PTFE Sealing Guide

- Rod Seals
- Piston Seals
- Spring Energised Seals

- Wiper Seals
- Guide Tape

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PTFE Compounds

Basic material properties of PTFE - Polytetrafluoroethylene

PTFE does not exhibit any change when subjected to practically all known chemicals, and it's surface is so smooth hardly any foreign substances remain.
Moisture and solar radiation (sunshine) cause neither volumetric change, nor disintegration and brittleness. The chrystalline change associated with the melting point of the material starts at 327°C without there being any typical thermoplastic liquefaction.
PTFE is resistant to almost all known chemicals - material offers low coefficient of friction for a solid as well as unlimited shelf life when stored correctly.

Processing:

For the above reasons, process technology similiar to powder metallurgy is utilised. PTFE powder is compressed into blocks, rods or tubes, sintered and then mechanically machined into the required shapes.
Based on experience of the last 30 years, the materials industry has developed PTFE types that can also be thermoplastically processed for certain applications.
This process allows bespoke sizes and designs without tool or mould costs.

Application:

The possibility of compounding, i.e. matching physical properties to specific applications through the addition of fillers, is an important factor for the use of PTFE in the manufacture of seals and guide elements.
In spite of its remarkable properties, pure Virgin PTFE has limited use for applications where high mechanical loading is required due to its tendency towards cold extrusion (creep).
(For this reason an outside energising force is necessary to combat both creep and wear)

Fillers:

The influence of filler materials is particularly illustrated by:
- improvement of the flow strength
- reduction of friction and wear
- increase in extrusion resistance
- increase in thermal shape stability
- increase in hardness

The most important standard fillers are:

- Glass fibres
- Carbon/graphite
- Calcium fluoride (CaF_2)
- Pigments
- Bronze
- Molybdenum Sulphide
- Polymers

The selection of fillers is determined by the following application criteria:

Glass fibres: Improve creep strength over a wide temperature range and increase the chemical stability (with the exception of strong alkaline solutions and hydrofluoric acid)
Bronze: Copper/tin alloys mixed with PTFE produce significant improvement in the creep strength and thermal conductivity
Carbon/Graphite: Creep strength, hardness and thermal conductivity are increased. There is also a distinct improvement in wear resistance. Machining of carbon filled compounds has much less tool wear, and is a favoured method of producing parts to close tolerances. Graphite is the chrystalline form of high purity carbon, is chemically inert and can resist high temperatures
MoS_2: Improved hardness and rigidity and less friction. Only used in small proportions and in conjunction with other fillers
CaF_2: Added if material is to be in contact with chemicals such as hydrofluoric acid or strong alkaline solution
Polymers: Polymer fillers that are resistant to high temperatures improve friction in contact with soft metals
Pigments: Pigments are added as a colouring agent. Depending upon the pigment, certain applications show improved wear resistance over virgin PTFE whilst maintaining the benefits of a low filled material

Special characteristics of PTFE:

At low temperatures:
Even at -269°C (boiling point of helium) PTFE still has residual extensibility, so that it can also be used under extreme conditions, e.g. outer space.The material does require strong spring forces to counteract shrinkage - PCTFE (PolyChloroTriFluoroEthylene) can also be used.

At high temperatures:
PTFE has exceptional thermal resistance, so that it can be used at prolonged temperatures of 260°C and up to 320°C for limited periods. Fillers have no influence on the PTFE's own thermal resistance. Furthermore, most fillers are themselves stable up to 400°C so that they do not restrict high temperature use.
It should be observed that mechanical strength does reduce with high temperatures, and a backing ring (e.g. PEEK - PolyEtherEtherKetone) may be required.

Behaviour under vacuum:
There are no problems associated with the use of PTFE under vacuum as it has an extremely low vapour pressure (< 10^{-5} mbar at 120°C). There are however restrictions when using graphite fillers with static seals.

In addition to the described (advantageous) properties of PTFE and its use for seals and guide elements, other typical characteristics are as follows:

Adhesion properties with compound components:
On account of its exceptional anti-adhesion characteristics, Virgin PTFE resists adhesives unless a special surface treatment is used. Filled compounds improve adhesion properties, but it is recommended that the surface is etched before application of the adhesive. Carbon/Graphite filled compounds have the best adhesion properties.

Contact with foodstuffs:
Generally PTFE is suitable for contact with foodstuffs and satisfies FDA requirements. However it remains the responsibility of the component manufacturer (e.g. in the case of seals, the cylinder manufacturer) to ensure the finished product complies with the standards specified by the FDA.

Electrical properties:
PTFE is an excellent insulator with a high dielectric strength, low permittivity and a very high electrical resistance. Some carbon and bronze fillers can impair electrical properties, however some carbon fillers can still be used. Our Application Engineers can advise these.

Tribological properties:
The coefficient of friction is only marginally influenced by fillers. The lowest value is achieved by compounds containing graphite or MoS_2 alone, or in combination with glass fibres.
The type of filler material strongly influences the wear characteristics. Less wear is experienced with fibrous fillers then with particulates.

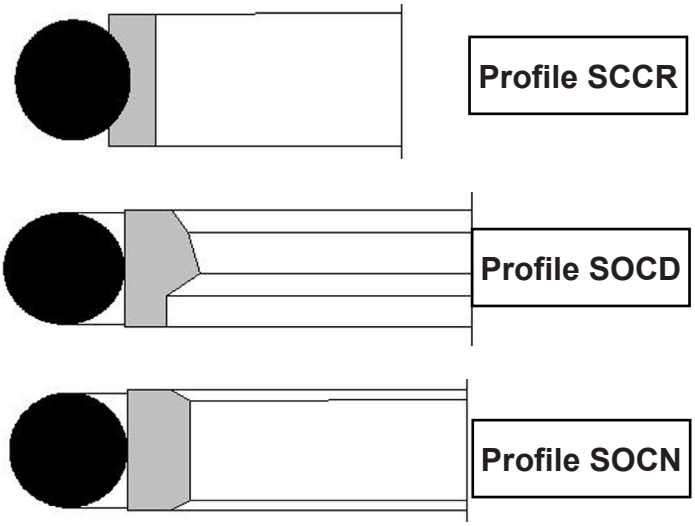
PTFE compounds can be used without lubrication. However, when sealing dynamically against lubricating fluids (mineral oils etc) the coefficient of friction can be reduced depending upon surface velocity, surface finish, pressure etc.
Some compounds behave better in water;- carbon fibre filled PTFE and UHMWPE in particular.

PTFE & O-Ring Compounds

Compound	Order Code	Temperature Min .	Max.	Application	Characteristics	Products
Virgin PTFE	01	-190°C	+ 230°C	- Chemical industry - Food industry	- High chemical resistance	- Back-up rings - Spring energised seals
Virgin TFM	02	-190°C	+ 230°C	- Chemical industry - Food industry - Pharmaceutical industry	- High chemical resistance - High mechanical strength	- Spring energised seals - Ball Valve seats
Modified PTFE	03	-190°C	+ 230°C	- Low duty hydraulic applications	- Improved wear resistance	- Spring energised seals - Glide rings
PTFE + 15% glass fibre	04	-190°C	+ 290°C	- Medium duty hydraulic applications	- High chemical resistance - High creep resistance - Electrical properties like Virgin PTFE	- Slide rings - Back-up rings - Guide rings - Gaskets
PTFE + 15% carbon	05	-190°C	+ 290°C	- Medium mechanical stress - Hard sealing surfaces - Water/Oil emulsions	- Chemical resistance limited by carbon	- Spring energised seals
PTFE +23% carbon + 2% graphite	06	-190°C	+ 315°C	- Heavy mechanical stress - Water/Oil hydraulics	- High wear and creep resistance	- Slide rings - Back-up rings
PTFE + 25% carbon	07	-190°C	+ 315°C	- Pneumatics	- High wear and creep resistance	- Guiding tapes
PTFE + 15% graphite	08	-190°C	+ 230°C	- Low mechanical stress - Soft sealing surfaces	- Chemical resistance limited by graphite	- Spring energised seals
PTFE + 40% bronze	09	-156°C	+ 260°C	- Heavy mechanical stress - Hydraulic sealing surfaces	- Outstanding wear and creep resistance	- Slide rings
PTFE + 10% ekonol	10	-260°C	+320 °C	- Medium mechanical stress - Soft sealing surfaces - Rotary sealing	- Limited chemical resistance - Limited use in hot water	- Spring energised seals - Rotary glide rings - Lip seals
PTFE + 50% stainless steel	11	-190°C	+ 260°C	- Heavy mechanical stress - Applications in chemical industry	- Chemical resistance from stainless steel filler (AISI 316)	- Ball valve seats
PTFE + 10% carbon fibre	12	-260°C	+ 310°C	- Water hydraulics - Seawater - Short strokes with high frequency	- Very good wear properties in water	- Slide rings - Spring energised seals
Plastic Materials						
UHMW-PE	13	-200°C	+ 80°C	- Food industry - Pneumatics	- Outstanding wear properties in water and air	- Slide rings - Spring energised seals - Guide rings
PVDF	14	-30°C	+ 140°C	- Food industry	- Wear properties like nylon - Resists steam sterilisation	- Spring energised seals - Back-up rings
PEEK	15	-120°C	+250°C	- Food industry - Chemical industry	- High chemical resistance - High pressure resistance - High temp resistance	- Back-up rings - Slide rings

O-Ring Order Code	Compound	Hardness	Temperature range
00	NO O-RING REQUIRED		
N70	NBR	70 +/- 5	-30 to +110°C
V75	FKM	75 +/- 5	-25 to +200°C
N75	NBR	75 +/- 5	-50 to +110°C
E80	EPDM	80 +/- 5	-40 to +150°C
N90	NBR	90 +/- 5	-20 to +110°C

Rod Seals



The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values and are interrelated. Under extreme working conditions it is recommended not to use all maximum values simultaneously.

However, it is possible to exceed working pressure and surface speed provided the working temperature is kept correspondingly lower.

For special requirements (pressure, temperature, speed etc) please consult our Application Engineers so that the suitable materials/seal designs can be recommended.

Rod Seal Installation Guidelines

The grooves must be carefully cleaned and de-burred. The rods must have a lead-in chamfer. We recommend open groove designs for rod diameters smaller than 30mm as these rings are prone to breaking if deformed.

Instruction for assembly
First the o-ring must be installed in the groove. Then the rod seal should be carefully formed into a kidney shape without sharp bends as shown in **Figure 1.** This deformed ring is placed in the groove and reformed/rounded with the aid of a pin.

Figure 1: A calibration mandrek is useful in reforming the seal from its kidney shape once assembled.
Insert the tool with its “scallop” aligned with kidney shaped seal. Once fully inserted, rotational movement should be used to aid reforming.

Fig. 1

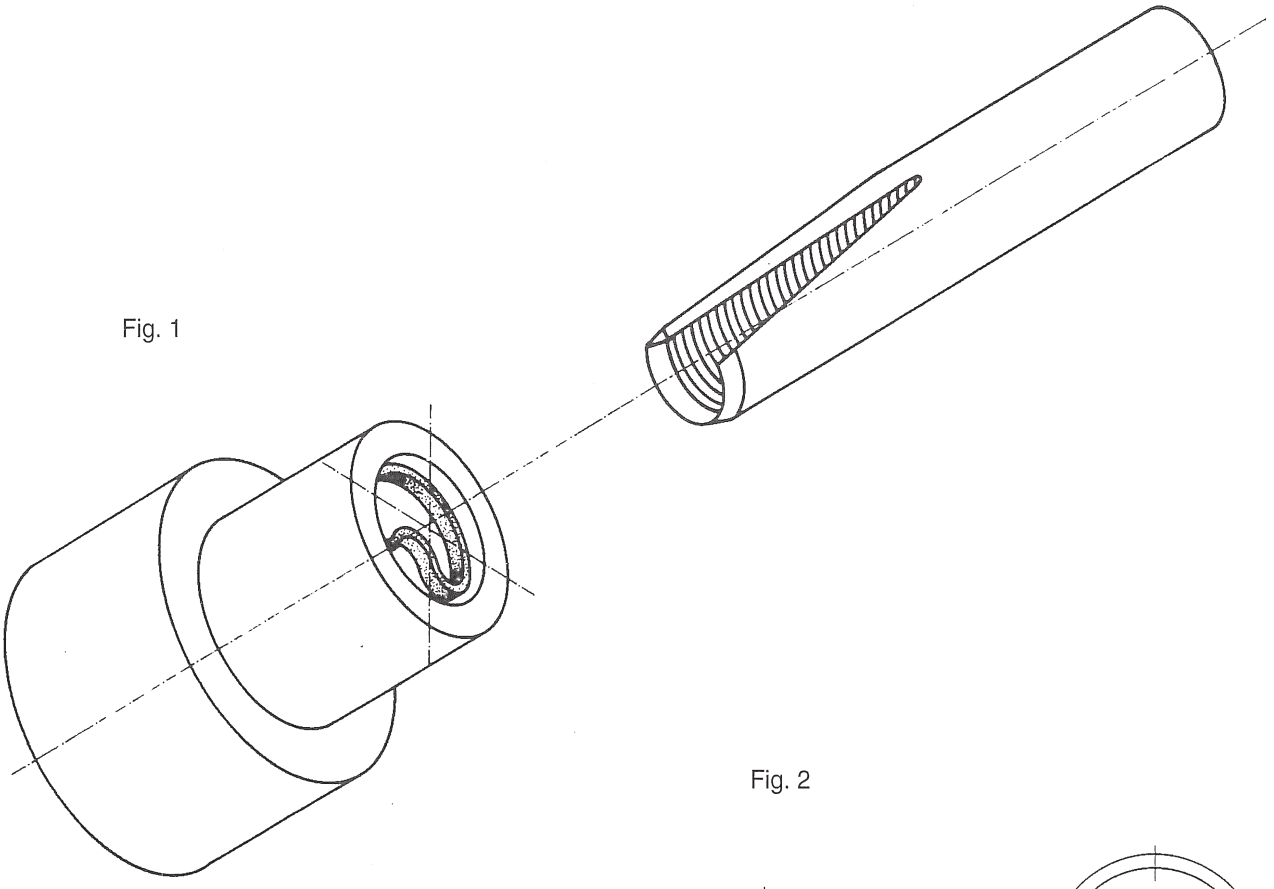
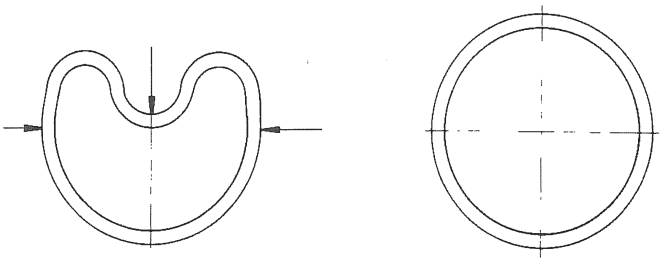


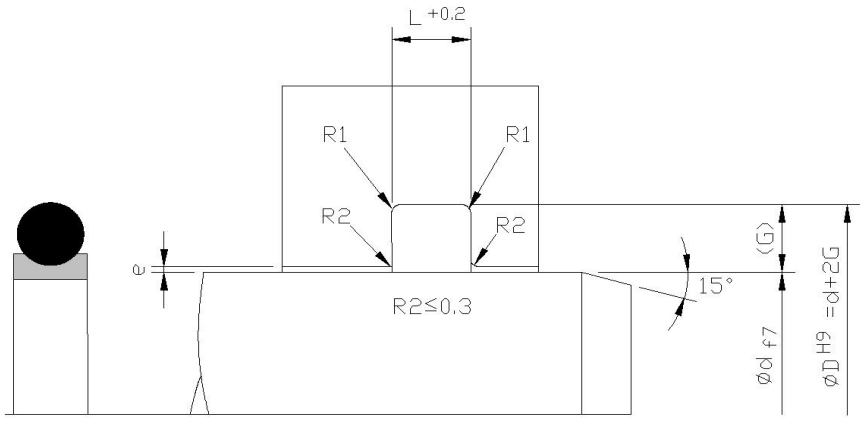
Fig. 2



Double Acting Rod Profile SCCR

The **SCCR** rod sealing set consists of a PTFE rod sealing ring and o-ring, and is used for sealing rods and plungers in hydraulic cylinders.
It is appropriate for dynamic applications as an alternative to an O-ring, for situations where sealing performance and friction have to be optimised.

Advantages:
- Minimal break-out and dynamic slide friction, therefore limited stick-slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatability with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds
- Can be used in existing O-ring grooves (dependant upon application - refer to Ceetak Application Engineer)
- Available in diameters up to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. e (mm)	Radius Max. R_1 (mm)
		≥	≤				
A	1.78	4	10	2.4	1.45	0.15	0.5
B	2.62	10	20	3.6	2.25	0.20	0.5
C	3.53	20	40	4.8	3.10	0.20	0.5
D	5.33	40	120	7.1	4.70	0.25	0.5
E	6.99	120	400	9.5	6.10	0.30	0.5

Ordering example: Rod Diameter 40 mm

SCCR	00400	01	N70	D
Profile	Rod Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 350 bar
Working temperature: -30 to +100°C **
Surface speed: ≤ 4 m/s

**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

Installation:
For diameters < 10 mm open grooves are required.
Please apply this seal in combination with guiding elements (e.g. F3)

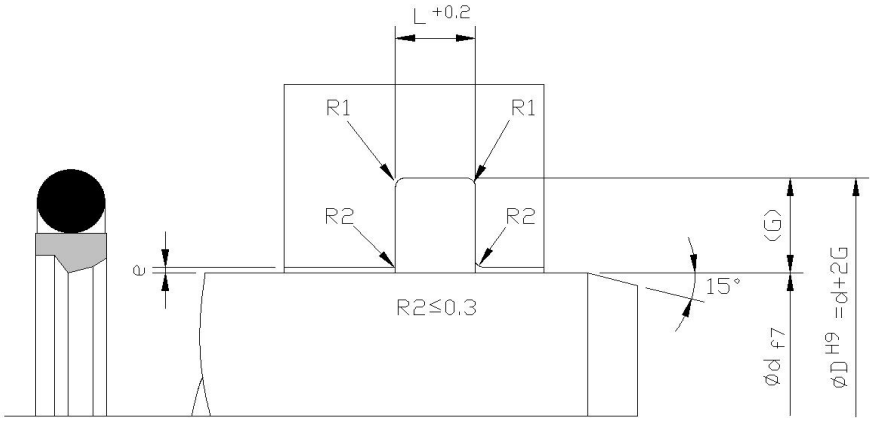
Please note: In some double-acting applications, machined notches are advisable. Please speak to our application engineers for further information

Single Acting Rod Profile SOCD

The **SOCD** rod sealing set consists of a PTFE rod sealing ring and an o-ring combined as a single unit and is appropriate for sealing rods and plungers in hydraulic cylinders.
Profile SOCD is particularly suitable for rods in control cylinders, servo-assisted equipment, machine tools, quick acting cylinders and in construction machinery.
Optimal sealing performance will be obtained if the rod sealing set is used in tandem with a double-acting wiper.

Advantages:

- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick-slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds
- Single acting seal designed to allow trapped fluid to return on retract stroke - for wider choice discuss with Ceetak's Application Engineers
- Available in diameters up to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. 0-200 bar e (mm)	Gap Max. 200-400 bar e (mm)	Radius Max. R_1 (mm)
		≥	≤					
A	1.78	4	8	2.2	2.45	0.6-0.4	0.4-0.2	0.5
B	2.62	8	19	3.2	3.65	0.8-0.5	0.5-0.3	0.5
C	3.53	19	38	4.2	5.35	0.8-0.5	0.5-0.3	0.5
D	5.33	38	200	6.3	7.55	1.0-0.6	0.6-0.4	0.9
E	6.99	200	256	8.1	10.25	1.0-0.6	0.6-0.4	0.9
F	6.99	256	650	8.1	12.00	1.2-0.7	0.7-0.5	0.9
G	8.40	650	1000	9.5	13.65	1.4-0.8	0.8-0.6	0.9

Ordering example: Rod diameter 40mm

SOCD	00400	01	N70	D
Profile	Rod Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 400 bar *
Working temperature: -30 to +100°C **
Surface speed: ≤ 4 m/s
* In case of reduced extrusion gap (H7/f7 up to 600 bar)
**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

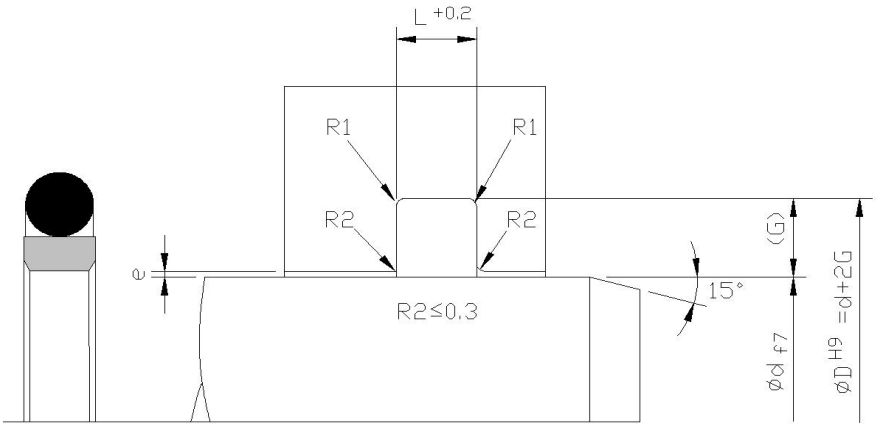
Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example "D") by the one you require (for example "C" or "E").

Installation:
Please apply this seal in combination with guiding elements

Double Acting Rod Profile SOCN

The **SOCN** rod sealing set consists of a PTFE rod sealing ring and an o-ring. Combined as a single unit, it is used for sealing rods and plungers in hydraulic cylinders.
Profile SOCN is particularly suitable for rods in control cylinders, servo-assisted equipment, machine tools, quick actuating cylinders and in construction machinery. Not to be used in tandem with a double-acting wiper - use single wiper only.

Advantages:
- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring and a wide selection of O-ring compounds
- Available in diameters up to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. 0-200 bar e (mm)	Gap Max. 200-400 bar e (mm)	Radius Max. R_1 (mm)
		≥	≤					
A	1.78	4	8	2.2	2.45	0.6-0.4	0.4-0.2	0.5
B	2.62	8	19	3.2	3.65	0.8-0.5	0.5-0.3	0.5
C	3.53	19	38	4.2	5.35	0.8-0.5	0.5-0.3	0.5
D	5.33	38	200	6.3	7.55	1.0-0.6	0.6-0.4	0.9
E	6.99	200	256	8.1	10.25	1.0-0.6	0.6-0.4	0.9
F	6.99	256	650	8.1	12.00	1.2-0.7	0.7-0.5	0.9
G	8.40	650	1000	9.5	13.65	1.4-0.8	0.8-0.6	0.9

Ordering example: Rod Diameter 40 mm

SOCN	00400	01	N70	D
Profile	Rod Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

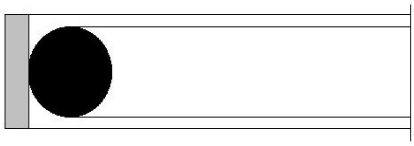
Range of application:
Working pressure: ≤ 400 bar *
Working temperature: -30 to +100°C **
Surface speed: ≤ 4 m/s
* In case of reduced extrusion gap (H7/f7) up to 600 bar
**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

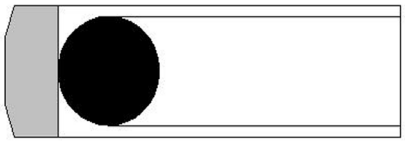
Installation:
Please apply this seal in combination with guiding elements (F2/F3)

Please note: In some double-acting applications, machined notches are advisable. Please speak to our application engineers for further information

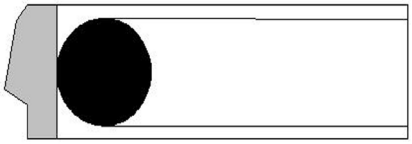
Piston Seals



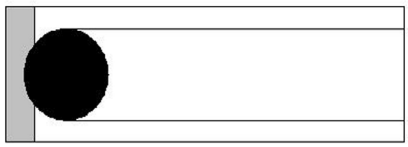
Profile SOCA



Profile SOCE



Profile SOCG



Profile SCCP

The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values and are interrelated. Under extreme working conditions it is recommended not to use all maximum values simultaneously.

However, it is possible to exceed working pressure and surface speed provided the working temperature is kept correspondingly lower.

For special requirements (pressure, temperature, speed etc) please consult our Application Engineers so that the suitable materials/seal designs can be recommended.

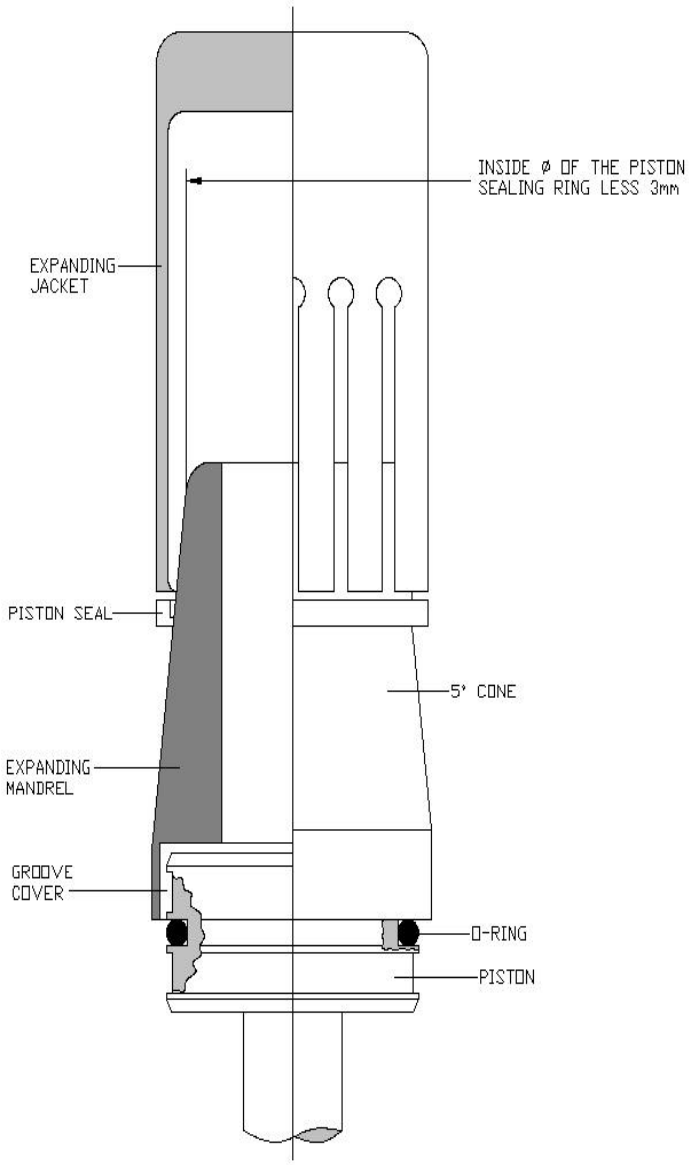
Piston Seal Installation Guidelines

Instruction for assembly
Install the o-ring in the groove as per normal practice. Piston sealing rings of up to 100 mm diamter and wall thickness of over 1.6mm should be “slowly” expanded and fitted with an assembly tool. Pre-heating to 60°C in hydraulic oil is advantageous. Larger rings can be expanded by hand.

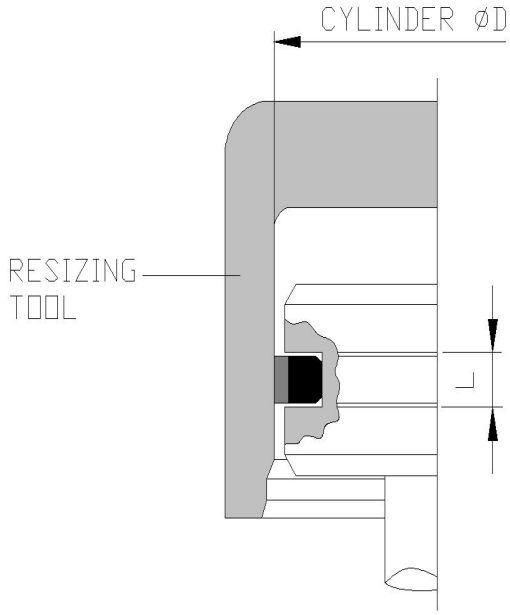
Inconsistent stretching or overstretching must be avoided in all circumstances.

Should it be necessary to draw the rings over existing wear ring grooves , these grooves must be covered in plastic tape. or alternatively the expanding mandrel must reach the groove in question (see drawing 3.)
This ensures that the piston sealing ring does not snap into the wrong groove.
The use of a resizing tool is recommended when the assembly of a piston is made difficult by an overstretched ring or when the cylinder has an adequate lead-in chamfer (see drawing 4.)
Assembly aids can be manufactured conveniently out of metal, however, in many cases acetal is more suitable.

Drawing 3



Drawing 4

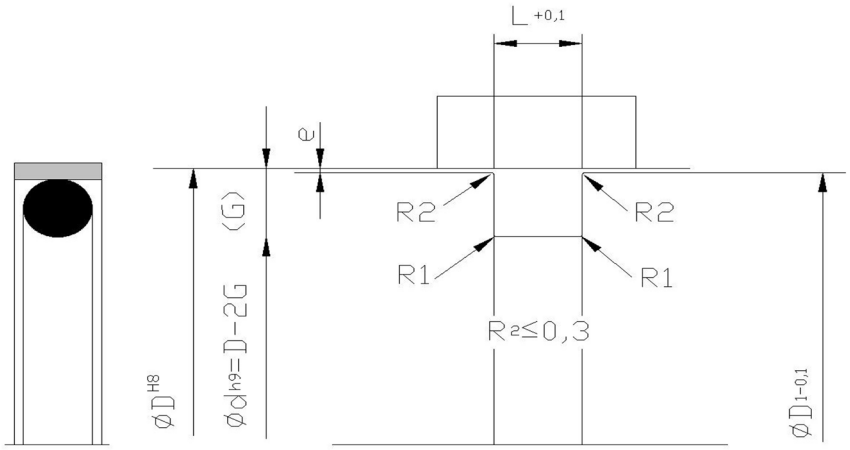


Please discuss details of particular assembly requirements with a Ceetak Application Engineer

Double Acting Piston Profile SOCA

The **SOCA** piston sealing set profile consists of a PTFE piston sealing ring and an o-ring. They are combined as a single unit and are appropriate for double acting pistons in pneumatic cylinders.
Profile SOCA is particularly suitable for double-acting pneumatic pistons, e.g. in control cylinders, servo-assisted equipment and quick-acting cylinders.

Advantages:
- Assembly on one-piece piston
- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance



Cross Section	O-Ring Cross section (mm)	Recommended piston ø range D (mm) ≥	Recommended piston ø range D (mm) ≤	Groove width L (mm)	Groove depth G (mm)	Gap e (mm)	Radius Max. R_1 (mm)
A	1.78	7	16	2.00	2.00	0.4	0.5
B	2.62	16	27	2.85	3.00	0.5	0.5
C	3.53	27	50	3.80	3.75	0.5	0.5
D	5.33	50	130	5.60	6.25	1.0	0.9
E	6.99	130	180	7.55	7.50	1.0	0.9
F	6.99	180	240	7.55	9.00	1.5	0.9
G	6.99	240	420	7.55	12.00	2.0	0.9

Ordering example: Piston diameter 40 mm

SOCA	00400	01	N70	D
Profile	Piston Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 16 bar
Working temperature: -30 to +80°C **
Surface speed: ≤ 4 m/s

**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

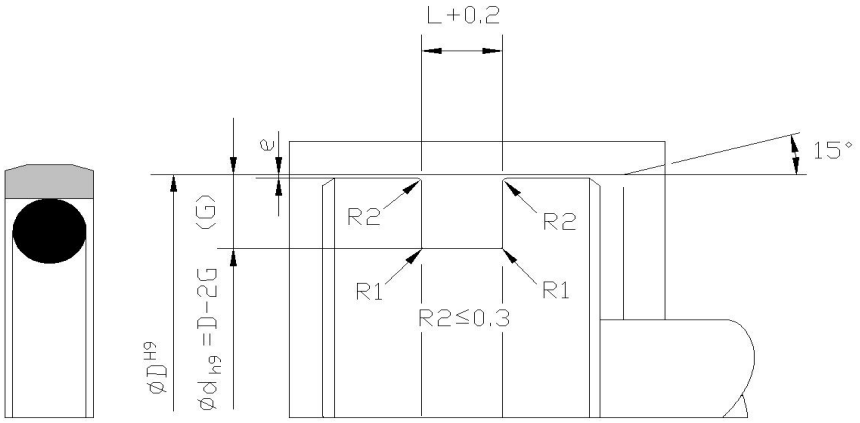
Installation:
Please apply this seal in combination with guiding elements (e,g, F2)

Please note: In some double-acting applications, machined notches are advisable. Please speak to our application engineers for further information

Double Acting Piston Profile SOCE

The **SOCE** piston sealing set profile consists of a PTFE sealing piston ring and an o-ring. They are combined as a single unit and are appropriate for double acting pistons in hydraulic cylinders.
Profile SOCE is particularly suitable for double acting pistons in control cylinders, in servo-controlled systems, machine tools, quick-acting cylinders and in construction machinery.

Advantages:
- Assembly on one-piece pistons
- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds
- Available in diameters up to to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. 0-200 bar e (mm)	Gap Max. 200-400 bar e (mm)	Radius Max. R_1 (mm)
		≥	≤					
A	1.78	8	15	2.2	2.45	0.6-0.4	0.4-0.2	0.5
B	2.62	15	40	3.2	3.75	0.8-0.5	0.5-0.3	0.5
C	3.53	40	80	4.2	5.50	0.8-0.5	0.5-0.3	0.5
D	5.33	80	133	6.3	7.75	1.0-0.6	0.6-0.4	0.9
E	6.99	133	330	8.1	10.50	1.0-0.6	0.6-0.4	0.9
F	6.99	330	670	8.1	12.25	1.2-0.7	0.7-0.5	0.9
G	8.40	670	1000	9.5	14.00	1.4-0.8	0.8-0.6	0.9

Ordering example: Piston diameter 40 mm

SOCE	00400	01	N70	D
Profile	Piston Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 400 bar *
Working temperature: -30 to +100°C **
Surface speed: ≤ 15 m/s
* In case of extrusion gap (H7/f7) up to 600 bar)
**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

Installation:
Please apply this seal in combination with guiding elements (e.g. F3)

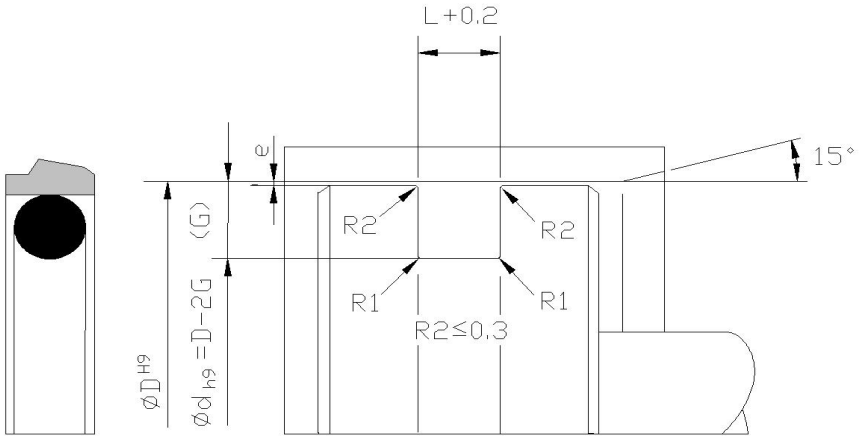
Please note: In some double-acting applications, machined notches are advisable. Please speak to our application engineers for further information

Piston Profile SOCG

The **SOCG** piston sealing set profile consists of a PTFE piston sealing ring and an O-ring. They are combined as a single unit.
Profile SOCG is particularly suitable for single-acting pistons in control cylinders, in servo-controlled systems, machine tools, quick-acting cylinders and in construction machinery.

Advantages:
- Assembly on one-piece pistons
- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds

Available in diameters up to to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. 0-200 bar e (mm)	Gap Max. 200-400 bar e (mm)	Radius Max. R_1 (mm)
		≥	≤					
A	1.78	8	17	2.2	2.45	0.6-0.4	0.4-0.2	0.5
B	2.62	17	27	3.2	3.65	0.8-0.5	0.5-0.3	0.5
C	3.53	27	60	4.2	5.35	0.8-0.5	0.5-0.3	0.5
D	5.33	60	200	6.3	7.55	1.0-0.6	0.6-0.4	0.9
E	6.99	200	256	8.1	10.25	1.0-0.6	0.6-0.4	0.9
F	6.99	256	670	8.1	12.00	1.2-0.7	0.7-0.5	0.9
G	8.40	670	1000	9.5	13.65	1.4-0.8	0.8-0.6	0.9

Ordering example: Piston diameter 40 mm

SOCG	00400	01	N70	D
Profile	Piston Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 400 bar *
Working temperature: -30 to + 100°C **
Surface speed: ≤ 5 m/s
* In case of reduced extrusion gap (H7/f7) up to 600 bar)
**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

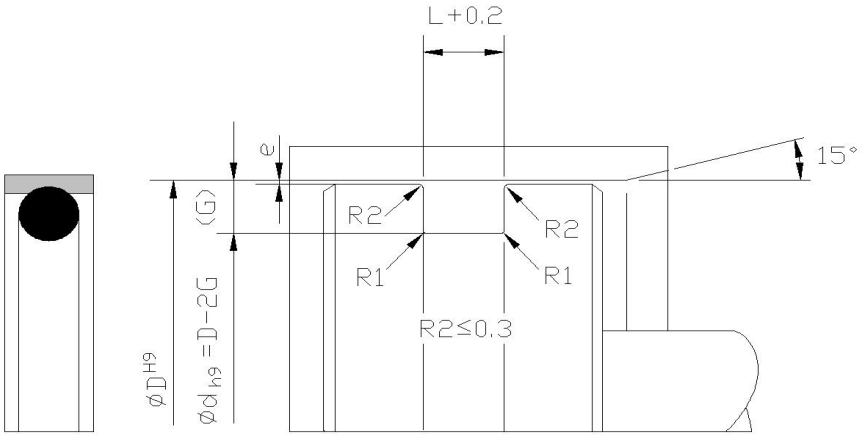
Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

Installation:
Please apply this seal in combination with guiding elements

Piston Profile SCCP

The **SCCP** piston sealing set consists of a PTFE piston sealing ring and an O-ring. It is a system for sealing double-acting pistons. Profile SCCP is appropriate for dynamic applications as an alternative to an o-ring in situations where sealing performance and friction have to be optimised.

Advantages:
- Assembly on one-piece pistons
- Short assembled length
- Minimal break-out and dynamic slide friction, therefore minimal stick slip. Steady movement is guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds
- Can be used in existing o-ring grooves (please discuss options with a Ceetak Application Engineer)
- Available in diameters up to to 2000 mm



Cross Section	O-Ring Cross section (mm)	Recommended rod ø range d (mm)		Groove width L (mm)	Groove depth G (mm)	Gap Max. e (mm)	Radius Max. R_1 (mm)
		≥	≤				
A	1.78	8	14	2.4	1.45	0.15	0.5
B	2.62	14	25	3.6	2.25	0.20	0.5
C	3.53	25	46	4.8	3.10	0.20	0.5
D	5.33	46	125	7.1	4.70	0.25	0.9
E	6.99	125	400	9.5	6.10	0.30	0.9

Ordering example: Piston diameter 40 mm

SCCP	00400	01	N70	D
Profile	Piston Ø x 10	PTFE Material (see table P. 3)	Oring Material (see table P. 3)	Cross Section (see table above)

Range of application:
Working pressure: ≤ 350 bar
Working temperature: -30 to + 100°C **
Surface speed: ≤ 4 m/s

**With deviation from standard temperature range, please consult our Application Engineers for the adequate O-ring compound.

Please note:
For certain applications, it might be convenient to use a non-standard cross section - reduced or heavier. In these cases, please replace the standard cross section code (in above example “D”) by the one you require (for example “C” or “E”).

Installation:
Please apply this seal in combination with guiding elements (e.g. F3)

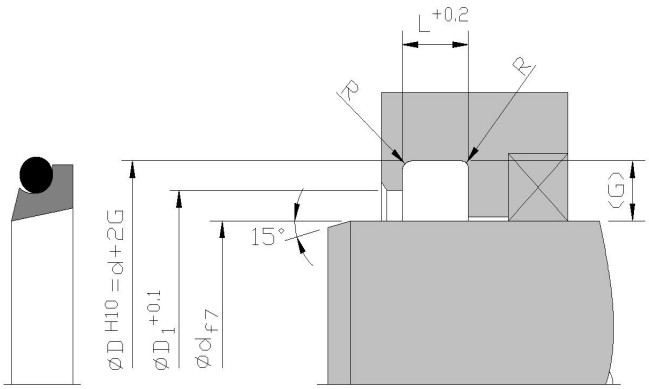
Overview of additional parts

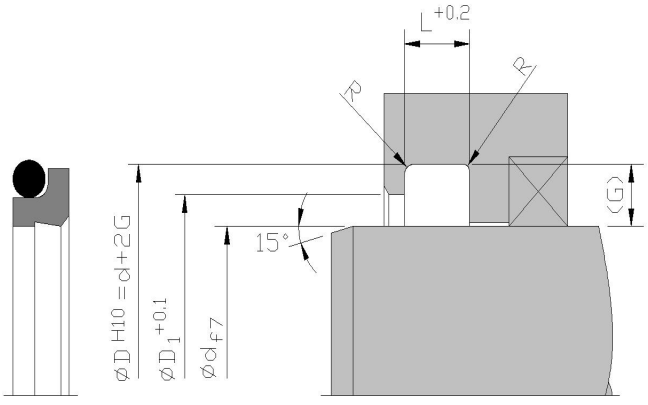
Ceetak also offer a range of additional PTFE parts including wipers, guide elements and rotary seals:

Wiper Rings
The function of wiper rings is to prevent dust, dirt, grains of sand and metal swarf from penetrating into axially moving rods and plungers, thus the develoment of scratches is largely prevented, guiding elements are protected and the working life of seals is extended.

Profile SACT
Profile SACT consists of a PTFE wiper ring and an o-ring as a pre-tensioning element
Advantages:
- Small installation grooves
- Minimal break-out and dynamic sliding friction. Steady movement guaranteed even at low velocities
- Excellent sliding properties
- High wear resistance, therefore longer service life
- Available in diameters up to 2000 mm

Note: Use with double acting rod seals as pressure interlock is reduced





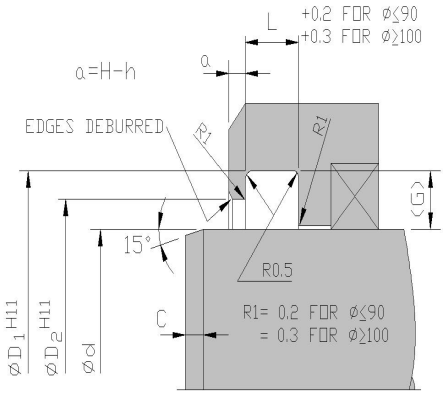
Profile SACD
Profile SACD consists of a PTFE wiper ring and an o-ring as a pre-tensioning element
Advantanges:
- Small installation grooves
- Minimal break-out and dynamic sliding friction. Steady movement guaranteed even at low velocities
- Excellent sliding properties
- High wear resistance, therefore longer service life
- Available in diameters up to 2000 mm

Note: Recommended for use with step-seal as an aid to back pumping.
Not recommended for use with double-acting rod seals

Overview of additional parts

Profile SACY (Wipers cont.)

The purpose of the SACY polyurethane double lip wiper is to prevent dust, dirt and metal swarfs. This is achieved by a special design which prevents scoring, protects the guiding parts and extends the sealing life of the cylinder.
The double wiper ring closes the rod in direction of the cylinder. No special screw-rings or brackets are required for installation. No close tolerances and no metal inserts are required. The wiper is supplied as a continuous ring and can be easily pressed into the groove .
In addition the sealing lip facing the media reduces the residual oil film. The polyurethane compound ensures excellent properties with regard to dry run, increased wear resistance, and extended service life due to good resistance to ozone and radiation caused by weather conditions
We recommend SACY double lip wipers when using single acting rod profile SOCD.
Max velocity is 1 m/s



Note: Not ideal for use with double-acting rod seals

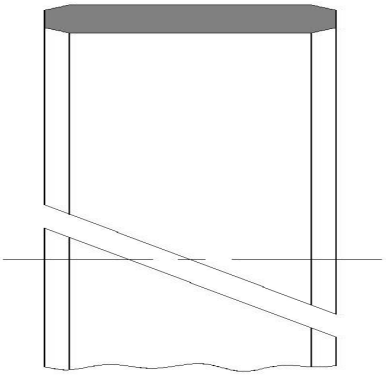
Guide Tape

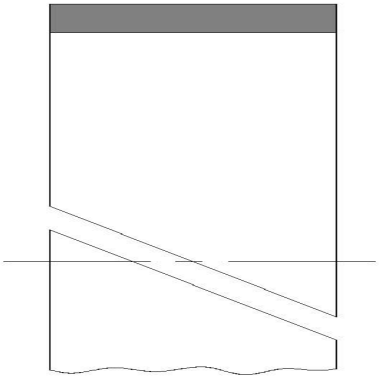
The function of guide tape is to act as a bearing to prevent metal surfaces rubbing together therefore preventing damage and wear and improving seal performance. Guide tape provides accurate guidance of pistons in bore or rods in housings.

Profile F2 - Specially designed for use in pneumatic cylinders

Advantages:

- Profile geometry which is exactly suited to work in lubricated air as well as dry and oil-free
- The tapes can be supplied either cut to length or by the metre, to be cut according to requirement
- High load capacity (compressive strength), low wear and reduced friction due to an additive of carbon to the PTFE material
- No tendency to stick-slip in the case of low sliding speed
- Simple groove designs
- Simple piston designs without metallic contact of the sliding surfaces
- Available in practical dimensions
- Data sheets on sizes available on request





Profile F3 - Specially designed for use in hydraulic cylinders

Advantages:

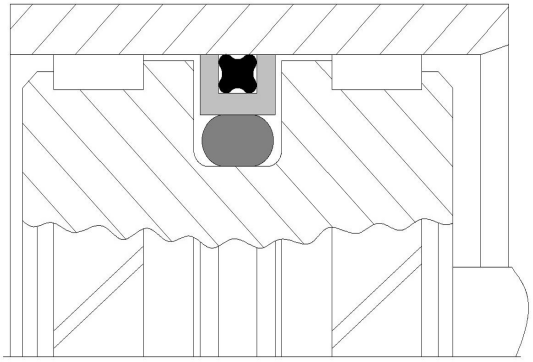
- The tapes can be supplied either cut to length or by the metre, to be cut according to requirement
- High load capacity (compressive strength), low wear and reduced friction due to an additive of carbon or bronze to the PTFE material
- No tendency to stick-slip in the case of low sliding speed
- Even with simple groove designs, no metallic contact of the sliding surfaces
- Available in practical dimensions

Overview of additional parts

Profile SCCQ

Combines the advantages of a low friction PTFE seal with improved sealing characteristics by using an elastomeric x-ring.

- Excellent seal for oil and gas separation e.g. piston accumulators
- Uses standard components meaning elastomer materials can be changed to suit media without having to resort to expensive mould tools
- Velocity up to 3 m/s
- Pressure 600 Bar max (see clearance)
- Temperature Range -40°C + 200°C (Ceetak Application Engineers can recommend suitable material for specific applications)
- Also available as a rod seal



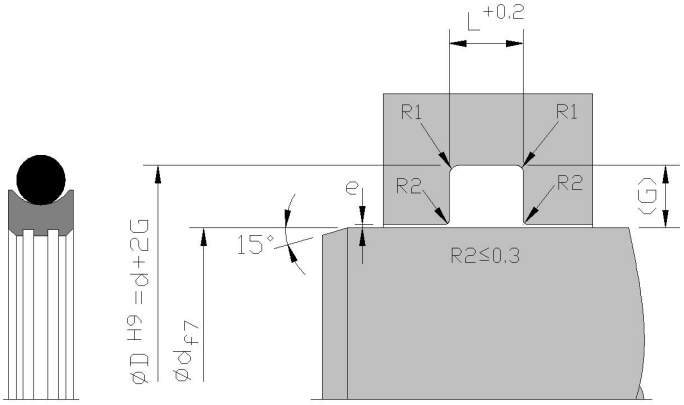
Rotary Sealing Set

Producers of rotary transmissions prefer simplified seal designs. This can be achieved by profile SOCR; which consists of wear resistant slide rings with an NBR o-ring as an energiser.
The rotary sealing set profile SOCR is suitable mainly for applications where the pressure alternates from one side of the seal to another, such as pivots for rotating track rings, swivel joints hose reels and in machine tool hydraulics.
Multiples of SOCR can be used where swivels incorporate several ports.
If the sealing set is used as an end seal, we recommend closing the construction with a wiper ring,

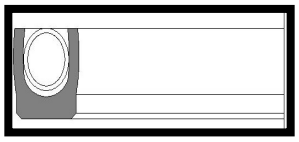
Considering the special working conditions, the rotary sealing set profile SOCR is equipped with one or two lubricating grooves.

Advantages:

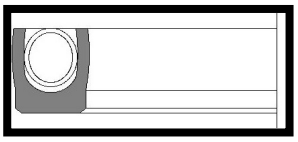
- Short assembled length
- Minimal break-out and dynamic slide friction. Steady movement guaranteed even at low velocities
- Low wear
- High extrusion resistance
- High temperature resistance
- Compatibility with nearly all media due to the high chemical resistance of the rod sealing ring, and a wide selection of O-ring compounds
- Available in diameters up to 2000 mm
- Please contact Ceetak Application Engineers to discuss limiting PV on specific applications



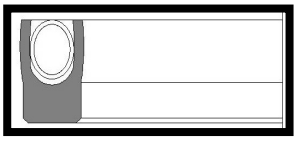
Spring energised seals



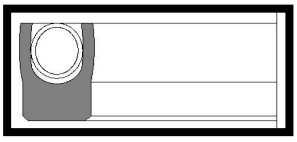
SNCAA
Piston



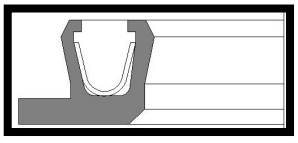
SNCAA
Rod



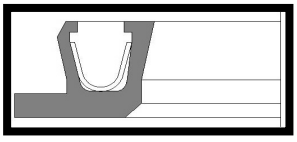
SNCHA
Piston



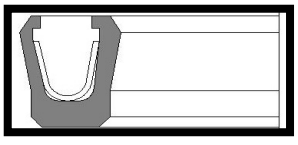
SNCHA
Rod



SFCLO

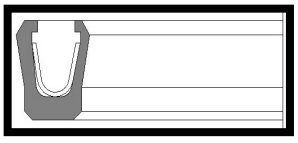


SFCLS



SNCLI

SSCLI



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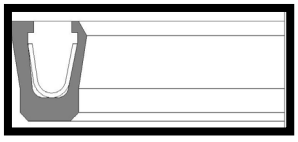
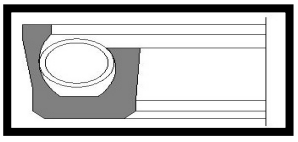
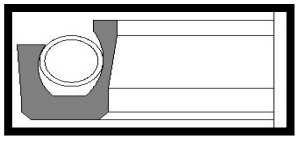


SSCLO



SBCAI



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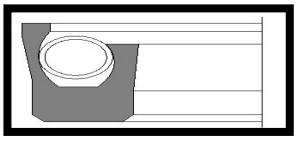
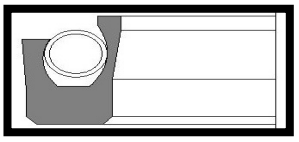
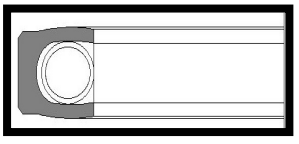


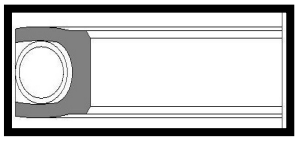
SBCHI



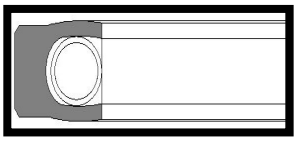
SBCHO



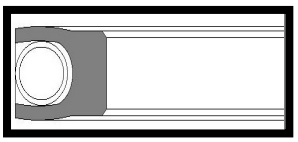
SNCAI



SNCAE



SNCHI



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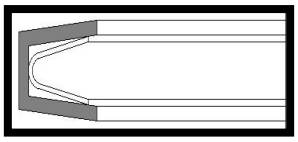
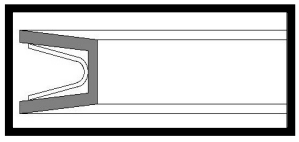


SNCRI



SNCRE

Spring energised seals

Spring energised seals are designed to meet extreme demands regarding temperature, medium, etc. which cannot be covered by conventional sealing compounds (for example elastomers, fabric materials....)

PTFE has almost no elasticity; therefore PTFE sealing elements have to be combined with an elastic component (usually an o-ring). Spring energised seals consist of a PTFE part, made of a specially modified compound, and an energising spring (usually stainless steel) so the outstanding thermal and chemical properties of PTFE can be used to full advantage.

How the spring energised seal works:

The spring energised seal is compressed radially when installed in the seal gland. The resilient spring responds with constant force, pushing out the sealing lips. As system pressure is applied, the seal is additionally energised, increasing the sealing force.

In dynamic applications, the spring expands, compensating for seal wear while continuing to provide load. In conditions that see thermal cycling, the spring continues to energise the seal lips without taking compression set.

The flexible spring provides a wide tolerance range that can help hardware misalignment and eccentricity without causing excessive friction or leakage.

The main characteristics of the spring are the spring force and the deflection range. The spring force influences the sealing function, friction and wear. The deflection range determines the availability of the seal to compensate for seal wear and variations in gland tolerances.

Different spring types are available:

Cantilever Spring
The V-shaped cantilever spring shows a moderate load versus deflection. The long beam-leg design puts the spring load out at the leading edge of the seal - right on the sealing edge.
The wide range of flexibility of the spring allows to compensate for some deviation in the gland tolerances and seal wear.

Recommended applications:
- Dynamic rod and piston seals
- Rotary seals

Helical Spring
The helically wound ribbon spring shows a high load versus deflection.
The load of the helical spring is provided directly through its centre line.
Due to the low selection range, the helical spring is not suitable for applications with wide gland tolerances or eccentricity.

Recommended applications:
- Static/Semi-static applications
- Low temperatures
- In very slow or infrequent dynamic conditions when friction and wear are secondary concerns to positive sealing

Spring energised seals

Field of Application:
Profiles for static applications as well as for reciprocating, rotating and helical movements are available.

Working Conditions:
PTFE seals with Cantilever spring:

Velocity:	Reciprocating:	15 m/s
	Helical and rotating:	max. 4 m/s
Pressure:	max. 350 bar	
Temperature:	-150 to +225°C	

PTFE seals with Helical spring:

Velocity:	Reciprocating:	2 m/s
	Helical and rotating:	max. 2 m/s
Pressure:	max. 800 bar	
Temperature:	-150 to +260°C	

Not all maximum operating conditions can be applied to the seal at one time!

Under certain circumstances, some of them can be exceeded - our Application Engineers are available to discuss technical details.

Recommendations for new designs:
Spring energised seals can be installed in grooves designed for o-rings in existing equipment with zero or one back-up ring width. Generally grooves should be split.

Advantages:

- To make this sealing system readily available for existing equipment, the standard designs are dimensionally adapted to be installed in standard o-ring grooves
- Outstanding high chemical and thermal resistance
- Unlimited storage time
- Spring energised seals can be sterilised in autoclaves or with any possible agent (with the exception of radioactive radiation)
- Easy to clean in assembled, as well as disassembled state
- As spring energised seals contain only PTFE and stainless steel, contacting media will not receive any contamination from the seal
- No stick-slip effect
- Very low friction
- High sealing efficiency after a short running-in period

PLEASE NOTE:
The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values and are interrelated. Under extreme working conditions it is recommended not to use all maximum values simultaneously.

However, it is possible to exceed working pressure and surface speed provided the working temperature is kept correspondingly lower.

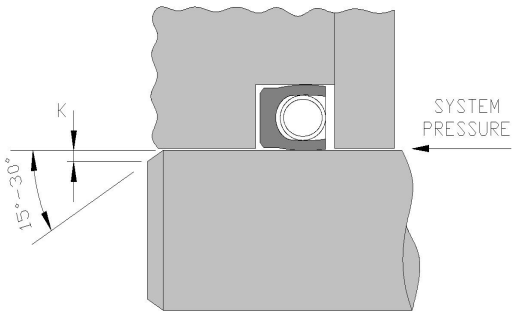
For special requirements (pressure, temperature, speed etc) please consult our Application Engineers so that the suitable materials/seal designs can be recommended.

Spring energised seals - Installation Guidelines

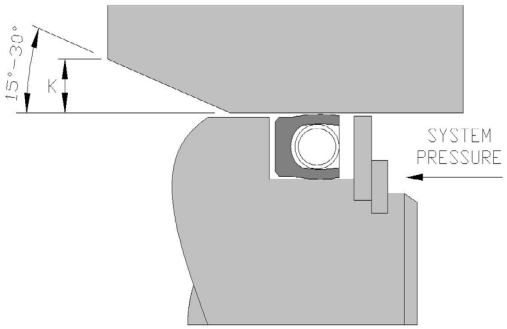
Recommended Installation Configurations

Split cavity configurations offer the simplest means of installation for spring energised seals. In this arrangement, one of the two cavity sides is separated from the mating hardware (shaft or bore, depending upon the cavity locations) which allows the seal to easily be installed without temporarily distorting or deforming it in the process.

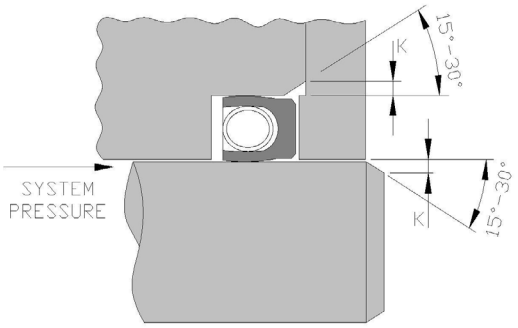
Typical split cavity configurations are illustrated in the figures below. The lead-in chamfers detailed in the figures and table will facilitate seal installation. To prevent possible seal damage, it is recommended that all corners where the seal is installed be rounded.



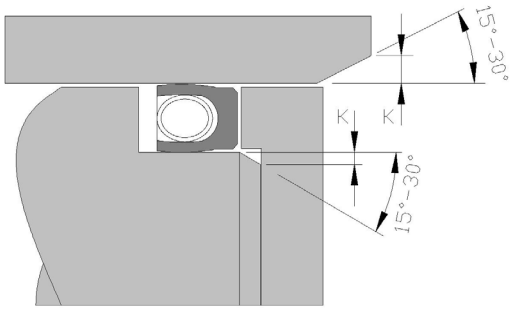
Installed heel end first into bore



Installed heel end first into piston

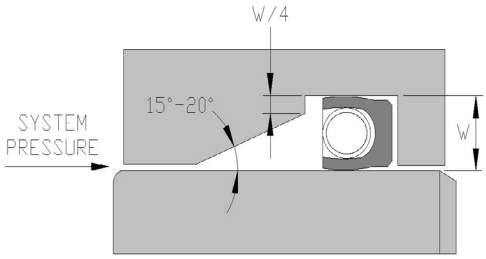


Installed open end first into bore



Installed open end first into piston

Nominal Seal Cross Section (mm)	1.59	2.38	3.18	4.76	6.35	9.54
Seal Cross Section Code	A	B	C	D	E	F
Chamfer Height, K min (mm)	0.40	0.60	0.75	0.90	1.00	1.50

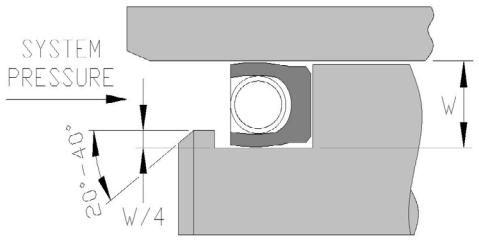


Alternate Installation Configurations/Non-Split Glands

Sometimes, use of a split cavity is not practical or possible. Here two non-split cavity geometries should be considered.

← Installation in the Housing

A modified cavity as shown here may be used. In installation, the circular spring energised seal is temporarily deformed to an eliptical shape as it is inserted into the bore, until the leading edge is seated in the groove. The angled gland “ramp” makes this installation possible with minimal temporary seal distortion. This installation should not be employed unless the ID of the seal is at least 15 times it’s cross section.



← Installation in partially-closed Piston cavity

A modified cavity as shown in this figure may be used. Proper seal installation is accomplished by rapidly moving the seal over the locking lip, minimising seal distortion. Rounded corners, a guide ramp and resizing tool may assist in installation.

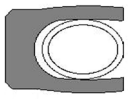
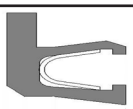
Spring energised seals - Jacket and Spring materials

Refer to the table below to select the jacket material for your seal type and application:

Compound	Order Code	Temperature Min .	Max.
Virgin PTFE	01	-190°C	+ 230°C
Virgin TFM	02	-190°C	+ 230°C
Modified PTFE	03	-190°C	+ 230°C
PTFE + 15% carbon	05	-190°C	+ 290°C
PTFE +23% carbon + 2% graphite	06	-190°C	+ 315°C
PTFE + 25% carbon	07	-190°C	+ 315°C
PTFE + 15% graphite	08	-190°C	+ 230°C

Compound	Order Code	Temperature Min .	Max.
PTFE + 40% bronze	09	-156°C	+ 260°C
PTFE + 10% ekonol	10	-260°C	+320 °C
PTFE + 50% stainless steel	11	-190°C	+ 260°C
PTFE + 10% carbon fibre	12	-260°C	+ 310°C
Plastic Materials			
UHMW-PE	13	-200°C	+ 80°C
PVDF	14	-30°C	+ 140°C
PEEK	15	-120°C	+250°C

Refer to the table below to select the spring material for your seal type and application:

Code	Material				NACE Approved (see note A)	Light/Heavy Spring? (see note B)
E1	17-7PH Stainless Steel	Standard				•
E2	Cobalt Chrome Alloy	Standard	Standard		•	•
E3	316 Stainless Steel		Optional	Optional		•
E3S	316 Stainless Steel with Silicone filling		Optional			
E4	304 Stainless Steel		Standard	Standard		•
E4S	304 Stainless Steel with Silicone filling		Optional			
E5	Buna N (see note D)	Optional				
E7	FKM (see note D)	Optional				
E8	Silicone filling only		Optional			
E10	Alloy X-750	Optional	Optional	Optional	•	
E11	301 Stainless Steel	Optional				

NOTES:

A) Approved for use in corrosive service per NACE MR-01-075

B) To specify a light spring for reduced seal friction, or a heavy spring to increase the sealing force, please contact one of our Application Engineers

C) Silicone filling prevents the seal media from contacting the metal spring in applications such as food processing. This is only available with axial pressure seals or internal pressure face seals and temperature limited to approximately 200°C

D) Temperature limit for Buna N is 100°C. Temperature limit for FKM is 200°C

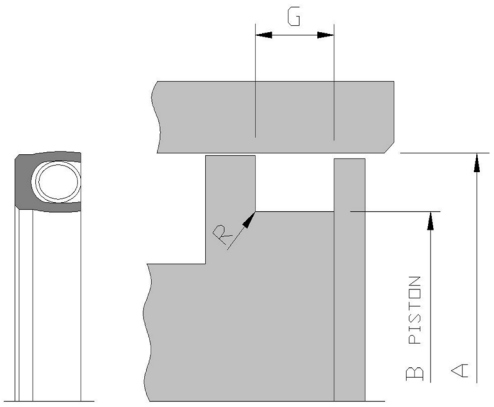
SNCAA Profile Seal

Applications:

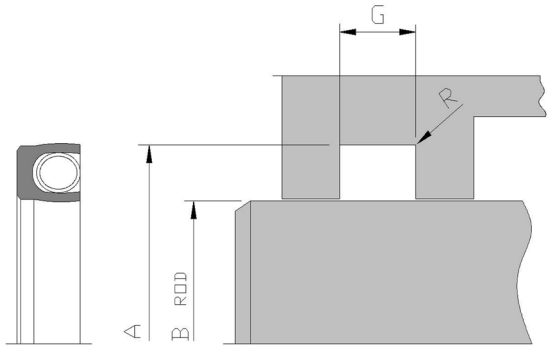
- Excellent for both static and intermittent dynamic use, such as valve stems and swivel joints
- Seals reciprocating or rotating movement, on either ID or OD
- Suitable for pressures to 200 bar

Features:

- Best choice for installation into non-split cavities: short heel and helical spring energisers stretch easily and the rounded lips won't "hang-up"
- Widest range of cross sections and diameters available, including sizes for upgrading standard O-ring glands
- Many high resilience spring energiser options including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available, all with excellent fatigue resistance



Piston seal



Rod seal

Nominal Cross Section	Cross Section Code	CAVITY			
		B ID range tolerance H8	A OD range tolerance H8	G Width	R Maximum Radius
1.6	A	2.5 - 75.00	B+ 2.84	2.39 - 2.64	0.38
2.4	B	3.00 - 180.00	B+ 4.52	3.58 - 3.84	0.64
3.2	C	6.00 - 250.00	B+ 6.15	4.78 - 5.03	0.76
4.7	D	12.50 - 300.00	B+ 9.45	7.14 - 7.39	0.76
6.4	E	50.00 - 500.00	B+12.12	9.53 - 9.78	0.76
9.5	F	150.00-1400.00	B+ 18.75	13.34 - 13.59	0.76

Ordering example: ROD - Rod diameter 40 mm
PISTON - Piston diameter 42.84 mm

SNCAA	00400	A	01	E1
Profile	Rod/ Groove Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

Rod Diameter (For rod seals)
Groove Diameter (For piston seals)

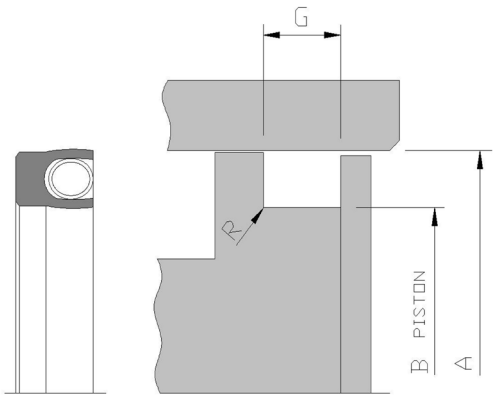
SNCHA Profile Seal

Applications:

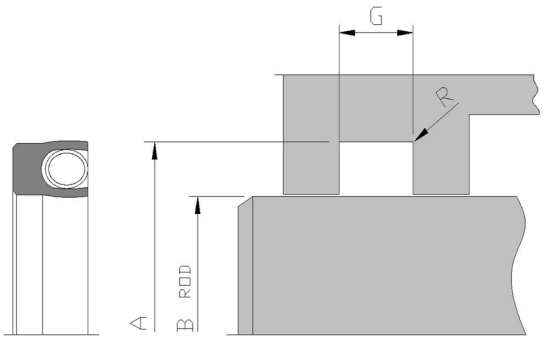
- Excellent for both static and intermittent dynamic use, such as high pressure valve stems and swivel joints
- Suitable for pressures up to 550 bar
- Seals reciprocating or rotating movement, on either ID or OD

Features:

- Extended heel reduces the effects of extrusion
- Good choice for installation into non-split cavities: helical spring energiser stretches easily and the rounded seal lips won't "hang-up"
- Widest range of cross-sections and diameters available, including sizes for upgrading standard O-ring glands
- Many high-resilience spring energiser options, including choice of light , medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use.



Piston seal



Rod seal

Nominal Cross Section	Cross Section Code	CAVITY			
		B ID range tolerance H8	A OD range tolerance H8	G Width	R Maximum Radius
1.6	A	2.5 - 75.00	B+ 2.84	3.78 - 4.04	0.38
2.4	B	3.00 - 180.00	B+ 4.52	4.65 - 4.90	0.64
3.2	C	6.00 - 250.00	B+ 6.15	5.97 - 6.22	0.76
4.7	D	12.50 - 300.00	B+ 9.45	8.48 -8.74	0.76
6.4	E	50.00 - 500.00	B+12.12	12.07 - 12.32	0.76
9.5	F	150.00-1400.00	B+ 18.75	15.80 - 16.05	0.76

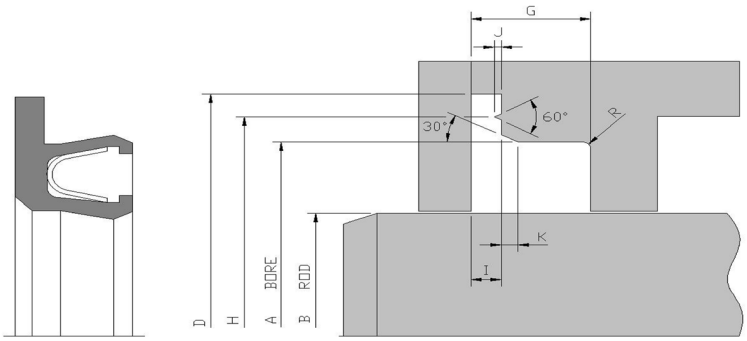
Ordering example:

SNCHA	00400	A	01	E1
Profile	Groove Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

SFCLO Flanged ID Dynamic Seal

Applications:
- Best choice for sealing rotating shafts such as pumps, motors and rotary actuators
- Suitable for pressures to 200 bar (subject to PV guidelines)

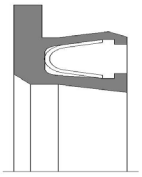
Features:
- OD flange stabilises seal, prevents seal rotation and resists thermally induced movement
- Heavy ID seal lip ensures longest life
- Dual retained spring energiser for maximum security
- Low load high-compliance spring energiser
- Many high resilience spring energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Available with silicone filled cavity for food and drug applications



Nominal Cross Section	Cross Section Code	CAVITY								
		B ID range tolerance H8	A OD tolerance H8	G Width Range	R Max Radius	D Flange OD tolerance H8	H Tolerance H8	I RANGE	J RANGE	K RANGE
1.6	A	3.00-76.00	B+ 2.84	2.39-2.64	0.38	B+ 7.00	B+ 5.00	0.56-0.64	0.25-0.35	0.40-0.50
2.4	B	5.00-180.00	B+ 4.52	3.58-3.84	0.64	B+ 9.00	B+7.00	0.56-0.64	0.25-0.35	0.80-1.00
3.2	C	12.50-250.00	B+ 6.15	4.78-5.03	0.76	B+ 12.50	B+ 10.00	0.66-074	0.30-0.40	1.00-1.20
4.7	D	22.00-300.00	B+ 9.45	7.14-7.39	0.76	B+ 17.50	B+ 13.50	0.96-1.04	0.41-0.51	1.30-1.60
6.4	E	50.00-685.00	B+ 12.12	9.53-9.78	0.76	B+ 22.000	B+ 17.00	1.16-1.24	0.56-0.66	1.70-2.00

Ordering example: Rod diameter 40 mm

SFCLO	00400	A	01	E1
Profile	Rod Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

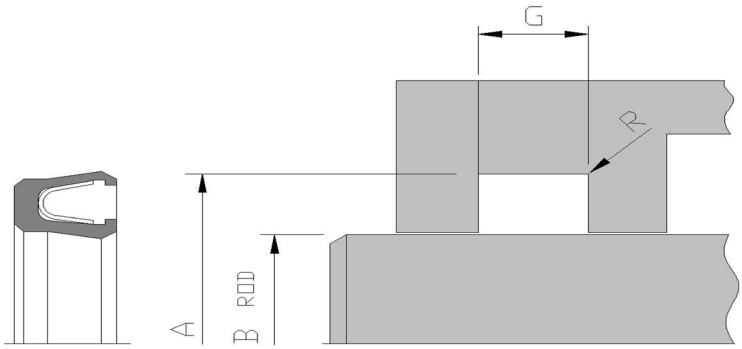


SFCLS Flanged Scraper Axial ID Dynamic Seal
For flanged scraper seal SFCLS specify SFCLS in the part number instead of SFCLO. All SFCLO cavity dimensions apply

SNCLI ID Dynamic Seal

Applications:
- Ideal for sealing rotating shafts without a flange cavity. Typical applications include pumps, motors and rotary actuators
- Used in low pressure reciprocating applications
- Suitable for pressures up to 200 bar (subject to PV guidelines)

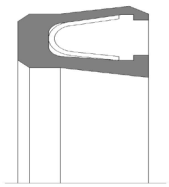
Features:
- Heavy ID seal lip ensures longest life
- Available with scraper lip option (SSCLI) for abrasive media
- Dual retained spring energiser for maximum security
- Low load high-compliance spring energiser
- Many high resilience spring energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Available with silicone filled cavity for food and drug applications



Nominal Cross Section	Cross Section Code	CAVITY			
		B ID range tolerance H8	A OD tolerance H8	G Width	R Maximum radius
1.6	A	3.00 - 75.00	B+ 2.84	2.39 - 2.64	0.38
2.4	B	5.00 - 180.00	B+ 4.52	3.58 - 3.84	0.64
3.2	C	12.50 - 250.00	B+ 6.15	4.78 - 5.03	0.76
4.7	D	22.00 - 300.00	B+ 9.45	7.14 - 7.39	0.76
6.4	E	50.00 - 685.00	B+12.12	9.53 - 9.78	0.76

Ordering example: Rod diameter 40 mm

SNCLI	00400	A	01	E1
Profile	Rod Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

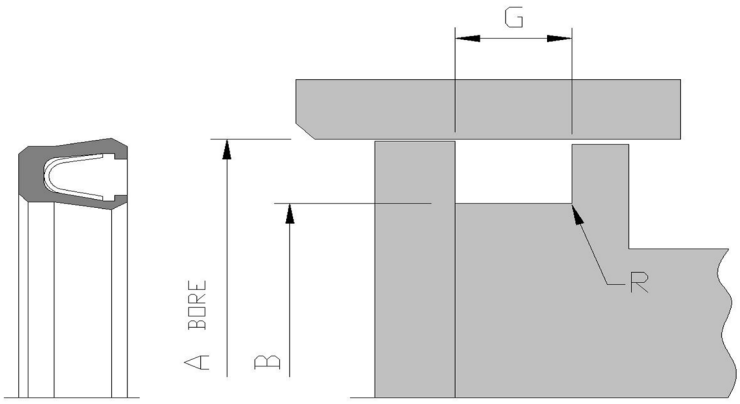


SSCLI Scraper Axial ID Dynamic Seal
For scraper seal SSCLI specify SSCLI in the part number instead of SNCLI. All SNCLI cavity dimensions apply.

SNCLO OD Dynamic Seal

Applications:
- Ideal for sealing OD rotating housings
- Used in low pressure reciprocating applications
- Suitable for pressures up to 200 bar (subject to PV guidelines)

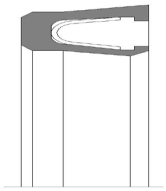
Features:
- Heavy OD seal lip ensures longest life
- Available with scraper lip option (SSCLO) for abrasive media
- Dual retained spring energiser for maximum security
- Low load high-compliance spring energiser
- Many high resilience spring energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Available with silicone filled cavity for food and drug applications



Nominal Cross Section	Cross Section Code	CAVITY			
		A OD range tolerance H8	B ID tolerance H8	G Width	R Maximum radius
1.6	A	6.00 - 75.00	A - 2.84	2.39 - 2.64	0.38
2.4	B	9.50 - 180.00	A - 4.52	3.58 - 3.84	0.64
3.2	C	19.00 - 250.00	A - 6.15	4.78 - 5.03	0.76
4.7	D	31.50 - 300.00	A - 9.45	7.14 - 7.39	0.76
6.4	E	63.00 - 685.00	A -12.12	9.53 - 9.78	0.76

Ordering example: Piston diameter 40 mm

SNCLO	00400	A	01	E1
Profile	Piston Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)



SSCLO Scraper Axial OD Dynamic Seal
For scraper seal SSCLO specify SSCLO in the part number instead of SNCLO.
All SNCLO cavity dimensions apply.

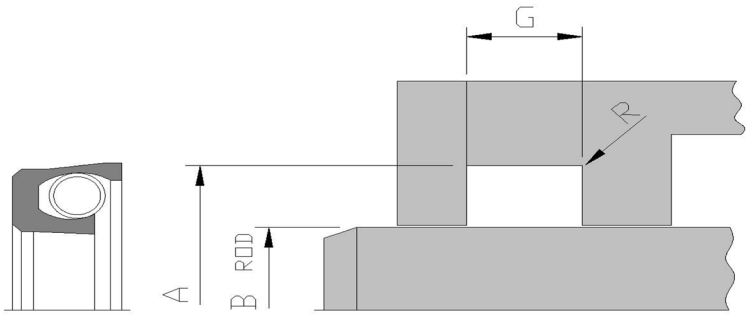
SBCAI ID Dynamic Seal

Applications:

- Best choice for sealing reciprocating actuator rods
- Suitable for pressures to 200 bar

Features:

- Heavy ID seal lip ensures longest life
- Short scraper type ID lip reduces frictional losses
- Squared, long, static leg stabilises seal
- Widest range of cross sections and diameters available, including sizes for upgrading standard o-ring glands
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		B OD range tolerance H8	A ID range tolerance H8	G Width	R Maximum Radius
1.6	A	2.50 - 75.00	B+ 2.84	2.39 - 2.64	0.38
2.4	B	3.00 - 180.00	B+ 4.52	3.58 - 3.84	0.64
3.2	C	6.00 - 250.00	B+ 6.15	4.78 - 5.03	0.76
4.7	D	12.50 - 300.00	B+ 9.45	7.14 - 7.39	0.76
6.4	E	50.00 - 500.00	B+ 12.12	9.53 - 9.78	0.76
9.5	F	150.00 - 1400.00	B+ 18.75	13.34 - 13.59	0.76

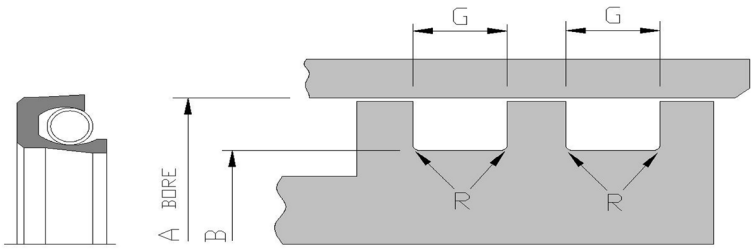
Ordering example: Rod diameter 40 mm

SBCAI	00400	A	01	E1
Profile	Rod Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

SBCAO OD Dynamic Seal

Applications:
- Best choice for sealing pistons
- Suitable for pressures to 200 bar

Features:
- Heavy OD seal lip ensures longest life
- Short scraper type OD lip reduces frictional losses
- Squared, long, static leg stabilises seal
- Widest range of cross sections and diameters available, including sizes for upgrading standard o-ring glands
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		A OD range tolerance H8	**B** ID range tolerance H8	**G** Width	**R** Maximum Radius
1.6	A	5.50 - 75.00	A - 2.84	2.39 - 2.64	0.38
2.4	B	7.50 - 180.00	A - 4.52	3.58 - 3.84	0.64
3.2	C	12.50 - 250.00	A - 6.15	4.78 - 5.03	0.76
4.7	D	22.00 - 300.00	A - 9.45	7.14 - 7.39	0.76
6.4	E	63.00 - 500.00	A - 12.12	9.53 - 9.78	0.76
9.5	F	170.00 - 1400.00	A - 18.75	13.34 - 13.59	0.76

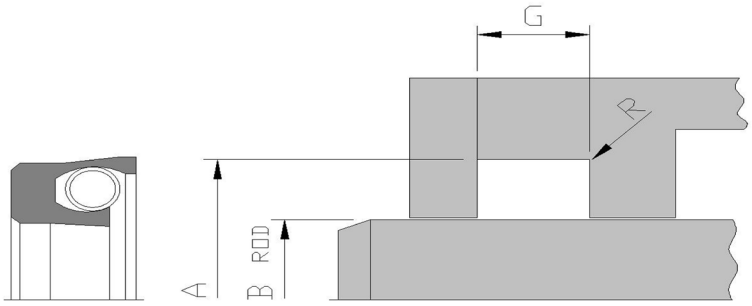
Ordering example: Piston Diameter 40 mm

SBCAO	00400	A	01	E1
Profile	Piston Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

SBCHI ID Dynamic Seal

Applications:
- Best choice for high pressure sealing of reciprocating actuator rods
- Suitable for pressures to 550 bar

Features:
- Extended heel reduces the effects of extrusion
- Heavy ID seal lip ensures longest life
- Short scraper type ID lip reduces frictional losses
- Squared, long, static leg stabilises seal
- Widest range of cross sections and diameters available, including sizes for upgrading standard o-ring glands
- Many high resilience spring-energiser options, inclduing choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		B ID range tolerance H8	A OD range tolerance H8	G Width	R Maximum Radius
1.6	A	2.5 - 75.00	B+ 2.84	3.78 - 4.04	0.38
2.4	B	3.00 - 180.00	B+ 4.52	4.65 - 4.90	0.64
3.2	C	6.00 - 250.00	B+ 6.15	5.97 - 6.22	0.76
4.7	D	12.50 - 300.00	B+ 9.45	8.48 - 8.74	0.76
6.4	E	50.00 - 500.00	B+ 12.12	12.07 - 12.32	0.76
9.5	F	150.00 - 1400.00	B+ 18.75	15.80 - 16.05	0.76

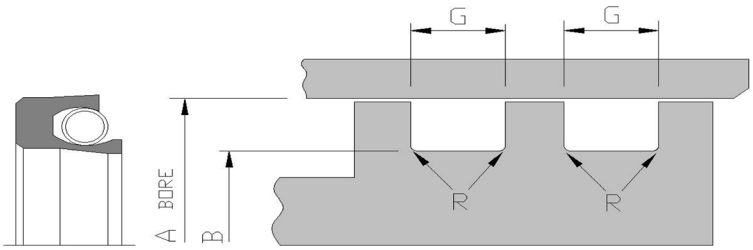
Ordering example: Rod diameter 40 mm

SBCHI	00400	A	01	E1
Profile	Rod Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

SBCHO OD Dynamic Seal

Applications:
- Best choice for high pressure sealing of pistons
- Suitable for pressures up to 550 bar

Features:
- Heavy OD seal lip ensures longest life
- Short scraper type OD lip reduces frictional losses
- Squared, long, static leg stabilises seal. Standard o-ring glands
- Extended heel reduces the effects of extrusion
- Widest range of cross sections and diameters available, including sizes for upgrading standard o-ring glands
- Many high resilience spring-energiser options, incldluing choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		A OD range tolerance H8	**B** ID tolerance H8	**G** Width	**R** Maximum Radius
1.6	A	5.50 - 75.00	A- 2.84	3.78 - 4.04	0.38
2.4	B	7.50 - 180.00	A- 4.52	4.65 - 4.90	0.64
3.2	C	12.5 - 250.00	A- 6.15	5.97 - 6.22	0.76
4.7	D	22.00 - 300.00	A- 9.45	8.48 - 8.74	0.76
6.4	E	63.00 - 500.00	A- 12.12	12.07 - 12.32	0.76
9.5	F	170.00 - 1400.00	A- 18.75	15.80 - 16.05	0.76

Ordering example: Piston diameter 40 mm

SBCHO	00400	A	01	E1
Profile	Piston Diameter x 10	Cross section code (see above table)	Jacket Material (see P. 23)	Energiser Code (see P. 23)

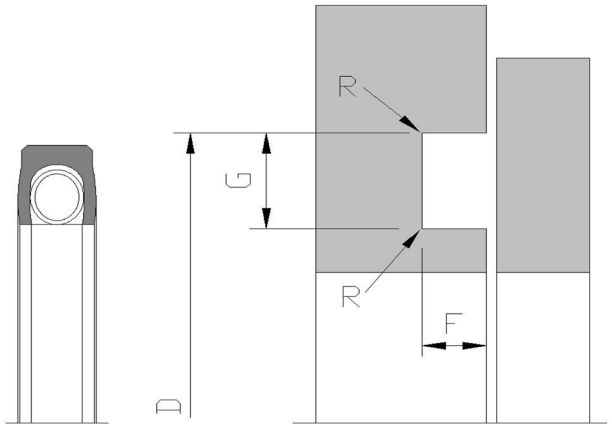
SNCAI Internal Pressure Face Seal

Applications:

- Excellent internally pressurised, spring energised face seal for static and intermittent dynamic use
- Suitable for use in shallow groove or counterbores with as little as 0.056 - 0.058 inch (1.42- 1.47mm) depth
- Good for pressures up to 550 bar

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		D OD range tolerance H10	**F** Depth range	**G** Minimum Width	**R** Maximum Radius
1.6	A	8.15 - 65.00	1.42 - 1.47	2.39	0.38
2.4	B	14.00 - 100.00	2.26 - 2.31	3.58	0.38
3.2	C	25.00 - 200.00	3.07 - 3.12	4.78	0.64
4.7	D	48.00 - 350.00	4.72 - 4.78	7.14	0.76
6.4	E	115.00 - 400.00	6.05 - 6.12	9.53	0.76
9.5	F	200.00 - 1000.00	9.47 - 9.58	13.26	0.76

Ordering example: Groove OD 40 mm

SNCAI	00400	A	01	E1
Profile	Groove OD x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

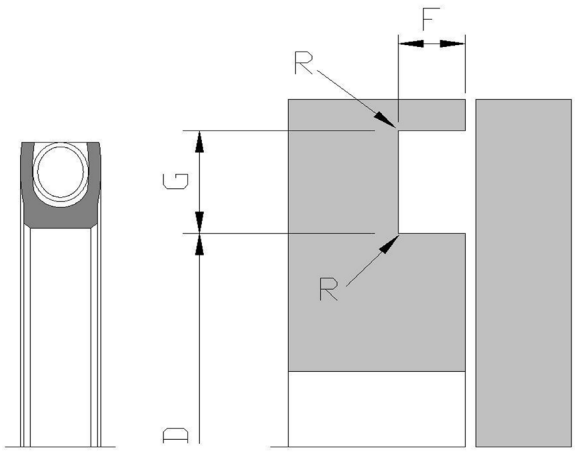
SNCAE External Pressure Face Seal

Applications:

- Excellent externally pressurised, spring energised face seal for static and intermittent dynamic use
- Suitable for use in shallow groove or counterbores with as little as 0.056 - 0.058 inch (1.42- 1.47mm) depth
- Good for pressures up to 550 bar

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion for resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		D ID range tolerance H10	F Depth range	G Minimum Width	R Maximum Radius
1.6	A	4.75 - 65.00	1.42 - 1.47	2.39	0.38
2.4	B	10.00 - 100.00	2.26 - 2.31	3.58	0.38
3.2	C	20.00 - 200.00	3.07 - 3.12	4.78	0.64
4.7	D	40.00 - 300.00	4.72 - 4.78	7.14	0.76
6.4	E	90.00 - 400.00	6.05 - 6.12	9.53	0.76
9.5	F	200.00 - 1000.00	9.47 - 9.58	13.26	0.76

Ordering example: Groove ID 40 mm

SNCAE	00400	A	01	E1
Profile	Groove ID x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

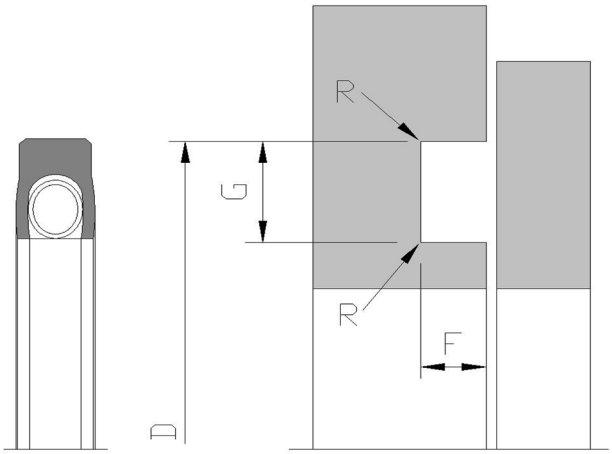
SNCHI Internal Pressure Face Seal

Applications:

- Excellent internally pressurised, spring energised face seal for static and intermittent dynamic use
- Suitable for use in shallow groove or counterbores with as little as 0.056 - 0.058 inch (1.42- 1.47mm) depth
- Good for highest pressures to 1350 bar

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Extended heel reduces the effects of extrusion
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		D OD range tolerance H10	**F** Depth range	**G** Minimum Width	**R** Maximum Radius
1.6	A	8.15 - 65.00	1.42 - 1.47	3.30	0.38
2.4	B	14.00 - 100.00	2.26 - 2.31	4.50	0.38
3.2	C	25.00 - 200.00	3.07 - 3.12	6.48	0.64
4.7	D	48.00 - 350.00	4.72 - 4.78	8.05	0.76
6.4	E	115.00 - 400.00	6.05 - 6.12	11.25	0.76
9.5	F	200.00 - 1000.00	9.47 - 9.58	15.80	0.76

Ordering example: Groove OD 40 mm

SNCHI	00400	A	01	E1
Profile	Groove OD x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

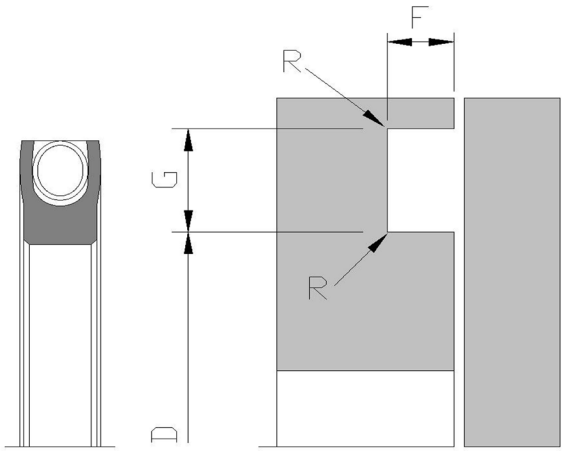
SNCHE External Pressure Face Seal

Applications:

- Excellent externally pressurised, spring energised face seal for static and intermittent dynamic use
- Suitable for use in shallow groove or counterbores with as little as 0.056 - 0.058 inch (1.42- 1.47mm) depth
- Good for highest pressures to 1350 bar

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Extended heel reduces the effects of extrusion
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE corrosion resistance for oil field use
- Lowest cost elastomeric energisers available; all with excellent fatigue resistance



Nominal Cross Section	Cross Section Code	CAVITY			
		D ID range tolerance H10	**F** Depth range	**G** Minimum Width	**R** Maximum Radius
1.6	A	4.75 - 65.00	1.42 - 1.47	3.30	0.38
2.4	B	10.00 - 100.00	2.26 - 2.31	4.50	0.38
3.2	C	20.00 - 200.00	3.07 - 3.12	6.48	0.64
4.7	D	40.00 - 300.00	4.72 - 4.78	8.05	0.76
6.4	E	90.00 - 400.00	6.05 - 6.12	11.25	0.76
9.5	F	200.00 - 1000.00	9.47 - 9.58	15.80	0.76

Ordering example: Groove ID 40 mm

SNCHE	00400	A	01	E1
Profile	Groove ID x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

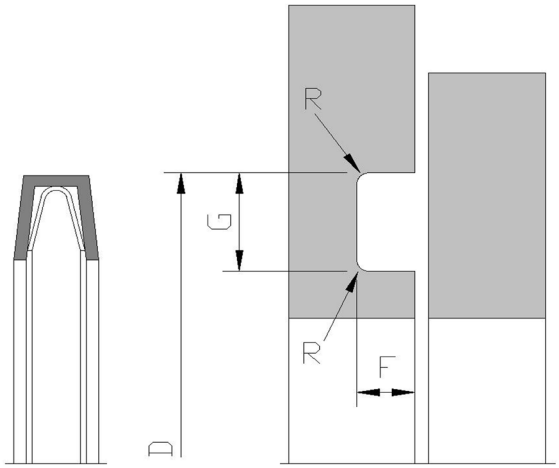
SNCRI Internal Pressure Face Seal

Applications:

- High force internally pressurised spring energised face seal for static cryogenic applications
- Good for pressures up to 340 bar
- Large sections and cantilever springs ensure suitability as swivel seals

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Spring energiser acts as control band to resist shrinkage
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE approved materials



Nominal Cross Section	Cross Section Code	CAVITY			
		D OD range tolerance H10	**F** Depth range	**G** Minimum Width	**R** Maximum Radius
4.7 mm	D	50.00 - 300.00	4.72 - 4.78	9.00	0.75
6.4 mm	E	80.00 - 1000.00	6.05 - 6.12	10.00	0.75
9.5 mm	F	150.00 - 1200.00	9.47 - 9.58	13.50	0.75
12.7 mm	G	200.00 - 1200.00	12.70 - 12.80	18.50	0.75

Ordering example: Groove OD 40 mm

SNCRI	00400	A	01	E1
Profile	Groove OD x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

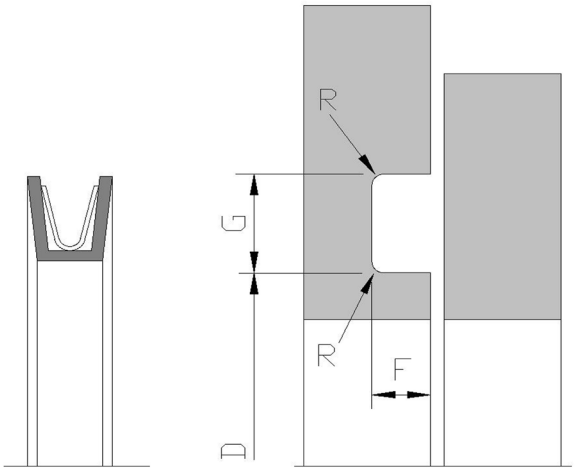
SNCRE External Pressure Face Seal

Applications:

- High force externally pressurised spring energised face seal for static cryogenic applications
- Good for pressures up to 340 bar

Features:

- High resiliency resists permanent set and maintains long term compliance to flange separation
- Many high resilience spring-energiser options, including choice of light, medium and heavy loads (for friction control) and NACE approved materials



Nominal Cross Section	Cross Section Code	CAVITY			
		D ID range tolerance H10	F Depth range	G Minimum Width	R Maximum Radius
4.7 mm	D	50.00 - 300.00	4.72 - 4.78	9.00	0.75
6.4 mm	E	80.00 - 1000.00	6.05 - 6.12	10.00	0.75
9.5 mm	F	150.00 - 1200.00	9.47 - 9.58	13.50	0.75
12.7 mm	G	200.00 - 1200.00	12.70 - 12.80	18.50	0.75

Ordering example: Groove ID 40 mm

SNCRE	00400	A	01	E1
Profile	Groove ID x 10	Cross section code (see above table)	Jacket Material (see P. 22)	Energiser Code (see P. 22)

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