Energized Seal type '11' up to '20' combines optimum sealing with very low friction values. Excellent for low and high speed applications, both rotary and reciprocating. Improved surface finish of the mating surface results also with this seals in an excellent tightness when sealing gas or low viscosity fluids. By changing the lip thickness, this seals can be designed to fit non standard groove sizes. Assembly in a closed groove design is possible. Contact our technical service department for more information.

**Groove Dimensions Type V09-V10: Inside and Outside Face Seals**

Cross section	Cross Section	Inside Face type V09	Outside Face type V10	type V09 - V10
Code	Size	Groove OD = Groove ID	Groove ID = Groove OD	Groove depth
1	1/16	+ 4,80	- 4,80	1,40/1,45
2	3/32	+ 7,20	- 7,20	2,25/2,30
3	1/8	+ 9,60	- 9,60	3,00/3,10
4	3/16	+ 14,20	- 14,20	4,70/4,80
5	1/4	+ 19,00	- 19,00	6,00/6,10


**Seal type 'V01' up to 'V10'**

Available diameters : 2 mm ID up to + 2 meter  
 Cross-sections : 1,25 mm up to 25 mm

See min. dia. for face seals on page 15  
 Available with chamfered heel and special back up to seal high pressure and high temperatures.

# Spring energized seals

## IN- AND OUTSIDE FACE SEALS, WITH FULL CONTACT SPRING

The seal designs 'W09' and 'W10' offer the highest possible spring deflection combined with the highest load per mm seal circumference. The special spring shape, full contact, and the low plastic deformation of the spring results in optimal seal performance under the most stringent conditions. Type 'W09' and 'W10' are used in static and moderate dynamic applications.

Temperatures from  $-260^{\circ}\text{C}$  to  $+320^{\circ}\text{C}$  are sealed without problems. Leak rates  $\leq 10$  high minus 5 mbar.l/sec can be achieved. With the use of special designed back up rings, Spring Energized Seals type 'W09' and 'W10', can seal successfully seal very high pressure/temperature combinations ( $+180$  bar/ $+ 320^{\circ}\text{C}$ ).



Type 'W09' Inside face seal for internal pressure.



Type 'W10' Outside face seal for external pressure.



### PART NUMBER EXAMPLE

M02540-4W09-0104

M : Metric dimension and type

02540 : Diameter OD groove, accuracy 1 decimal\*

4 : Cross section 3/16

W09 : Type

01 : Jacket material, see page 6

04 : Spring material, see page 7

**VERY IMPORTANT**  
Outside diameter for  
type W09 and Inside  
diameter for W10

See the 'Application data form' on page 20/21, and send it to our technical service department.

# Spring energized seals

## Groove Dimensions Type W09-W10

Cross section	Cross Section	Inside Face type W09	Outside Face type W10	type W09 - W10
Code	Size	Groove OD = Groove ID	Groove ID = Groove OD	Groove depth
3	1/8	+ 9,60	- 9,60	3,00/3,10
4	3/16	+ 14,20	- 14,20	4,70/4,80
5	1/4	+ 19,00	- 19,00	6,00/6,10
6	3/8	+ 30,00	- 30,00	9,50/9,60
7	1/2	+ 40,00	- 40,00	12,70/12,90



### Spring Seal type 'W09' up to 'W10'

Available diameters : 20 mm up to + 2 meter

Cross-sections : 3 mm up to 12,7 mm

Available with chamfered heel and special back up to seal high pressure and high temperatures.

## Minimum Seal Diameters for Face Seals

Full Contact Type W09-W10				Face Seals Type H,U,V/09-10			
Cross section code	Size	Inside Face Min. OD mm	Outside Face Min. ID mm	Cross section code	Size	Inside Face Min. OD mm	Outside Face Min. ID mm
3	1/8	30	20	1	1/16	12	10
4	3/16	50	40	2	3/32	20	15
5	1/4	90	80	3	1/8	25	20
6	3/8	140	120	4	3/16	35	30
7	1/2	250	200	5	1/4	60	50

# Spring energized seals

## LIPSEALS

### Standard designs

#### Type L01



Surface speed up to 25 m/s.  
Maximum pressure 5 bar.  
Can be used in lubricated and unlubricated applications.  
Max. temperature 100 °C.  
For diameters < 300 mm.

#### Type L02



Same as type L01, yet because of the internal back up ring, made from stainless steel AISI 316, this seal can be used up to 200°C.  
Diameters available up to 2 meter.

#### Type L03



Improved sealing with the increased lip thickness. Because of the higher load, this seal should not be used for surface speeds above 8 m/s.  
Temperature- and diameter limitations as type L01.

#### Type L04



As type L03, but recommend up to 200 °C.  
Available up to + 2 meter diameter.  
Metal back up ring is always AISI 316

#### Type L05



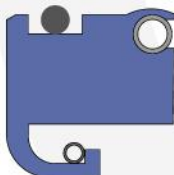
Lipseals for applications up to 3 bar, surface speed up to 8 m/s. Especially designed for changing directions of rotation and shaft eccentricity. Temperature- and diameter limitations as type L01.

#### Type L06



As type L05, but recommended up to 200 °C.  
Available up to + 2 meter diameter.  
Metal back up ring is always AISI 316

#### Type L07



As type L03, but with high corrosion resistant Spring Energized Seal design to seal aggressive chemicals.  
Secondary seal preferably in Viton.

#### Type L08



As type L07, but usable up to 200 °C.  
Available up to + 2 meter diameter.  
Metal back up ring is always AISI 316

### PART NUMBER EXAMPLE

M030X047X07-L01-0610

- M : Metric dimension and type
- 030X047X07 : Housing dimension
- L01 : Seal type
- 06 : Seal material, see page 6
- 10 : Elastomer seal, see page 7

For non-Din 3760 groove dimensions, please enter the groove dimensions between ( ).

Example OD = 47 mm Shaft = 30 mm / Width = 7.0

See the 'Application data form' on page 20/21, and send it to our technical service department.



# Spring energized seals

## LIPSEALS

### APPLICATIONS

Rotary lip seals are recommended for applications where conventional rubber lip seals are no longer an alternative. Lipseals withstand high surface speeds, low and high temperatures and chemical attack. For small quantities and or small diameters the Lipseal is the most cost effective solution for high performance rotary lip seals.

### MATERIAL SELECTION

For shaft hardness below 50 Hrc, Material codes '05' or '06' is recommended.

For high surface speeds, high pressure and shaft hardness of min. 50 to 60 Rockwell C , material code '03' or "04" will be the better choice.

### SURFACE FINISH SHAFT & BORE

#### SURFACE FINISH SHAFT

- Ra 0,3 - 0,5 when lubricated
- Ra 0,2 - 0,4 when running dry
- Ra 0,1 - 0,2 when sealing vacuum

#### SURFACE FINISH BORE

- Ra 0,8 - 1,6 with O-Ring
- Ra 0,2 - 0,4 with spring energized seal, Lipseals type 'L07' and 'L08'

### GROOVE DIMENSIONS LIPSEALS

Lipseals are produced to fit Din 3760 groove dimensions. The design is produced to press fit in the bore.

Lipseals are machined to your specific groove design without extra cost.

For diameters up to + 1 meter, according your design or our proposal, ask our technical service department. Special designs for specific problems.

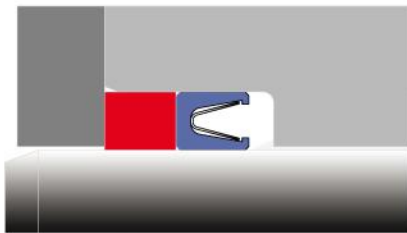
# Spring energized seals

## BACK UP RINGS, O-RINGS

### Back up rings, PTFE or PTFE-Compounds

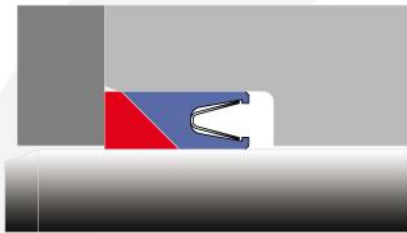
Back up rings are used to secure seal integrity when the extrusion gap behind the seal becomes critical for the seal under the existing temperatures and pressures. Depending on the temperature and pressure combinations

a longer or shorter back up ring may be used. The figures below depict the situation where the extrusion gap is on the shaft side. For bore located extrusion gaps the back up rings have to be rotated 180°.



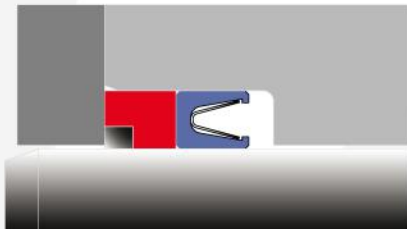
#### Rectangular Back Up Ring

The rectangular back up ring is used for moderate temperatures and higher pressures. They are made from high filled PTFE compounds or from a PEEK or other high modulus polymer material.



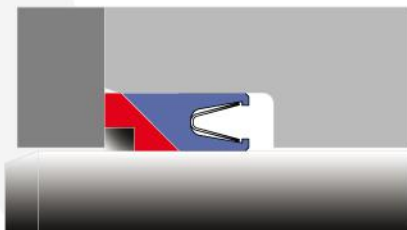
#### Triangle Shaped Back Up Ring

The triangular back up gives a better direction of the back up towards the extrusion gap. It should only be used for open grooves. It tends to slip to the ID for assemblies where the inner part is inserted, as shown on the picture, from the right side.



#### Rectangular Back Up with metal Insert

The rectangular back up with a metal insert is used for extreme temperature and pressure combinations. The hydraulic forces on the polymer push the metal back up towards the extrusion gap. The metal part has a special cut, to allow it to adapt to changing groove sizes and thus closing gaps.



#### Triangle Back Up Ring with metal insert

Similar construction as above with better control of pushing the metal insert to the extrusion gap. The polymer part of the construction is machined from a filled PTFE compound. Again these metal insert back up systems should only be used in open groove designs.

### Back up ring material

Back up rings are generally made of material with a higher resistance to deformation under load. A carbon filled PTFE or PEEK are good material choices for back up rings. Consult our technical service department for assistance.

# Spring energized seals

## APPLICATIONS

### Summary

Spring Energized Seals and PTFE Lips seals, are used successfully in a wide variety of applications.

Temperatures ranges from - 270° C up to + 340°C

Often **high pressures** and **high temperatures** are sealed safe with Spring Energized Seals.

**Special designed back up rings** prevent the seal from **extrusion**.

The high chemical resistance of the PTFE, PTFE-compounds and the stainless steel spring material, opens a wide spectrum of applications.

Spring Energized Seals have an unlimited shelf life.

Explosive Decompression  
High Vacuum.

## Examples

### Spring Energized Seals



Aero hydraulics & Pneumatic Systems  
Coolers  
Cryogenic Swivels  
Diesel Engines  
Filling Machines  
Flange connections  
Fuel Control Systems  
Gas Turbine Engines  
HPLC Pumps  
Laboratory equipment  
Low Friction Pneumatics  
Medical & Laboratory Instrumentations  
Oil Field Equipment  
Pumps  
Robotics  
Rotary joints  
Semiconductor Processing Equipment  
Swivels  
Vacuum Equipment  
Valves, Cryogenic, High temperature  
Valves, Gate, Ball, Control...

### Lip Seals



Compressors  
Gearbox shafts  
High speed shafts  
Pumps

## Warranty

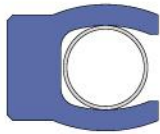
Fluorten Srl holds certification to  
ISO9001\_2008  
EN9100\_2009  
14001\_2004

See [www.fluorten.com/en/documents/1292-2/](http://www.fluorten.com/en/documents/1292-2/) for the latest update

In case of unexpected quality failures, our liability will be limited to the replacement of the products supplied. Under no circumstances Fluorten Srl will be responsible or liable for costs as a result of the products supplied. The information in this catalogue is based on our present state of knowledge and is intended to provide general

information on our products and their uses. Therefore this data should not be seen as guaranteeing specific properties for specific applications. Since a sealing consists of three different interacting objects, seal, mating surface and service conditions, we recommend to endurance test the application under live conditions.

# Spring energized seals



## APPLICATION DATA SHEET SPRING ENERGIZED SEALS

<b>Project Name:</b>			
<b>Contact</b>		<b>Company</b>	
First Name:		Street:	
Last name:		City:	
Department:		Country:	
Direct phone:		Direct phone:	
Email:		Fax:	
Current Seal? What kind of improvements are you looking for?			
Service - Tightness - Life - Friction - Temperature resistance - Chemical resistance - Price			
<b>Groove design</b>	Piston seal:	Shaft Seal:	Face Seal:
<b>Seal location</b>	Bore:	Piston:	
<b>Groove dimension</b>	Groove OD :		
	Groove ID :		
	Width or Depth:		
<b>Surface finish</b>	Bore :		Shaft :
<b>Extrusion gap</b>			
<b>Eccentricity Shaft versus Bore:</b>			
<b>Service conditions</b>	Pressure :		Max. Pressure:
	Temperature :		Max. Temp.:
	Media :		
Pressure direction	One side		Both sides
RPM:		Stroke length:	
<b>Service condition description</b>			
Quotation	Annual volume:		Lot size:
Samples quantity:		Lead-time:	

# Spring energized seals



## APPLICATION DATA SHEET LIPSEALS

<b>Project Name:</b>		
<b>Contact</b>	<b>Company</b>	
First Name:	Street:	
Last name:	City:	
Department:	Country:	
Direct phone:	Direct phone:	
Email:	Fax:	
Current Seal? What kind of improvements are you looking for?		
Service - Tightness - Life - Friction - Temperature resistance - Chemical resistance - Price		
<b>Groove Dimensions</b>	Bore Diameter:	Shaft Diameter:
	Groove Width:	Shaft Hardness:
	Bore Finish:	Shaft Finish:
	Shaft Material:	
<b>Service Conditions</b>	Bore/Shaft Misalignment:	
	Eccentricity shaft:	
	Pressure:	Max. Pressure:
	Media :	
	Pressure :	Max. Pressure:
	Temperature :	Max. Temp.:
	Media Level: <input type="checkbox"/> Below seal <input type="checkbox"/> Halfway seal <input type="checkbox"/> Above seal	
Pressure direction	One side:	Both sides:
RPM:	Continuous	
Direction of shaft rotation seen from low pressure site CW or CCW (clockwise or counter clock wise)		
<b>Service condition description</b>		
Quotation	Annual volume:	Lot size:
Samples quantity:		Lead-time:

Please complete this data sheet and return to Fluoriten  
 Mail [SES@fluoriten.com](mailto:SES@fluoriten.com) / Fax. +39 035 848496  
 Or just call us Tel +39 035 4425115



# Spring energized seals



Spring Energized Seals - SES - are manufactured in PTFE, PTFE compounds, TFM and other suitable high performance polymers - HPP -. Spring Energized Seals are precision machined parts. Both the seal diameter as well as the seal section are function critical.

The U-cup shape or jacket creates the initial seating load needed to create positive sealing.

Fluorten's SES are available in a wide variety of designs, each with a spring design optimized to handle the most demanding applications. Most of these require higher ones. Fluorten SES are designed to function from extreme low temperatures, -270°C up to very high temperatures, sometimes exceeding 300°C. Specific

designs can withstand extreme HTHP combinations. (high temperature-high pressure) Fluorten's SES are available in radial design as well as face sealing design, both for static as well as dynamic applications.

The available sizes cover all possible combinations from as small as a few mm up to +2 meter diameter. For low friction applications both seal design and spring selection are equally important.

Fluorten's SES are virtually inert to all chemicals except molten alkali metals, fluorine gas at high temperature and chlorine trifluoride.

The available spring materials range from stainless steel like 1.4301 up to high alloys such as Elgiloy®, Hastelloy®.

# Spring energized seals

## Our history



Since the foundation in 1966, Fluorten has always strived to produce high quality products.

Over the years, the company has been able to progressively grow into a leading manufacturer of basic shapes in high performance Fluor polymers. Later, in close cooperation with our customers, the development and manufacturing of demanding technical parts has been added to our activities.

It is Fluorten's philosophy to work closely with our customers. Listen to what the market expects from our customers products. Understanding the industry drivers leads to new developments, satisfying customers' requirements.

Today Fluorten's facility in the Bergamo area has state of the art production equipment. The latter includes high temperature extrusion and moulding equipment for Fluoropolymers and iso-static compressing equipment for Ptfе billet manufacturing.

The quality laboratory uses ultra-modern test equipment to verify and control the physical properties of the materials produced.

In addition Fluorten is dedicated to manufacture high performance Fluoropolymers, machined parts and spring energized seals under the most stringent quality procedures. The company is ISO9001 and ISO14001 certified. The quality system has been audited according EN9100.

A fully integrated ERP business system supported by a modern CRM system assist in achieving a perfect traceability.

## The products

FLUORTEN develops a range of standard and specific products requested by the customer. These include:

- Semifinished and finished products in PTFE and Rulon®
- Injection moulding of technical parts in fluorinated (FEP, PFA, PVDF, PCTFE etc.) and in technopolymers of high technological contents (VICTREX® PEEK, Polyurethane, Polycarbonate, PPS etc.)
- Moulds designing and manufacturing
- Slipper rings and FLUOR-S/SC tapes for hydraulic and pneumatic applications
- Spring Energized seals and compressor seals in PTFE, PEEK and HPP
- Valve seats and components in PTFE, FEP, PFA, PVDF, PEEK etc.
- DuPont™ Vespel® - Official Italian distributor

RULON® is a registered trade mark of Saint-Gobain Performance Plastics





**fluorten**® s.r.l.

PTFE and Technopolymers manufacturing

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