



MOONTOWN LTD

**UK Manufacturer of PTFE Spring
Energised and Hydraulic Seals**



Company Profile

Moontown Limited was established in 1996 to offer a comprehensive range of PTFE spring energised and hydraulic seals. The company offers its customers the benefits of the latest technology for cost effective sealing solutions, supported by decades of experience working with PTFE resins and associated high performance plastics.

Having built a broad customer base it was decided, in 2012, to make the transition from distributor to manufacturer, where we started to supply our first UK made seals from, "Powder To Part". Since that time we have continued to grow, investing in new equipment, staff and training to ensure the highest possible standards.

All of our sealing products are available in a range of materials and sizes for use in a wide range of industries such as:

- Oil and Gas Industry
- Petrochemical Processing/Handling
- Fuel Control and Engine Bleed Systems
- Off Highway and Construction Equipment
- Machine Tools
- Semiconductor Industry
- Food and Drugs
- Medical and Laboratory Equipment
- Pumps, Valves and Compressors
- Renewable Energy
- Marine Industry
- Motorsport

Our capabilities range from 2mm rod seals to 2000mm piston seals. Custom and user specified designs can also be catered for subject to discussion with our Technical Department.

Moontown Ltd is an ISO 9001:2015 approved company.

Powder To Part

We pride ourselves on the complete service we provide which we have come to call our "Powder To Part" production service. It is made up of the following key areas and is designed to give total control over the design and manufacture of our products.

In-house PTFE Billet Production - Moontown compression mould and sinter billets on-site.

Complete Seal Design Service - To complement our existing design service, Moontown have invested in a FEA capable 3D design programme.

Experienced CNC Programmers & Production Staff - To accompany our design capabilities, Moontown strive to ensure that staff are skilled and experienced in their field, from design, to CNC programming, to production.

Advanced On-Site CNC Machining - Moontown uses the latest CNC machining technology and techniques.

In-house Spring Winding - Moontown uses bespoke spring winding equipment to allow us to produce coil springs to suit almost any application.

EDM Facilities For Tool Making - Moontown have invested in EDM machinery in order to produce tooling on-site.



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Jacket Materials

Moontown offers a wide range of seal jacket material options, largely based on PTFE (Polytetrafluoroethylene) resins.

The table below shows a selection of our most commonly used materials. Other materials are available and will be recommended by our Technical Department upon review of each application.

CODE	DESCRIPTION	COL	APPLICATION	Temp (°C)	COEFF. FRICTION	WEAR FACTOR
01	Virgin PTFE	White	Excellent for static duty. Low gas permeability. Good cryogenic properties. FDA approved.	-260 +200	0.09	10000 HIGH
02	Premium PTFE	Blue	Similar properties to Code 01 but with improved wear resistance.	-260 +200	0.09	150
03	PTFE / Carbon / Graphite	Black	Excellent material for heat and wear resistance. Recommended for dry and poorly lubricated applications. Suitable for water and steam service.	-260 +300	0.09	10
04	PTFE / Glass / MoS ₂	Grey	Recommended for high pressure hydraulic service, steam and water. Abrasive against soft metal in dynamic applications under high pressure.	-200 +260	0.08	10
05	PTFE / Carbon / Graphite	Black	Similar to Code 03 but with increased wear resistance. Excellent in steam and water under severe conditions. Very good extrusion resistance at high temperature. Excellent for back up rings.	-250 +300	0.10	6
06	Premium PTFE	Black	Excellent material for extreme dynamic conditions and combinations such as high temperature, pressure, speed and dry running. Excellent in water and water based solutions. Abrasive against soft metals.	-250 +300	0.09	1
07	PTFE / Bronze	Brown	Excellent in hydraulic applications. Not recommended for rotary applications.	-150 +290	0.08	5
08	PTFE / Polyester	Dark Tan	Special compound for high temperature applications. Recommended for low to medium speed applications running against soft metals.	-240 +300	0.13	4
09	Ekonal filled PTFE	Tan	Special compound with superior heat and wear resistance characteristics. Non abrasive. Recommended for low to high speed running against soft metals. Not good in water.	-250 +315	0.15	3
10	UHMW-PE	White	Excellent wear material but limited heat and chemical resistance. Excellent for cryogenic temperatures. FDA approved.	-250 +80	0.11	4
11	PTFE / Glass / MoS ₂	Grey	Similar to code 04 but softer for improved sealing at lower pressure. Can be abrasive against soft metals.	-250 +300	0.09	1
12	PTFE / Graphite	Black	General purpose material with good heat and wear characteristics. Good in water, non lubricating fluids and, compatible with all hydraulic fluids and most chemicals.	-250 +300	0.09	20
13	PEEK	Tan	A high modulus material with excellent high temperature resistance. Excellent for back-up rings only.	-70 +250	N/A	N/A
15	Filled PTFE	White	A food and drug compatible blend. Application tests should be carried out for prolonged use in water. FDA approved.	-250 +300	0.11	3
17	15% Glass filled PTFE	White	Typically used for back-up rings. Abrasive in dynamic applications running against soft metals.	-200 +270	0.10	3
22	Modified PTFE	White	Excellent for static applications, particularly good in cryogenic duty using thin gases. FDA approved.	-260 +230	0.09	10
27	Filled PTFE	Black	Good wear material, particularly in rotary applications and less abrasive on softer mating surfaces.	-240 +290	0.10	5

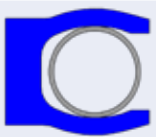






Approved Materials

Moontown have invested in Norsok M-710 Rev 2 and API 6A Annex F sour fluid immersion testing approvals for the following materials:

CODE	DESCRIPTION	NORSOK M-710 REV 2		API 6A ANNEX F	
		MATERIAL CODE	APPROVED	MATERIAL CODE	APPROVED
01	Virgin PTFE	-01N	✓	-01A	✓
03	PTFE/Carbon/Graphite	-03N	✓	-03A	✓
05	PTFE/Carbon/Graphite	-05N	✓	-05A	✓
06	Premium PTFE	-06N	✓	-06A	✓
13	Virgin PEEK	-13N	✓	-13A	✓
17	15% Glass filled PTFE	-17N	✓	-17A	✓
22	Modified PTFE	-22N	✓	-22A	✓
26	Glass/Graphite/PTFE	-26N	✓	-26A	✓

Energiser Materials

CODE	DESCRIPTION	M01-M10	M20-M29/ M60-M69	M30-M31	M50-M59	M70-M79
						
01	AISI 301 1.4310		Standard	Standard	Standard	
02	Elgiloy		Optional			
03	Phynox	Standard				
04	17/7 ph	Optional				
05	FKM O-Ring	Optional			Standard	Optional
06	Nitrile O-Ring	Optional			Optional	Standard
07	EPDM O-Ring	Optional			Optional	Optional
08	HNBR O-Ring	Optional			Optional	Optional
09	Silicone O-Ring	Optional			Optional	Optional

Elgiloy® is a registered trademark of the Elgiloy Co.

In addition to the above range of energisers, Moontown can also supply more specialised materials. Please contact our Technical Department for further details.

NACE MR0175

Our Code 02 and Code 03 energiser materials are approved to NACE MR0175 and are available in all our standard seal sizes.



Design Notes

PTFE has an excellent chemical resistance to most chemicals with the exception of Chlorine Trifluoride/fluorine gas at high temperature, and molten Alkali metals. When using filled PTFE materials, consideration should be given to the filler material to ensure its compatibility with the sealed media.

At temperatures below -40°C, PTFE and many other jacket materials will harden and shrink. This feature imposes higher loads on the energiser and could have an impact on seal performance. It should be noted that while Axial (Face) Seals are less affected by the lower temperatures, it is recommended that you contact our Technical Department for any seal designs intended for use at -40°C and below.

Friction Force

Friction force is the resistance to sliding between a seal and the hardware's mating surface. There are many factors that contribute towards this friction force including but not limited to:

- Seal diameter and geometry
- Hardware material and surface finish
- Material coefficients
- Lubrication
- System pressure
- Spring type and material

It is difficult to predict exact running and break-out friction values and therefore any values given can only be classed as estimates. We recommend contacting our Technical Department for further information. Testing under actual working conditions may also be useful.

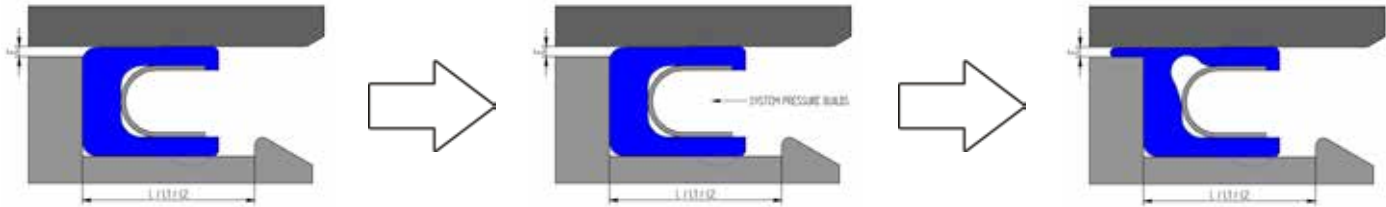
Minimum Manufacturing Sizes

CROSS SECTION	M01-M08 STYLES		M20-M27/M60-M67 STYLES		M09/M10/M28/M29/ M68/ M69 STYLES		M30/M31 STYLE	
	MIN ROD	MIN BORE	MIN ROD	MIN BORE	MIN ID	MIN OD	MIN ID	MIN OD
1	2	5	5	8	6	10	N/A	
2	4	9	10	15	12	15		
3	7	13	12	18	20	26		
4	15	25	16	26	45	50	100	120
5	60	72	65	77	85	95	150	170
6	85	105	100	120	100	110	300	320
7	160	190	180	210	120	150	On Request	



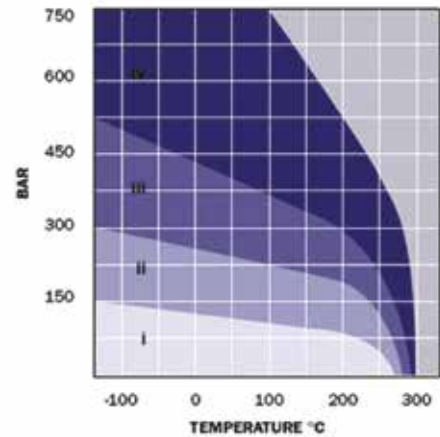
Extrusion Gaps

When sealing at high temperature and/or pressure, the extrusion gap behind the seal becomes critical. A typical extrusion gap is illustrated below. Extrusion occurs when the pressure in the cavity (usually in combination with a high temperature) causes the jacket to flow into the extrusion gap. This can be prevented through controlling the size of the extrusion gap, the heel length of the seal, and through the addition of a back up ring(s). As a general rule the extrusion gap should be held at the minimum practicable size achievable.



Moontown offer the following as a guide to the effects of extrusion considering temperature and pressure.

GROOVE LENGTH		MATERIAL	i	ii	iii	iv
L		Unfilled PTFE	0.10	0.07	0.05	
		Filled PTFE	0.15	0.10	0.07	
L1		Unfilled PTFE	0.15	0.10	0.07	
		Filled PTFE	0.20	0.15	0.10	0.07
L2		Filled PTFE Back-up	0.20	0.15	0.10	0.07
		PEEK Back-up	0.20	0.15	0.10	0.07
L2		Filled PTFE Back-up	0.25	0.20	0.15	0.10
		PEEK Back-up	0.35	0.25	0.20	0.15



Hardware and Surface Finishes

The quality of the surface finish influences the relative wear of the jacket materials. The transfer of a thin film of PTFE from the jacket to the dynamic surface will improve seal life by reducing friction. A rough surface finish could cause the jacket to wear too quickly by removing an excessive amount of material. Conversely, if the surface finish is too smooth, this will result in insufficient material transfer, increasing friction.

As a general rule, the higher the sealing surface hardness, the better the seal performance. High hardness reduces wear and increases seal life. A 55 HRC or higher is recommended for moderate to slow movements. The ideal hardness is between 60 and 70 HRC.

For a static application the lay of the surfaces must be concentric to help to eliminate leak paths.

FLUID BEING SEALED	SURFACE FINISH	
	DYNAMIC SURFACES	STATIC SURFACES
Cryogenics	Ra0.10 - Ra0.20	Ra0.10 - Ra0.20
Helium Gas Hydrogen Gas Freon	Ra0.10 - Ra0.20	Ra0.15 - Ra0.30
Air Nitrogen Gas Argon Gas Natural Gas Fuel	Ra0.15 - Ra0.30	Ra0.30 - Ra0.80
Water Hydraulic Oil Crude Oil Sealants	Ra0.20 - Ra0.40	Ra0.40 - Ra0.80



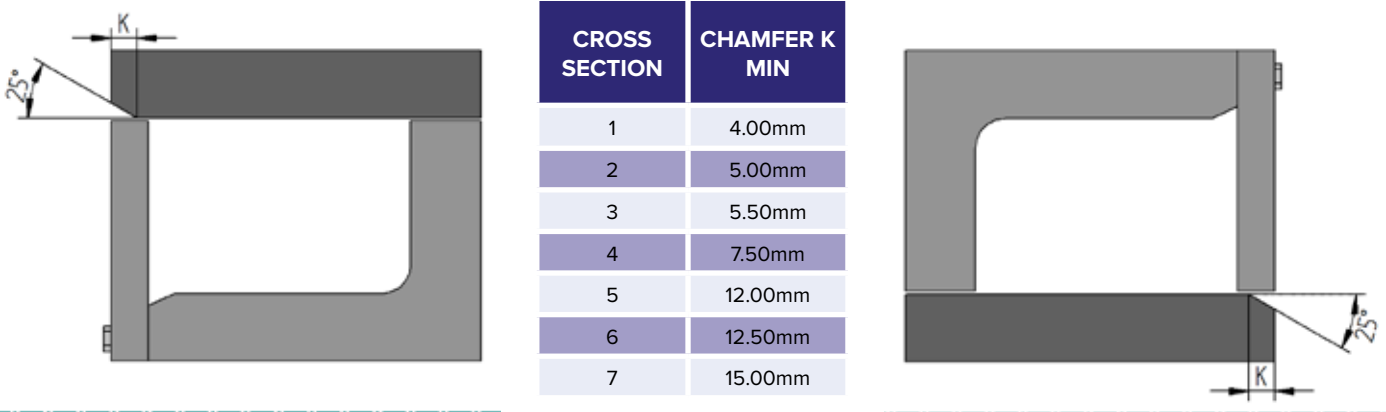
Assembly Notes

When designing hardware for Moontown spring energised seals, it is important to consider the installation. Though PTFE has reasonable elastic properties, it has its limits. If the seals are over stretched or over compressed during assembly, seal performance could be compromised. Wherever possible, it is recommended to use an open groove as this will greatly reduce the risk of damaging the seal during assembly. Closed groove assembly is only possible with our helicoil style seals.

Light, clean oil or grease may be used to assist assembly. Grease with fillers should not be used, and compatibility with sealed media should be considered.

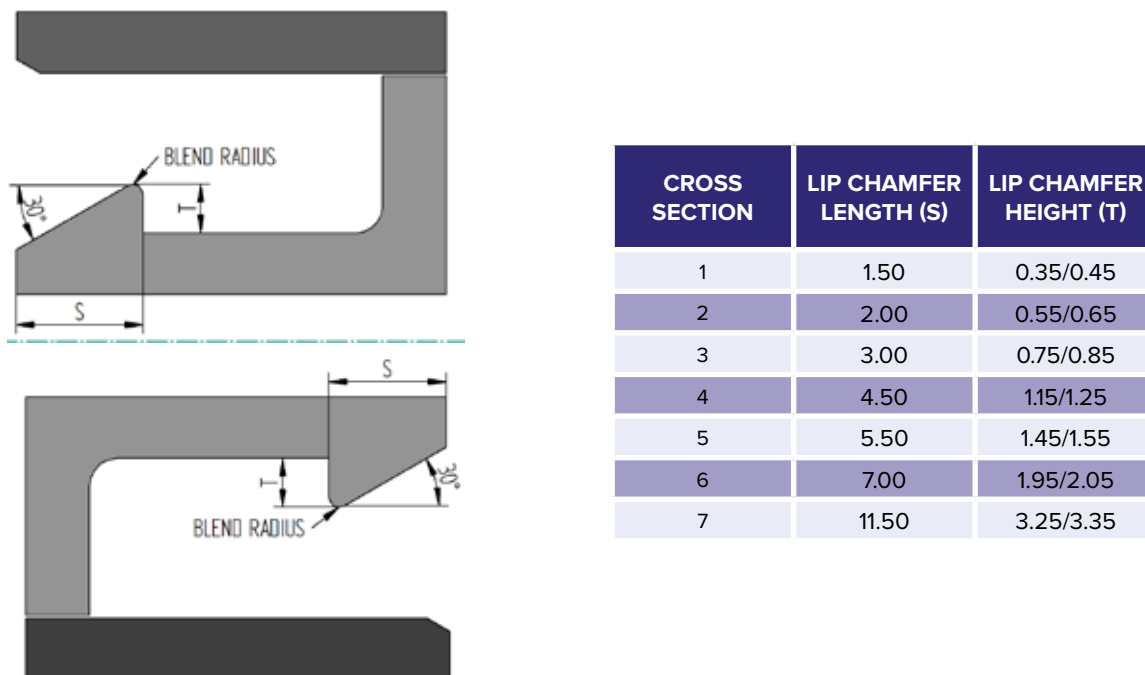
Open Groove Assembly

An open groove or 'split groove' assembly is one whereby the hardware groove is formed by the mating of two pieces. This allows the seals to be easily installed with minimal deformation. Lead-in chamfers are used to ensure the seal locates into the groove and engages with the rod or piston smoothly. Below is an example of the groove for both a rod and piston configuration as well as recommended sizes for the chamfers.



Semi-Open Groove Assembly

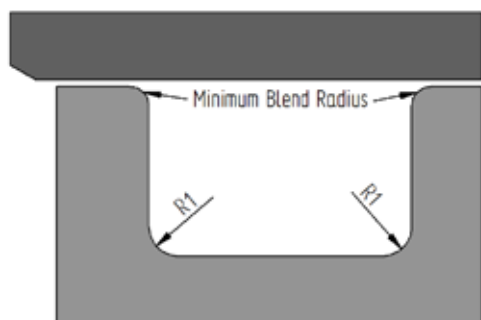
In this configuration a lip is incorporated into the design of the groove to retain the seal. In this way the hardware can be made from a single piece of material. The main advantage of this assembly is that it allows U-spring style seals to be assembled without risking potential spring damage caused by overstretching the seal. It should be noted that in this assembly, the seal can only be installed non-pressure side (heel) first. Shown below are both a rod and piston examples of a semi-open groove, and the details for the lead-in chamfer required.



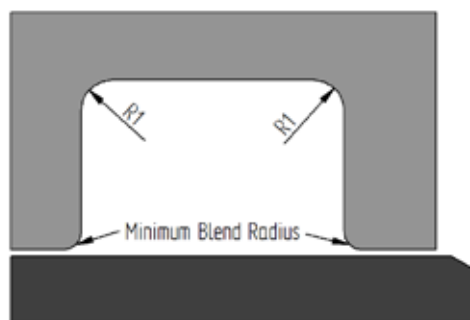
Assembly Notes

Closed Groove Assembly

Due to the nature of a closed groove, seals must be stretched/deformed into the groove. When assembling a spring energised seal into a closed groove, extra care must be taken to ensure that the seals are not taken beyond their limits of deformation. Doing so could affect seal performance. Blend radii are suggested on the corners to help ensure the seal isn't damaged as it locates into the groove. It is not recommended to fit U-spring style seals into a closed groove as the spring can be damaged during assembly. Please contact our Technical Department for advice on the minimum practicable sizes for assembling helicoil seals into closed grooves.



CROSS SECTION	GROOVE RADIUS MAX (R1)
1	0.40mm
2	0.50mm
3	0.60mm
4	0.70mm
5	0.80mm
6	0.80mm
7	1.00mm



Installation Tools

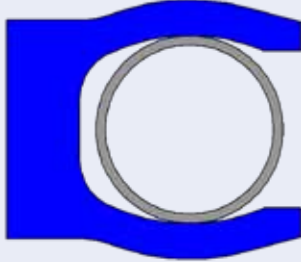
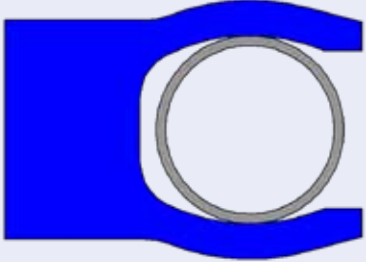
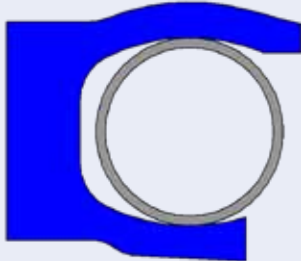
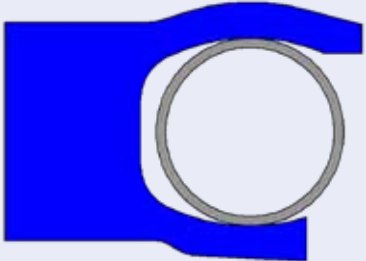
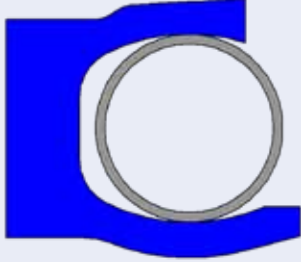
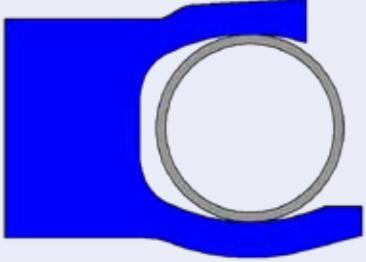
To assist with the installation of spring energised seals into closed grooves, a stretching ramp and resizing tool can be employed. The use of the ramp will allow the seal to be stretched rapidly and so will minimise seal distortion. If the ramp is coupled with a flexible pusher this will further help to ensure the seal is stretched equally across its diameter, helping to minimise seal distortion. Because the seal will not return to its original size on its own, the resizing tool will help to ensure the seal is correctly fitted into the groove and will engage smoothly with the hardware. Moontown are happy to advise on individual tooling requirements on request. Contact our Technical Department for details.



Helicoil Spring Profile Seals

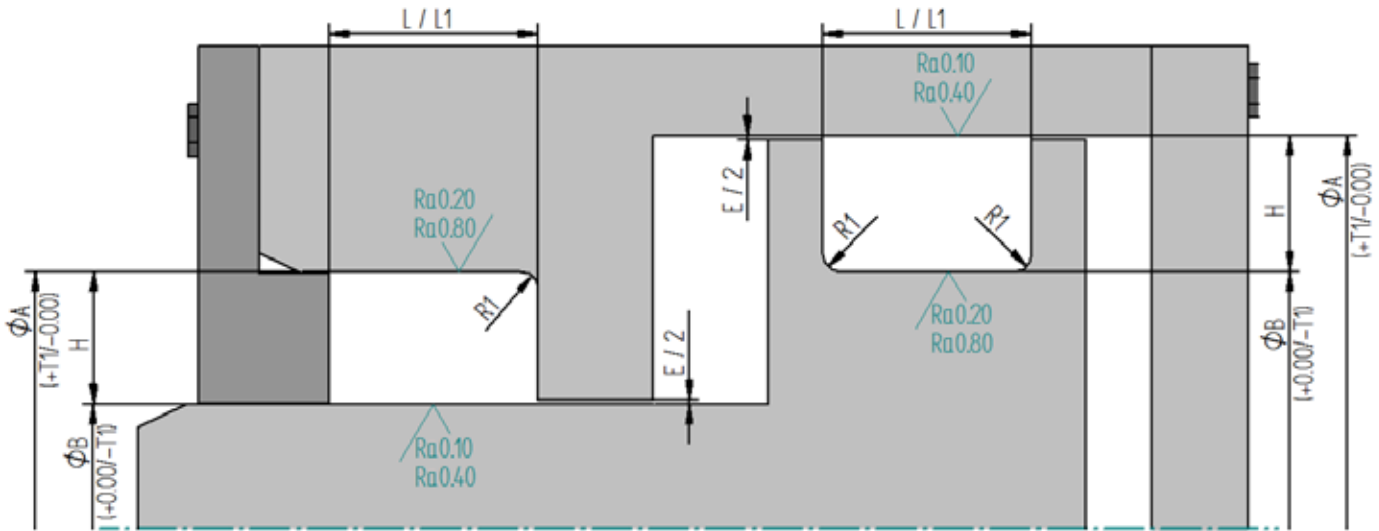
Moontown's helicoil spring style is a single acting radial spring energised seal. The seal consists of a polymer jacket energised with a corrosion resistant spring. These seals are used where conventional sealing materials, such as elastomers and polyurethanes, fail to meet the requirements of pressure, temperature, chemical compatibility and/or friction levels for a desired application. The helicoil spring is a medium to high load, low deflection spring that gives excellent sealing integrity at vacuum and low pressures while still being very capable of performing at pressures of up to 1000 BAR. The helicoil spring also tolerates a wide temperature range of -250°C to 300°C and has impressive chemical resistance.

All our helicoil springs are coiled on site to a range of standard sizes. Our on-site spring facilities also allow us to produce springs to non-standard sizes, enabling us to tailor our seals to suit a wide range of unique applications.

	STANDARD LENGTH L WIDTH	EXTENDED HEEL L1 WIDTH
<p>Standard Lip Profile</p> <p>The standard profile suitable for static and dynamic applications. Can be both OD and ID sealing</p>		
Style:	M01	M02
<p>ID Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the ID</p>		
Style:	M03	M04
<p>OD Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the OD</p>		
Style:	M05	M06



Helicoil Spring Styles Hardware



CROSS SECTION	H	T1	L	L1	E	R1
			(+0.30/-0.00)		MAX	MAX
1	1.42 / 1.47	0.05	2.40	3.80	0.10	0.40
2	2.26 / 2.31	0.05	3.60	4.60	0.13	0.50
3	3.07 / 3.12	0.05	4.80	6.00	0.15	0.60
4	4.72 / 4.78	0.06	7.10	8.50	0.18	0.70
5	6.05 / 6.12	0.07	9.50	12.10	0.20	0.80
6	9.35 / 9.40	0.08	13.50	15.00	0.24	0.80
7	12.70/12.75	0.10	18.00	20.00	0.30	1.00

The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:

STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M01	3	1	-	01250	-	03	03
The basic profile of the seal	The hardware cross section	The seal type: 1 - Shaft seal 2 - Piston seal	-	The datum diameter of the hardware, given to 1 decimal place i.e. 125mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

Example Part Number: M0131-01250-0303



Rounded U-Spring Profile Seals

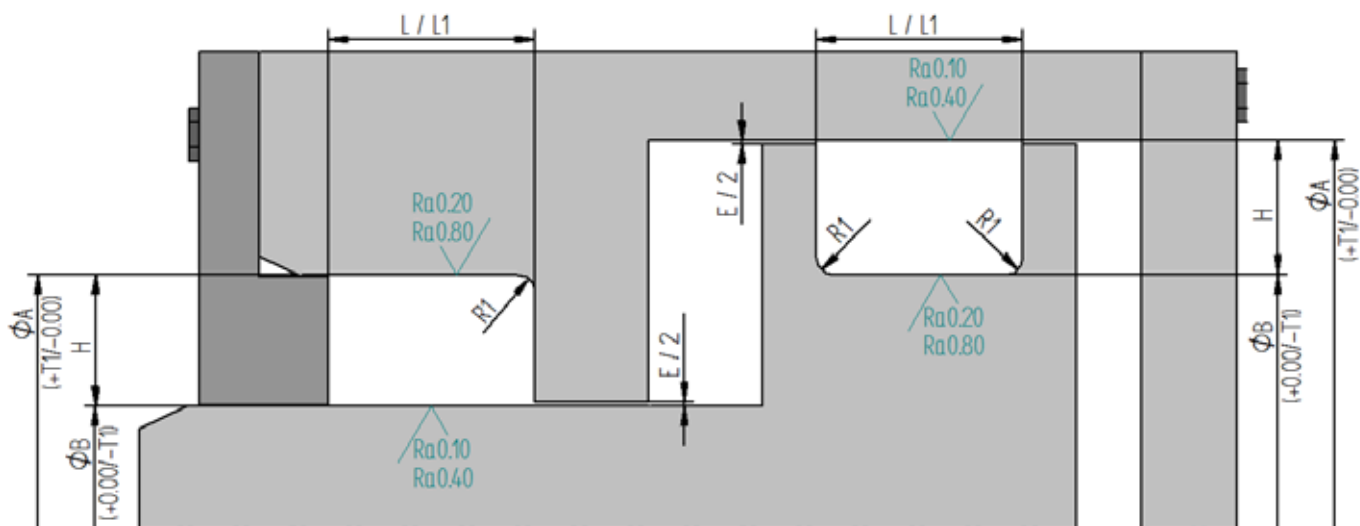
Moontown's rounded lip U-spring style is a single acting radial spring energised seal. The seal consists of a polymer jacket energised with a corrosion resistant U-spring. These seals are used where conventional sealing materials, such as elastomers and polyurethanes, fail to meet the requirements of pressure, temperature, chemical compatibility and/or friction levels for a desired application. The U-spring is a medium load, high deflection spring which provides low friction sealing and compensates for minor eccentricity or misalignment. The U-spring design offers good sealing integrity at low to medium pressures and in applications where friction values need to be considered. They can also be used in high (1000 BAR) applications subject to approval of actual working conditions. The rounded lip U-spring also tolerates a wide temperature range of -75°C to 300°C and has impressive chemical resistance.

These seals can also be offered with a silicone filled cavity for food and drug applications (see page 20).

	STANDARD LENGTH L WIDTH	EXTENDED HEEL L1 WIDTH
<p>Standard Lip Profile</p> <p>The standard profile suitable for static and dynamic applications. Can be both OD and ID sealing</p>		
Style:	M20	M21
<p>ID Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the ID</p>		
Style:	M22	M23
<p>OD Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the OD</p>		
Style:	M24	M25



Rounded U-Spring Profile Hardware



CROSS SECTION	H	T1	L	L1	E	R1
			(+0.30/-0.00)		MAX	MAX
1	1.42 / 1.47	0.05	2.40	3.80	0.10	0.40
2	2.26 / 2.31	0.05	3.60	4.60	0.13	0.50
3	3.07 / 3.12	0.05	4.80	6.00	0.15	0.60
4	4.72 / 4.78	0.06	7.10	8.50	0.18	0.70
5	6.05 / 6.12	0.07	9.50	12.10	0.20	0.80
6	9.35 / 9.40	0.08	13.50	15.00	0.24	0.80
7	12.70/12.75	0.10	18.00	20.00	0.30	1.00

The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:

STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M24	5	2	-	03600	-	22	01
The basic profile of the seal	The hardware cross section	The seal type: 1 - Shaft seal 2 - Piston seal	-	The datum diameter of the hardware, given to 1 decimal place i.e. 360mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

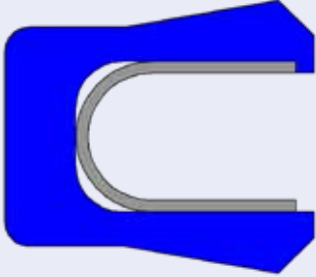
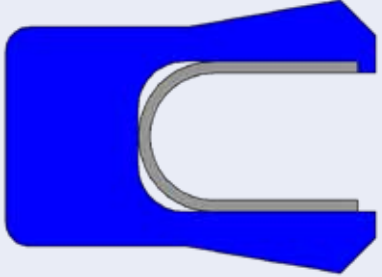
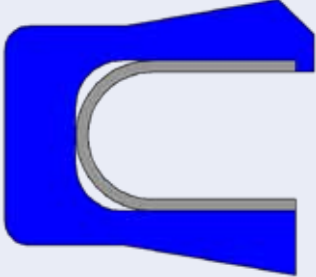
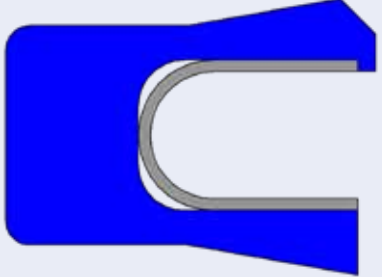
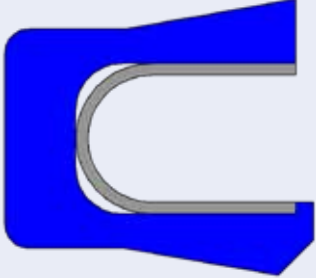
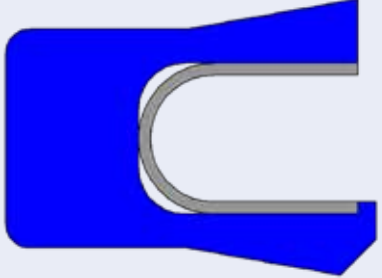
Example Part Number: M2452-03600-2201



Pointed U-Spring Profile Seals

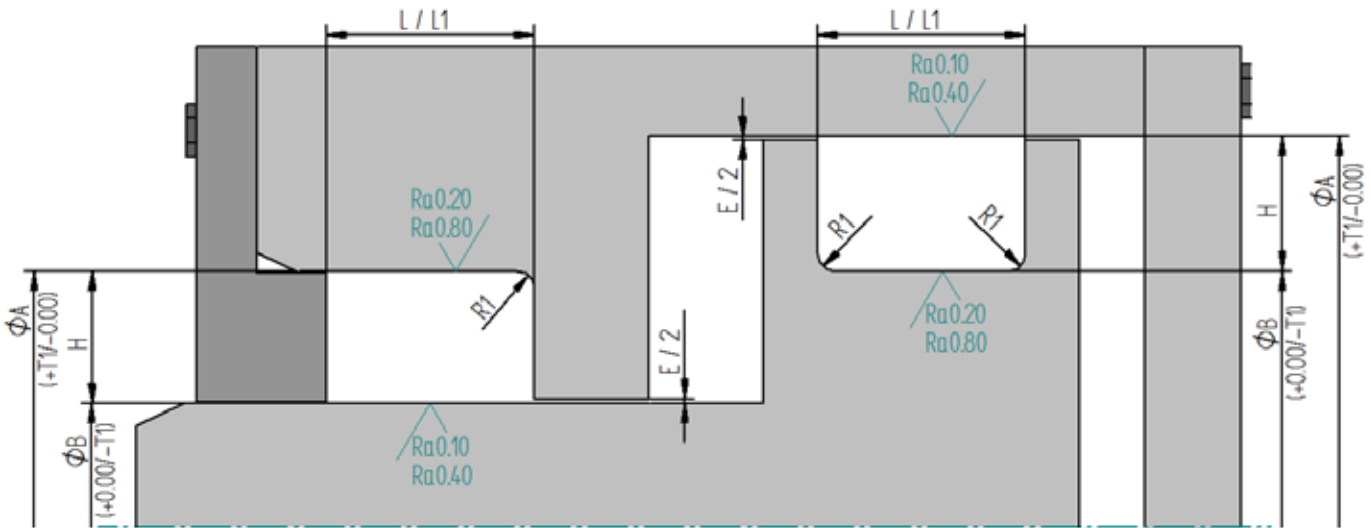
Moontown's pointed lip U-spring style is a single acting radial spring energised seal. The seal consists of a polymer jacket energised with a corrosion resistant U-spring. These seals are used where conventional sealing materials, such as elastomers and polyurethanes, fail to meet the requirements of pressure, temperature, chemical compatibility and/or friction levels for a desired application. The U-spring is a medium load, high deflection spring which provides low friction sealing and compensates for minor eccentricity or misalignment. The U-spring design offers good sealing integrity at low to medium pressures and in applications where friction values need to be considered. They can also be used in high (1000 BAR) applications subject to approval of actual working conditions. The pointed lip U-spring also tolerates a wide temperature range of -75°C to 300°C and has an impressive chemical resistance.

These seals can also be offered with a silicone filled cavity for food and drug applications (see page 20).

	STANDARD LENGTH L WIDTH	EXTENDED HEEL L1 WIDTH
<p>Standard Lip Profile</p> <p>The standard profile suitable for static and dynamic applications. Can be both OD and ID sealing.</p>		
Style:	M60	M61
<p>ID Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the ID</p>		
Style:	M62	M63
<p>OD Scraper Lip Profile</p> <p>For the removal of particulate matter in reciprocating applications when the dynamic surface is on the OD</p>		
Style:	M64	M65



Pointed U-Spring Style Hardware



CROSS SECTION	H	T1	L	L1	E	R1
			(+0.30/-0.00)		MAX	MAX
1	1.42 / 1.47	0.05	2.40	3.80	0.10	0.40
2	2.26 / 2.31	0.05	3.60	4.60	0.13	0.50
3	3.07 / 3.12	0.05	4.80	6.00	0.15	0.60
4	4.72 / 4.78	0.06	7.10	8.50	0.18	0.70
5	6.05 / 6.12	0.07	9.50	12.10	0.20	0.80
6	9.35 / 9.40	0.08	13.50	15.00	0.24	0.80
7	12.70/12.75	0.10	18.00	20.00	0.30	1.00

The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:







STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M60	2	1	-	00295	-	09	02
The basic profile of the seal	The hardware cross section	The seal type: 1 - Shaft seal 2 - Piston seal	-	The datum diameter of the hardware, given to 1 decimal place i.e. 29.5mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

Example Part Number: M6021-00295-0902



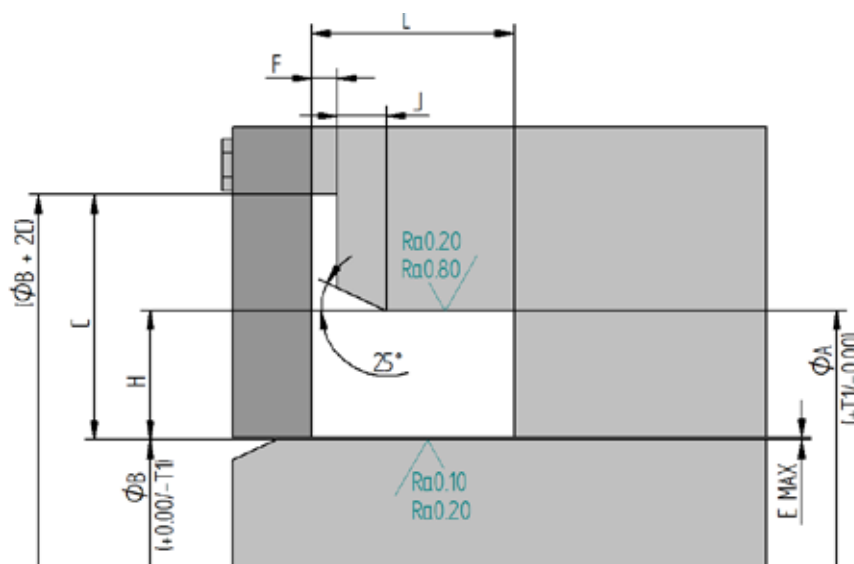
Flanged Rotary Seals

Moontown's range of flanged rotary seals are extensions of our standard single acting radial spring energised seals incorporating a flange to resist seal movement in rotary applications. Capable of rotary speeds up to 5m/s and pressures of 200 BAR (please check with our Technical Department for suitability), these seals are also used in cryogenic applications where the flange helps resist jacket shrinkage onto the shaft. In general applications, i.e. good lubrication and heat dissipation, these seals can be used at PV values up to 100BAR/m/s.

	STANDARD LIPS	SCRAPER LIPS
<p>Helicoil Profile</p> <p>Used in slow to medium duty rotary applications. Suitable for cryogenic applications.</p>		
Style:	M07	M08
<p>Rounded U-Spring Profile</p> <p>Used in all duty of rotary applications.</p>		
Style:	M26	M27
<p>Pointed U-Spring Profile</p> <p>Used in all duty of rotary applications.</p>		
Style:	M66	M67



Flanged Rotary Hardware



CROSS SECTION	H	T1	L	C	J	F	E
			(+0.30/-0.00)	+/-0.15	+/-0.15	+/-0.05	Max
1	1.42 / 1.47	0.05	2.40	3.40	0.80	0.40	0.10
2	2.26 / 2.31	0.05	3.60	4.30	0.90	0.60	0.13
3	3.07 / 3.12	0.05	4.80	5.50	1.30	0.70	0.15
4	4.72 / 4.78	0.06	7.10	8.50	1.80	0.80	0.18
5	6.05 / 6.12	0.07	9.50	11.50	2.30	1.20	0.20
6	9.35 / 9.40	0.08	13.50	15.50	3.30	1.60	0.24
7	12.70/12.75	0.10	18.00	20.50	4.00	2.00	0.30

The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:

STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M07	4	1	-	01270	-	02	03
The basic profile of the seal	The hardware cross section	The seal type: 1 - Shaft seal	-	The datum diameter of the hardware, given to 1 decimal place i.e. 127.0mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

Example Part Number: M0741-01270-0203



Axial Seal Profiles

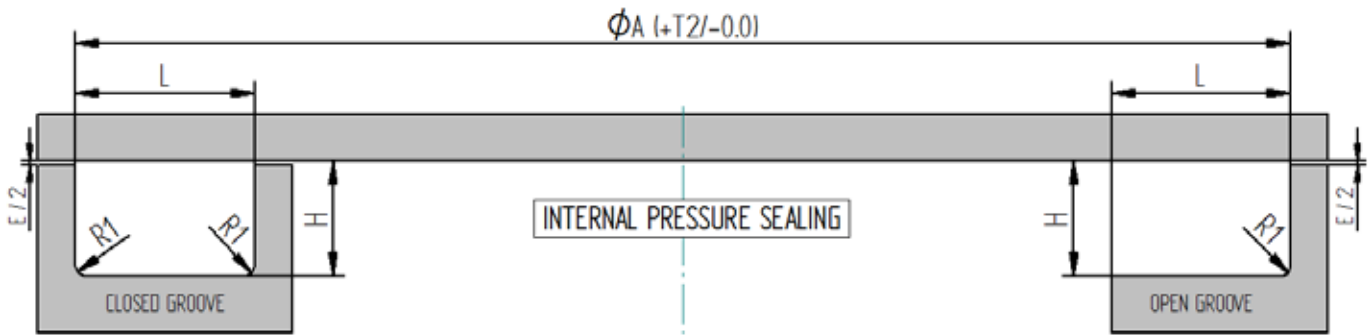
Moontown's axial (face) seals are single acting radial spring energised seals. These seals consist of a polymer jacket energised with a corrosion resistant coil or U-spring. These seals are used where conventional sealing materials, such as elastomers and polyurethanes, fail to meet the requirements of pressure, temperature, chemical compatibility and/or friction levels for a desired application. These seals give excellent sealing integrity at vacuum and low pressures while still being capable of performing at pressures of up to 1000 BAR. The axial seal profiles also tolerate a wide temperature range of -250°C to 300°C and have an impressive chemical resistance.

The axial sealing range is available in our helicoil, rounded lip and pointed lip profiles and can be made to suit both internal and external pressure sealing applications.

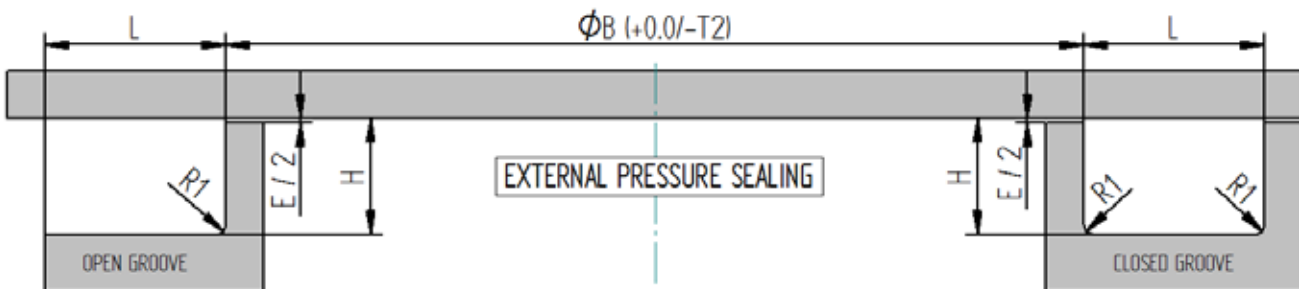
	INTERNAL PRESSURE SEALING	EXTERNAL PRESSURE SEALING
<p>Helicoil Profile</p> <p>Suitable for static and slow oscillatory applications. Suitable for cryogenic applications. Can be used to seal thin gases.</p>		
Style:	M09	M10
<p>Rounded U-Spring Profile</p> <p>Suitable for static and slow oscillatory applications.</p>		
Style:	M28	M29
<p>Pointed U-Spring Profile</p> <p>Suitable for static and slow oscillatory applications.</p>		
Style:	M68	M69



Axial Style Hardware



CROSS SECTION	H	L	ϕA	ϕB	T2	E
		MIN	MIN	MIN		MAX
1	1.42 / 1.47	2.40	6	10	0.13	0.10
2	2.26 / 2.31	3.60	12	15	0.13	0.13
3	3.07 / 3.12	4.80	20	26	0.15	0.15
4	4.72 / 4.78	7.10	45	50	0.15	0.18
5	6.05 / 6.12	9.50	85	95	0.20	0.20
6	9.35 / 9.40	13.50	100	110	0.25	0.24
7	12.70/12.75	18.00	120	150	0.30	0.30



The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:

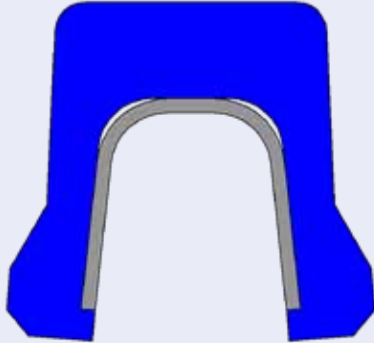

STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M10	6	0	-	03000	-	17	03
The basic profile of the seal	The hardware cross section	The seal type: 0 – Axial seal	-	The datum diameter (A or B) of the hardware, given to 1 decimal place i.e. 300mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

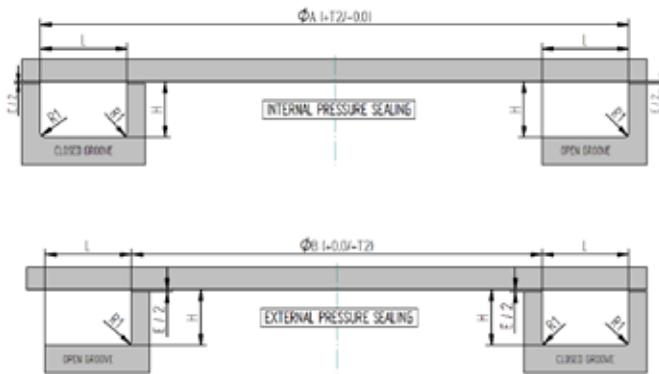
Example Part Number: M1060-03000-1703



Finger Spring Profile Seals

Moontown's M30 and M31 style axial face seals employ a heavy duty, very high load spring, suitable for both static and slow dynamic applications. These seals are ideal for marine loading arm swivels and such applications where high torque and clamping forces are available. They are also recommended for cryogenic applications, ultra high vacuum and thin gases.

	INTERNAL PRESSURE SEALING	EXTERNAL PRESSURE SEALING
<p>Standard Lip Profile</p> <p>The standard profile suitable for static and dynamic applications</p>		
Style:	M30	M31



CROSS SECTION	H	L	T2	R1	E MAX
4	4.72 / 4.78	7.10	0.15	0.70	0.18
5	6.05 / 6.12	9.50	0.20	0.80	0.20
6	9.35 / 9.40	13.50	0.25	0.80	0.24
7	12.70 / 12.75	16.50	0.30	1.00	0.30

The above table and diagram details standard hardware sizes for Moontown seals. Seals can also be manufactured to suit non standard sizes. Please contact our Technical Department for assistance. The part numbers for standard seals can be assigned as per the example below:


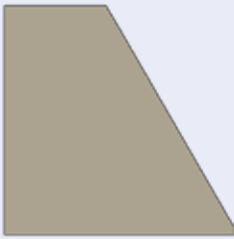
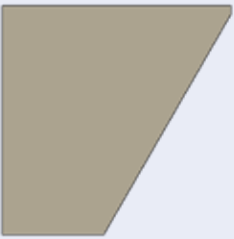
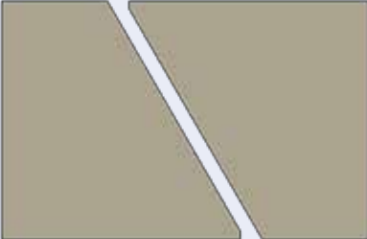

STYLE	CROSS SECTION	AXIAL	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL
M30	7	0	-	12700	-	22	01
The basic profile of the seal	The hardware cross section	The seal type: 0 - Axial seal	-	The datum diameter (A or B) of the hardware, given to 1 decimal place i.e. 127.0mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)

Example Part Number: M3070-12700-2201



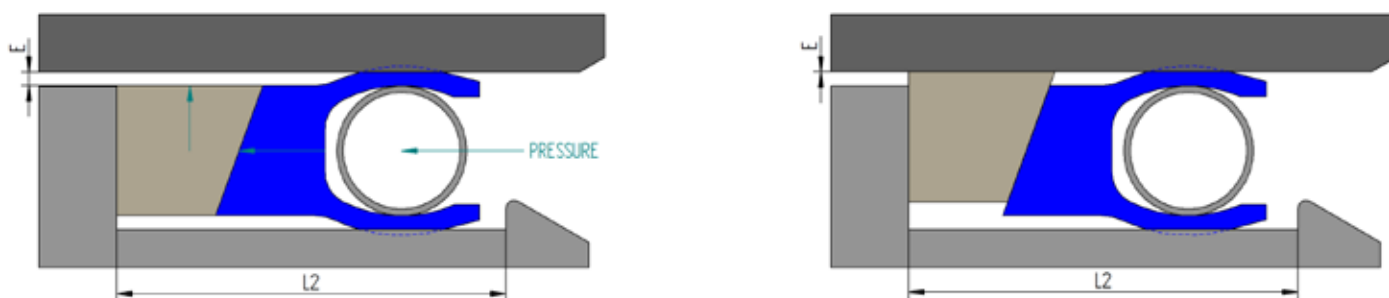
Solid Back-Up and O-Rings

We offer a range of PTFE back-up rings and O-rings that are available in any of our high performance materials. Back-up rings are usually employed where additional extrusion resistance is required. Below are the standard back-up ring profiles. For other styles or the machining of your own design please contact our Technical Department.

MBU01	MBU02	MBU03	MBU04	MBU05
				
Quadrilateral Back-up Used to improve extrusion resistance.	ID Cammed Back-up Used in conjunction with an angled heel seal to minimise the extrusion gap. Used on ID sealing seals.	OD Cammed Back-up Used in conjunction with an angled heel seal to minimise the extrusion gap. Used on OD sealing seals.	Double Cammed Back-up Can be added to existing seals and seals without an angled heel to reduce the extrusion gap. Can be used on OD or ID sealing seals.	PTFE O-Ring Used when standard elastomer O-Rings aren't compatible with the sealing media. Can be used as a static seal.

Cammed Back-up Rings

As the system pressure increases and the seal is forced back, the addition of a back-up ring behind the seal, provides extra material to resist the pressure and prevent extrusion. A cammed style back-up ring uses the movement of the seal to force itself into the path of the extrusion gap, thus greatly reducing it. The diagram below provides a brief outline of the concept.



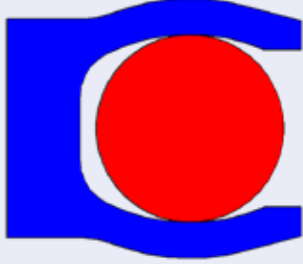
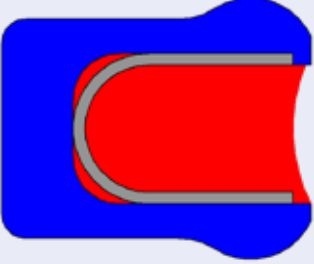
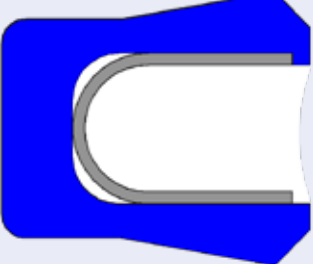
STYLE	-	ID	x	SECTION	x	WIDTH	-	MATERIAL CODE
MBU02	-	50.8	x	6.35	x	7.0	-	13
The basic profile of the ring	-	The ID of the ring given to 1 decimal place (including the decimal point)	x	The radial section of the ring given to 2 decimal places (including the decimal point)	x	The width of the ring given to 1 decimal place (including the decimal point)	-	The jacket material code (See page 4)

Example Part Number: MBU02-50.8x6.35x7.0-13



Sanitary Seals

Moontown's range of sanitary seals is comprised of our U-spring profile seals with a silicone filled cavity and, silicone O-ring energised cavities of our helicoil profiles.

HELICOIL PROFILE	ROUNDED LIP U-SPRING PROFILE	POINTED LIP U-SPRING PROFILE
		
Any of our standard, scraper or flanged helicoil profiles can be modified to suit a silicone O-ring energiser.	Any of our standard, scraper or flanged rounded lip profiles can be supplied with a silicone filled cavity.	Any of our standard, scraper or flanged pointed lip profiles can be supplied with a silicone filled cavity.

Our U-spring profiles comprise of a standard spring energiser with a silicone filled cavity, leaving the surface smooth. This prevents dirt particles from entering the cavity, making the seal easy to clean. These seals are favoured in applications where there are excessive amounts of dirt and debris and also in food and drug applications where FDA approval is required.

We also offer our range of helicoil seals with a silicone O-ring in place of the coil spring. This creates a smooth surface to prevent dirt and contaminants from entering the seal.

Below are our FDA materials which are commonly used with these seals and our options of silicone filling and O-rings.

JACKET MATERIALS			
CODE	DESCRIPTION	COLOUR	FDA STATUS
01	Virgin PTFE	White	Approved
10	UHMW-PE	White	Approved
15	Filled PTFE	White	Approved
22	Modified PTFE	White	Approved

SILICONE OPTIONS			
COLOUR	CAVITY FILL	O-RING	FDA STATUS
Red	✓	✓	Approved
White	✓	✓	Approved
Clear	✓		Approved

Please note that red silicone is supplied as standard. Other colours available on request.

STYLE	CROSS SECTION	SHAFT OR PISTON	-	REFERENCE DIAMETER	-	JACKET MATERIAL	ENERGISER MATERIAL	SILICONE SUFFIX
M60	4	1	-	00600	-	10	01	S
The basic profile of the seal	The hardware cross section	The seal type: 1 - Shaft seal 2 - Piston seal	-	The datum diameter of the hardware, given to 1 decimal place i.e. 60mm	-	The jacket material code (see page 4)	The energiser material code (see page 5)	An 'S' suffix is added to indicate a silicone filled cavity.

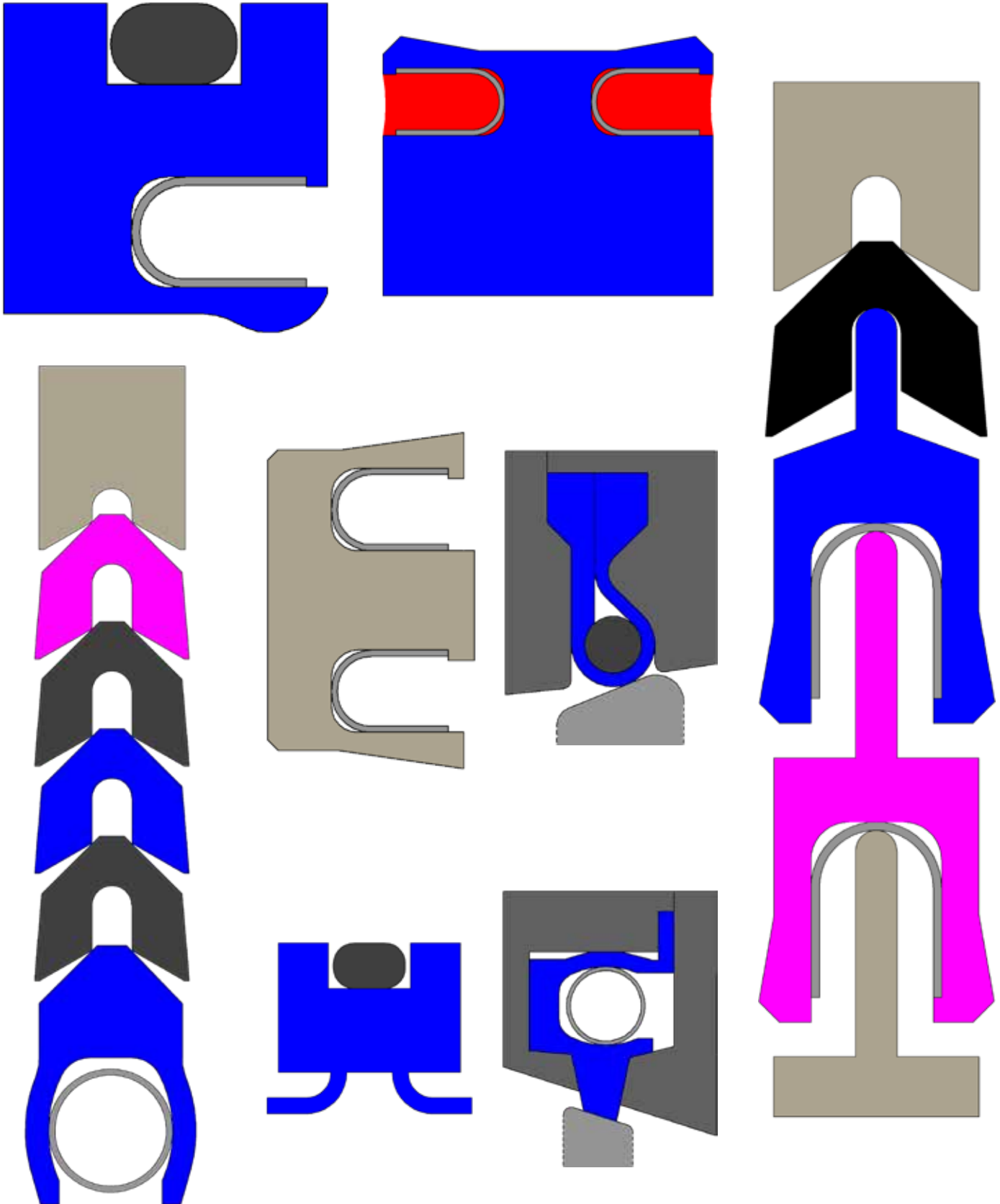
Example Part Number: M6041-00600-1001S



Special Designs

The flexibility of our “Powder To Part” production offers Moontown the ability to tailor our range of standard seal profiles to suit non-standard sizes. We are also able to modify seal profiles to suit specific applications.


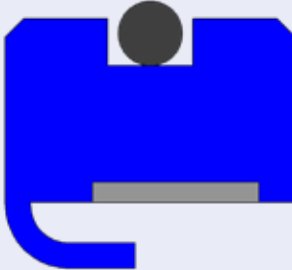






Below are some examples of our Special Designs:



Rotary Lip Profile Seals



Moontown's rotary lip profile is a single acting radial seal. It consists of a polymer jacket held in place by an elastomeric O-ring. These seals give excellent sealing integrity at vacuum and low pressures while still being capable of performing at pressures of up to 30 BAR. The rotary lip also has an exceptional temperature range of -20°C to +250°C and excellent corrosion resistance.

The rotary lip seal provides designers with a significant performance improvement over elastomeric lip seals yet still offers a reduction in cost when compared with mechanical face seals and metal cased lip seals. They provide a low friction solution that is easy to install and replace. The lip seals are suitable for dry running or running with abrasive media and can be used at surface speeds of up to 25m/s. A metal supporting ring can be added for high temperature applications. For additional sealing, a spring energised sealing element can be incorporated into either the OD or the ID.

	STANDARD TEMPERATURE UP TO 100°C	HIGH TEMPERATURE UP TO 250°C
Used for shaft speeds of up to 25m/s. Maximum pressure of up to 5 BAR. Suitable for lubricated and non-lubricated applications. Temperature is limited by the O-ring material.		
Style:	M50	M51
Improved sealing of gases and abrasive media due to increased lip load. Not recommended for shaft speeds greater than 8m/s		
Style:	M52	M53
The addition of a spring to the sealing lip increases lip load and helps to account for run-out or misalignment of the shaft. Used at up to 3 BAR and surface speeds of up to 7m/s.		
Style:	M54	M55
Suitable for shaft speeds of up to 30m/s. Maximum pressure of 1.5 BAR. Low friction seal, often used as an environmental seal.		
Style:	M56	M57

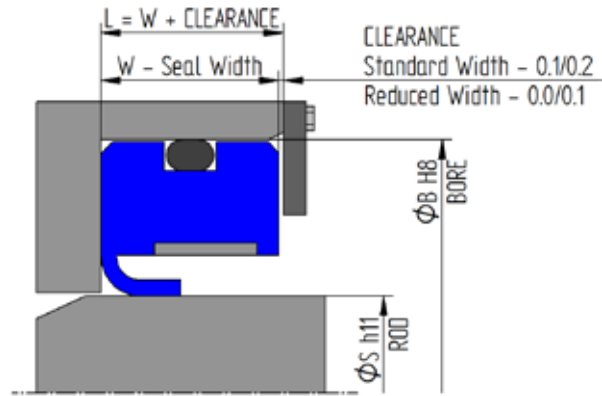


Rotary Lip Profile Seals

	RADIAL CLAMPING STANDARD GROOVE	AXIAL CLAMPING REDUCED WIDTH GROOVE
Used in high pressure hydraulic applications such as pumps and hydraulic motors. Have an operational PV of up to 65 BAR m/s. Temperature is limited by the O-ring material.		
Style:	M58	M59

Hardware and Surface Finishes

SURFACE FINISHES	
Bore	Ra 0.8 - 1.6µm
	<Ra 0.8µm for SE sealed OD
	The preferred finishing method is plunge grinding with no lead
Shaft	Ra 0.3 - 0.5µm for lubricated applications
	Ra 0.2 - 0.4µm for non-lubricated or abrasive media
	<Ra 0.2µm for vacuum



SHAFT MATERIAL AND HARDNESS	
Material	Cast iron, hardened steel or similar
Shaft	40 to 65 HRc with hydraulic oil up to 15 BAR
	58 to 65 HRc with pressure > 15 BAR and non lubricating or abrasive media

Moontown's rotary lip seals can be manufactured to a wide range of sizes to suit many applications. DIN Standard 3760 sizes should be favoured where possible. The below table shows our standard part number format.

STYLE	-	SHAFT	x	GROOVE	x	WIDTH	x	JACKET MATERIAL	ENERGISER MATERIAL
M52	-	48	x	62	x	8	x	11	05
The basic profile of the seal	-	The diameter of the shaft (ØS)	x	The diameter of the shaft (ØB)	x	The width of the groove	x	The jacket material code (see page 4)	The energiser material code (see page 5)

Example Part Number: M52-48x62x8-1105

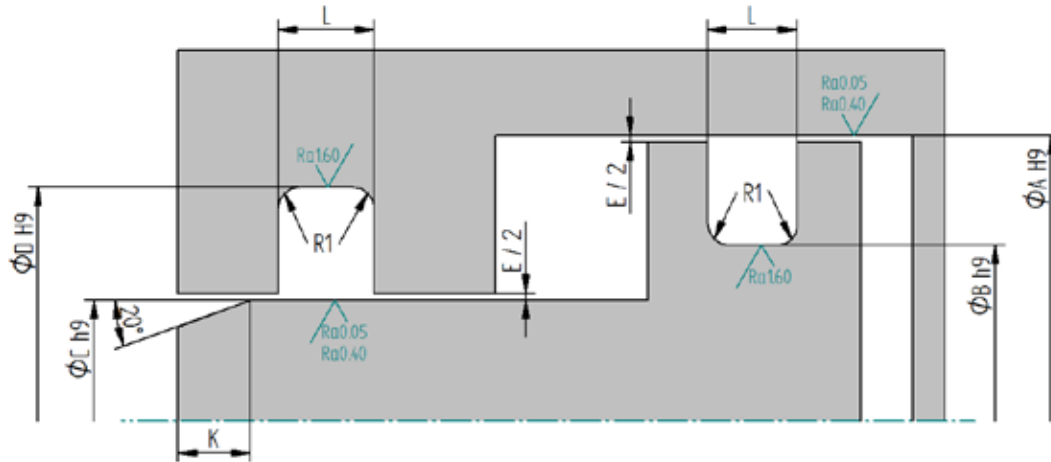


Double Acting Style Seals

Moontown's double acting seals consist of a PTFE slipper element energised by an elastomeric O-ring to seal the rods and pistons of cylinders. They are suitable for reciprocating applications at up to 15m/s and can be used at pressures up to 800 BAR. Our double acting seals also have a wide temperature tolerance of -60°C to +200°C, limited only by the O-ring material. Due to the nature of the PTFE slipper, these seals have excellent anti-friction characteristics, show no adhesion effect and, have no stick-slip effect during start-up. They are suitable for use in both dry and lubricated applications.

M70 STYLE – ROD SEAL	ROD ØC			GROOVE ØD	GROOVE WIDTH L -0.00/+0.20
	HEAVY DUTY M70A	STANDARD DUTY M70B	LIGHT DUTY M70C		
		3 - 7.9	8 - 18.9	C + 4.9	2.2
			8 - 18.9	C + 7.3	3.2
	8 - 18.9	19 - 37.9	38 - 199.9	C + 10.7	4.2
	19 - 37.9	38 - 199.9	200 - 255.9	C + 15.1	6.3
	38 - 199.9	200 - 255.9	256 - 649.9	C + 20.5	8.1
	200 - 255.9	256 - 649.9	650 - 999.9	C + 24.0	8.1
	256 - 649.9	650 - 999.9		C + 27.3	9.5

M71 STYLE - PISTON SEAL	BORE ØA			GROOVE ØB	GROOVE WIDTH L -0.00/+0.20
	HEAVY DUTY M71A	STANDARD DUTY M71B	LIGHT DUTY M71C		
		8 - 14.9	15 - 39.9	A - 4.9	2.2
			15 - 39.9	A - 7.5	3.2
	15 - 39.9	40 - 79.9	80 - 132.9	A - 11.0	4.2
	40 - 79.9	80 - 132.9	133 - 329.9	A - 15.5	6.3
	80 - 132.9	133 - 329.9	330 - 669.9	A - 21.0	8.1
	133 - 329.9	330 - 669.9	670 - 999.9	A - 24.5	8.1
	330 - 669.9	670 - 999.9		A - 28.0	9.5

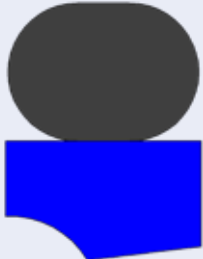


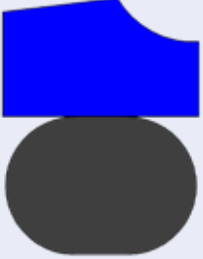
GROOVE WIDTH L -0.00/+0.20	E MAX		RADIUS R1	CHAMFER K MIN	O-RING	
	0 - 200 BAR	200 - 400 BAR			SERIES	C/S
2.2	0.60	0.40	0.3 - 0.5	1.8	000	1.78
3.2	0.80	0.50	0.5 - 0.8	2.6	100	2.62
4.2	0.80	0.50	0.8 - 1.2	3.4	200	3.53
6.3	1.00	0.60	1.2 - 1.5	5.1	300	5.33
8.1	1.00	0.60	1.5 - 2.0	6.5	400	7.00
8.1	1.20	0.80	1.5 - 2.0	6.5	400	7.00
9.5	1.40	1.00	2.0 - 3.0	7.6	500	8.40

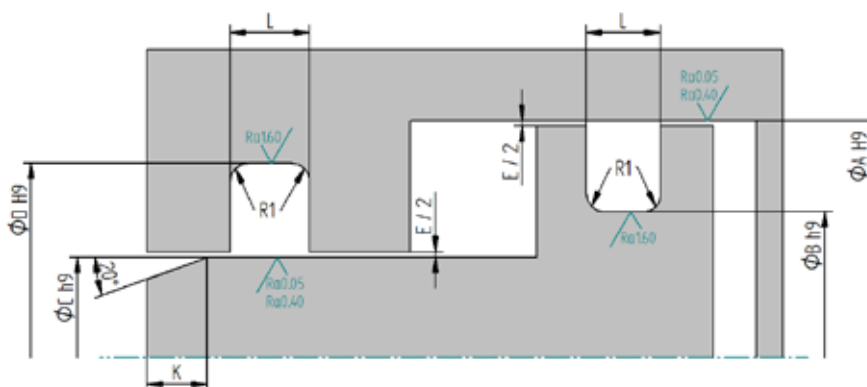


Single Acting Style Seals

Moontown's single acting seals consist of a PTFE slipper element energised by an elastomeric O-ring to seal the rods and pistons of cylinders. They are suitable for reciprocating applications at up to 15m/s and can be used at pressures up to 800 BAR. Our single acting seals also have a wide temperature range of -60°C to +200°C, limited only by the O-ring material. Due to the nature of the PTFE slipper, these seals have excellent anti-friction characteristics, show no adhesion effect and, have no stick-slip effect during start-up. They are suitable for use in both dry and lubricated applications.

M72 STYLE - ROD SEALS	ROD ØC			GROOVE ØD	GROOVE WIDTH L -0.00/+0.20
	HEAVY DUTY M72A	STANDARD DUTY M72B	LIGHT DUTY M72C		
		3 - 7.9	8 - 18.9	C + 4.9	2.2
			8 - 18.9	C + 7.3	3.2
	8 - 18.9	19 - 37.9	38 - 199.9	C + 10.7	4.2
	19 - 37.9	38 - 199.9	200 - 255.9	C + 15.1	6.3
	38 - 199.9	200 - 255.9	256 - 649.9	C + 20.5	8.1
	200 - 255.9	256 - 649.9	650 - 999.9	C + 24.0	8.1
	256 - 649.9	650 - 999.9		C + 27.3	9.5

M73 STYLE - PISTON SEALS	BORE ØA			GROOVE ØB	GROOVE WIDTH L -0.00/+0.20
	HEAVY DUTY M73A	STANDARD DUTY M73B	LIGHT DUTY M73C		
		8 - 16.9	17 - 26.9	A - 4.9	2.2
			17 - 26.9	A - 7.3	3.2
	17 - 26.9	27 - 59.9	60 - 199.9	A - 10.7	4.2
	27 - 59.9	60 - 199.9	200 - 255.9	A - 15.1	6.3
	60 - 199.9	200 - 255.9	256 - 669.9	A - 20.5	8.1
	200 - 255.9	256 - 669.9	670 - 999.9	A - 24.0	8.1
	256 - 669.9	670 - 999.9		A - 27.3	9.5



GROOVE WIDTH L -0.00/+0.20	E MAX		RADIUS R1	CHAMFER K MIN	O-RING	
	0 - 200 BAR	200 - 400 BAR			SERIES	C/S
2.2	0.60	0.40	0.3 - 0.5	1.8	000	1.78
3.2	0.80	0.50	0.5 - 0.8	2.6	100	2.62
4.2	0.80	0.50	0.8 - 1.2	3.4	200	3.53
6.3	1.00	0.60	1.2 - 1.5	5.1	300	5.33
8.1	1.00	0.60	1.5 - 2.0	6.5	400	7.00
8.1	1.20	0.80	1.5 - 2.0	6.5	400	7.00
9.5	1.40	1.00	2.0 - 3.0	7.6	500	8.40

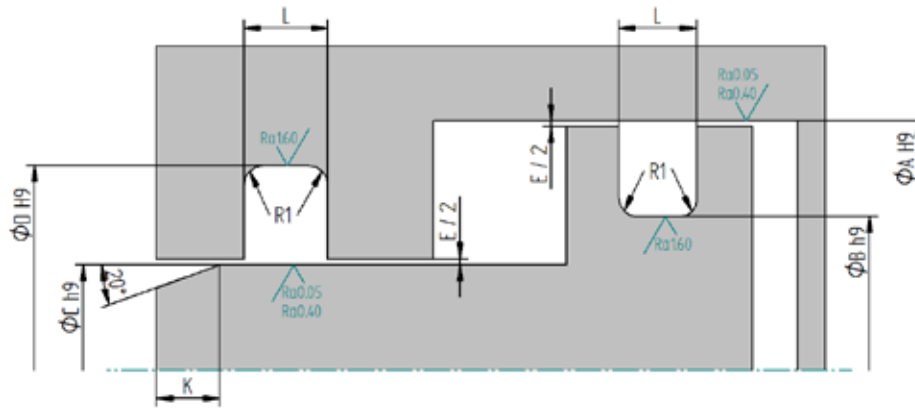


Double Acting Rotary Style Seals

Moontown's double acting rotary seals consist of a PTFE slipper element energised by an elastomeric O-ring to seal the rods and pistons of pumps, motors and hydraulic unions etc. They are suitable for rotary and oscillating applications at up to 1m/s continuously and up to 5m/s intermittently. These seals can be used at pressures up to 300 BAR. Our double acting rotary seals also have a wide temperature tolerance of -60°C to +200°C, limited only by the O-ring material. Due to the nature of the PTFE slipper, these seals have excellent anti-friction characteristics, show no adhesion effect and, have no stick-slip effect during start-up. They are suitable for use in both dry and lubricated applications.

M74 STYLE - ROD SEALS	TYPE	ROD ØC	GROOVE ØD	GROOVE WIDTH L -0.00/+0.20
	M74A	8 - 18.9	C + 4.9	2.2
	M74B	19 - 37.9	C + 7.5	3.2
	M74C	38 - 199.9	C + 11.0	4.2
	M74D	200 - 255.9	C + 15.5	6.3
	M74E	256 - 649.9	C + 21.0	8.1
	M74F	650 - 999.9	C + 28.0	9.5

M75 STYLE - PISTON SEALS	TYPE	BORE ØA	GROOVE ØB	GROOVE WIDTH L -0.00/+0.20
	M75A	8 - 18.9	A - 4.9	2.2
	M75B	19 - 37.9	A - 7.5	3.2
	M75C	38 - 199.9	A - 11.0	4.2
	M75D	200 - 255.9	A - 15.5	6.3
	M75E	256 - 649.9	A - 21.0	8.1
	M75F	650 - 999.9	A - 28.0	9.5





GROOVE WIDTH L -0.00/+0.20	E MAX		RADIUS R1	CHAMFER K MIN	O-RING	
	0 - 200 BAR	200 - 400 BAR			SERIES	C/S
2.2	0.40	0.20	0.3 - 0.5	1.8	000	1.78
3.2	0.60	0.40	0.5 - 0.8	2.6	100	2.62
4.2	0.60	0.40	0.8 - 1.2	3.4	200	3.53
6.3	0.80	0.50	1.2 - 1.5	5.1	300	5.33
8.1	0.80	0.50	1.5 - 2.0	6.5	400	7.00
9.5	1.20	0.80	2.0 - 3.0	7.6	500	8.40

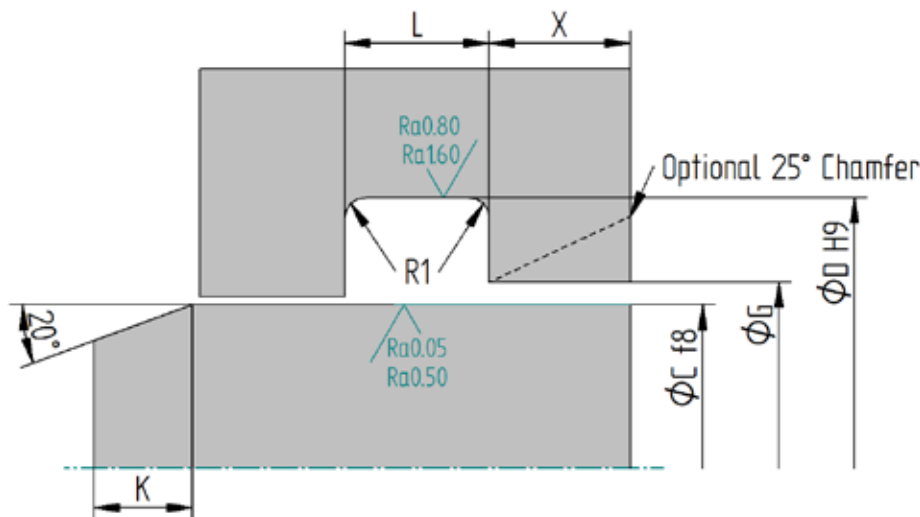


Wiper Rings

Moontown's single and double wiper rings consist of a PTFE wiper element energised by an elastomeric O-ring to clean the rods and pistons of cylinders. These wiper rings are suitable for reciprocating applications at up to 15m/s and have a wide temperature range of -60°C to +200°C, limited only by the O-ring material. Due to the nature of the PTFE slipper, these seals have excellent anti-friction characteristics, show no adhesion effect and, have no stick-slip effect during start-up. This also makes them suitable for use in both dry and lubricated applications. They offer an efficient wiping effect against firmly adhering dirt.

M76 STYLE - DOUBLE WIPER	TYPE	ROD ØC	GROOVE ØD	GROOVE WIDTH L -0.00/+0.20	RADIUS R1	BORE ØG -0.00 /+0.30	X MIN	O-RING	
								SERIES	C/S
	M76A	19 - 39.9	C + 7.9	4.2	0.8	C + 1.0	3	000	1.78
	M76B	12 - 64.9	C + 6.8	5.0	0.7	C + 1.5	3	100	2.62
	M76C	65 - 250.9	C + 8.8	6.0	1.0	C + 1.5	4	200	3.53
	M76D	251 - 420.9	C + 12.2	8.4	1.2	C + 2.0	5	300	5.33
	M76E	421 - 650.9	C + 16.0	11.0	1.5	C + 2.0	8	400	7.00
	M76F	651 - 999.9	C + 20.0	14.0	2.0	C + 2.5	10	500	8.40

M77 STYLE - SINGLE WIPER	TYPE	ROD ØC	GROOVE ØD	GROOVE WIDTH L -0.00/+0.20	RADIUS R1	BORE ØG -0.00 /+0.30	X MIN	O-RING	
								SERIES	C/S
	M77A	6 - 11.9	C + 4.8	3.7	0.4	C + 1.5	2	000	1.78
	M77B	12 - 64.9	C + 6.8	5.0	0.7	C + 1.5	2	100	2.62
	M77C	65 - 250.9	C + 8.8	6.0	1.0	C + 1.5	3	200	3.53
	M77D	251 - 420.9	C + 12.2	8.4	1.2	C + 2.0	3	300	5.33
	M77E	421 - 650.9	C + 16.0	11.0	1.5	C + 2.0	4	400	7.00
	M77F	651 - 999.9	C + 20.0	14.0	2.0	C + 2.5	5	500	8.40



When designing the grooves for wiper rings, additional clearance should be left between the rod and bore (as shown by ØG). This clearance is positioned on the wiping side of the seal, allowing detritus to be wiped from the shaft. To assist assembly, a 25° chamfer can be incorporated in the X dimension. Ensure there are no sharp edges on the hardware.

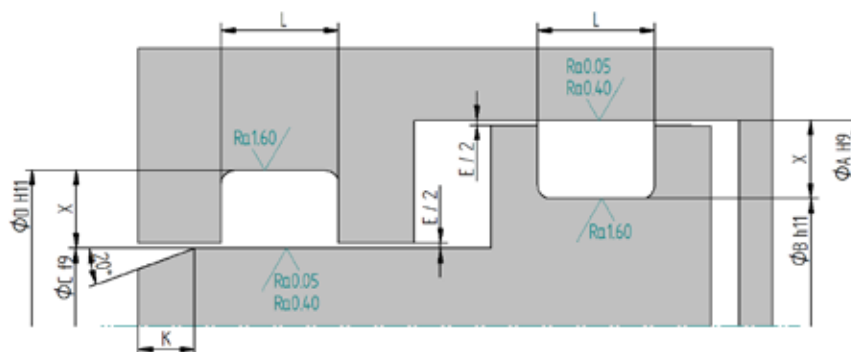


Compact Double Acting Style Seals

Moontown's compact double acting seals consist of a PTFE slipper element energised by an elastomeric O-ring to seal the rods and pistons of cylinders. These seals are designed to fit into existing O-ring grooves to improve performance and, as such, can be used for both rotary and reciprocating applications. Our compact double acting seals have a wide temperature range of -60°C to +200°C, limited only by the O-ring material. Due to the nature of the PTFE slipper, these seals have excellent anti-friction characteristics, show no adhesion effect and, have no stick-slip effect during start-up. They are suitable for use in both dry and lubricated applications.

TYPE M78 - ROD SEAL	TYPE	ROD ØC	GROOVE ØD	GROOVE WIDTH L	GROOVE DEPTH X
	M78A	4 - 9.9	C + 2.9	2.4	1.45
	M78F			3.8	1.45
	M78B	10 - 19.9	C + 4.5	3.6	2.25
	M78G			4.7	2.25
	M78C	20 - 39.9	C + 6.2	4.8	3.10
	M78H			5.7	3.10
	M78D	40 - 119.9	C + 9.4	7.1	4.70
	M78J			8.5	4.70
	M78E	120 - 400.9	C + 12.2	9.5	6.10
	M78K			11.2	6.10

TYPE M78 - ROD SEAL	TYPE	BORE ØA	GROOVE ØB	GROOVE WIDTH L	GROOVE DEPTH X
	M79A	8 - 13.9	A - 2.9	2.4	1.45
	M79F			3.8	1.45
	M79B	14 - 24.9	A - 4.5	3.6	2.25
	M79G			4.7	2.25
	M79C	25 - 45.9	A - 6.2	4.8	3.10
	M79H			5.7	3.10
	M79D	46 - 124.9	A - 9.4	7.1	4.70
	M79J			8.5	4.70
	M79E	125 - 400.9	A - 12.2	9.5	6.10
	M79K			11.2	6.10



GROOVE DEPTH X	RADIUS R1	E MAX	K MIN	O-RING	
				SERIES	C/S
1.45	0.2 - 0.4	0.13	3.70	000	1.78
2.25	0.2 - 0.4	0.13	4.60	100	2.62
3.10	0.4 - 0.6	0.15	6.80	200	3.53
4.70	0.6 - 0.8	0.17	9.00	300	5.33
6.10	0.6 - 0.8	0.25	11.00	400	7.00



Hydraulic Seals Notes

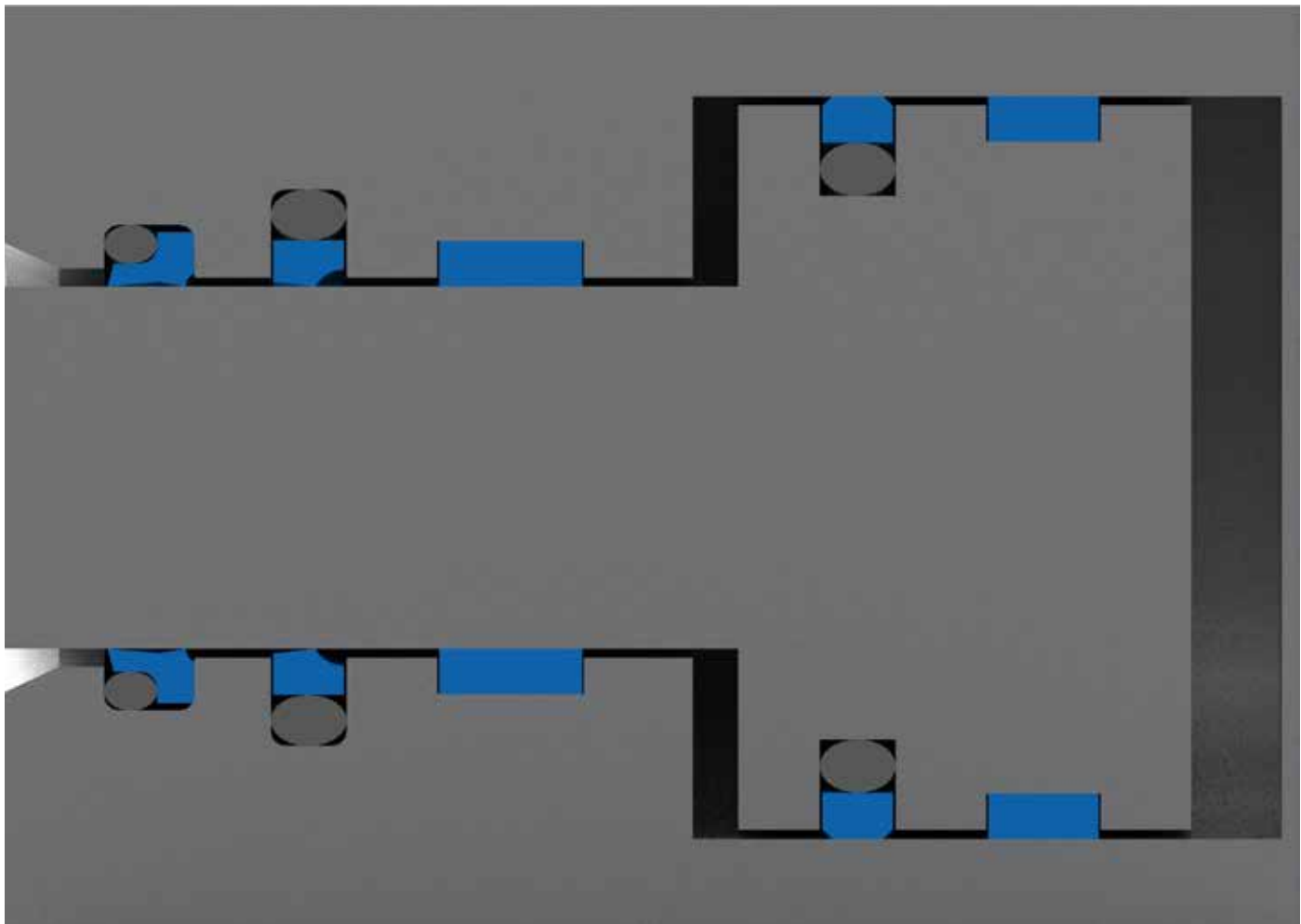
All part numbers for Moontown's hydraulic seals can be assigned as per the below example:

STYLE	-	DATUM DIAMETER	-	SLIPPER MATERIAL	O-RING MATERIAL
M72B	-	03655	-	09	05
The basic profile of the ring	-	The diameter of the ring given to 1 decimal place i.e. 365.5mm	-	The material code of the slipper (see page 4)	The material code of the O-ring (see page 4)

Example Part Number: M72B-03655-0905

Hydraulic Assemblies

Commonly, hydraulic cylinders will incorporate various seals, wipers and wear rings into one working system. Shown below is a sample hydraulic assembly.



Wear Rings

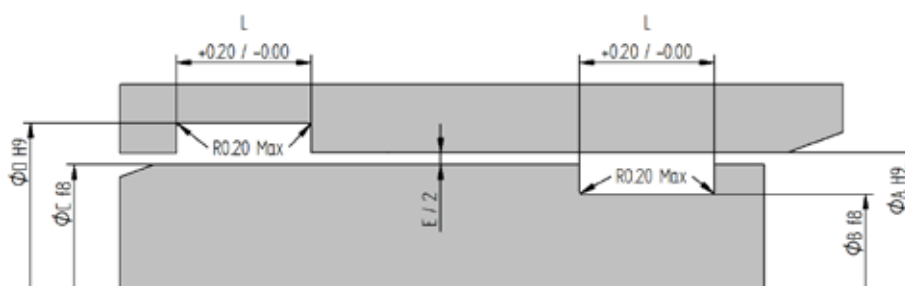
Moontown's range of wear rings are designed to guide rods, pistons and stems and to absorb lateral forces where they occur. They also help to prevent metal to metal contact and, in the correct design, they can eliminate the possibility of metallic seizure. Wear rings are available as both cut tape or machined rings and can be supplied in a variety of cut styles to suit different applications. They are easily fitted by hand into open and closed grooves. The number of wear rings used will depend on a number of factors such as the radial forces acting on the ring, the permissible surface pressure of the wear ring material, as well as the size and motion of the hardware.

Typical materials used for wear rings include virgin and filled PTFE, a compound of PTFE and fabric materials and thermoplastics. Virgin and filled PTFE have a low coefficient of friction and are best suited for low load applications. Fabric/PTFE compounds and thermoplastics have a much higher load capability with a higher coefficient of friction, making them more suitable for higher load applications.



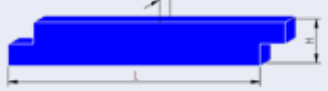
	M80 STYLE - TAPE	M81 STYLE - MACHINED RING
<p>M80 - Available to suit the groove sizes given in the tables below. Can be supplied as cut lengths or as an uncut roll.</p> <p>M81 - Available to suit the groove sizes in the tables below and can be made to suit non-standard groove sizes</p>		

TYPE - ROD				
SIZE	ROD ØC	GROOVE ØD	GROOVE WIDTH L	E
03C	8 - 20	C + 3	3.20	0.40 - 1.00
04C	15 - 35	C + 5	4.20	0.50 - 2.00
06C	20 - 75	C + 5	6.30	0.50 - 2.00
08C	30 - 250	C + 5	8.10	0.50 - 2.00
09C	50 - 300	C + 5	9.70	0.50 - 2.00
10C	50 - 300	C + 5	10.00	0.50 - 2.00
15C	120 - 900	C + 5	15.00	0.50 - 2.00
20C	200+	C + 5	20.00	0.50 - 2.00
25C	300+	C + 5	25.00	0.50 - 2.00
30C	300+	C + 5	30.00	0.50 - 2.00
40C	300+	C + 5	40.00	0.50 - 2.00
50C	300+	C + 5	50.00	0.50 - 2.00

TYPE - PISTON				
SIZE	BORE ØA	GROOVE ØB	GROOVE WIDTH L	E
03A	10 - 25	A - 3	3.20	0.40 - 1.00
04A	20 - 40	A - 5	4.20	0.50 - 2.00
06A	25 - 80	A - 5	6.30	0.50 - 2.00
08A	40 - 270	A - 5	8.10	0.50 - 2.00
09A	60 - 320	A - 5	9.70	0.50 - 2.00
10A	60 - 320	A - 5	10.00	0.50 - 2.00
15A	120 - 900	A - 5	15.00	0.50 - 2.00
20A	200+	A - 5	20.00	0.50 - 2.00
25A	300+	A - 5	25.00	0.50 - 2.00
30A	300+	A - 5	30.00	0.50 - 2.00
40A	300+	A - 5	40.00	0.50 - 2.00
50A	300+	A - 5	50.00	0.50 - 2.00



Wear Rings

CUT STYLE	
<p>X-Cut Standard choice for reciprocating applications</p>	
<p>Y-Cut Standard choice for rotary applications</p>	
<p>Z-Cut Used in contaminated applications for both rotary and reciprocating motion.</p>	

Calculating Wear Ring Lengths

If:

- L = Length
- A = Bore diameter
- C = Rod diameter
- S = Wear ring thickness

Then:

For pistons: $L=(A-S)*3.1415*0.99-1$

For rods: $L=(C+S)*3.1415*0.99-1$

Calculating Wear Ring Widths

If:

- H = Wear ring width
- F = Side load (Kp)
- Fg = Material specific load
- A = Bore diameter
- C = Rod diameter

Then:

$H=0.5 F/(Fg \times A)$

CODE	COMPOSITION	TEMP (°C)	MATERIAL LOAD KP/MM2	APPLICATION	COEFF. FRICTION
05	PTFE/Carbon/Graphite	-250	0.85 at 50°C	Water/Air	0.10
		+320	0.65 at 85°C		
07	PTFE/Bronze	-150	1.60 at 50°C	Hydraulic Oil	0.08
		+290	0.90 at 85°C		
10	UHMW - PE	-150	16.5 at 50°C	Water	0.11
		+80			
99	PTFE/Polyester	-150	340 at 50°C	Water, Air, Hydraulic Oil	0.10
		+145			

STYLE	CROSS SECTION	-	DATUM DIAMETER	-	MATERIAL CODE	CUT STYLE
M80	10A	-	04000	-	05	X
The basic style i.e. strip or machined ring	The groove size from the standard sizes tables opposite	-	The datum diameter of the hardware given to 1 decimal place	-	The material code (see page 04)	The cut style as per the above table

Example Part Number: M8010A-04000-05X



Metal Seals

To complement our spring energised seal range, Moontown also offer a range of metallic sealing products. Metal seals are commonly used in applications where factors such as temperature, radiation, corrosion or permeability exclude the use of PTFE seals. Manufactured from a range of high quality alloys and stainless steels, our metallic seals are suitable for use with gas and liquid media.

Our range includes metal O and C-rings, spring energised metal C-rings, metal E-rings, and shaped metal O-rings. These products can be supplied in many combinations of size, material and plating, making them suitable for a wide range of applications.

Use of metallic seals should consider the following:

- What section of seal can be accommodated? We advise the largest possible section.
- Can the required seating loads be achieved?
- What is the maximum temperature? Ensure an appropriate material is chosen.
- Can the required surface finish be achieved? Is a plating required to help with sealing?
- Is the sealed media harsh or oxidising? Should a protective plating be used?

For anything not included in our catalogue or any applications outside the recommended temperature and/or pressure ranges, please contact our Technical Department for assistance.

Seal Selection - Quick Guide

While all our metal seals are excellent for high temperature and high pressure applications, the different characteristics possessed by the various types mean designers can find a seal ideally suited to their application.

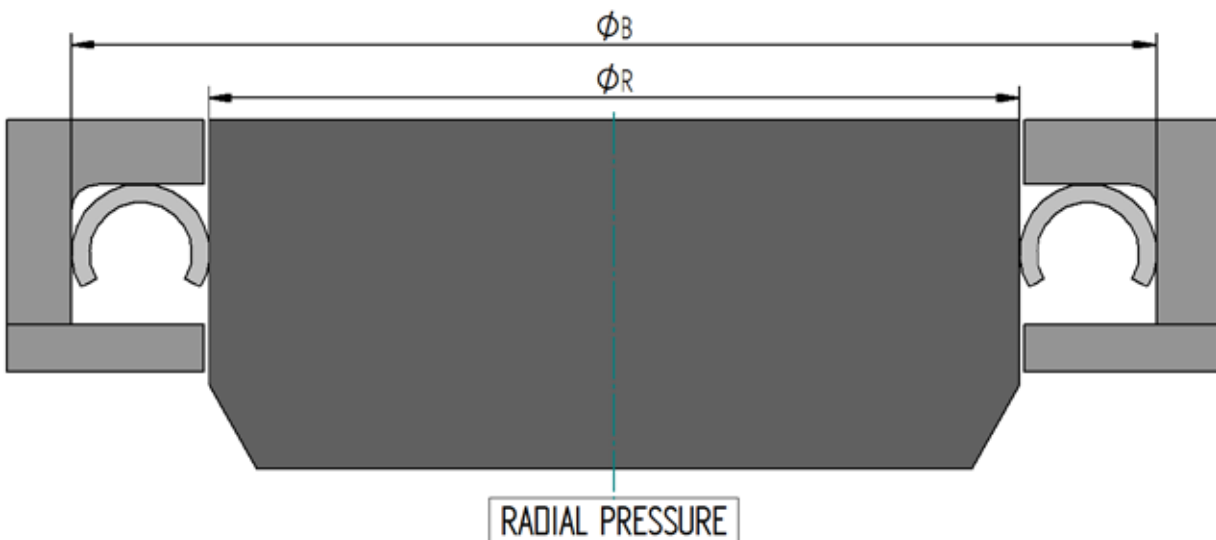
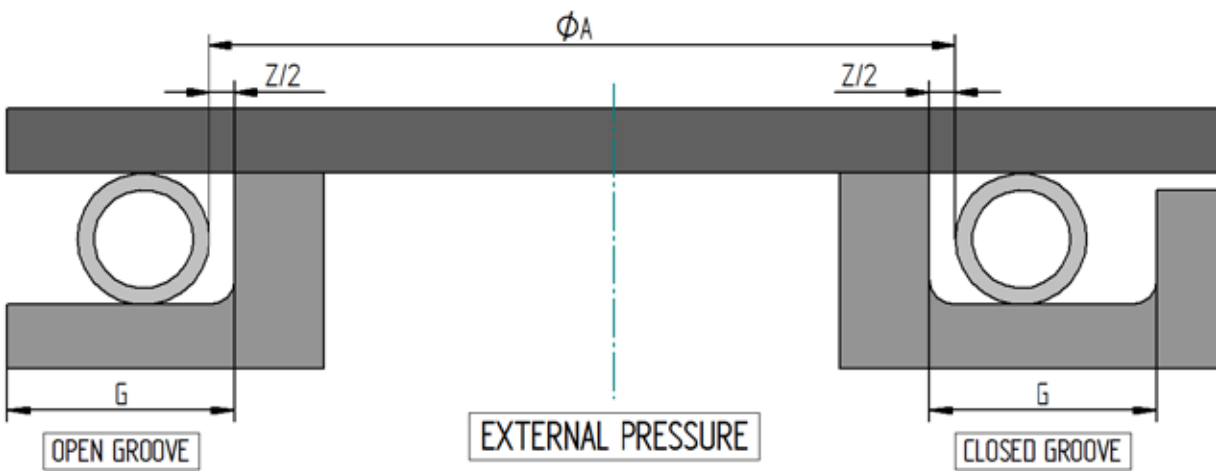
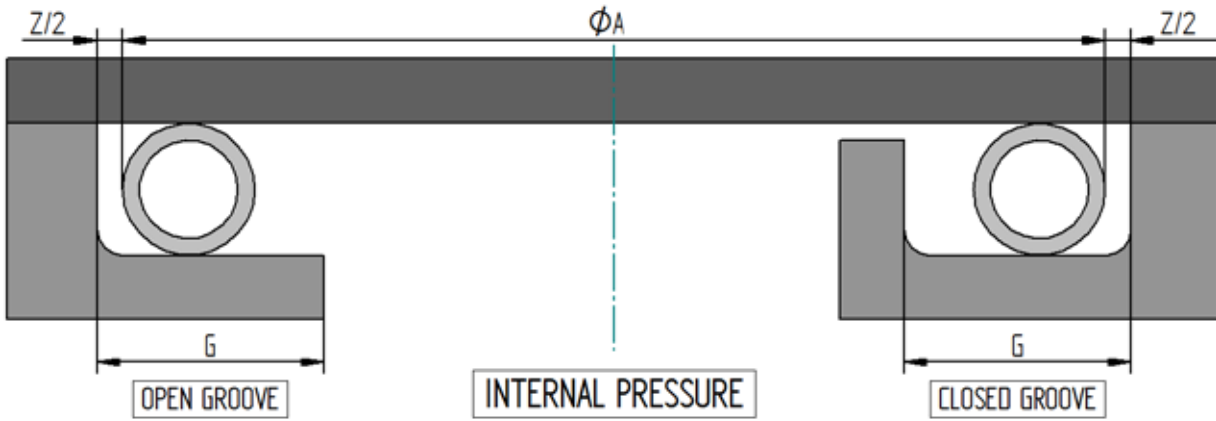
Factors such as flange separation, available bolting load and thin gas requirements will influence the design engineers seal selection. To help with this, Moontown have compared our metal seals in a range of common design criteria and ranked them from most (1) to least (4) appropriate. By adding the scores of the criteria concerned, a comparison can be made to the suitability of each style. If all factors are equally important then the style with the lowest cumulative score should be considered the best choice.

SEAL TYPE	HIGH SPRING BACK	HIGH SEALING LOAD	LOW BOLTING LOAD	LOW LEAK RATE	LOW COST
Metal O-Ring	4	2	4	2	1
Metal C-Ring	3	3	2	3	2
Spring Energised Metal C-Ring	2	1	3	1	3
Metal E-Ring	1	4	1	4	4



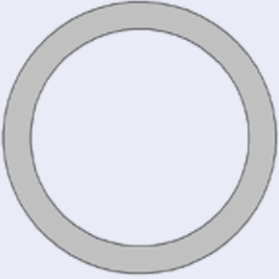
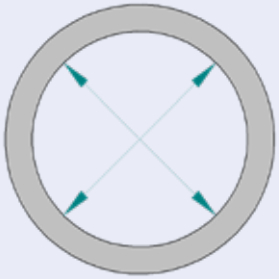
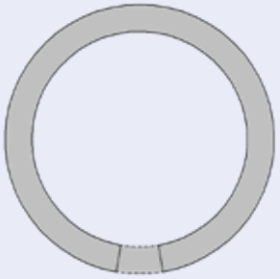
Metal Seals Hardware

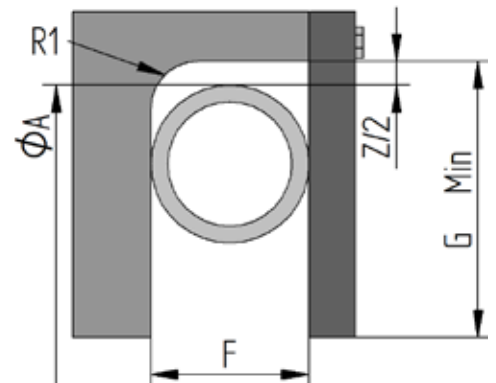
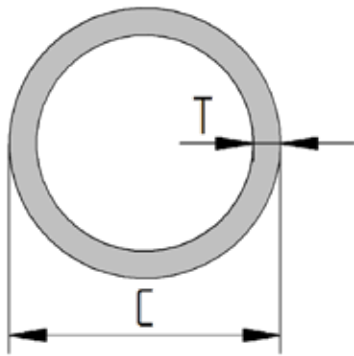
To assist in the choice of correct seal design, the illustrations below show open and closed considerations. As surface finishes do not permit spiral finishes, use of open grooves make it easier to achieve the correct finish.



Metal O-Rings

Metal O-rings are most widely used for axial (face) sealing applications at temperatures of -300° C to 980° C and pressures of vacuum to 1500 Bar.

TYPE MSO - METAL O-RING	TYPE MSP - PRESSURE FILLED O-RING	TYPE MSV - VENTED O-RING
		
Standard design. Recommended for pressure of vacuum to 70 BAR.	The O-Ring is filled with gas to increase the sealing load at high temperature.	Vent holes are used to allow the system pressure to equalise with the internal pressure of the ring and reduce stresses on the ring. Recommended for applications over 70 BAR.




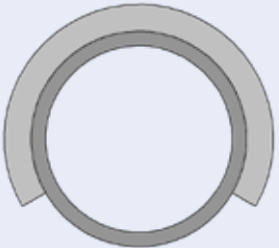
SECTION CODE	FREE HEIGHT (C)	WALL (T)	GROOVE HEIGHT (F)	GROOVE WIDTH (G)	R1 MAX	Z MIN	ØA RANGE	AVERAGE SEATING LOAD (N/MM)	TYPICAL SPRING BACK (MM)
1	0.89	0.15 (B)	0.64 / 0.69	1.40	0.25	0.20	6 - 25	65	0.01
2	1.57	0.25 (C)	1.14 / 1.37	2.29	0.38	0.28	12 - 200	100	0.03
		0.38 (D)						220	0.03
3	2.39	0.25 (C)	1.88 / 2.01	3.18	0.51	0.33	25 - 200	55	0.05
		0.46 (F)						200	0.03
4	3.18	0.25 (C)	2.54 / 2.67	4.06	0.76	0.43	50 - 400	35	0.07
		0.51 (G)						160	0.04
5	3.96	0.41 (E)	3.18 / 3.30	5.08	1.27	0.61	75 - 650	70	0.10
		0.51 (G)						115	0.08
6	4.78	0.51 (G)	3.84 / 3.99	6.35	1.27	0.71	100 - 800	90	0.10
		0.64 (H)						150	0.08
7	6.35	0.64 (H)	5.05 / 5.28	8.89	1.52	0.76	200 - 1200	100	0.20
		0.81 (J)						180	0.10
8	9.53	0.97 (K)	8.26 / 8.51	12.70	1.52	1.02	300 - 2000	160	0.15
		1.27 (L)						280	0.12

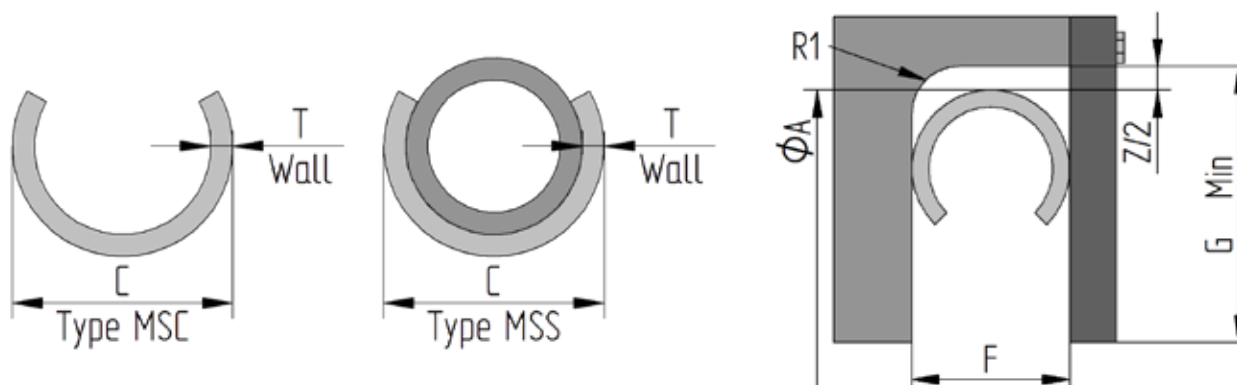
Seating load and spring back figures based on work hardened Inconel X750. Load figures for 321 stainless steel are approximately 85% of the above figures.



Metal C-Rings

Our metal C-rings offer a high temperature sealing solution that offers both a lower seating load and higher spring back in comparison to metal O-rings.

TYPE MSC - METAL C-RING	TYPE MSS - SPRING ENERGISED METAL C-RING
	
Standard design. Recommended for pressures of vacuum to 2000 Bar.	Similar to type MSC, but with a spring energiser. This additional spring force helps to provide lower leak rates and can help to compensate with rougher mating surfaces.





SECTION CODE	FREE HEIGHT (C)	WALL (T)	GROOVE HEIGHT (F)	GROOVE WIDTH (G)	R1 MAX	Z MIN	ØA RANGE	AVERAGE SEATING LOAD (N/MM)	TYPICAL SPRING BACK (MM)
1	0.79	0.13 (A)	0.64 / 0.69	1.02	0.25	0.08	6 - 25	30	0.04
2	1.57	0.15 (B)	1.27 / 1.37	1.91	0.38	0.15	10 - 200	20	0.08
		0.25 (C)						60	0.06
3	2.39	0.25 (C)	1.91 / 2.01	2.67	0.51	0.24	13 - 400	45	0.10
		0.38 (D)						95	0.08
4	3.18	0.38 (D)	2.54 / 2.67	3.43	0.76	0.32	30 - 600	55	0.15
		0.51 (G)						105	0.13
5	3.96	0.41 (E)	3.18 / 3.30	4.32	1.27	0.39	75 - 750	45	0.20
		0.64 (H)						115	0.17
6	4.78	0.51 (G)	3.84 / 3.99	5.02	1.27	0.47	75 - 900	60	0.22
		0.76 (I)						145	0.18
7	6.35	0.64 (H)	5.08 / 5.28	6.60	1.52	0.64	100 - 1200	65	0.30
		0.97 (K)						175	0.27
8	9.53	0.97 (K)	7.62 / 8.03	9.65	1.52	0.96	300 - 2000	100	0.40
		1.27 (L)						185	0.32

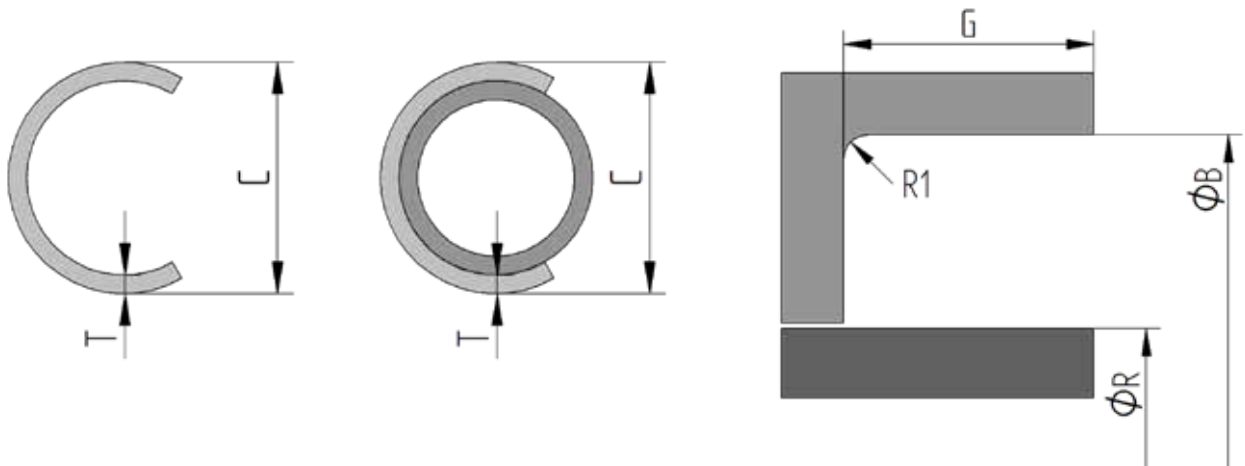
Seating load and spring back figures based on solution annealed + precipitation hardened Inconel 718 type MSC. Please contact Moontown for type MSS.



Radial Metal C-Rings

Radial metal C-rings are used for rod and piston sealing applications. They are suitable for static and light dynamic duty.

TYPE MSC - METAL C-RING	TYPE MSS - SPRING ENERGISED METAL C-RING
	
Standard design. Recommended for pressures of vacuum to 2000 Bar.	Similar to type MSC, but with a spring energiser. This additional spring force helps to provide lower leak rates and can help to compensate with rougher mating surfaces.



SECTION CODE	FREE HEIGHT (C)	RING OD (ØA)	BORE DIAMETER (ØB)	BORE TOLERANCE	ROD DIAMETER (ØR)	ROD TOLERANCE	GROOVE WIDTH (G)	MAX RADIUS (R1)	
2	1.57	ØB + 0.08	12 - 38	+0.03/-0.00	ØB - 3.12	+0.00/-0.03	1.50	0.25	
		ØB + 0.10	38 - 45		ØB - 3.07				
3	2.39	ØB + 0.08	30 - 38		ØB - 4.70		2.14	0.28	
		ØB + 0.10	38 - 85						ØB - 4.65
4	3.18	ØB + 0.10	50 - 85		ØB - 6.25		2.80	0.38	
		ØB + 0.15	85 - 150						ØB - 6.15
		ØB + 0.20	150 - 200						
5	3.96	ØB + 0.15	85 - 150	ØB - 7.72	3.45	0.51			
		ØB + 0.20	150 - 250				ØB - 7.62		
6	4.78	ØB + 0.15	100 - 150	+0.00/-0.03	ØB - 9.32	+0.00/-0.05	4.11	0.51	
		ØB + 0.20	150 - 300		ØB - 9.22				
7	6.35	ØB + 0.20	150 - 300	ØB - 12.40	5.24	0.76			



Metal Seals Materials

Seal Base Materials

MATERIAL CODE	MATERIAL	DESCRIPTION	TEMPERATURE RANGE (°C)	O-RING	C-RING
1	304 Stainless Steel	A commonly used stainless steel alloy.	-196°C +300°C	✓	
2	321 Stainless Steel	Similar to 304 with the addition of titanium for stability.	-196°C +300°C	✓	
3	Inconel 718	Nickel-chromium alloy with good oxidisation resistance.	-196°C +430°C	✓	✓
4	Inconel 600	Age hardened nickel alloy with good Strength and oxidisation resistance.	-196°C +600°C	✓	✓
5	Inconel X750	Age hardened nickel super-alloy. Excellent high temperature material.	-196°C +980°C	✓	✓

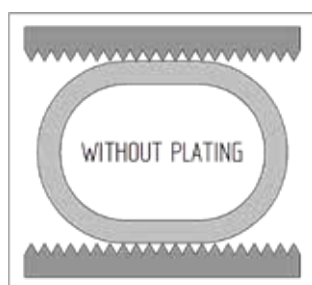
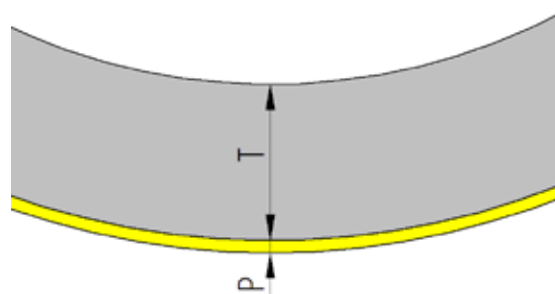
Other materials are available on request. Please contact our Technical Department to discuss your requirements. For TYPE MSS ONLY two numbers separated with a stroke is used to specify the spring material i.e 5/5

Seal Material Thickness Codes

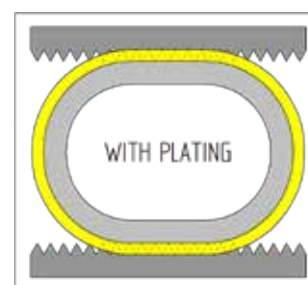
CODE	A	B	C	D	E	F	G	H	I	J	K	L
THICKNESS (T)	0.13	0.15	0.25	0.38	0.41	0.46	0.51	0.64	0.76	0.81	0.97	1.27

Plating Materials & Thickness

PLATING CODE	MATERIAL	MAXIMUM TEMP	PLATING THICKNESS (P)
X	None	-	X - No Plating
I	Indium	80°C	
P	Lead	150°C	1 - 0.03/0.05
T	PTFE	250°C	
C	Copper	500°C	2 - 0.05/0.08
S	Silver	800°C	
G	Gold	850°C	3 - 0.07/0.10
N	Nickel	975°C	



Plating is normally added to the ring to improve sealing against rougher surfaces. It achieves this by being a softer mating surface which moulds into the peaks and troughs of the rougher surface.



TYPE	PRESSURE DIRECTION	SECTION CODE	MATERIAL THICKNESS	RING DIAMETER	MATERIAL CODE	PLATING MATERIAL	PLATING THICKNESS
MSO	I	3	C	01254	4	S	1
The type of seal	The direction of pressure I - Internal E - External R - Radial	The free height section code from the standard sizes table	The wall thickness of the ring	The reference Ø of the seal including plating, given to 1 decimal place (i.e. 125.4mm)	The material code as per the materials table above	The plating code as per the plating table above	The plating thickness as per the plating table above

Example part number: MSO-I3C-01254-4S1





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