PTFE Sealing Solutions

ceetak
sealing solutions

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Recommendations on product and material selection are based on technical information available to Ceetak, and are offered as a guide to help the user identify suitable products for their application. Any reliance placed on such information by the user is strictly at the user's risk. Each user should make their own tests to determine the suitability for their own particular application. Ceetak Ltd offers no express or implied warranties concerning the compatibility of a product or material from this guide.

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Ceetak Ltd is a leading UK designer and supplier of seals and sealing solutions.

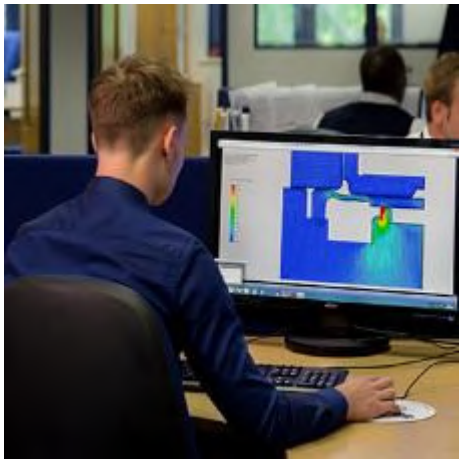
Established for over 45 years, and part of the Ceetak Holdings Group, our Head Office is based in Bedford, England.

Our products and systems are used throughout all major industries, from the most technically demanding applications, to high quality, high volume, precision components.

We have a team of Application Engineers ready to assist in the design of seals for all applications. They fully understand the variety of technical challenges when designing and manufacturing components for critical conditions.

Engineering Design and Quality Assurance

We provide unrivalled technical and engineering support to ensure our customers benefit from the best possible performance at optimum cost. We are dedicated to providing a complete design service, from initial seal geometry and profile choice, to material selection and prototyping, through to final production.



Working closely with your engineers we provide the most effective sealing solution for each bespoke application. Our application Engineers utilise years of seal design experience and materials expertise, alongside technologies such as 2D/3D CAD and FEA analytical programmes to simulate performance before finalising each individual seal design.

We provide both in-house and on-site technical support and have the skills, experience and resources to assist customers in all industries; regardless of the complexity or challenges involved in each application

To meet the required standards and approvals demanded by industry, strict quality procedures are maintained at all stages of design, development and manufacture. We are ISO9001:2015, AS9120B and ISO14001:2015 approved, with our manufacturing partners also carrying IATF16949:2009 and ISO13485 approvals.

Ceetak has a dedicated team of Quality Engineers and Quality Inspectors ensuring that advanced product quality planning is at the heart of our quality function.

Fundamental activities include, mitigation of risk during all manufacturing processes, anticipating potential risks, regular review of process controls and stability, PPAP review, continuous monitoring of production SPC data, regular audits of manufacturing facilities and monthly manufacturing performance monitoring.

Our stringent quality principles and proactive controls mean our customers have reduced claims and associated costs, increased change control and prevention of productivity loss and line-stops.

The Discovery of PTFE

PTFE (Polytetrafluoroethylene) was created accidentally by Dr Roy Plunkett whilst experimenting with refrigerants on behalf of DuPont in 1938. Subsequent experiments on the material he had created demonstrated that the material was resistant to acids and solvents and was subsequently used in the handling of chemicals.

Since 1947, DuPont commercially launched PTFE under the brand Teflon, but this has since found its way into many diverse applications, including sealing technology.

Its uses in the world of hydraulic and pneumatic seals are numerous, thanks to its high melting point in excess of 300 degrees C, its resistance to ageing and degradation and being inert to nearly all known chemicals, not to mention its low coefficient of friction.

PTFE is a linear molecule with fluorine atoms protecting a backbone of carbon. The carbon fluorine bond is stable and the fluorine atoms relatively large in size, together protecting the polymer from chemical attack.

Processing

Process technology similar to powder metallurgy is used in the creation of PTFE seal materials. PTFE powder is pressed and sintered into rods, tubes and blocks using a number of proprietary processes before being machined to the required shape.

The material is not suitable for processing by standard plastic moulding techniques, however some of our common rod materials may be prepared by ram extrusion, sintered within the process.

Application

PTFE materials do not exhibit elastic properties, and in most applications require an energising force to facilitate effective sealing. Such force is usually gained through the use of an elastomeric (typically o-ring) or metallic spring element.

PTFE polymer chains are formed with a straight helix, tightly packed with fluorine, preventing polymer entanglement and reducing the number of chain entanglements. This leads to creep and wear of the material, which can make a virgin PTFE unsuitable for certain application conditions. Where these conditions exist, it is recommended to use fillers appropriate to the application.

The influence of filler materials is particularly illustrated by:

Reduction in cold flow,

Reduction in friction,

Reduction in wear,

Increase in thermal shape stability,

Increase in hardness,

Information on our filler materials can be found below.

Fillers

Fillers can be used in fibre and powder form, often materials will employ a combination of a number of fillers to combine strengths, and overcome weaknesses of each.

Widely used fillers may include the following materials:

Glass fibres – These offer greatly improved resistance to wear across a wide temperature range, however the resistance to creep is limited. Glass fibres should be used only in well lubricated environments.

Carbon/graphite (Powder) – These fillers provide improved wear, hardness and extrusion resistance, and are both chemically inert and able to handle extreme temperatures. The surface finish of the compound remains smooth, making these materials suitable for sealing low viscosity fluids and gases. The materials are mild against softer counter faces and can be used with poorly lubricating media.

Carbon Fibre – the fibres result in an uneven surface texture, which trap small amounts of the system fluid and can help maintain the lubricating film between the seal and hardware. This property offers benefits with poorly lubricating materials, such as water, but cannot be used for gases. Carbon fibre filled materials are often used in rotary applications.

Calcium Fluoride – this can be added to the material to help compatibility with hydrofluoric acid, or strong alkalines, both of which are known to breakdown the otherwise stable PTFE elements.

Pigments – primarily added for colour, certain of these can also be used to offer slight performance advantages over the virgin material

Bronze – Copper/Tin alloys mixed with PTFE exhibit significant improvement in the creep resistance of the material improving static and dynamic extrusion resistance, and significantly reducing wear of the seal. The thermal conductivity is also greatly improved making this ideal for arduous linear duties, where good lubrication is present.

Molybdenum Disulfide – Similar in look and feel to graphite, it is often used alongside other fillers, and in small amounts. The MoS2 offers improved hardness and wear resistance, and reduces friction.

Polymers – these fillers can be used to offer improved wear and extrusion resistance, without compromising the seals abrasiveness against soft counter faces. These smooth materials operate well after only a short running in period, and are effective at sealing both liquids and gases in both rotary and linear applications.

Special Characteristics of PTFE

At Low Temperatures:

Even at -269 degrees C (boiling point of helium) PTFE still has residual extensibility, allowing it to be used under such extreme conditions such as in outer space. The material does not 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 260C and up to 320C for limited periods. Fillers have no influence on the PTFE's own thermal resistance. Furthermore, most fillers are themselves stable up to 400C, so 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.

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 120C). 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 of common known fillers.

Contact with foodstuffs:

Generally PTFE is suitable for contact with foodstuffs and satisfies FDA requirements. Ceetak are able to provide a number of FDA, USP and WRAS compliant materials upon request.

Electrical Properties:

PTFE is an excellent insulator with a high dielectric strength, low permittivity, and a very high electrical resistance. Some fillers can be used to improve conductivity where required.

Tribological properties:

The coefficient of friction is only marginally influenced by most fillers, however when sealing dynamically against lubricating fluids, the coefficient of friction can be reduced, depending on e.g. surface speed, finish and pressure.

Ceetak offer PTFE materials with a number of different fillers, designed to favour the material properties towards different application areas. The effects that common fillers have on the PTFE material are explained further in section A-2.

The level of filler can strongly influence the material's performance. Ceetak offers materials with a high (approximately 40%) medium (approximately 25%) or low (approximately 10-15%) level of filler within the PTFE material. The amount of filler can enhance the PTFE strength and wear resistance, but this can also affect the ability to stretch, and the ultimate sealing performance of the base polymer.

Compound	Order Code	Temperature Min . Max.		Application	Characteristics	Products
PTFE Materials						
Virgin PTFE	**P01**	-260°C	+ 260°C	- Chemical industry - Food industry	- High chemical resistance	- Back-up rings - Spring energised seals
Virgin TFM	**P02**	-260°C	+ 230°C	- Chemical industry - Food & Pharmaceutical - Cryogenics	- High chemical resistance - High mechanical strength	- Spring energised seals - Ball Valve seats
Modified PTFE	**P03**	-260°C	+ 260°C	- Low duty hydraulic applications	- Improved wear resistance	- Spring energised seals - Glide rings
PTFE Glass Fibre Low Fill	**P04**	-260°C	+ 300°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 Carbon Low Fill (Powder)	**P05**	-260°C	+ 300°C	- Medium mechanical stress - Hard sealing surfaces - Water/Oil emulsions	- Chemical resistance limited by carbon	- Spring energised seals
PTFE Carbon & Graphite Medium Fill	**P06**	-260°C	+ 300°C	- Heavy mechanical stress - Water/Oil hydraulics	- High wear and creep resistance	- Slide rings - Back-up rings
PTFE Carbon Medium Fill (Powder)	**P07**	-260°C	+ 300C	- Pneumatics	- High wear and creep resistance	- Guiding tapes
PTFE Graphite Low Fill	**P08**	-260°C	+ 230°C	- Low mechanical stress - Soft sealing surfaces	- Chemical resistance limited by graphite	- Spring energised seals
PTFE Bronze High fill	**P09**	-260°C	+ 300°C	- Heavy mechanical stress - Hydraulic sealing surfaces	- Outstanding wear and creep resistance	- Slide rings
PTFE Ekonol Low Fill	**P10**	-260°C	+315 °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 Glass Fibre (High Fill)	**P12**	-260°C	+ 300°C	- Heavy duty hydraulic applications	- High chemical resistance - High creep resistance - Electrical properties like Virgin PTFE	- Slipper Seals - Back-up rings - Guide rings - Gaskets

PTFE TFM Glass Low Fill	**P13**	-260°C	+ 260°C	- Chemical industry - Food industry - Pharmaceutical industry	- High chemical resistance - High mechanical strength	- Spring energised seals - Ball Valve seats
PTFE TFM Glass Medium Fill	**P14**	-260°C	+ 260°C	- Chemical industry - Food industry - Pharmaceutical industry	- High chemical resistance - High mechanical strength	- Spring energised seals - Ball Valve seats
PTFE TFM Carbon Low Fill (Powder)	**P15**	-260°C	+ 260°C	- Heavy mechanical stress - Water/Oil hydraulics	- High wear and creep resistance	- Slide rings - Back-up rings
PTFE Carbon Fibre Fill	**P16**	-260°C	+ 300°C	- High mechanical stress - Hard sealing surfaces - Water, high wear applications	- High wear resistance - Rotary applications	- Spring energised seals
Plastic Materials						
PCTFE	**K12**	-200°C	+200	- Aerospace Industry - Nuclear applications	- Low outgassing and permeability - Low water absorption - Resistant to Ionising radiation	- Slipper Seals - Spring Energised Seals
UHMW-PE	**K13**	-200°C	+ 80°C	- Food industry - Pneumatics	- Outstanding wear properties in water and air	- Slide rings - Spring energised seals - Guide rings
PEEK	**K15**	-260°C	+250°C	- Food industry - Chemical industry	- High chemical resistance - High pressure resistance - High temp resistance	- Back-up rings
Reinforced PEEK	**K16**	-260°C	+250°C	- Oil and Gas Industry - Chemical industry	- High chemical resistance - High pressure resistance - High temp resistance	- Back-up rings
Materials for Wear Rings						
PTFE + Lubricant	**B16**	-260°C	+200°C	- Hydraulic and Pneumatic cylinders	- High chemical resistance - High Load Capacity	Wear Rings
PTFE + Bronze	**B17**	-260°C	+200°C	- Hydraulic and Pneumatic cylinders	- High chemical resistance - High Load Capacity	Wear Rings
PTFE + Carbon + Graphite	**B18**	-260°C	+200°C	- Hydraulic and Pneumatic cylinders	- High chemical resistance - High Load Capacity	Wear Rings

PTFE has almost no elasticity; therefore PTFE sealing elements have to be combined with an elastic component (usually an o-ring or metallic spring). Energised seals consist of a PTFE part, made of a specially modified compound, and an energising material.

Ceetak have an extensive range of materials to meet demanding application conditions.

Metallic Energiser Materials

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). Metallic springs allow the outstanding thermal and chemical properties of PTFE to be used to full advantage.

Ceetak offer the following metallic spring materials.

Information on spring type can be found on the product pages within this guide.

Code	Material	NACE Approved (see note A)	Light/Heavy Spring? (see note B)
E01	17-7PH Stainless Steel		•
E02	Cobalt Chrome Alloy	•	•
E03	316 Stainless Steel		•
E3S	316 Stainless Steel with Silicone filling		
E04	304 Stainless Steel		•
E4S	304 Stainless Steel with Silicone filling		
E05	Buna N (see note D)		
E07	FKM (see note D)		
E08	Silicone filling only		
E10	Alloy X-750	•	
E11	301 Stainless Steel		
E12	302 Stainless Steel		

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 Ceetak
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

Elastomer Energiser Materials

Where seals require the use of an elastomer energising element, or component within a multi part seal kit, the following material codes can be used to specify and constrain the accompanying elastomer.

These elastomers meet the minimum requirements of the ASTM reference detailed and may be supplied from multiple sources and batches depending on stock at time of order. Where the operating conditions of your application demand a specific matched elastomer, there is a need for consistent source of supply, traceability, shelf life restrictions or other such demand within your programme life, Ceetak would recommend individual elastomer codes are specified. Please contact Ceetak for assistance in material selection tailored to you.

Material	Compound Description	ASTM D2000	Temperature (Static)
N70	Medium Nitrile, 70 shore A	M2BG 710 A14 B14 EF11 EO14 EO34	-30°C to +100°C
N90	Medium Nitrile, 90 Shore A	M2BG 910 A14 B14 EF11 EO14 EO34	-30°C to +100°C
V75	FKM Type A, 75 Shore A	M2HK 810 A1-10 B38 EF31 EO78	-20°C to +200°C
V90	FKM Type A, 75 shore A	M2HK 910 A1-10 B38 EF31 EO78	-20°C to +200°C
H80	HNBR, 80 Shore A	M2DH 810 A26 B16 EO16 EO36	-35°C to +150°C
E70	EPDM, 70 Shore A	M2DA 710 A26 B36 EA14	-50°C to +150°C

Standard Material Specification Data

Material: **NBR70**
Compound Ref: **N70**
Specification: **ASTM D2000 M2BG 710 A14 B14 EA14 EO14 EO34**
Colour: **Black**
Temperature Range: **-30°C to +100°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	70±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	250 min
Specific Gravity	ASTM D297	g/cm3	±0.03
Compression Set (B14)	ASTM D395-03 (22Hrs. @ 100°C)	%	25 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 100°C (A14) ASTM D573	Hardness Change	°	±15
	Tensile Strength Change	%	±30
	Elongation Change	%	-50 max

Change in Physical Properties

Test	Property	Units	Specification
Water 70 Hrs. @ 100°C (EA14) ASTM D471	Hardness Change	°	±10
	Tensile Strength Change	%	n/a
	Elongation Change	%	n/a
	Volume Change	%	±15
ASTM Oil No. 1 70 Hrs. @ 100°C (EO14) ASTM D471	Hardness Change	°	-5 to +10
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-45 max
	Volume Change	%	-10 to +5
ASTM Oil No. 3 70 Hrs. @ 100°C (EO34) ASTM D471	Hardness Change	°	-10 to +5
	Tensile Strength Change	%	-45 max
	Elongation Change	%	-45 max
	Volume Change	%	0 to +25

*Temperature rating subject to full application review

Standard Material Specification Data

Material: **NBR90**
Compound Ref: **N90**
Specification: **ASTM D2000 M2BG 910 A14 B14 EF11 EO14 EO34**
Colour: **Black**
Temperature Range: **-30°C to +100°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	90±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	100 min
Specific Gravity	ASTM D297	g/cm3	+/- 0.03
Compression Set (B14)	ASTM D395-03 (22Hrs. @ 100°C)	%	25 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 100°C (A14) ASTM D573	Hardness Change	°	+15 max
	Tensile Strength Change	%	-20 max
	Elongation Change	%	-40 max

Change in Physical Properties

Test	Property	Units	Specification
Fuel A 70 Hrs. @ 23°C (EF11) ASTM D471	Hardness Change	°	+/- 10
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-25 max
	Volume Change	%	-5 to +10
ASTM Oil No. 1 70 Hrs. @ 100°C (EO14) ASTM D471	Hardness Change	°	-5 to +10
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-45 max
	Volume Change	%	-10 to + 5
ASTM Oil No. 3 70 Hrs. @ 100°C (EO34) ASTM D471	Hardness Change	°	-10 to + 5
	Tensile Strength Change	%	-45 max
	Elongation Change	%	-45 max
	Volume Change	%	0 to +25

*Temperature rating subject to full application review

Standard Material Specification Data

Material: **FKM75**
Compound Ref: **V75**
Specification: **ASTM D2000 M2HK810 A1-10 B38 EF31 EO78**
Colour: **Black**
Temperature Range: **-20°C to +200°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	75±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	150 min
Specific Gravity	ASTM D297	g/cm3	1.08 to 2.03
Compression Set (B38)	ASTM D395-03 (22Hrs. @ 200°C)	%	50 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 250°C	Hardness Change	°	+10 max
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-25 max

Change in Physical Properties

Test	Property	Units	Specification
Fuel C 70 Hrs. @ 23°C (EF31) ASTM D471	Hardness Change	°	+/- 5
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-20 max
	Volume Change	%	0 to +10
Service liquid No. 101 70 Hrs. @ 200°C (EO78) ASTM D471	Hardness Change	°	-15 ~ +5
	Tensile Strength Change	%	-40 max
	Elongation Change	%	-20 max
	Volume Change	%	0 ~ +15

*Temperature rating subject to full application review

Standard Material Specification Data

Material: **FKM90**
Compound Ref: **V90**
Specification: **ASTM D2000 M2HK 910 A1-10 B38 EF31 EO78**
Colour: **Black**
Temperature Range: **-20°C to +200°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	90±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	100 min
Specific Gravity	ASTM D297	g/cm3	+/- 0.03
Compression Set (B38)	ASTM D395-03 (22Hrs. @ 200°C)	%	50 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 250°C (A1-10) ASTM D573	Hardness Change	°	+10 max
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-25 max

Change in Physical Properties

Test	Property	Units	Specification
Fuel C 70 Hrs. @ 23°C (EF31) ASTM D471	Hardness Change	°	+/- 5
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-20 max
	Volume Change	%	0 to +10
Service liquid No. 101 70 Hrs. @ 100°C (EO78) ASTM D471	Hardness Change	°	-15 to +5
	Tensile Strength Change	%	-40 max
	Elongation Change	%	-20 max
	Volume Change	%	0 to + 15

*Temperature rating subject to full application review

Standard Material Specification Data

Material: **HNBR80**
Compound Ref: **H80**
Specification: **ASTM D2000 M2DH 810 A26 B16 EO16 EO36**
Colour: **Black**
Temperature Range: **-35°C to +150°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	80±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	100 min
Specific Gravity	ASTM D297	g/cm3	+/- 0.03
Compression Set (B16)	ASTM D395-03 (22Hrs. @ 150°C)	%	30 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 150°C (A26) ASTM D573	Hardness Change	°	+10 max
	Tensile Strength Change	%	-25 max
	Elongation Change	%	-30 max

Change in Physical Properties

Test	Property	Units	Specification
ASTM Oil No. 1 70 Hrs. @ 150°C (EO16) ASTM D471	Hardness Change	°	-5 to + 10
	Tensile Strength Change	%	-20 max
	Elongation Change	%	-30 max
	Volume Change	%	+/- 5
ASTM Oil No. 3 70 Hrs. @ 150°C (EO36) ASTM D471	Hardness Change	°	-15 max
	Tensile Strength Change	%	-40 max
	Elongation Change	%	-40 max
	Volume Change	%	+25 max

*Temperature rating subject to full application review

Standard Material Specification Data

Material: **EPDM70**
Compound Ref: **E70**
Specification: **ASTM D2000 M2DA 710 A26 B36 EA14**
Colour: **Black**
Temperature Range: **-50°C to +150°C**

Original Physical Properties

Property	Test	Units	Specification
Hardness	ASTM D2240-05	Shore A	70±5
Tensile Strength	ASTM D412-06a	MPa	10 min
Elongation	ASTM D412-06a	%	200 min
Specific Gravity	ASTM D297	g/cm3	+/- 0.03
Compression Set	ASTM D395-03 (22Hrs. @ 150°C)	%	40 max

Change in Physical Properties

Test	Property	Units	Specification
Heat Ageing in Air 70 Hrs. @ 150°C (A26) ASTM D573	Hardness Change	°	+10 max
	Tensile Strength Change	%	-20 max
	Elongation Change	%	-20 max

Change in Physical Properties

Test	Property	Units	Specification
Water 70 Hrs. @ 100°C (EA14) ASTM D471	Volume Change	%	+/- 5

*Temperature rating subject to full application review

Seals are critical in preventing system fluid loss in hydraulic and pneumatic actuation, whilst polymer wipers play an important role in preventing the ingress of foreign objects which can lead to damage of the sealing system within.

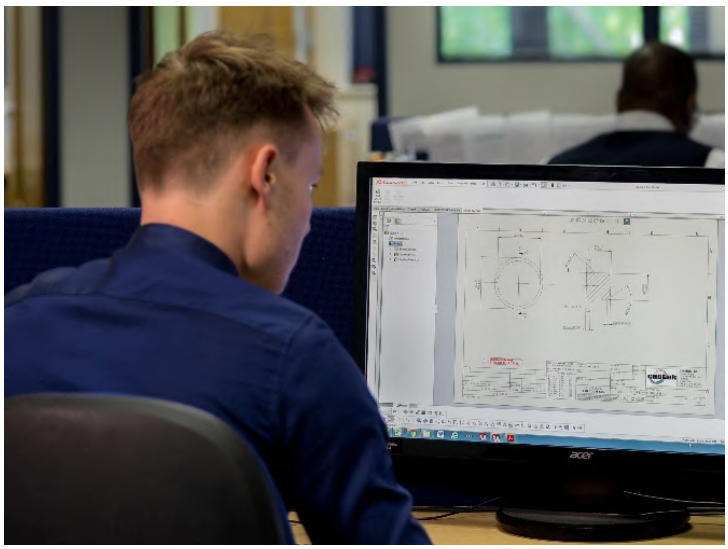
PTFE seals are designed to withstand high pressures, rapid acceleration and high operating speeds. They often utilise the system fluid to improve heat dissipation, and reduce wear, with certain seals designed to run hydrostatically under optimum conditions.

Each seal operates independently within a sealing system, each facing a unique set of application parameters. For this reason, it is often the case that multiple seal arrangements utilise differing seal types, designed to work together to prevent lubricant starvation, inter-stage pressures and high temperature generation and wear.

Ceetak offer a wide range of sealing products, and operate at the leading edge of sealing technology to furnish ever increasing demands for efficiency, performance and reliability.

When designing a sealing system, it is important to consider whether the sealing arrangement demands a single acting seal – designed to seal in one direction, and allow a fluid return on the return stroke, or a double acting seal - designed to restrict the fluid in both directions. Spacing of these seals should be carefully considered. The volume and pressure of fluid between the seals can fluctuate as the system operates.

Sideloading of the rod should be considered carefully. Seals should not be considered as load bearing beyond those loads directly from system pressure. Where sideloading is likely, low friction polymer bearings may be used to support the sealing system. Polymer bearings can help to protect the system from leakage, wear, and from damage from foreign objects.



Ceetak can support with both seal and system design support, helping to select the right engineered sealing solution for the customers requirements. By combining many years of design experience with modern materials, we can help our customers optimise their sealing system performance.

The function of a sealing system is typically to prevent or control passage of liquid or gas media.

Seals operate by controlling the flow of media at the interface between the seal and the hardware. Whilst the performance of the sealing system is governed in part by the selective use of appropriate seal materials and profiles matched to the application demands, the surface characteristics of the counter face will also directly influence the performance of the sealing system.

Today's sealing system designer is faced with countless seal choices, and must also consider the effects of abrasion, friction, leakage, service life, temperature and system cost when designing the seal system.

The following guide is designed to outline some of the basic finish requirements, Ceetak's specialised engineers are on hand to provide further support and guidance should it be required.

Static Seals intent (leak tightness)

Static seals are typically designed to prevent the passage of all media, by covering the micro channels and machining marks in the surfaces. An ideal counter face for static sealing would have limited peaks above the surface, and no large depressions or valleys. The minimum roughness of static interfaces is not limited; however the maximum roughness should be controlled in accordance with the values in the table below.

Dynamic Seals intent (lubrication)

Dynamic seals are typically designed to operate on a thin film of lubricating fluid. The seals are in many cases designed to preserve and control this lubricant film, and work in partnership with the small pockets in the counter face which can trap small amounts of lubricant. For this reason, a dynamic surface should feature very few sharp peaks, with a greater number of valleys. For dynamic seals, it is possible to finish a shaft to be too smooth, whereby seal life may be compromised due to lack of lubrication and cooling.

The surface finish of the seal interface is critical to both the leak performance, but also the power loss, seal life and noise & vibration generated by the sealing system.

Surface finish can be measured and specified using many different parameters, often working together to help define the characteristics of the material finish. It is often insufficient to specify the surface finish based on Ra alone.

Surface finish recommendations also may vary depending on the type of media being sealed, the hardware material and the materials selected for the seal element. Recommendations also differ depending on whether the seal is to be static, or dynamic relevant to the mating hardware.

Bedding In

When PTFE seals are first installed, there may be a period where both wear and friction are a little higher than anticipated. This period may be reduced by exercising the unit a number of times prior to applying system pressure. This cyclic dynamic movement can facilitate a slight transfer of PTFE into the counterface whilst with certain PTFE

materials, aid in polishing of the hardware. This period ends when the surface peaks have polished, and the material transferred. The time to overcome this, depends on the hardness of the material, and the surface finish achieved prior to installation.

Manufacture Method

The method of manufacture, platings, and polishing can all affect the dynamic and wear characteristics. It is recommended that a finishing method that reduces the formation of leak paths (such as spiral machining marks) is selected. Ceetak can offer guidance upon request.

Definitions

Ra – this is the most commonly used indicator of surface roughness. Ra is the arithmetical mean, or average, roughness. This measures the average deviation away from the mean measurement line, but does not capture the existence of a limited number of sharp peaks and valleys.

Rmax – This is the maximum depth between the highest peak and deepest valley from the reference sample, indicating the amplitude of the roughness.

Rz – This is the average value of the 5 highest peaks, and the 5 highest valleys from the reference sample, indicating the amplitude of the roughness.

Rmr - Bearing Ratio. This is the ratio of the amount of material at a given depth from the reference measurement line, typically 5%. A bearing ratio of between 50% and 90% may be suitable for PTFE dynamic seals.

Spring energised seals are designed to meet extreme demands regarding temperature, medium, etc. which cannot be covered by conventional elastomer and fabric sealing materials.

PTFE has almost no elastic memory due to the nature of the material structure; therefore PTFE sealing elements have to be combined with a product which can energise the PTFE against the sealed surfaces, often an elastomer or metallic spring.

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 force, pushing out the sealing lips. As system pressure is applied, this works with the spring, increasing and ultimately overcoming the sealing force.

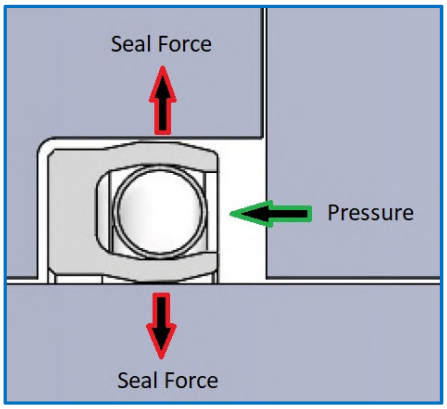
In dynamic applications, the spring expands, compensating for seal wear while continuing to provide load. In conditions that see thermal cycling, the spring continues to energise the seal lips without taking compression set, and combats the creep exhibited by the thermoplastic seal jacket.

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

Note that 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, however Ceetak engineers are available to provide guidance where a one piece housing is necessary.

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.

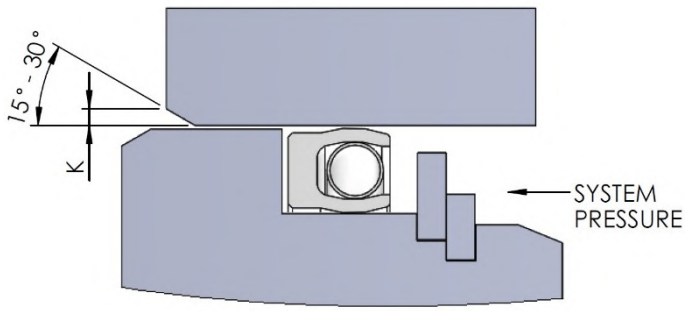
However, it is possible to exceed working pressure and surface speed provided the working temperature is kept correspondingly lower.

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

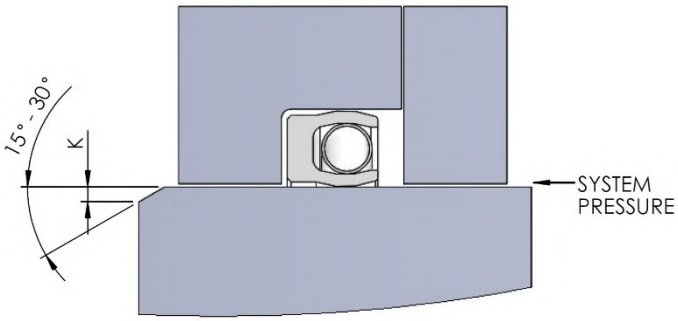
Spring energised seals - Installation Guidelines

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.

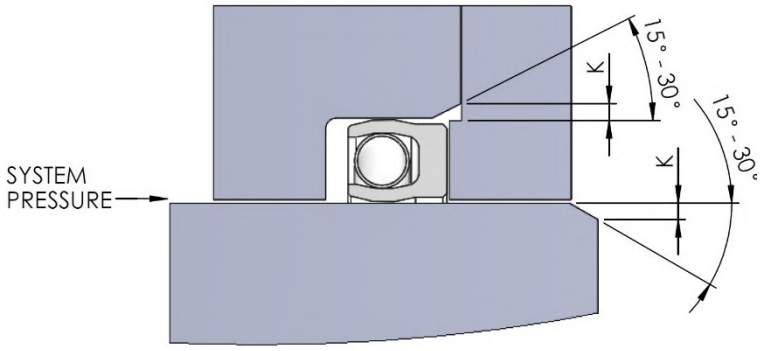
Typical split cavity configurations are illustrated in the figures below. The lead-in chamfers detailed in the figures and table will facilitate seal installation. To prevent possible seal damage, it is recommended that all corners where the seal is installed be rounded.



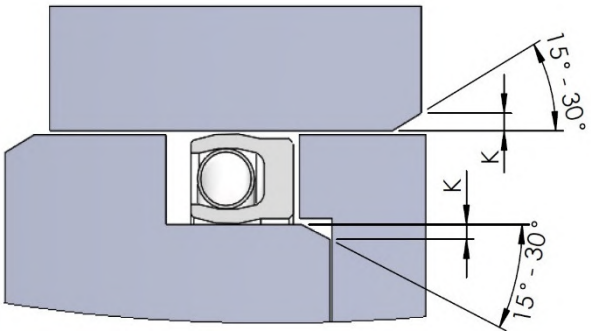
Heel End onto Piston



Heel End into Bore



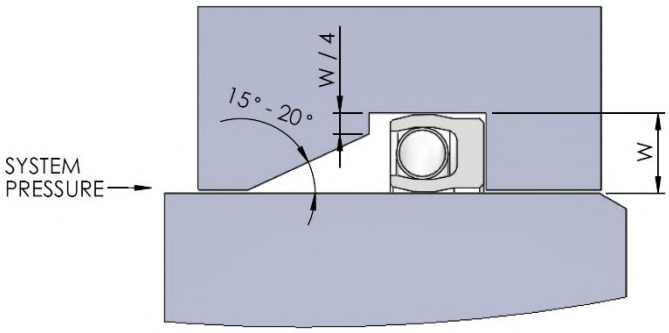
Open End onto Piston



Open End into Bore

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 could be considered.

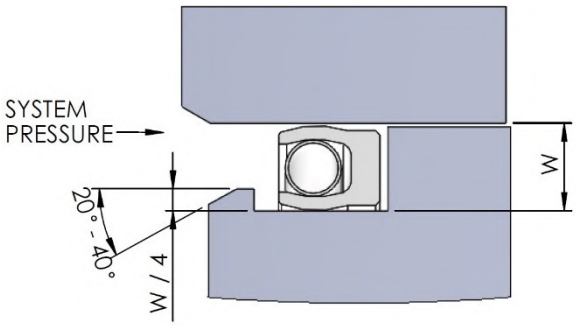


Installation in the Housing

A modified cavity as shown here may be used. In installation, the circular spring energised seal is temporarily deformed to an elliptical 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.



Slipper Seals

Whilst elastomers provide strong sealing performance with regards to leakage, the friction can be high, which in turn can reduce system efficiency, increase temperatures and demand regular servicing.

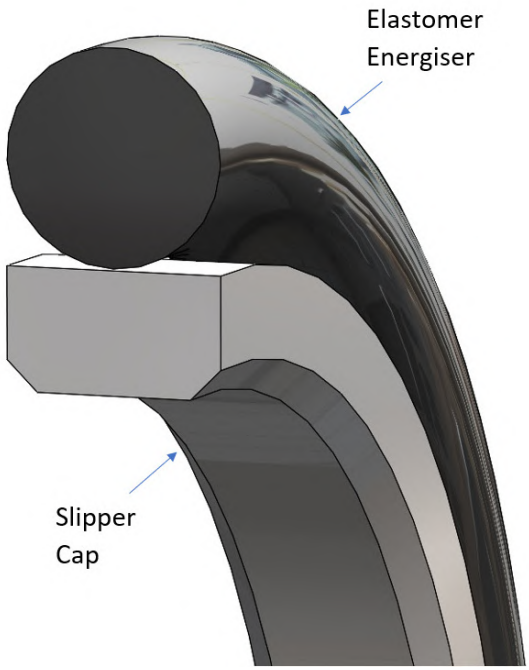
Slipper seals combine the beneficial properties of PTFE with the flexibility of an elastomer.

The use of a slipper cap can extend the temperature range and durability of a seal. Friction is vastly reduced with stick slip almost eliminated upon start-up. The PTFE cap can often withstand higher system pressures, higher surface speeds and rapid changes in direction.

Slipper seals typically fit within compact grooves, some able to retrofit to an existing o-ring groove. Many other Ceetak PTFE seals fit internationally recognised groove sizes, and depending on the cross section and diameter of the seal, can be installed into a closed groove, ensuring hardware complexity is minimised.

How Slipper seals work

Slipper seals consist of a PTFE part, usually made of a specially modified compound which is tailored to the application conditions, and an energising element.



PTFE has almost no elastic memory due to the nature of the material structure; PTFE seals typically have to be combined with a product which can energise the PTFE against the sealed surfaces to provide an acceptable leak tightness. This energising element is often an elastomer or metallic spring.

All seals work by a relationship between surface contact and pressure profiles.

The o-ring beneath the slipper seal cap is compressed into the seal gland during installation. The elastic recovery forces provided by the elastomer provide initial sealing pressure transferred to the sealing surfaces of the slipper assembly. As system pressure is applied, this increases the “squeeze” applied by the elastomer, increasing the surface pressure beneath the seal, ensuring this is always greater than the system pressure applied, thus preventing leakage.

In dynamic applications, the elastomer provides cushioning to the seal, that can help withstand hardware misalignment and eccentricity without causing excessive friction or leakage.

The flexibility of the energiser also helps to overcome the effects of wear and creep.

The temperature resistance of the PTFE slipper seal assembly is typically limited by the temperature range of the elastomer used and care should be taken to adopt an appropriate elastomer from our range. This catalogue features only commonly used industrial materials. Ceetak has a materials library of over 2000 active materials. Please consult Ceetak for guidance on materials outside of this catalogue range.

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.

Piston Seal Installation

Piston seal installation usually requires the user to stretch the PTFE seal into place over a piston.

To assist with installation, and reduce the risk of damage, the PTFE piston seal rings can be warmed prior to use. This can be with an air oven, water or oil bath. Ceetak would advise that the seals are warmed to no more than 65°C to avoid the risk of scalding for the user. Warming the seal helps to expand the material a little, and to soften the material to improve pliability before then assisting with the contraction into the groove as it cools.

When stretching over the piston, the material should expand evenly, however design features such as notches, holes and general tolerance conditions may result in the seal stretching more in some areas than others. It is advised, when fitting by hand, to look for, and avoid over stretching the seal in any one area, often signified by whitening at the seal surface.

Due to the nature of the PTFE material, the installation often leaves the seal with plastic deformation, which requires re-sizing to the groove after installation.

This re-sizing can be completed with tape bands, wrapped tightly around the seal outer diameter, or by a re-sizing mandrel, with a long gentle lead-in chamfer, and a bore diameter close to the piston diameter.

Install into Closed Grooves

Piston seals can be installed into split or closed grooves. Split grooves are necessary when the section size is too large for the size of piston it is to install upon. Recommendation for this can be found within the product information.

For a closed groove installation, tools are usually required.

Where dedicated tooling (pushers and resizing mandrels) are not to be used, it is recommended to thread a flat tape beneath the seal before inserting the ring into part of the seal groove, then pulling and working the PTFE seal material into place with the tapes. These tapes can be removed and subsequently used to help resize the seal. This method is effective where the production volumes are low, and the stretch of the material is not approaching the design limits as stated for each product.

Use of dedicated tooling

Installation considerations

Assembly should take place in a clean well-lit area.

The hardware and seals should be inspected prior to use, and any foreign objects, or machining debris should be removed.

Leading edges and groove edges should be checked to ensure that there are no sharp corners of burrs.

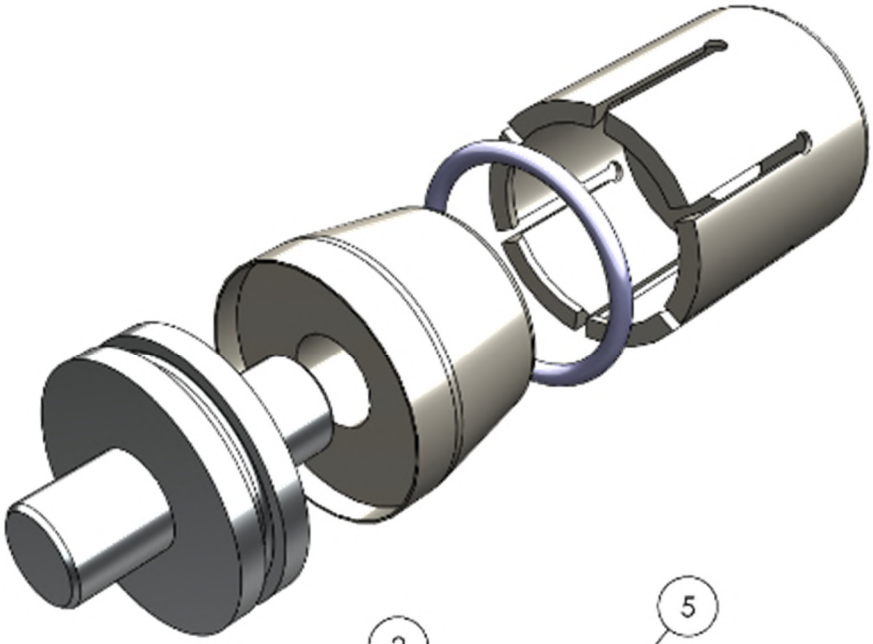
Sharp screw threads along the installation path should be covered to prevent scratching of the seals

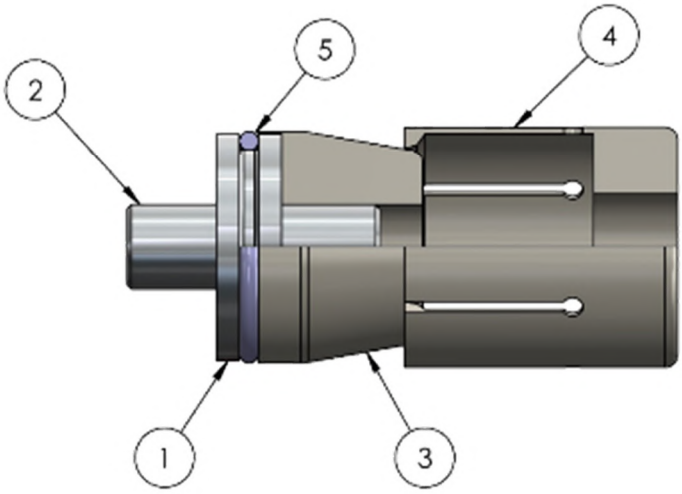
The use of metallic assembly aids should be avoided where possible.

If lubricant is used to assist with assembly, the compatibility of this with the seal material, including any o-rings, should be considered, and if required, checked.

If a seal installation path features ports, seal channels or other machined features, consider the use of installation tools.

Where a faster, more consistent and reliable approach is demanded by the application, Ceetak recommend the use of machined installation tools in the form of a pusher and a cone.





1. Hardware Assembly – Piston
2. Hardware Assembly – Piston Rod
3. Installation Cone
4. Expanding Pusher Tool
5. Seal

The cones should be designed such that foremost seal grooves, should they exist, are covered. A number of stand off rings may be used to assist with the positioning of the cone. It is recommended that the seals are fitted in a single and firm push using the pusher tool to void prolonged stretching and resulting creep of the material. These tools are typically unique to each application, please contact Ceetak for guidance on recommended designs for your application.

Rod Seal Installation:

Rod seals can be installed into split of closed grooves.

This guide focusses on installation into closed grooves, as generally, installation into open grooves is trouble free.

In all cases, when installing slipper seals, the o-ring is to be installed first, followed by the PTFE element. If in doubt, please contact Ceetak for guidance.

For rod seals, there are limitations to the diameter at which closed grooves can be used. Please see each product page for guidance on where split housings are required.

Where multiple seals are used in a series, begin the installation with the innermost seal to prevent subsequent damage to seals.

Before Installation:

In a well-lit area, check both the seals, and the hardware to ensure there is no debris or damage to either component.

Check all leading edges to ensure these are free from burrs, and that sharp edges are removed or protected.

If lubricant is used to assist with assembly, the compatibility of this with the seal material, including any o-rings, should be considered, and if required, checked.

Installation Procedure:

Insert the o-ring into the groove.

Create a kidney shape with the PTFE slipper seal cap, being careful not to create any sharp radii or folds. It is important not to fold the seal where a sidewall notch or other such stress raising feature is present.

Tools to assist in installation can be used where installation proves difficult. Tools, such as the one pictured, are available from Ceetak.

The seal can now be placed into the groove (atop the elastomer if present).

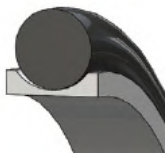
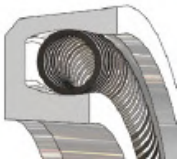
Due to the nature of the PTFE material, the installation often leaves the seal with plastic deformation, which requires re-sizing to the groove after installation.

Re-sizing can be completed with a resizing tool with a long gentle lead-in chamfer, and a rod diameter close to the bore diameter.

The calibration tool should use a lead chamfer of 15 degrees maximum, scalloped to accommodate the kidneyed form, and rotated on insertion to correct the deformation of the rod seal.

For smaller diameters, where insertion of the seals can be difficult, or where the seal must pass a series of grooves prior to installation, an inverted cone and pusher tool may be used to help locate the seal.

Note. The use of metallic assembly aids should be avoided where possible.

Profile	Product Code	Application	Range of Applications	Page Number
	FRCR	Working pressure: ≤ 350 bar Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Double-acting rod sealing set. Suitable for dynamic applications as an alternative to an o-ring and for situations where sealing performance and friction have to be optimised	B-2
	FRON	Working pressure: ≤ 600 bar * Working temperature: -30 to +200°C ** Surface speed: ≤ 4 m/s	Single/Double-acting rod sealing set. Good sealing performance in extremely small assembly conditions	B-3
	FROM	Working pressure: ≤ 600 bar * Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Double-acting rod sealing set. Particularly suitable for sealing rods in control cylinders, servo-assisted equipment and in quick-acting cylinders	B-4
	FROD	Working pressure: ≤ 400 bar* Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Single acting rod sealing set. Particularly suitable for sealing rods in control cylinders, servo-assisted equipment, machine tools and quick-acting cylinders	B-5
	FRNA	Working pressure: ≤ 200 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 0.005 m/s	Excellent for both static & intermittently dynamic applications. Can be used for reciprocating or rotating movements	B-6
	FRNH	Working pressure: ≤ 550 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 0.005 m/s	Excellent for both static & intermittently dynamic applications at high pressures. Can be used for reciprocating or rotating movements	B-7
	FRBA	Working pressure: ≤ 200 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 15 m/s	For sealing reciprocating actuator rods. Features helical spring for high load and small deflection range	B-8
	FRBH	Working pressure: ≤ 550 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 15 m/s	For sealing high pressure, reciprocating actuator rods. Features helical spring for high load & small deflection range and extended heel reduces effects of extrusion	B-9
	FRCS	Working pressure: ≤ 600 bar * Working temperature: -45 to +260°C ** Surface speed: ≤ 4 m/s	Bi-directional seal used when ports, cross bores and diametral relief are present on the working surface.	B-10

*Working pressure is limited by the PTFE material selection and extrusion gap and may be increased where corner reinforcement or backing rings are used with reinforced seal materials.

**Temperature range is limited by the o-ring material, care should be taken to select a compound which is compatible with both the application temperature and contacting media.

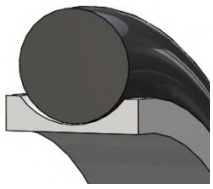
The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values which should not be used at the same time.

It is possible in some cases to exceed working pressure and surface speed provided the working temperature is low.

For applications exceeding the above parameters, or for special design considerations, please contact Ceetak. Our engineers are available to provide guidance and recommendation for your material, profile and sealing system design.

Rod Seals

CEETAK STYLE FRCR



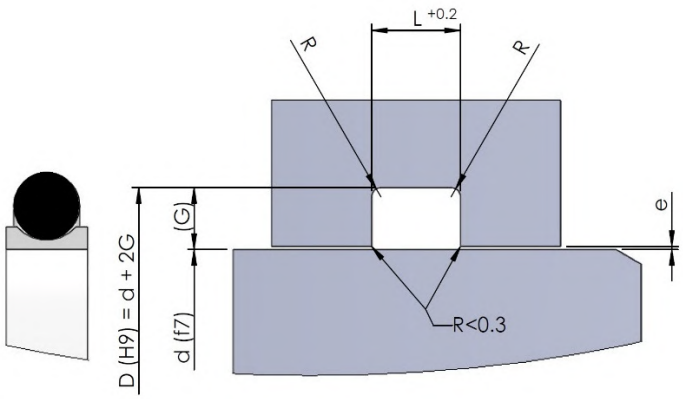
Seal Selection Guide

Double acting PTFE rod seal energised by an elastomer O-ring.

The FRCR profile is suitable for dynamic applications, replacing o-rings where sealing performance and friction need to be optimised, but where space remains limited.

Application

Typical Applications: Pneumatic, Light duty Hydraulic
Operating Pressure: ≤ 160 bar
Operating Temperature: -45°C to +200°C (limited by choice of elastomer)
Surface Speed: ≤4m/s



Key Features

- Installs within small diameters
- Extrusion & wear resistant
- Low friction
- Simple installation into o-ring grooves
- Responsive to pressure and directional change
- Shallow section allows o-ring sealing force to transfer to dynamic interfaces.

Installation Dimensions

Cross Section	O-ring cross section	Recommended rod diameter range d (mm)	Groove Width L (mm)	Groove Depth G (mm)	Gap max. e (mm)	Radius max. R (mm)
A	1.78	≥4 <10	2.4	1.45	0.15	0.5
B	2.62	≥10 <20	3.6	2.25	0.2	0.5
C	3.53	≥20 <40	4.8	3.10	0.2	0.5
D	5.33	≥40 <120	7.1	4.70	0.25	0.9
E	6.99	≥120 <400	9.5	6.10	0.3	0.9

Note:
For diameters <10 mm open grooves are required
Note: Piston Seal styles are also available
This Seal should be used with guiding elements

Part Number
Example: 100mm Rod = 01000

Product Code F RCR 0 01000 D P03 N70

Rod or Piston
Product Code
Feature
Diameter x 10
Seal Series
Material Code PTFE
Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE - See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in Section H

Rod Seals

CEETAK STYLE FRON

Seal Selection Guide

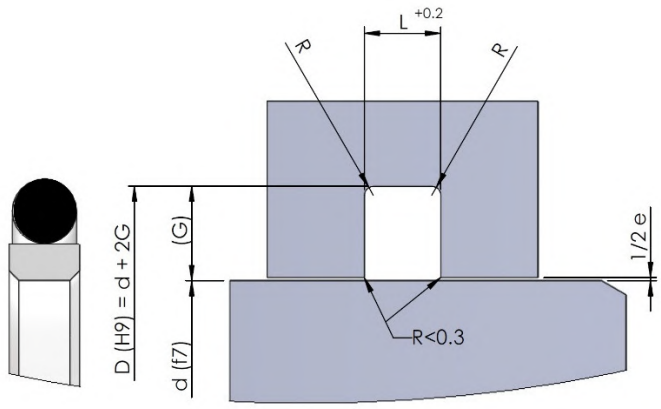
Double acting rod seal set consists of a PTFE rod seal ring energised with an O-ring preloading element.

The FRON profile is ideally suited for double acting hydraulic applications, for example in control cylinders, and quick acting cylinders. The large PTFE radial height allows for improved extrusion resistance at higher pressures.

Application

Typical Applications: Hydraulic
Operating Pressure: ≤ 400 bar* (Can increase to 600 Bar with reduced extrusion gap)
Operating Temperature: -45°C to +200°C* (Limited by choice of elastomer)
Surface Speed: ≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of resisting changes in direction of pressure

Installation Dimensions

Cross Section	O-ring cross section	Recommended rod diameter 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 (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 – 0.6	0.6 – 0.4	0.9
E	6.99	≥200 <255	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥255 <670	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥670 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

Part Number
Example: 100mm rod = 01000

Product Code F R ON 0 01000 D P03 N70

Rod or Piston
Product Code
Feature
Diameter x 10
Seal Series
Material Code PTFE
Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75
Other materials available on request.

Feature Codes Available
0 – Standard
C – Single Corner Reinforcement Rings
D – Dual Corner Reinforcement Rings
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in Section H

Rod Seals

CEETAK STYLE FROM

Seal Selection Guide

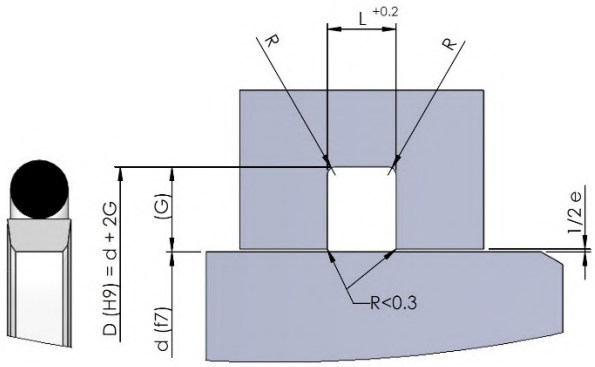
Double acting rod seal set consists of a PTFE rod seal ring energised with an O-ring preloading element.

The FROM profile is ideally suited for fast response double acting hydraulic applications, for example in control cylinders, and quick acting cylinders. The large PTFE radial height allows for improved extrusion resistance at higher pressures.

Application

Typical Applications: Hydraulic
Operating Pressure: ≤ 400 bar* (Can increase to 600 Bar with reduced extrusion gap)
Operating Temperature: -45°C to +200°C* (Limited by choice of elastomer)
Surface Speed: ≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of resisting changes in direction of pressure

Installation Dimensions

Cross Section	O-ring cross section	Recommended rod diameter 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 (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 – 0.6	0.6 – 0.4	0.9
E	6.99	≥200 <255	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥255 <670	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥670 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

Part Number
Example: 100mm rod = 01000

Product Code F R OM 0 01000 D P03 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75
Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Rod Seals

CEETAK STYLE FROD

Seal Selection Guide

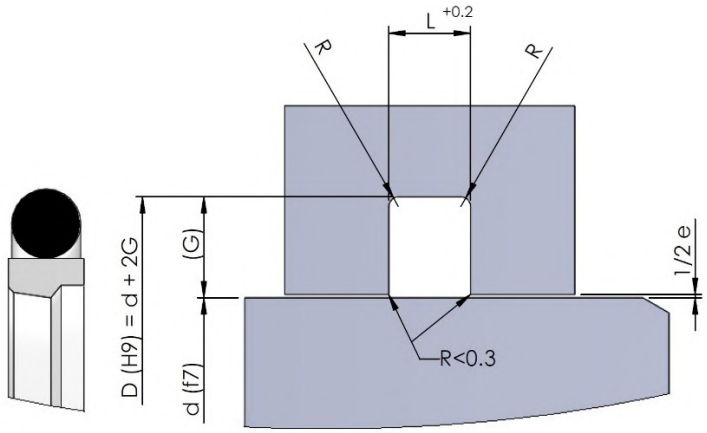
Single acting rod seal set consists of a PTFE rod seal ring energised with an O-ring preloading element.

The FROD profile is ideally suited for single acting hydraulic pistons such as in control cylinders, and quick acting cylinders, its unique back pumping ability allows for good lubrication whilst minimising leakage.

Application

Typical Applications: Single acting Hydraulics
Operating Pressure: ≤ 400 bar (600 Bar possible with reduced extrusion gap)
Operating Temperature: -45°C to +200°C (limited by o-ring material selection)
Surface Speed: ≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Insensitive to pressure peaks
- High extrusion resistance
- Hydrodynamic back pumping helps minimise fluid losses
- Excellent as part of a tandem seal system

Installation Dimensions

Cross Section	O-ring cross section	Recommended rod diameter 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 (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 – 0.6	0.6 – 0.4	0.9
E	6.99	≥200 <256	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥256 <650	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥650 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

For diameters <30mm open grooves are required
Note: Piston Seal styles are also available

Part Number
Example: 100mm rod = 01000

Product Code F R OD 0 01000 D P09 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 70 Shore A – V70

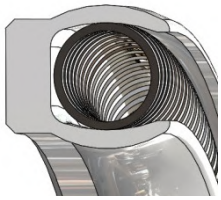
Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcement
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FRNA



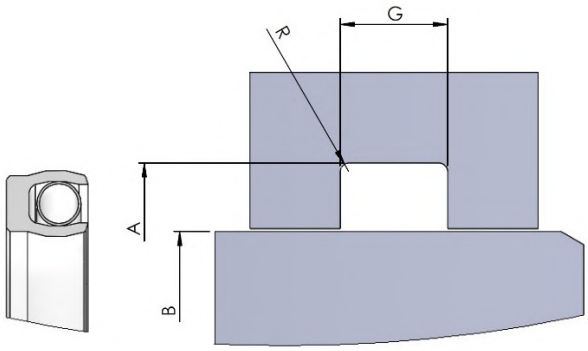
Seal Selection Guide

The FRNA style seal is ideal for static and intermittent dynamic applications. The FRNA profile uses a high strength helical spring to provide a high sealing force.

FRNA is suitable for valve stems, secondary sealing functions and piston or swivel joints.

Application

Typical Applications: Static Pneumatic, Hydraulic, Cryogenic.
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Rounded lip for ease of installation
- Short heel and flexible spring may allow stretch into closed or semi closed grooves
- Can be combined with fatigue resistant elastomer energisers
- High load deflection for leak tight sealing

Did you know?

A rod version of this seal is available.
For more information, see product page C-8, FPNA

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	2.4	0.30
2.4	B	≥5.5 ≤180	B + 4.52	3.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	4.8	0.50
4.7	D	≥12.5 ≤300	B + 9.45	7.1	0.75
6.4	E	≥50.0 ≤500	B + 12.12	9.5	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	13.3	0.75
12.7	G	≥300 ≤3000	B + 25.40	18.0	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F R NA 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FRNA is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE- See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

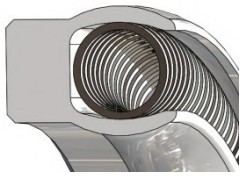
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FRNH



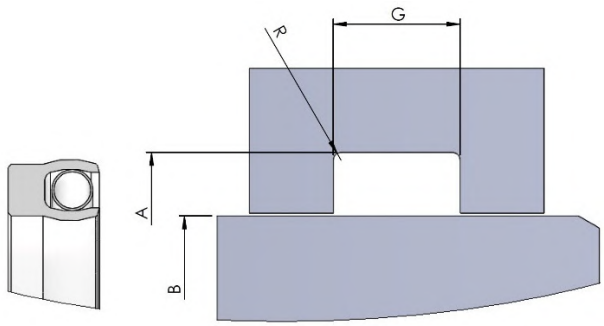
Seal Selection Guide

The FRNH seal is ideal for static and intermittent dynamic applications at high pressures. An FRNH profile can be used for reciprocating or rotating movements.

An FRNH is suitable for high pressure valve stems, secondary sealing functions and piston or swivel joints.

Application

Typical Applications: Static Pneumatic, Hydraulic, Cryogenic.
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Rounded lip for ease of installation
- Short heel and flexible spring may allow stretch into closed or semi closed grooves
- Can be combined with fatigue resistant elastomer energisers

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	3.8	0.30
2.4	B	≥5.5 ≤180	B + 4.52	4.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	6.0	0.50
4.7	D	≥12.5 ≤300	B + 9.45	8.5	0.75
6.4	E	≥50.0 ≤500	B + 12.12	12.1	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	15.8	0.75
12.7	G	≥300 ≤3000	B + 25.40	20.5	0.75

Further Installation Guidance can be found A-6

Part Number
Example: 100mm Rod = 01000

Product Code F R NH 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FRNH is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE- See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

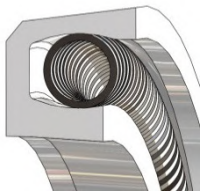
Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcment

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FRBA

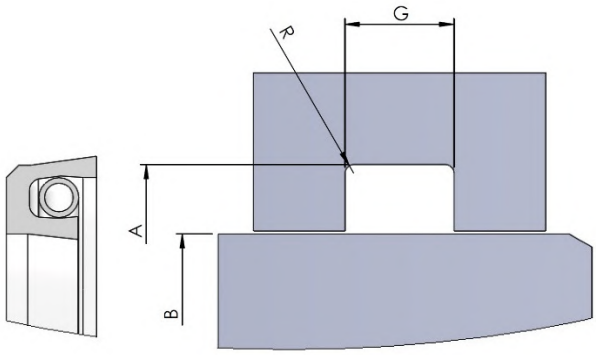


Seal Selection Guide

The FRBA style rod seal is ideal for dynamic reciprocating applications such as actuator rods, using a high strength helical spring for increased sealing force.
The FRBA includes a heavy duty dynamic lip to prolong seal life.

Application

Typical Applications: Dynamic Hydraulic Reciprocating
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤15 m/s



Key Features

- Stable within groove
- Short dynamic lip for reduced friction
- Increased lip thickness for improved seal life

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	2.4	0.30
2.4	B	≥5.5 ≤180	B + 4.52	3.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	4.8	0.50
4.7	D	≥12.5 ≤300	B + 9.45	7.1	0.75
6.4	E	≥50.0 ≤500	B + 12.12	9.5	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	13.3	0.75
12.7	G	≥300 ≤3000	B + 25.40	18.0	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F R BA 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FRBA is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE- See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

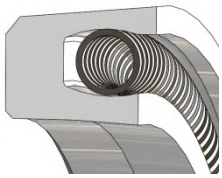
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FRBH

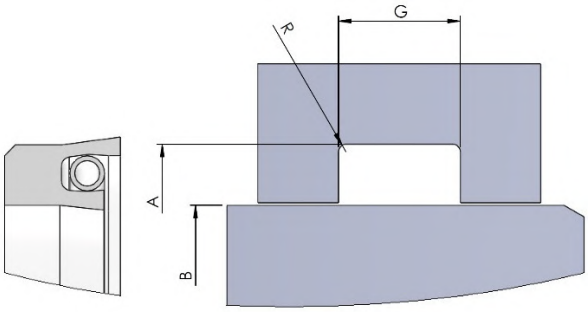


Seal Selection Guide

The FRBH style rod seal is ideal for high pressure dynamic reciprocating applications. The increased heel depth increases pressure handling capabilities and reduces extrusion, whilst the asymmetric design increases seal stability within the groove.

Application

Typical Applications: Dynamic Hydraulic
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤15 m/s



Key Features

- Stable within groove
- Short dynamic lip for reduced friction
- Increased lip thickness for improved seal life
- Extended heel reduces seal extrusion

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	3.8	0.30
2.4	B	≥5.5 ≤180	B + 4.52	4.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	6.0	0.50
4.7	D	≥12.5 ≤300	B + 9.45	8.5	0.75
6.4	E	≥50.0 ≤500	B + 12.12	12.1	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	15.8	0.75
12.7	G	≥300 ≤3000	B + 25.40	20.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F R BH 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FRBH is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

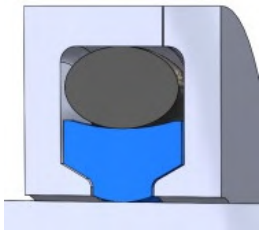
Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcement

Guidance on features can be found in section H

Rod Seals

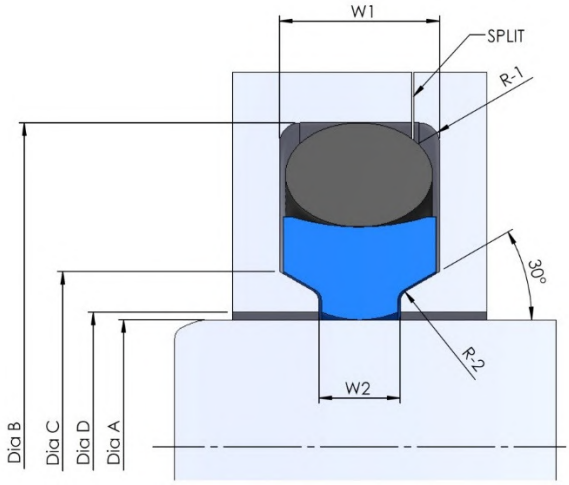
CEETAK STYLE FRCS



Seal Selection Guide

The Ceetak Captive Rod seal FRCS is recommended for hydraulic applications where dimensional changes occur on application hardware (example, crossing a port). On standard conventional seals these dimension changes would have an adverse effect of the sealing function, therefore a Captive rod seal can be used to maintain sealing performance without damaging the seal and allowing the seal to remain stable in the groove.

Application



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of retaining in the groove when crossing open ports.

Installation Dimensions

Series	Dia A Rod recomm. h8	Dia B Groove H10	Dia C Groove +0/-0.1	W1 Groove Width +0.2/-0	W2 Groove Width +0.2/-0	R-1 max	R-2 ±0.05	Dia D (Bore max)			
								0 bar	100 bar	200 bar	400 bar
A	6 - 59.9	A + 8.0	A + 1.6	3.2	1.8	0.5	0.3	A + 0.4	A + 0.25	A + 0.2	A + 0.15
B	60 – 132.9	A + 11.0	A + 2.4	4.2	2.2	0.7	0.5	A + 0.5	A + 0.3	A + 0.25	A + 0.2
C	133 – 329.9	A + 15.5	A + 3.8	6.3	3.2	0.8	1.0	A + 0.6	A + 0.45	A + 0.4	A + 0.25
D	330 – 654.9	A + 21.0	A + 5.2	8.1	4.2	0.8	1.2	A + 0.7	A + 0.5	A + 0.45	A + 0.25
E	650 – 999.9	A + 28.0	A + 6.8	9.5	6.3	0.8	1.2	A + 0.8	A + 0.6	A + 0.5	A + 0.3

Part Number
Example: 100mm Rod = 01000

Product Code F RCS 0 01000 D P06 N70

- F – Rod or Piston
- RCS – Product Code
- 0 – Feature
- 01000 – Diameter x 10
- D – Seal Series
- P06 – Material Code PTFE
- N70 – Material Code Elastomer*

***Leave blank if o-ring is not required**

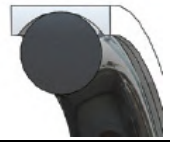
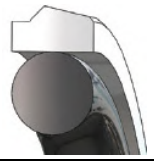
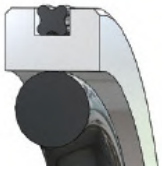
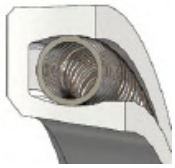
Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

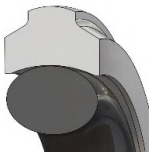
Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seal Profiles

Profile	Product Code	Application	Range of Applications	Page Number
	FPCR	Working pressure: ≤ 350 bar * Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Double-acting rod sealing set. Particularly suitable for sealing rods in control cylinders, servo-assisted equipment and in quick-acting cylinders	C-2
	FPON	Working pressure: ≤ 600 bar* Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Single/Double-acting piston sealing set. Particularly suitable for double-acting pistons in control cylinders, in servo-controlled systems, machine tools, quick-acting and steering cylinders	C-3
	FPOM	Working pressure: ≤ 600 bar* Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Double-acting piston sealing set. Particularly suitable for double-acting pistons in control cylinders, in servo-controlled systems, machine tools, quick-acting and steering cylinders	C-4
	FPOD	Working pressure: ≤ 400 bar* Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Single acting piston sealing set. Asymmetrical cross section is designed for best drag oil performance during stroke in both directions	C-5
	FPCQ	Working pressure: ≤ 500 bar* Working temperature: -45 to +200°C ** Surface speed: ≤ 2 m/s	A double-acting sealing set suitable for sealing between two media such as fluids/gases. Energised with an o-ring and incorporates and X-ring inset into the dynamic sealing face	C-6
	F**POA**	Working pressure: ≤ 16 bar Working temperature: -45 to +80°C ** Surface speed: ≤ 4 m/s	Double-acting piston sealing set. Particularly suitable for double-acting pneumatic pistons. Assembly on one part piston is possible	C-7
	FPNA	Working pressure: ≤ 200 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 0.005 m/s	Excellent for both static & intermittently dynamic applications. Can be used for reciprocating or rotating movements	C-8
	FPNH	Working pressure: ≤ 550 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 0.005 m/s	Excellent for both static & intermittently dynamic applications at high pressures. Can be used for reciprocating or rotating movements	C-9
	FPBA	Working pressure: ≤ 200 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 15 m/s	For sealing reciprocating actuator rods. Features helical spring for high load and small deflection range	C-10
	FPBH	Working pressure: ≤ 550 bar * Working temperature: -260 to +315°C ** Surface speed: ≤ 15 m/s	For sealing high pressure, reciprocating actuator rods. Features helical spring for high load & small deflection range and extended heel reduces effects of extrusion	C-11

	FPCS	Working pressure: ≤ 600 bar * Working temperature: -45 to +260°C ** Surface speed: ≤ 4 m/s	Bi-directional seal used when ports, cross bores and diametral relief are present on the working surface.	C-12

*Working pressure is limited by the PTFE material selection and extrusion gap and may be increased where corner reinforcement or backing rings are used with reinforced seal materials.

**Temperature range is limited by the o-ring material, care should be taken to select a compound which is compatible with both the application temperature and contacting media.

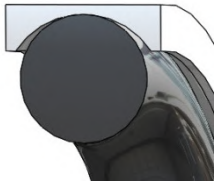
The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values which should not be used at the same time.

It is possible in some cases to exceed working pressure and surface speed provided the working temperature is low.

For applications exceeding the above parameters, or for special design considerations, please contact Ceetak. Our engineers are available to provide guidance and recommendation for your material, profile and sealing system design.

Piston Seals

CEETAK STYLE FPCR



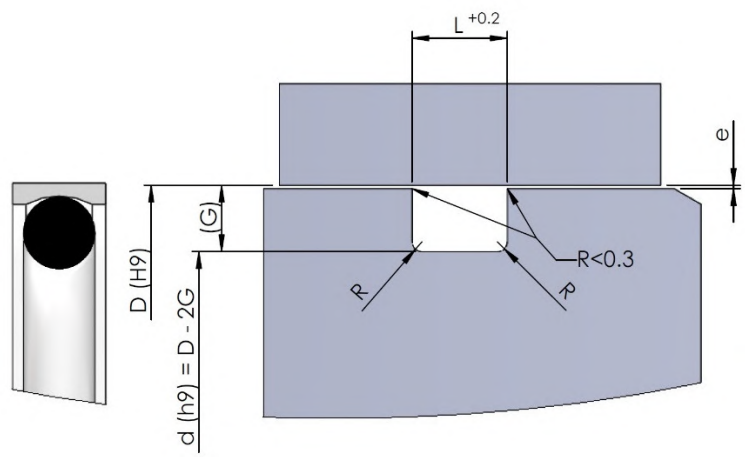
Seal Selection Guide

Double acting piston seal set consists of a PTFE piston seal ring energised with an O-ring preloading element.

The FPCR profile is suitable for dynamic applications as an alternative to an O-ring in situations where sealing performance and friction need to be optimised.

Application

Typical Applications: Pneumatic, Light duty Hydraulic
Operating Pressure: ≤ 160 bar
Operating Temperature: -45°C to +200°C (Limited by Choice of Elastomer
Surface Speed: ≤4 m/s



Key Features

- Installs within small diameters
- Extrusion & wear resistant
- Low friction
- Simple installation into o-ring grooves
- Responsive to pressure and directional change
- Shallow section allows o-ring sealing force to transfer to dynamic interfaces.

Installation Dimensions

Cross Section	O-ring cross section	Recommended piston diameter range D (mm)	Groove Width L (mm)	Groove Depth G (mm)	Gap max. e (mm)	Radius max. R1 (mm)
A	1.78	≥8 <14	2.4	1.45	0.15	0.5
B	2.62	≥14 <25	3.6	2.25	0.2	0.5
C	3.53	≥25 <46	4.8	3.10	0.2	0.5
D	5.33	≥46 <125	7.1	4.70	0.25	0.9
E	6.99	≥125 <400	9.5	6.10	0.3	0.9

Note: Rod Seal styles are also available
This seal should be used with guiding elements

Part Number
Example: 100mm Piston = 01000

Product Code F P CR 0 01000 D P03 N70

- F – Rod or Piston
- P – Product Code
- CR – Feature
- 01000 – Diameter x 10
- D – Seal Series
- P03 – Material Code PTFE
- N70 – Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE, See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

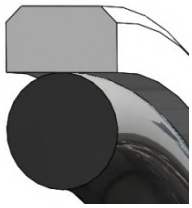
Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seals

CEETAK STYLE FPON



Seal Selection Guide

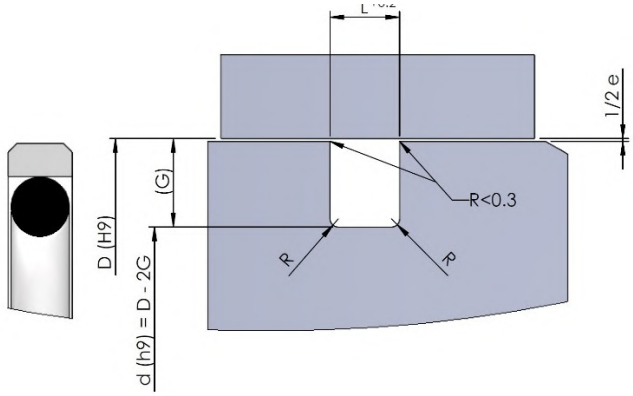
Double acting piston seal set consists of a PTFE piston seal ring energised with an O-ring preloading element.

The FPON profile is ideally suited for double acting hydraulic pistons, for example in control cylinders, and quick acting cylinders.

Application

Typical Applications:	Hydraulic
Operating Pressure	≤ 400 bar* (Can increase to 600 Bar with reduced extrusion gap)
Operating Temperature	-45°C to +200°C (Limited by choice of elastomer)
Surface Speed	≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of resisting changes in direction of pressure

Installation Dimensions

Cross Section	O-ring cross section	Recommended piston diameter 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. R1 (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	3.65	0.8 – 0.5	0.5 – 0.3	0.5
C	3.53	≥40 <80	4.2	5.35	0.8 – 0.5	0.5 – 0.3	0.5
D	5.33	≥80 <133	6.3	7.55	1 – 0.6	0.6 – 0.4	0.9
E	6.99	≥133 <330	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥330 <670	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥670 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

Note: Rod Seal styles are also available

Part Number
Example: 100mm piston = 01000

Product Code F P ON 0 01000 D P03 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE, See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

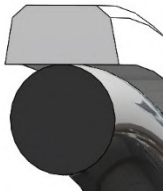
Other materials available on request.

Feature Codes Available
0 – Standard
C – Single Corner Reinforcement
D – Dual Corner Reinforcement
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seals

CEETAK STYLE FPOM



Seal Selection Guide

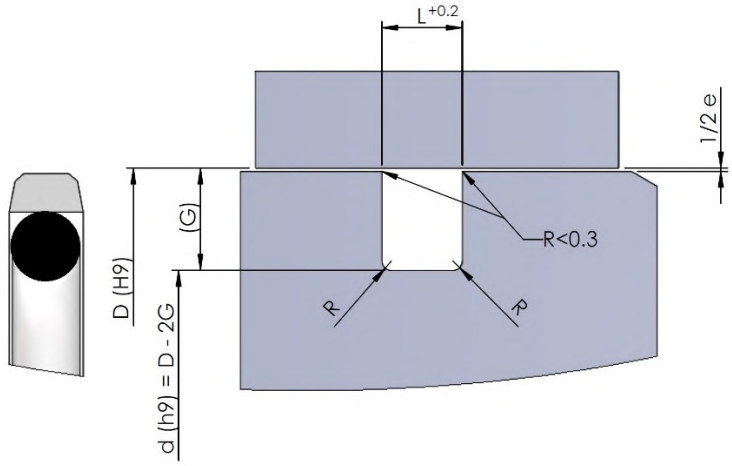
Double acting piston seal set consists of a PTFE piston seal ring energised with an O-ring preloading element.

The FPOM profile is ideally suited for fast response double acting hydraulic pistons, for example in control cylinders, and quick acting cylinders.

Application

Typical Applications:	Hydraulic
Operating Pressure	≤ 400 bar* (Can increase to 600 Bar with reduced extrusion gap)
Operating Temperature	-45°C to +200°C (Limited by choice of elastomer)
Surface Speed	≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of resisting changes in direction of pressure

Installation Dimensions

Cross Section	O-ring cross section	Recommended piston diameter 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. R1 (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	3.65	0.8 – 0.5	0.5 – 0.3	0.5
C	3.53	≥40 <80	4.2	5.35	0.8 – 0.5	0.5 – 0.3	0.5
D	5.33	≥80 <133	6.3	7.55	1 – 0.6	0.6 – 0.4	0.9
E	6.99	≥133 <330	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥330 <670	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥670 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

Note: Rod Seal styles are also available

Part Number
Example: 100mm piston = 01000

Product Code F P OM 0 01000 D P03 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

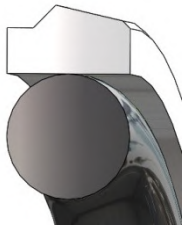
Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seals

CEETAK STYLE FPOD



Seal Selection Guide

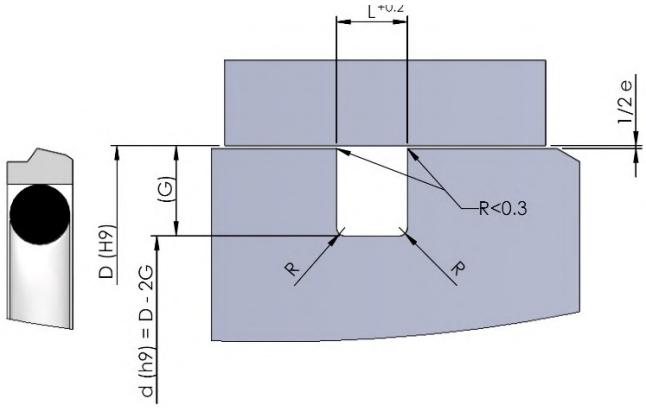
Single acting piston seal set consists of a PTFE piston seal ring energised with an O-ring preloading element.

The FPOD profile is ideally suited for single acting hydraulic pistons such as in control cylinders, and quick acting cylinders, its unique back pumping ability allows for good lubrication whilst minimising leakage.

Application

Typical Applications: Single acting Hydraulics
Operating Pressure: ≤ 400 bar (600 Bar possible with reduced extrusion gap)
Operating Temperature: -45°C to +200°C (Limited by o-ring material selection)
Surface Speed: ≤4 m/s

- This seal should be used in combination with guiding elements
- Corner reinforcements are available for pressures above 600 Bar



Key Features

- Good overall wear resistance
- Low friction
- Insensitive to pressure peaks
- High extrusion resistance
- Hydrodynamic back pumping helps minimise fluid losses
- Excellent as part of a tandem seal system

Installation Dimensions

Cross Section	O-ring cross section	Recommended piston diameter 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. R1 (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 – 0.6	0.6 – 0.4	0.9
E	6.99	≥200 <256	8.1	10.25	1 – 0.6	0.6 – 0.4	0.9
F	6.99	≥256 <670	8.1	12.0	1.2 – 0.7	0.7 – 0.5	0.9
G	8.4	≥670 <1000	9.5	13.65	1.4 – 0.8	0.8 – 0.6	0.9

Note: Rod Seal styles are also available

Part Number
Example: 100mm piston = 01000

Product Code F P OD 0 01000 D P09 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE, See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

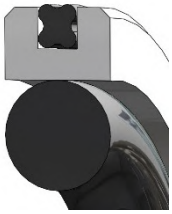
Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcement
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seals

CEETAK STYLE FPCQ



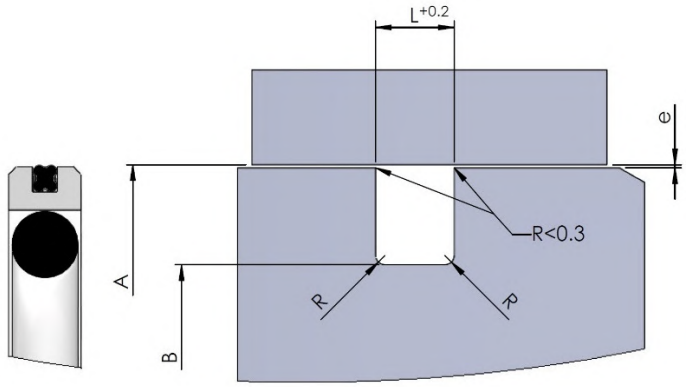
Seal Selection Guide

Double acting PTFE seal energised by an elastomer o-ring.

The FPCQ seal profile is the seal of choice when it comes to separating media, including low molecular weight fluids. The embedded elastomer contact in the slipper cap ensures strong leak performance in dynamic applications, even when subjected to high pressures.

Application

Typical Applications: Hydraulic Accumulators, Media Separation
Operating Pressure: ≤ 500 bar
Operating Temperature: -45°C to +200°C
Surface Speed: ≤2m/s



Key Features

- Responsive to pressure and direction change
- Excellent static and dynamic leak tightness
- Low friction, wear resistant media separation seal
- High pressure handling capability

Installation Dimensions

Series	ØA Bore dia.	ØB Groove Dia.	L Groove Width	R Radius	e Radial Gap		e Radial Gap			B O-ring id	O-ring C/S	X-ring C/S
	H10	h10	+0.2 -0	Max.	Max.	Min.	100 bar	200 bar	400 bar			
C	15-79.9	ØD-11.0	4.2	0.7	0.6	0.1	0.25	0.15	0.10	Ød	3.53	1.78
D	40-132.9	ØD-15.5	6.3	0.7	0.6	0.1	0.20	0.15	0.15	Ød	5.33	1.78
E	80-259.9	ØD-21.0	8.1	1.2	0.8	0.2	0.30	0.20	0.15	Ød	7.00	2.62
F	133-259.9	ØD-24.5	8.1	1.5	0.8	0.2	0.30	0.20	0.15	Ød	7.00	2.62
G	260-469.9	ØD-28.0	9.5	2.0	1.2	0.4	0.45	0.30	0.25	Ød	8.40	3.53
H	470-700	ØD-35.0	11.5	3.0	1.4	0.6	0.55	0.40	0.35	Ød	10.0	5.33

Note: Rod Seal styles are also available

Part Number
Example: 100mm Piston = 01000

Product Code F P CQ 0 01000 D P03 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE, See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

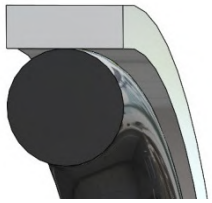
Other materials available on request.

Feature Codes Available
0 – Standard
C – Single Corner Reinforcement
D – Dual Corner Reinforcement
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Piston Seals

CEETAK STYLE FPOA



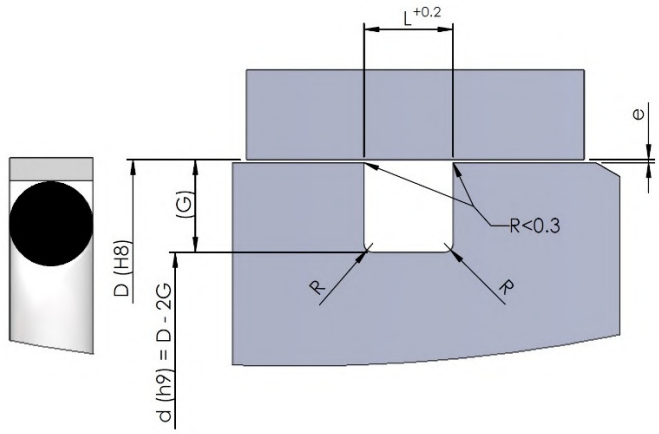
Seal Selection Guide

Double acting piston seal set consists of a PTFE piston seal ring energised with an O-ring preloading element.

The FPOA profile is ideally suited for double acting pneumatic pistons such as in control cylinders, and quick acting cylinders

Application

Typical Applications: Pneumatic, Light duty Hydraulic
Operating Pressure: ≤ 16 bar
Operating Temperature: -45°C to +80°C (Limited by Choice of Materials)
Surface Speed: ≤4 m/s



Key Features

- Ideal for small assembly conditions
- Good overall wear resistance
- Low friction
- Can be used for double and single acting applications
- Can fit within existing o-ring grooves

Installation Dimensions

This seal should only be used in combination with guiding elements.

Cross Section	O-ring cross section	Recommended piston diameter range D (mm)	Groove Width L (mm)	Groove Depth G (mm)	Gap max. e (mm)	Radius max. R1 (mm)
A	1.78	≥7 <16	2.00	2.00	0.20	0.5
B	2.62	≥16 <27	2.85	3.00	0.25	0.5
C	3.53	≥27 <50	3.80	3.75	0.25	0.5
D	5.33	≥50 <130	5.60	6.25	0.50	0.9
E	6.99	≥130 <180	7.55	7.50	0.50	0.9
F	6.99	≥180 <240	7.55	9.00	0.75	0.9
G	6.99	≥240 <420	7.55	12.00	1.00	0.9

Note: Rod Seal styles are also available

Part Number
Example: 100mm Piston = 01000

Product Code F P OA 0 01000 D P02 N70

- F – Rod or Piston
- P – Product Code
- OA – Feature
- 0 – Diameter x 10
- 01000 – Seal Series
- D – Material Code PTFE
- P02 – Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

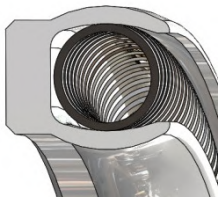
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FPNA



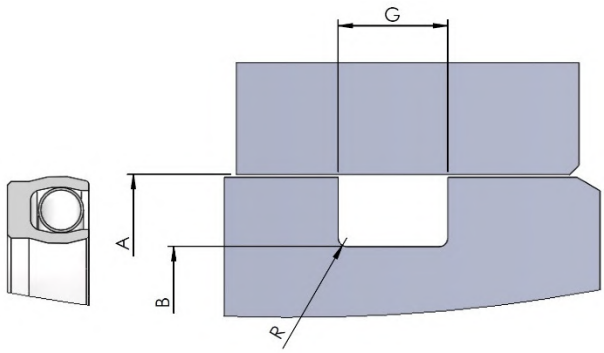
Seal Selection Guide

The FPNA style seal is ideal for static and intermittent dynamic applications. The FPNA profile uses a high strength helical spring to provide a high sealing force.

FPNA is suitable for valve stems, secondary sealing functions and piston or swivel joints.

Application

Typical Applications: Static Pneumatic, Hydraulic, Cryogenic.
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Rounded lip for ease of installation
- Short heel and flexible spring may allow stretch into closed or semi closed grooves
- Can be combined with fatigue resistant elastomer energisers
- High load deflection for leak tight sealing

Did you know?

A rod version of this seal is available.
For more information, see product page B-6, FRNA

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Piston Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	2.4	0.30
2.4	B	≥5.5 ≤180	B + 4.52	3.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	4.8	0.50
4.7	D	≥12.5 ≤300	B + 9.45	7.1	0.75
6.4	E	≥50.0 ≤500	B + 12.12	9.5	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	13.3	0.75
12.7	G	≥300 ≤3000	B + 25.40	18.0	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm piston = 01000

Product Code F P NA 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FPNA is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

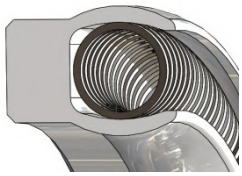
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FPNH



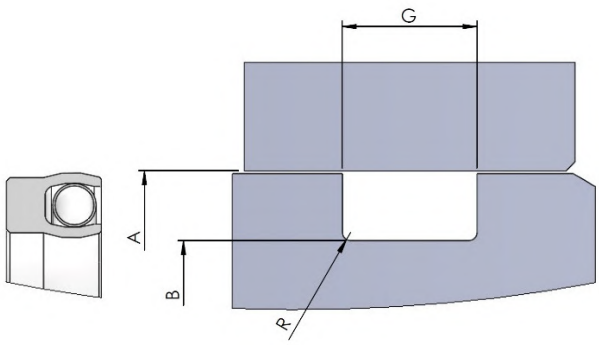
Seal Selection Guide

The FPNH style seal is ideal for static and intermittent dynamic applications at high pressures. A PNCH profile can be used for reciprocating or rotating movements.

FPNH is suitable for high pressure valve stems, secondary sealing functions and piston or swivel joints.

Application

Typical Applications: Pneumatic, Hydraulic, Cryogenic.
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Rounded lip for ease of installation
- Extended heel for improved extrusion resistance
- Can be combined with fatigue resistant elastomer energisers
- High load deflection for leak tight sealing

Did you know?
A rod version of this seal is available.
For more information, see product page B-7, FRNH

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Piston Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥7.5 ≤75	B + 2.84	3.8	0.30
2.4	B	≥5.5 ≤180	B + 4.52	4.6	0.50
3.2	C	≥6.0 ≤250	B + 6.15	6.0	0.50
4.7	D	≥12.5 ≤300	B + 9.45	8.5	0.75
6.4	E	≥50.0 ≤500	B + 12.12	12.1	0.75
9.5	F	≥150.0 ≤1400	B + 18.75	15.8	0.75
12.7	G	≥300 ≤3000	B + 25.40	20.5	0.75

Further Installation Guidance can be found on pages XX

Part Number
Example: 100mm piston = 01000

Product Code F P NH 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FPNH is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcment

Guidance on features can be found in section H

Spring Energised Seal

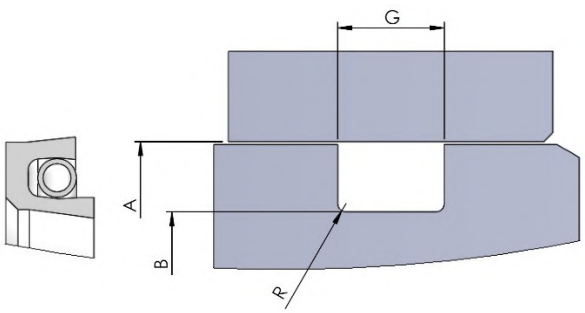
CEETAK STYLE FPBA

Seal Selection Guide

The FPBA style rod seal is ideal for dynamic piston reciprocating applications, using a high strength spring for increased sealing force.
The FPBA includes a heavy dynamic lip to prolong seal life.

Application

Typical Applications:	Dynamic Hydraulic
Operating Pressure:	≤ 200 bar
Operating Temperature:	-260°C to +315°C
Surface Speed:	≤15 m/s



Key Features

- Stable within groove
- Short dynamic lip for reduced friction
- Increased lip thickness for improved seal life

Installation Dimensions

Further Installation Guidance can be found in section A-6

Nominal Cross Section	Cross Section Code	A (mm) Bore Diameter H8 tolerance	B (mm) tolerance h8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥10 ≤75	A - 2.84	2.4	0.30
2.4	B	≥10 ≤180	A - 4.52	3.6	0.50
3.2	C	≥12.5 ≤250	A - 6.15	4.8	0.50
4.7	D	≥22 ≤300	A - 9.45	7.1	0.75
6.4	E	≥63 ≤500	A - 12.12	9.5	0.75
9.5	F	≥170 ≤1400	A - 18.75	13.3	0.75
12.7	G	≥325 ≤3000	A - 25.40	18.0	0.75

Part Number
Example: 100mm Bore = 01000

Product Code F P BA 0 01000 D P02 E03

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FPBA is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Spring Energised Seal

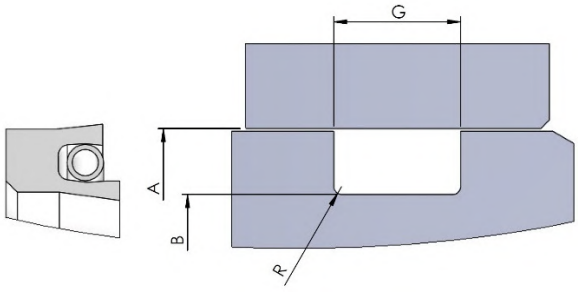
CEETAK STYLE FPBH

Seal Selection Guide

The FPBH style rod seal is ideal for high pressure dynamic reciprocating applications. The increased heel depth increases pressure handling capabilities and reduces extrusion, whilst the asymmetric design increases seal stability within the groove.

Application

Typical Applications: Dynamic Hydraulic
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤15 m/s



Key Features

- Stable within groove
- Short dynamic lip for reduced friction
- Increased lip thickness for improved seal life
- Extended heel reduces seal extrusion

Installation Dimensions

Nominal Cross Section	Cross Section Code	A (mm) Bore Diameter H8 tolerance	B (mm) tolerance h8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥10 ≤75	A - 2.84	3.8	0.30
2.4	B	≥10 ≤180	A - 4.52	4.6	0.50
3.2	C	≥12.5 ≤250	A - 6.15	6.0	0.50
4.7	D	≥22 ≤300	A - 9.45	8.5	0.75
6.4	E	≥63 ≤500	A - 12.12	12.1	0.75
9.5	F	≥170 ≤1400	A - 18.75	15.8	0.75
12.7	G	≥325 ≤3000	A - 25.40	20.5	0.75

Further Installation Guidance can be found in section A-6

Part Number

Example: 100mm Piston = 01000

Product Code F P BH 0 01000 D P02 E03

- F — Rod or Piston
- P BH — Product Code
- 0 — Feature
- 01000 — Diameter x 10
- D — Seal Section
- P02 — Material Code PTFE
- E03 — Material Code Spring

Materials
The FPBH is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

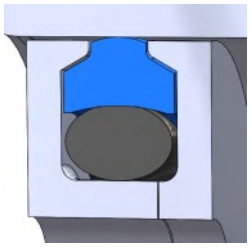
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Piston Seals

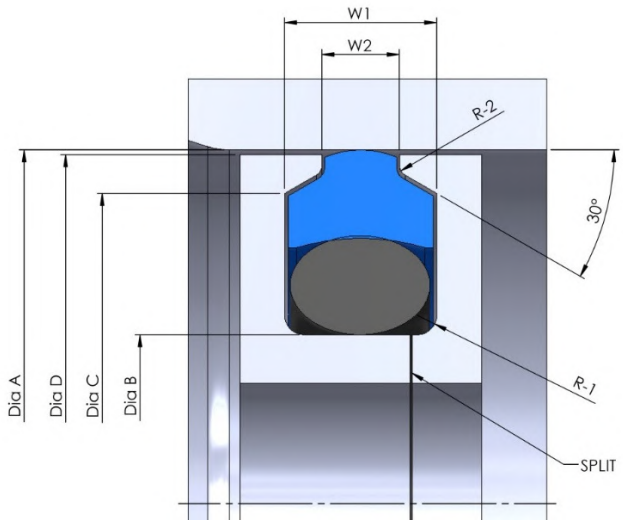
CEETAK STYLE FPCS



Seal Selection Guide

The Ceetak Captive Piston seal FPCS is recommended for hydraulic applications where dimensional changes occur on application hardware (example, crossing a port). On standard conventional seals these dimension changes would have an adverse effect of the sealing function, therefore a Captive piston seal can be used to maintain sealing performance without damaging the seal and allowing the seal to remain stable in the groove.

Application



Key Features

- Good overall wear resistance
- Low friction
- Used for Double Acting Pressures
- High extrusion resistance
- Insensitive to pressure peaks
- Stable footprint capable of retaining in the groove when crossing open ports.

Installation Dimensions

Series	Dia A Bore recomm. H8	Dia B Groove h10	Dia C Groove +0/-0.1	W1 Groove Width +0.2/-0	W2 Groove Width +0.2/-0	R-1 max	R-2 ±0.05	Dia D (Piston max)			
								0 bar	100 bar	200 bar	400 bar
A	15 – 69.9	A - 8.0	A - 1.6	3.2	1.8	0.5	0.3	A - 0.4	A - 0.25	A - 0.2	A - 0.15
B	70 – 132.9	A - 11.0	A - 2.4	4.2	2.2	0.7	0.5	A - 0.5	A - 0.3	A - 0.25	A - 0.2
C	140 – 329.9	A - 15.5	A - 3.8	6.3	3.2	0.8	1.0	A - 0.6	A - 0.45	A - 0.4	A - 0.25
D	330 – 689.9	A - 21.0	A - 5.2	8.1	4.2	0.8	1.2	A - 0.7	A - 0.5	A - 0.45	A - 0.25
E	690 – 999.9	A - 28.0	A - 6.8	9.5	6.3	0.8	1.2	A - 0.8	A - 0.6	A - 0.5	A - 0.3

Part Number
Example: 100mm Piston = 01000

Product Code F PCS 0 01000 D P06 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

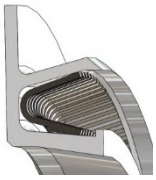
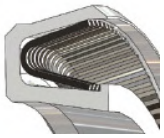
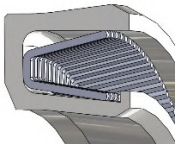
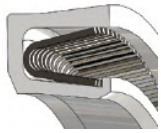
Materials
Standard compounds:
Sealing ring:
PTFE -See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

Other materials available on request.

Feature Codes Available
0 – Standard
N – Sidewall Notches for Alternating Pressure

Guidance on features can be found in section H

Rotary Seal Profiles

Profile	Product Code	Application	Range of Applications	Page Number
	FTOR	Operating pressure: ≤ 300 bar Operating temperature: -45 to +200°C Surface Speed: ≤2 m/s	Ideal for hydraulic applications which operate with alternating pressure direction, under low to moderate rotation speed.	D-2
	FTOP	Operating pressure: ≤ 300 bar Operating temperature: -45 to +200°C Surface Speed: ≤2 m/s	Ideal for hydraulic applications which operate with alternating pressure direction, under low to moderate rotation speed.	**D-3**
	FTFR	Operating Pressure: ≤ 200 bar Operating Temperature: -260°C to +315°C Surface Speed: ≤10 m/s	Suitable for high speed rotary shafts with uni directional pressure. High temperature range and suitable for use in aggressive media. Typically found in motors and pumps.	**D-4**
	FWFR	Operating Pressure: ≤ 200 bar Operating Temperature: -260°C to +315°C Surface Speed: ≤10 m/s	Similar to the FTFR, designed with a modified contact lip to help prevent unwanted contamination and debris from entering the system. .	**D-5**
	FTNR	Operating Pressure: ≤ 200 bar Operating Temperature: -260°C to +315°C Surface Speed: ≤5 m/s	Ideal for rotating shafts where a flange cavity or split housing is not possible. Suitable for pneumatic and hydraulic applications.	**D-6**
	FWNR (Rod)	Working pressure: ≤ NA Working temperature: -200 to +200°C Surface speed: ≤ 15 m/s	Ideal for sealing abrasive media for rotating shafts without the possibility of a flange cavity in the groove. Can be used in low pressure reciprocating applications	**D-7**
	FTNP	Operating Pressure: ≤ 200 bar Operating Temperature: -260°C to +315°C Surface Speed: ≤5 m/s	Ideal for rotating bores where a flange cavity or split housing is not possible. Suitable for pneumatic and hydraulic applications.	**D-8**
	FWNP (Piston)	Working pressure: ≤ NA Working temperature: -200 to +200°C Surface speed: ≤ 15 m/s	Ideal for sealing abrasive media with outside rotating housings. Can also be used in low pressure reciprocating applications.	**D-9**

*Operating pressure is limited by the PTFE material selection and extrusion gap and may be increased where corner reinforcement or backing rings are used with reinforced seal materials.

The data for operating pressure and operating temperature stated in the following pages represent maximum values which should not be used at the same time.

It is possible in some cases to exceed operating pressure provided the operating temperature is low.

For applications exceeding the above parameters, or for special design considerations, please contact Ceetak. Our engineers are available to provide guidance and recommendation for your material, profile and sealing system design.

Rotary Seals

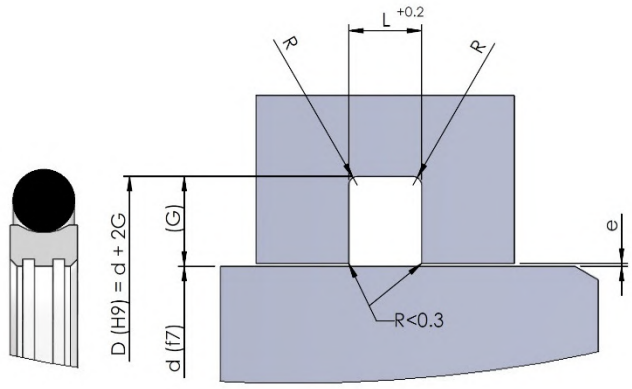
CEETAK STYLE FTOR

Seal Selection Guide

A Double acting slipper seal ideally suited to hydraulic applications. It is capable under alternating pressure directions and is ideal for sealing high pressure loads with slow to moderate rotational speeds.
Initial sealing force is provided by an elastomer o-ring, seated within a machined saddle and activated by system pressure to perform under high system demands. The central lubricating channel (when present) provides low friction and wear.

Application

Typical Applications: Hydraulic, pneumatic, slow speed rotary
Operating Pressure: ≤ 300 bar
Operating Temperature: -45°C to +200°C
Surface Speed: ≤2 m/s



Key Features

- Extrusion resistant under high pressure
- Low stick slip and low friction
- Simple Groove Design
- Circumferential lubricant grooves on the sealing face (dependent on section)
- Sidewall notches enable pressure activation in single and double acting applications
- Axial notches available to improve friction and response in single acting applications

Installation Dimensions

This seal should only be used in combination with guiding elements.

Cross Section	O-ring cross section	Recommended rod diameter 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. R1 (mm)
A	1.78	≥4 <8	2.2	2.45	0.4 – 0.2	0.2 – 0.1	0.5
B	2.62	≥8 <19	3.2	3.75	0.4 – 0.2	0.2 – 0.1	0.5
C	3.53	≥19 <38	4.2	5.5	0.6 – 0.3	0.3 – 0.2	0.5
D	5.33	≥38 <200	6.3	7.75	0.8 – 0.4	0.4 – 0.2	0.9
E	6.99	≥200 <256	8.1	10.5	1 – 0.5	0.5 – 0.3	0.9
F	6.99	≥256 <650	8.1	12.25	1 – 0.5	0.5 – 0.3	0.9
G	8.4	≥650 <1000	9.5	14.0	1 – 0.5	0.5 – 0.3	0.9

Part Number
Example: 100mm Rod = 01000

Product Code F T OR 0 01000 D P07 N70

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

Other materials available on request.

Feature Codes Available
0 – Standard
K – Axial Notch in seal face
N – Sidewall Notch

Guidance on features can be found in section H

Rotary Seals

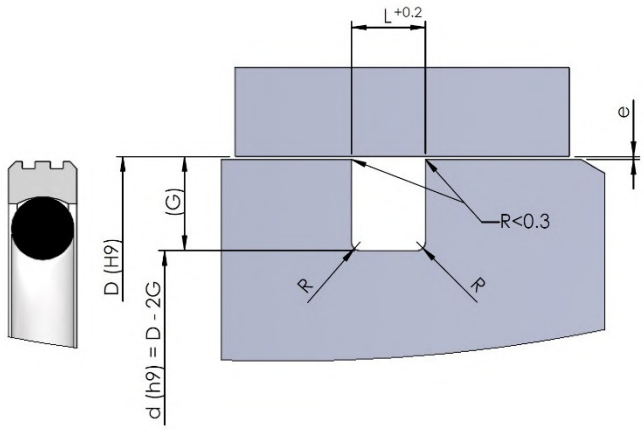
CEETAK STYLE FTOP

Seal Selection Guide

A Double acting slipper seal ideally suited to hydraulic applications. It is capable under alternating pressure directions and is ideal for sealing high pressure loads with slow to moderate rotational speeds.
Initial sealing force is provided by an elastomer o-ring, seated within a machined saddle and activated by system pressure to perform under high system demands. The central lubricating channel (when present) provides low friction and wear.

Application

Typical Applications: Hydraulic, pneumatic, slow speed rotary
Operating Pressure: ≤ 300 bar
Operating Temperature: -45°C to +200°C
Surface Speed: ≤2 m/s



Key Features

- Extrusion resistant under high pressure
- Low stick slip and low friction
- Simple Groove Design
- Circumferential lubricant grooves on the sealing face (dependent on section)
- Sidewall notches enable pressure activation in single and double acting applications
- Axial notches available to improve friction and response in single acting applications

Installation Dimensions

This seal should only be used in combination with guiding elements.

Cross Section	O-ring cross section	Recommended rod diameter 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. R1 (mm)
A	1.78	≥4 <8	2.2	2.45	0.4 – 0.2	0.2 – 0.1	0.5
B	2.62	≥8 <19	3.2	3.65	0.4 – 0.2	0.2 – 0.1	0.5
C	3.53	≥19 <38	4.2	5.35	0.6 – 0.3	0.3 – 0.2	0.5
D	5.33	≥38 <200	6.3	7.55	0.8 – 0.4	0.4 – 0.2	0.9
E	6.99	≥200 <256	8.1	10.25	1 – 0.5	0.5 – 0.3	0.9
F	6.99	≥256 <650	8.1	12.0	1 – 0.5	0.5 – 0.3	0.9
G	8.4	≥650 <1000	9.5	13.65	1 – 0.5	0.5 – 0.3	0.9

Part Number
Example: 100mm Piston = 01000

Product Code F T OP 0 01000 D P07 N70

Rod or Piston
Product Code
Feature
Diameter x 10
Seal Series
Material Code PTFE
Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE-See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

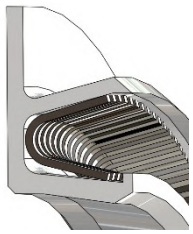
Other materials available on request.

Feature Codes Available
0 – Standard
K – Axial Notch in seal face

Guidance on features can be found in section H

Spring Energised Rotary Seal

CEETAK STYLE FTFR

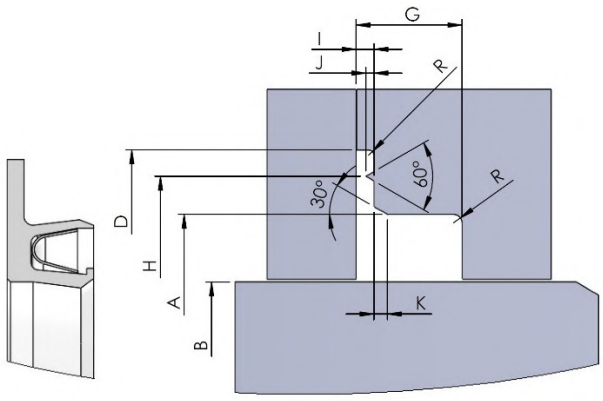


Seal Selection Guide

The FTFR offers excellent sealing capability in rotating and linear seal applications. The clamped flange provides stability during rotation and prevents the seal from rotating within the groove.

Application

Typical Applications: Rotary shafts - motors, pumps
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤10 m/s



Key Features

- Silicone fill available for food and drug use
- Heavy dynamic lip to prolong life
- Cantilever spring for high compliance and low load behaviour

Did you know?

Rotary seals demand very good mating surfaces. Ceetak recommend a minimum shaft hardness of 55HRc

The above stated pressure and velocity values are discrete maximums and should note be used together. Ceetak recommend a maximum of 7MPa x m/s is used where good cooling and lubrications is available.

Installation Dimensions

Nom C/S	Cross Section Code	B (mm) Rod Diameter tolerance h10	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max	D (mm) Flange outer dia tol H11	H (mm) Nose Dia tol H11	I (mm) Flange Width tol +0.08	J (mm) Nose Width tol +0.10	K (mm) Chamf width
1.6	A	≥3.0 ≤75	B + 2.84	2.4	0.30	B + 7.0	B + 5.0	0.56	0.25	0.4 – 0.5
2.4	B	≥5.0 ≤180	B + 4.52	3.6	0.50	B + 9.0	B + 7.0	0.56	0.25	0.8 – 1.0
3.2	C	≥12.5 ≤250	B + 6.15	4.8	0.50	B + 12.5	B + 10.0	0.66	0.30	1.0 – 1.2
4.7	D	≥22.0 ≤300	B + 9.45	7.1	0.75	B + 17.5	B + 13.5	0.96	0.41	1.3 – 1.6
6.4	E	≥50.0 ≤685	B + 12.12	9.5	0.75	B + 22.0	B + 17.0	1.16	0.56	1.7 – 2.0

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F T FR 0 01000 D P02 E01

- Rotary
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FTFR is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE - See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

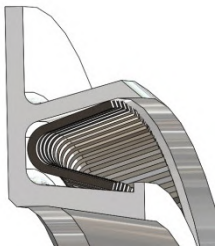
Other materials available on request.

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Rotary Seal

CEETAK STYLE FWFR

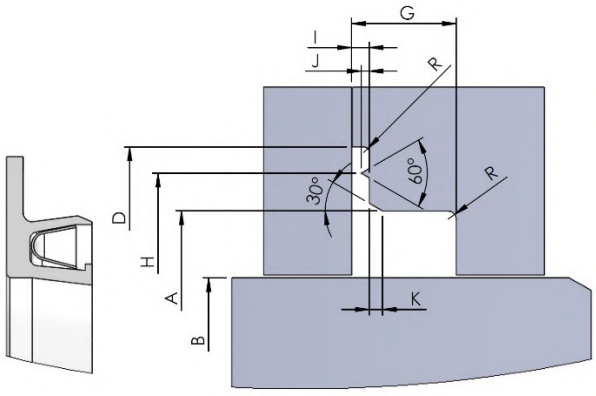


Seal Selection Guide

The FWFR features a sharp contact lip making it the ideal choice for rotating shafts with abrasive media. The clamped flange maintains the seals stability during rotation.

Application

Typical Applications: Rotary shafts with abrasive media, motors, pumps etc
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤10 m/s



Key Features

- Suitable for sealing abrasive media
- Silicone fill available for food and drug use
- Heavy dynamic lip to prolong life
- Cantilever spring for high compliance and low load behaviour

Did you know?

A wide range of sealing materials and springs are available to match your industry and application requirements.

Installation Dimensions

Nom C/S	Cross Section Code	B (mm) Rod Diameter tolerance h10	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max	D (mm) Flange outer dia tol H11	H (mm) Nose Dia tol H11	I (mm) Flange Width tol +0.08	J (mm) Nose Width tol +0.10	K (mm) Chamf width
1.6	A	≥3.0 ≤75	B + 2.84	2.4	0.30	B + 7.0	B + 5.0	0.56	0.25	0.4 – 0.5
2.4	B	≥5.0 ≤180	B + 4.52	3.6	0.50	B + 9.0	B + 7.0	0.56	0.25	0.8 – 1.0
3.2	C	≥12.5 ≤250	B + 6.15	4.8	0.50	B + 12.5	B + 10.0	0.66	0.30	1.0 – 1.2
4.7	D	≥22.0 ≤300	B + 9.45	7.1	0.75	B + 17.5	B + 13.5	0.96	0.41	1.3 – 1.6
6.4	E	≥50.0 ≤685	B + 12.12	9.5	0.75	B + 22.0	B + 17.0	1.16	0.56	1.7 – 2.0

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F W FR 0 01000 D P02 E01

- Wiper
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FWFR is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

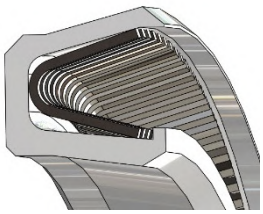
Other materials available on request

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FTNR

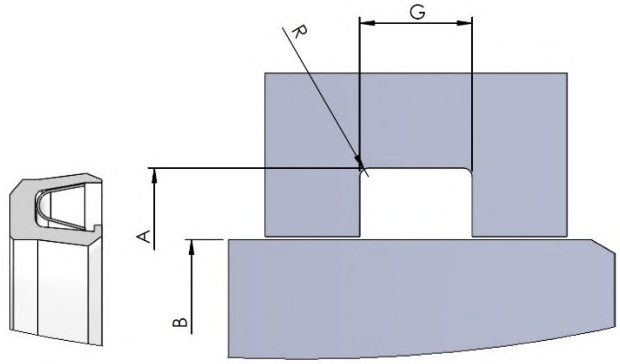


Seal Selection Guide

The FTNR style seal is ideal for sealing abrasive media for rotating shafts without the requirement for a flange cavity in the groove. It can also be used in low pressure reciprocating applications.
This seal profile is well suited for pumps, motors, rotary actuators and reciprocating stems.

Application

Typical Applications: Rotary, Pneumatic, Hydraulic
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤5 m/s



Key Features

- Ideal for sealing rotating shafts
- Simple Groove and Installation Requirements
- Wide Range of jacket and Spring Materials Available

Did you know?

Available with silicone fill cavity for food and drug applications

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥3.0 ≤75	B + 2.84	2.4	0.30
2.4	B	≥5.0 ≤180	B + 4.52	3.6	0.50
3.2	C	≥12.5 ≤250	B + 6.15	4.8	0.50
4.7	D	≥22.0 ≤300	B + 9.45	7.1	0.75
6.4	E	≥50.0 ≤685	B + 12.12	9.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F T NR 0 01000 D P02 E01

- Rotary
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FTNR is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE, See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

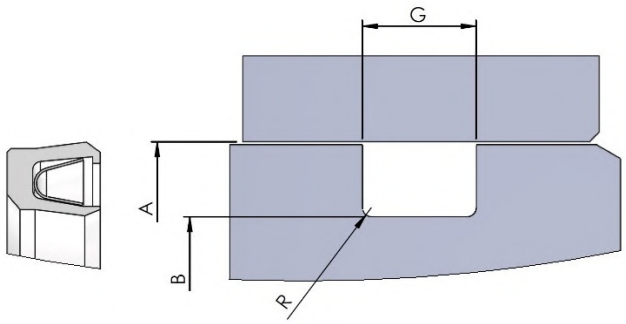
CEETAK STYLE FTNP

Seal Selection Guide

The FTNP style seal is ideal for sealing outside rotating bores without the requirement for a flange cavity in the groove. It can also be used in low pressure reciprocating applications.

Application

Typical Applications: Rotary, Pneumatic, Hydraulic
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤5 m/s



Key Features

- Ideal for sealing rotating bores
- Simple groove design
- Compliant cantilever spring to accept housing offset.
- Available in a wide range of materials, and with a range of Industry approvals.

Did you know?

Our FTNP profile is also available to provide effective sealing against abrasive media and harsh environments.

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥6.0 ≤75	B + 2.84	2.4	0.30
2.4	B	≥9.5 ≤180	B + 4.52	3.6	0.50
3.2	C	≥19.0 ≤250	B + 6.15	4.8	0.50
4.7	D	≥31.5 ≤300	B + 9.45	7.1	0.75
6.4	E	≥63.0 ≤685	B + 12.12	9.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Bore = 01000

Product Code F T NP 0 01000 D P02 E02

- F — Rotary
- T NP — Product Code
- 0 — Feature
- 01000 — Diameter x 10
- D — Seal Section
- P02 — Material Code PTFE
- E02 — Material Code Spring

Materials
The FTNP is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

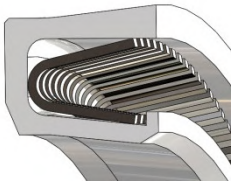
Standard compounds:
Sealing ring:
PTFE- See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found on in section H

Spring Energised Seal

CEETAK STYLE FWNP

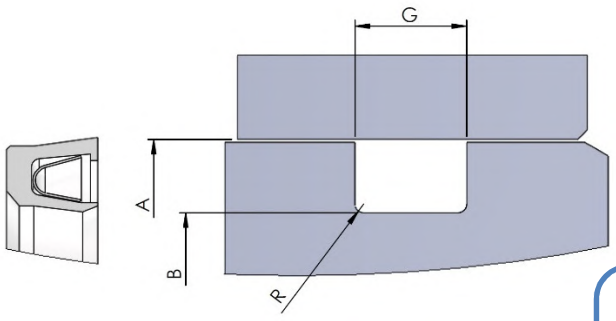


Seal Selection Guide

The FWNP wiper style seal is ideal for sealing rotating bores without the requirement for a flange cavity in the groove. It can also be used in low pressure reciprocating applications. The FWNP is designed to exclude foreign particles, protecting and prolonging the sealing system.

Application

Typical Applications: Rotary, Pneumatic, Hydraulic
Operating Pressure: ≤ 200 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤5 m/s



Key Features

- Ideal for sealing rotating bores
- Simple groove and installation
- Ideal for abrasive media
- Suitable also for reciprocating movement
- Available in a wide range of materials

Did you know?

The FWNP is suitable for a wide range of industries, for example a silicone filled spring cavity can be specified for food use, and NACE compliant springs used for oil and gas applications.

Installation Dimensions

Nominal Cross Section	Cross Section Code	B (mm) Rod Diameter h8 tolerance	A (mm) OD range tolerance H8	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥6.0 ≤75	B + 2.84	2.4	0.30
2.4	B	≥9.5 ≤180	B + 4.52	3.6	0.50
3.2	C	≥19.0 ≤250	B + 6.15	4.8	0.50
4.7	D	≥31.5 ≤300	B + 9.45	7.1	0.75
6.4	E	≥63.0 ≤685	B + 12.12	9.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Bore = 01000

Product Code F W NP 0 01000 D P02 E01

- F – Wiper
- W – Product Code
- NP – Feature
- 0 – Diameter x 10
- 01000 – Seal Section
- D – Material Code PTFE
- P02 – Material Code Spring
- E01

Materials
The FWNP is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE - See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

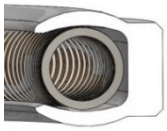
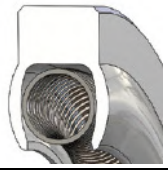
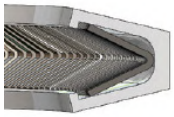
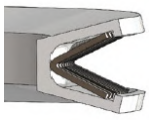
Other materials available on request.

Feature Codes Available
0 – Standard
F – Filled Sping Cavity

Guidance on features can be found in section H

Spring Energised Face Seals

Face Seal Profiles

Profile	Product Code	Application	Range of Applications	Page Number
	FFAI	Working pressure: ≤ 550 bar Working temperature: -260 to +315°C	Excellent for sealing internally pressurized static & intermittently dynamic flange applications. Features helical spring for high load & small deflection range	E-2
	FFAE	Working pressure: ≤ 550 bar Working temperature: -260 to +315°C	For sealing externally pressurized static and intermittently dynamic flange applications. Features helical spring for high load & small deflection range	E-3
	FFHI	Working pressure: ≤ 1400 bar * Working temperature: -260 to +315°C	Excellent for sealing internally high pressurized static & intermittently dynamic flange applications	E-4
	FFHE	Working pressure: ≤ 1400 bar * Working temperature: -260 to +315°C	Excellent for sealing internally high pressurized static & intermittently dynamic flange applications	E-5
	FFRI	Working pressure: ≤ 350 bar* Working temperature: -260 to +315°C	For sealing internally pressurized flanges, in particular cryogenic static and intermittently dynamic applications	E-6
	FFRE	Working pressure: ≤ 350 bar* Working temperature: -260 to +315°C	For sealing externally pressurized flanges, in particular cryogenic static and intermittently dynamic applications	E-7

*Working pressure is limited by the PTFE material selection and extrusion gap and may be increased where corner reinforcement or backing rings are used with reinforced seal materials.

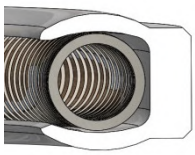
The data for working pressure and working temperature stated in the following pages represent maximum values which should not be used at the same time.

It is possible in some cases to exceed working pressure provided the working temperature is low.

For applications exceeding the above parameters, or for special design considerations, please contact Ceetak. Our engineers are available to provide guidance and recommendation for your material, profile and sealing system design.

Spring Energised Seal

CEETAK STYLE FFAI

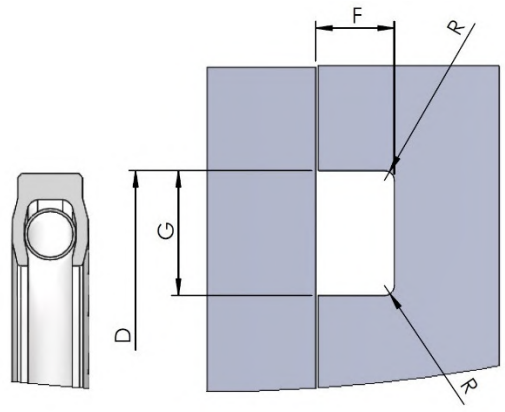


Seal Selection Guide

The FFAI style seal is excellent for sealing internally pressurised static and intermittently dynamic flange applications. This is the standard type for flange and face seal applications, the heavy spring provides optimum seal performance.

Application

Typical Applications: Static and intermittent dynamic flange applications
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Ideal for sealing static flange applications
- Available in a wide range of polymers
- Helical spring resists set, providing long term protection against flange separation

Did you know?

This seal is also available for applications with external pressure

Corner reinforcement rings are available for higher pressure dynamic applications

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter H10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥10 ≤65	1.42 – 1.47	2.4	0.30
2.4	B	≥14 ≤100	2.26 – 2.31	3.6	0.50
3.2	C	≥25 ≤200	3.07 – 3.12	4.8	0.50
4.7	D	≥48 ≤350	4.72 – 4.78	7.1	0.75
6.4	E	≥115 ≤400	6.05 – 6.12	9.5	0.75
9.5	F	≥200 ≤1000	9.47 – 9.58	13.3	0.75
12.7	G	≥325 ≤3000	12.70 – 12.80	18.0	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F F AI 0 01000 D P02 E01

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FFAI is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE - See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

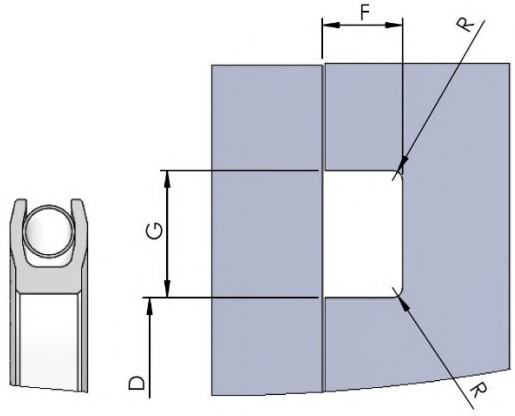
CEETAK STYLE FFAE

Seal Selection Guide

The FFAE style seal is excellent for sealing internally pressurised static and intermittently dynamic flange applications. This is the standard type for flange and face seal applications, the heavy spring provides optimum seal performance.

Application

Typical Applications: Static and intermittent dynamic flange application's
Operating Pressure: ≤ 550 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Ideal for sealing static flange applications
- Available in a wide range of polymers
- Helical spring resists set, providing long term protection against flange separation
- Fits o-ring grooves to ISO3601-1 and AS568

Did you know?

This seal is also available for applications with Internal pressure

Corner reinforcement rings are available for higher pressure dynamic applications

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter h10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥5 ≤65	1.42 – 1.47	2.4	0.30
2.4	B	≥10 ≤100	2.26 – 2.31	3.6	0.50
3.2	C	≥20 ≤200	3.07 – 3.12	4.8	0.50
4.7	D	≥40 ≤350	4.72 – 4.78	7.1	0.75
6.4	E	≥90 ≤400	6.05 – 6.12	9.5	0.75
9.5	F	≥200 ≤1000	9.47 – 9.58	13.3	0.75
12.7	G	≥300 ≤3000	12.70 – 12.80	18.0	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F F AE 0 01000 D P02 E01

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FFAE is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring:
PTFE - See Section A-3
Spring:
Stainless steel 300 series- See Section A-3

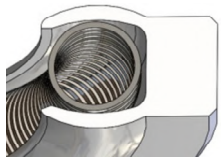
Other materials available on request

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FFHI

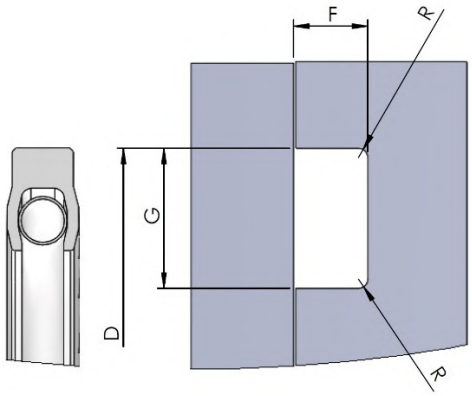


Seal Selection Guide

The FFHI seal uses a high strength helical spring. The sealing principle is similar to the FFAI, the extended heel providing additional support for higher pressure applications, or to fit o-ring grooves where a backing ring has previously been specified.

Application

Typical Applications: Static and intermittent dynamic flange application's
Operating Pressure: ≤ 1400 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Heel extension allows high pressure use
- Available in a wide range of polymers
- Helical spring resists set, providing long term protection against flange separation

Did you know?

These seals fit o-ring grooves to ISO3601-1 and AS568 with 1 backing ring width

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter H10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥10 ≤65	1.42 – 1.47	3.3	0.30
2.4	B	≥14 ≤100	2.26 – 2.31	4.5	0.50
3.2	C	≥25 ≤200	3.07 – 3.12	6.5	0.50
4.7	D	≥48 ≤350	4.72 – 4.78	8.0	0.75
6.4	E	≥115 ≤400	6.05 – 6.12	11.3	0.75
9.5	F	≥200 ≤1000	9.47 – 9.58	15.8	0.75
12.7	G	≥325 ≤3000	12.70 – 12.80	20.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F F HI 0 01000 D P02 E01

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FFHI is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring: PTFE - See Section A-3
Spring: Stainless steel 300 series- See Section A-3

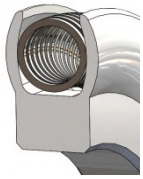
Other materials available on request

Feature Codes Available
0 – Standard
C – Corner Reinforcement
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FFHE

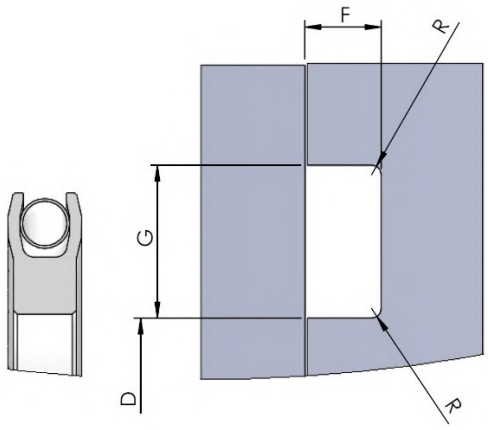


Seal Selection Guide

The FFHE style seal is excellent for sealing externally high pressurised static and intermittently dynamic flange applications.

Application

Typical Applications: Static and intermittent dynamic flange application's
Operating Pressure: ≤ 1400 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- Heel extension allows high pressure use
- Available in a wide range of polymers
- Helical spring resists set, providing long term protection against flange separation

Did you know?

These seals fit o-ring grooves to ISO3601-1 and AS568 with 1 backing ring width

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter h10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
1.6	A	≥5 ≤65	1.42 – 1.47	3.3	0.30
2.4	B	≥10 ≤100	2.26 – 2.31	4.5	0.50
3.2	C	≥20 ≤200	3.07 – 3.12	6.5	0.50
4.7	D	≥40 ≤350	4.72 – 4.78	8.0	0.75
6.4	E	≥90 ≤400	6.05 – 6.12	11.3	0.75
9.5	F	≥200 ≤1000	9.47 – 9.58	15.8	0.75
12.7	G	≥300 ≤3000	12.70 – 12.80	20.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F FHE 0 01000 D P02 E01

- Face
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FHCE is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring: PTFE- See Section A-3
Spring: Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard
C – Corner Reinforcement
F – Silicone Fill Cavity

Guidance on features can be found on in section H

Spring Energised Seal

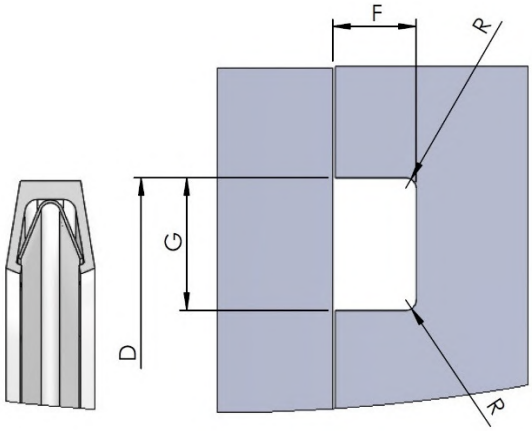
CEETAK STYLE FFRI

Seal Selection Guide

The FFRI style seal is excellent for sealing internally pressurised static and intermittently dynamic flange applications in cryogenic environments. The product is available in large sections, ideal for large diameters.

Application

Typical Applications:	Static and intermittent dynamic flange applications (Cryogenic)
Operating Pressure:	≤ 350 bar
Operating Temperature:	-260°C to +315°C
Surface Speed:	≤0.005 m/s



Key Features

- High surface contact pressure
- Available in NACE approved materials
- High Strength spring
- Narrow contact band

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter H10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
4.7	D	≥50 ≤300	4.72 – 4.78	9.0	0.75
6.4	E	≥80 ≤1000	6.05 – 6.12	10.0	0.75
9.5	F	≥150 ≤1200	9.47 – 9.58	13.5	0.75
12.7	G	≥200 ≤3000	12.70 – 12.80	18.5	0.75

Further Installation Guidance can be found in section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F F RI 0 01000 D P02 E01

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FFRI is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring: PTFE - See Section A-3
Spring: Stainless steel 300 series- See Section A-3

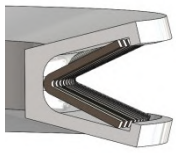
Other materials available on request

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Spring Energised Seal

CEETAK STYLE FRCE

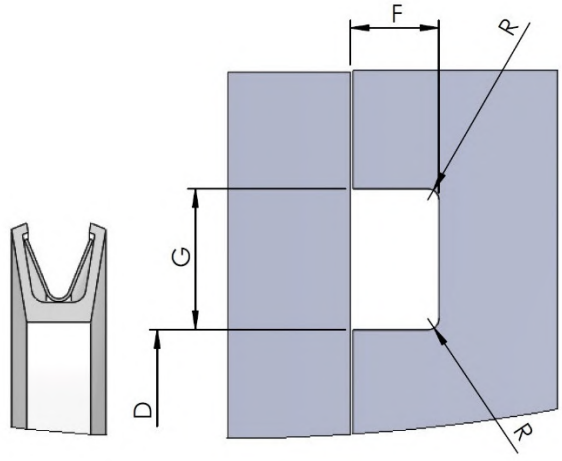


Seal Selection Guide

The FFRE style seal is excellent for sealing internally pressurised static and intermittently dynamic flange applications in cryogenic environments. The product is available in large sections, ideal for large diameters.

Application

Typical Applications: Static and intermittent dynamic flange applications (Cryogenic)
Operating Pressure: ≤ 350 bar
Operating Temperature: -260°C to +315°C
Surface Speed: ≤0.005 m/s



Key Features

- High surface contact pressure
- Available in NACE approved materials
- High Strength spring
- Narrow contact band

Installation Dimensions

Nominal Cross Section	Cross Section Code	D (mm) Groove Diameter h10 tolerance	F (mm) Groove depth range	G (mm) Groove width Min	R (mm) Radius Max
4.7	D	≥50 ≤300	4.72 – 4.78	9.0	0.75
6.4	E	≥80 ≤1000	6.05 – 6.12	10.0	0.75
9.5	F	≥150 ≤1200	9.47 – 9.58	13.5	0.75
12.7	G	≥200 ≤3000	12.70 – 12.80	18.5	0.75

Further Installation Guidance can be found in Section A-6

Part Number
Example: 100mm Rod = 01000

Product Code F F RE 0 01000 D P02 E01

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Section
- Material Code PTFE
- Material Code Spring

Materials
The FFRE is available in a wide range of polymer compounds. Including Virgin PTFE, filled PTFE, UHMWPE, PEEK and others on request.

Standard compounds:
Sealing ring: PTFE- See Section A-3
Spring: Stainless steel 300 series- See Section A-3

Other materials available on request.

Feature Codes Available
0 – Standard
F – Silicone Fill Cavity

Guidance on features can be found in section H

Linear Slipper Seals

Wiper Profiles

Profile	Product Code	Application	Range of Applications	Page Number
	FWAT	Working pressure: NA Working temperature: -45 to +200°C ** Surface speed: ≤ 4 m/s	Single acting rod wiper with reducing debris trap area, and angled face for displacement of debris and fluid.	F-2
	FWAD	Working pressure: ≤ NA Working temperature: -45 to +200°C ** Surface speed: ≤ 15 m/s	Double acting wiper designed to reduce the space claim of a sealing system, by combining a single acting seal with a wiper to both retain fluid within, whilst excluding debris.	F-3

**Temperature range is limited by the elastomer material, care should be taken to select a compound which is compatible with both the application temperature and contacting media.

The data for working pressure, working temperature, and surface speed stated in the following pages represent maximum values which should not be used at the same time.

It is possible in some cases to exceed working pressure and surface speed provided the working temperature is low.

For applications exceeding the above parameters, or for special design considerations, please contact Ceetak. Our engineers are available to provide guidance and recommendation for your material, profile and sealing system design.

Wiper Ring

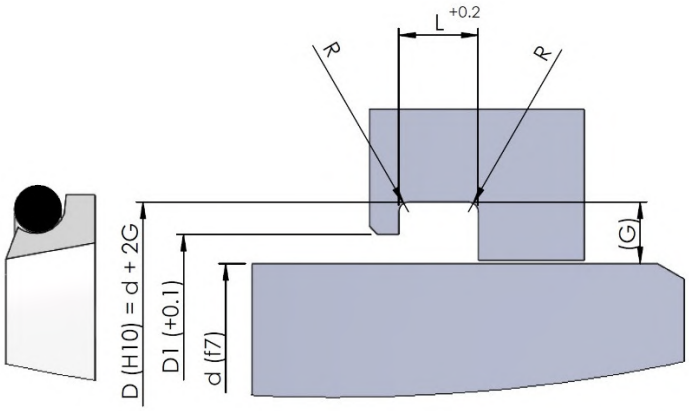
CEETAK STYLE FWAT

Seal Selection Guide

The wiper ring FWAT is designed to prevent dust, dirt, sand, and other debris such as metal swarf from entering axially moving rods and plungers, protecting the seal and extending the system life.

Application

Typical Applications:	Rod cylinders, plungers
Operating Pressure:	0 bar
Operating Temperature:	-45°C to +200°C (limited by o-ring material selection)
Surface Speed:	≤4 m/s



Key Features

- High sealing pressure at wiping lip
- Good wear resistance
- Low friction
- Angular scraping face for positive displacement of debris from rod and reduction of debris trapping

Installation Dimensions

Cross Section	O-ring cross section	Recommended rod diameter range d (mm)	Groove Width L (mm)	Groove Depth G (mm)	Retainer Dia D1 (mm)	Radius max. (mm)
A	1.78	≥6 <12	3.7	2.4	d + 2.7	0.4
B	2.62	≥12 <65	5	3.4	d + 3.5	0.4
C	3.53	≥65 <250	6	4.4	d + 4.0	0.4
D	5.33	≥250 <420	8.4	6.1	d + 4.5	0.4
E	6.99	≥420 <650	11	8.0	d + 5.2	0.4
F	8.40	≥650 <1000	14	10.0	d + 6.6	0.4

Note: This seal should only be used in combination with guiding elements.

Part Number
Example: 100mm Rod = 01000

Product Code F W AT 0 01000 D P03 N70

- Wiper
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

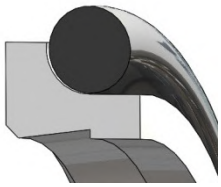
Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Wiper Seal Ring

CEETAK STYLE FWAD

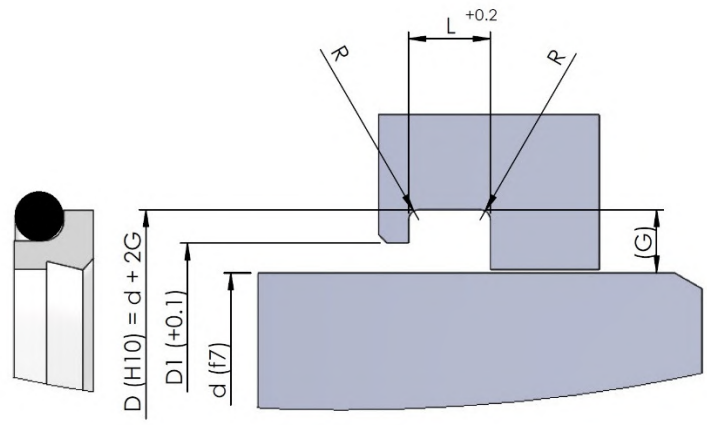


Seal Selection Guide

The wiper seal ring FWAD is designed to prevent debris such as dust, dirt, sand, and metal swarf from entering into axially moving rods and plungers, In turn protecting the seal and extending the sealing life.
The FWAD combines two functions, wiping against debris from the outside whilst sealing the system media within. This allows the designer to reduce the overall sealing system space claim.

Application

Typical Applications: Rod cylinders, plungers
Operating Pressure: N/A
Operating Temperature: -45°C to +200°C (limited by o-ring selection)
Surface Speed: ≤8 m/s



Key Features

- Wiper lip
- Reduced Space Claim
- Good wear resistance
- Low friction
- Assists seal system with back pumping of fluid

Installation Dimensions

This seal should only be used in combination with guiding elements.

Cross Section	O-ring cross section	Recommended rod diameter range d (mm)	Groove Width L (mm)	Groove Depth G (mm)	Retainer Dia D1 (mm)	Radius max. (mm)
A	1.78	≥6 <12	3.7	2.4	d + 1.5	0.4
B	2.62	≥12 <65	5	3.4	d + 1.5	0.4
C	3.53	≥65 <250	6	4.4	d + 2.0	0.4
D	5.33	≥250 <420	8.4	6.1	d + 2.0	0.4
E	6.99	≥420 <650	11	8.0	d + 2.5	0.4
F	8.40	≥650 <1000	14	10.0	d + 2.5	0.4

Part Number
Example: 100mm Rod = 01000

Product Code F W AD 0 01000 D P03 N70

- Wiper
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Material Code Elastomer*

***Leave blank if o-ring is not required**

Materials
Standard compounds:
Sealing ring:
PTFE- See Section A-3
O-ring:
NBR 70 Shore A – N70
FKM 75 Shore A – V75

Other materials available on request.

Feature Codes Available
0 – Standard

Guidance on features can be found in section H

Polymer Bearings and Guide Tapes

The use of polymer bearing tapes prevents the rod and pistons from contact with the bore, preventing damage to hardware and helping to maintain a controlled sealing gap.

Ceetak bearing materials are designed to offer long life low friction operation, using specially modified PTFE materials.

Using non-metallic bearing material offers many advantages to the user. The bearing strips are cost effective and can be installed into closed grooves minimising the cost of the hardware to the customer.

The materials are suitable for almost all known fluid media, and are able to run dry should the unit become starved from lubrication. Ceetak bearing materials are able to run at system temperatures of up to 200 degrees Celsius.

Polymer bearings can not only extend the life of the sealing system by absorbing load and vibration, but the materials offer an ability to buffer the system pressure from the sealing system in quick acting cylinders, and can reduce dieseling and extrusion damage as a result. The materials are also capable of absorbing contaminant particles in some cases, and can reduce the chance of rapid seal failure.

Bearing tapes can be supplied cut to length, machined to size or as a complete roll for the user to cut as required.

Installation is simple and can be completed onsite without a need for special tooling.

Please don’t hesitate to contact our technical department for further information and support.

Selecting the Correct Wear Tape

Ceetak wear rings are available with 2 different surface finishes, specified through the part number.

Wear rings are supplied plain as a default, however the use of lubrication pockets can help to prolong the life of the bearing by improving the surface lubrication. The bearing load capability is also increased, by up to 15% when lubrication pockets are used.

Cut Style

Ceetak's wear rings are provided with 3 types of cut design, which can be specified using the standard part number, defined on each product page.

Scarf Cut, Type S.

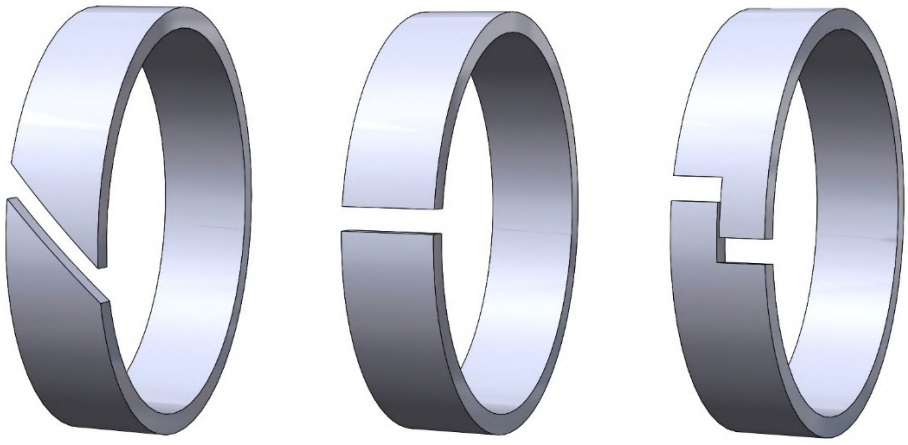
This is Ceetak's standard cut type. This cut allows system pressure and lubricating fluid to the sealing system, without leaving the rod or piston unsupported, and deflects the fluid flow from the seal faces.

Straight Cut, Type L.

This cut also allows system pressure and lubrication to reach the seal elements, but this cut type is often found in rotating hardware, to reduce the likelihood of snag damage to the cut ends. Straight cut parts can also be found in heavy duty linear hydraulics, where system fluid flow can from time to time rotate the Scarf cut rings with fast linear fluid flow.

Step Cut, Type Z. This is found often in high pressure or high speed systems where the wear ring acts as a buffer to shield the sealing system from rapid changes in high pressure. The cut closes the gap in the wear ring, and reduces fluid flow, sometimes used as a single piece piston seal or damper.

The cut width, Q, is designed to allow for thermal expansion of the rings, and to prevent possible fluid entrapment and should be maintained when specifying wear rings to cut to length.



Scarf Cut
Type S

Straight Cut
Type L

Step Cut
Type Z

The developed length of the wear ring, including the recommended C clearance, can be calculated as follows:

For Pistons: $L = 3.1 \times (D - T) - Q$

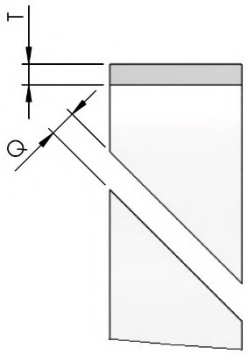
For Rods: $L = 3.1 \times (d + T) - Q$

Where:

W = the ring radial height

D = the bore diameter

Cylinder Diameter	Tolerance	Gap Q
≤45	±0.25	1.8
>45	±0.40	3.5
>80	±0.60	4.4
>100	±0.80	5.6
>125	±1.00	6.6
>150	±1.20	8.0
>180	±1.40	9.5
>215	±1.60	12.0
>270	±1.80	15.5
>330	±2.00	19.0



Where temperatures exceed 120 degrees Celsius, Ceetak recommend increasing the C gap by a further 1mm to allow for expansion.

Calculating the correct width of bearing for your application

A suitable bearing width can be estimated using the following formula.

Width = F/ (D x M) x S

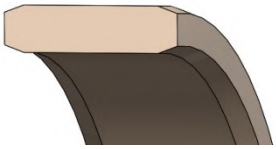
Where:

F = radial force applied
D = Rod or Bore diameter
M = Material pressure capability as found on the product information pages (note effects of temperature)
S = Safety Factor. Ceetak recommend using a value of 2 or greater.

Note that the bearing load can be accommodated within a single wear tape, or by the use of multiple wear tapes of smaller width. Please see available standard sizes on the product pages. Special sizes available on request.

Guide Rings

CEETAK STYLE FBR2 (Rod)

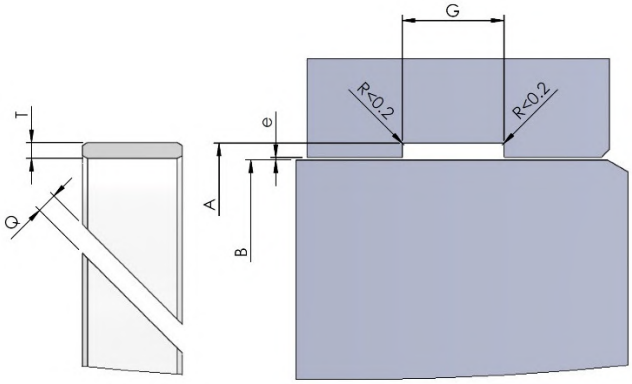


Seal Selection Guide

The FBR2 guide tape is designed with pneumatic cylinders in mind. The sizes Ceetak offer are in accordance with ISO 10766, housing dimensions for rectangular section cut bearings.
Wear rings are available in cut length or strip with or without surface lubrication pockets.

Application

Typical Applications:	Pneumatic pistons and rods
Operating Temperature:	-100°C to +120°C,
Surface Speed:	≤10 m/s
Surface Pressure:	2.5N/mm^2 - For High Temperatures, See Product FBR3.



Installation Dimensions

Cross Section	Section Height, T (mm)	Groove Width G (mm) (+0.1mm)	Groove Dia. A H8 (mm) Rod Installation	Clearance Gap, e (mm)
A	1.55	4.0	B + 3.1	0.2-0.4
B	1.55	5.0	B + 3.1	0.2-0.4
C	1.55	8.0	B + 3.1	0.2-0.4
D	1.55	9.0	B + 3.1	0.2-0.4
E	1.55	10.0	B + 3.1	0.2-0.4
F	1.55	12.0	B + 3.1	0.2-0.4
G	1.55	15.0	B + 3.1	0.3-0.5
H	1.55	20.0	B + 3.1	0.3-0.5
I	1.55	25.0	B + 3.1	0.3-0.5

Note

Should the tolerance of piston and bore prevent the above clearances being met, please contact Ceetak for guidance on alternative guide tape thicknesses.

Part Number
Example: 100mm Rod = 01000

Product Code F B R2 L 01000 D B17 S

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Cut Type*
  - * S – Scarf Cut
  - L – Straight Cut
  - Z – Step Cut

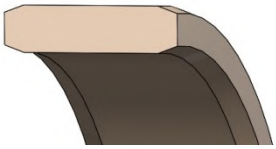
Materials
Standard compounds:
Bearing ring:
B16 - Modified PTFE with Lubricant
B17 – PTFE with Bronze 40%
B18 – PTFE with Carbon 25% & Graphite.
Other materials available on request.

Feature Codes Available
0 – Standard
L – Lubrication pockets

Guidance on features can be found in section H

Guide Rings

CEETAK STYLE FBP2 (Piston)

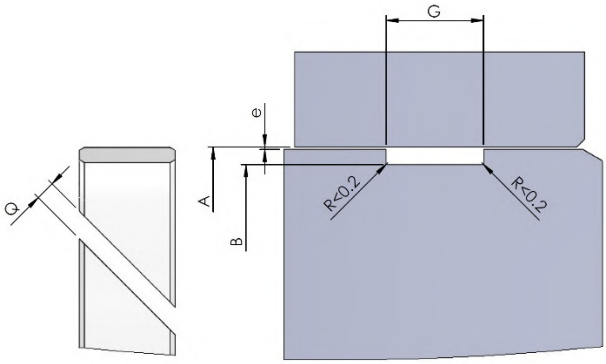


Seal Selection Guide

The FBP2 guide tape is designed with pneumatic cylinders in mind. The sizes Ceetak offer are in accordance with ISO 10766, housing dimensions for rectangular section cut bearings.
Wear rings are available in cut length or strip with or without surface lubrication pockets.

Application

Typical Applications:	Pneumatic pistons and rods
Operating Temperature:	-100°C to +120°C,
Surface Speed:	≤10 m/s
Surface Pressure:	2.5N/mm^2 - For High Temperatures, See Product FBP3.



Installation Dimensions

Cross Section	Section Height, T (mm)	Groove Width G (mm) (+0.1mm)	Groove Dia. B h8 (mm) Piston Installation	Clearance Gap, e (mm)
A	1.55	4.0	A – 3.1	0.2-0.4
B	1.55	5.0	A – 3.1	0.2-0.4
C	1.55	8.0	A – 3.1	0.2-0.4
D	1.55	9.0	A – 3.1	0.2-0.4
E	1.55	10.0	A – 3.1	0.2-0.4
F	1.55	12.0	A – 3.1	0.2-0.4
G	1.55	15.0	A – 3.1	0.3-0.5
H	1.55	20.0	A – 3.1	0.3-0.5
I	1.55	25.0	A – 3.1	0.3-0.5

Note

Should the tolerance of piston and bore prevent the above clearances being met, please contact Ceetak for guidance on alternative guide tape thicknesses.

Part Number
Example: 100mm Piston = 01000

Product Code F B P2 L 01000 D B17 S

- Type
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Cut Type*
  - * S – Scarf Cut
  - L – Straight Cut
  - Z – Step Cut

Materials
Standard compounds:
Bearing ring:
B16 - Modified PTFE with Lubricant
B17 – PTFE with Bronze 40%
B18 – PTFE with Carbon 25% & Graphite.
Other materials available on request.

Feature Codes Available
0 – Standard
L – Lubrication pockets

Guidance on features can be found in section H

Guide Rings

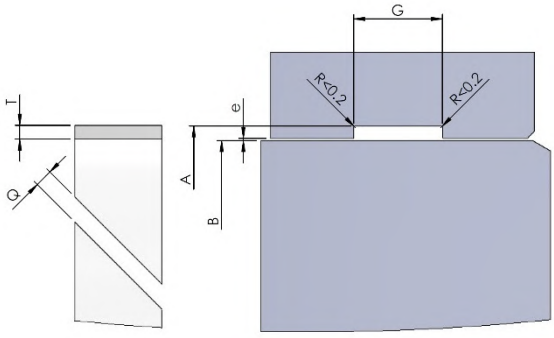
CEETAK STYLE FBR3 (Rod)

Seal Selection Guide

The FBR3 guide tape is designed with pneumatic cylinders in mind. The sizes Ceetak offer are in accordance with ISO 10766, housing dimensions for rectangular section cut bearings.
Wear rings are available in cut length or strip with or without surface lubrication pockets.

Application

Typical Applications:	Pneumatic and Hydraulic Pistons and Rods
Operating Temperature:	-100°C to +120°C,
Surface Speed:	≤10 m/s
Surface Pressure:	The maximum pressure capability is affected by temperature, 16.5N/mm² < 20°C 11.5N/mm² <60°C 8.5 N/mm² <100°C



Installation Dimensions

Cross Section	Recomm. Diameter	Section Height, T (mm)	Groove Width G (mm)	Groove Dia. A H8 (mm) Rod Installation	Clearance Gap, e (mm)
A	8 - 30	1.50	$6.3^{+0.1}$	B + 3.0	0.2-0.4
B	15 - 50	1.50	$8.1^{+0.1}$		
C	15 – 50	1.55	$2.5^{+0.1}$	B + 3.1	
D	20 - 50	1.55	$4.0^{+0.1}$		
E	20 – 80	2.00	$6.3^{+0.1}$	B + 4.0	0.3-0.5
F	20 – 100	2.00	$8.1^{+0.1}$		
G	20 – 150	2.50	$4.2^{+0.1}$	B + 5.0	
H	20 - 240	2.50	$6.3^{+0.1}$		
I	50 – 240	2.50	$8.1^{+0.1}$		0.3-0.6
J	50 – 300	2.50	$9.7^{+0.1}$		
K	80 – 400	2.50	$15^{+0.2}$		
L	400 - 999	2.50	$20.0^{+0.2}$		0.5 – 1.1
M	400 - 999	2.50	$30.0^{+0.2}$		

Notes:

Should the tolerance of piston and bore, or the requirements of adjacent seals prevent these clearances being met, please contact Ceetak for guidance.

Note: Other Sizes are Available on Request

Part Number
Example: 100mm Rod = 01000

Product Code F B R3 L 01000 D B17 S

- Rod or Piston
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Cut Type*

* S – Scarf Cut
L – Straight Cut
Z – Step Cut

Materials
Standard compounds:
Bearing ring:
B16 - Modified PTFE with Lubricant
B17 – PTFE with Bronze (High Fill)
B18 – PTFE with Carbon & Graphite (Medium Fill)
Other materials available on request.

Feature Codes Available
0 – Standard
L – Lubrication pockets

Guidance on features can be found in section H

Guide Rings

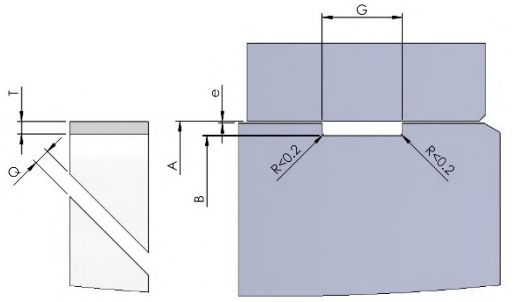
CEETAK STYLE FBP3 (Piston)

Seal Selection Guide

The FBP3 guide tape is designed with pneumatic cylinders in mind. The sizes Ceetak offer are in accordance with ISO 10766, housing dimensions for rectangular section cut bearings.
Wear rings are available in cut length or strip with or without surface lubrication pockets.

Application

Typical Applications:	Pneumatic and Hydraulic Pistons and Rods
Operating Temperature:	-100°C to +120°C,
Surface Speed:	≤10 m/s
Surface Pressure:	The maximum pressure capability is affected by temperature, 16.5N/mm² < 20°C 11.5N/mm² <60°C 8.5 N/mm² <100°C



Installation Dimensions

Cross Section	Recomm. Diameter	Section Height, T (mm)	Groove Width G (mm)	Groove Dia. B h8 (mm) Piston Installation	Clearance Gap, e (mm)
A	8 - 30	1.50	$6.3^{+0.1}$	A – 3.0	0.2-0.4
B	15 - 50	1.50	$8.1^{+0.1}$		
C	15 – 50	1.55	$2.5^{+0.1}$	A – 3.1	
D	20 - 50	1.55	$4.0^{+0.1}$		
E	20 – 80	2.00	$6.3^{+0.1}$	A – 4.0	0.3-0.5
F	20 – 100	2.00	$8.1^{+0.1}$		
G	20 – 150	2.50	$4.2^{+0.1}$	A – 5.0	
H	20 - 240	2.50	$6.3^{+0.1}$		
I	50 – 240	2.50	$8.1^{+0.1}$		0.3-0.6
J	50 – 300	2.50	$9.7^{+0.1}$		
K	80 – 400	2.50	$15^{+0.2}$		
L	400 - 999	2.50	$20.0^{+0.2}$		0.5-1.1
M	400 - 999	2.50	$30.0^{+0.2}$		

Notes:

Should the tolerance of piston and bore, or the requirements of adjacent seals prevent these clearances being met, please contact Ceetak for guidance.

Note: Other Sizes are Available on Request

Part Number
Example: 100mm Rod = 01000

Product Code F B P3 L 01000 D B17 S

- Type
- Product Code
- Feature
- Diameter x 10
- Seal Series
- Material Code PTFE
- Cut Type*

* S – Scarf Cut
L – Straight Cut
Z – Step Cut

Materials
Standard compounds:
Bearing ring:
B16 - Modified PTFE with Lubricant
B17 – PTFE with Bronze (High Fill)
B18 – PTFE with Carbon & Graphite (Medium Fill)
Other materials available on request.

Feature Codes Available
0 – Standard
L – Lubrication pockets

Guidance on features can be found in section H

List of Special Features	
0	Standard
B	Backing Ring
C	Corner Reinforcement (Single Acting)
D	Corner Reinforcements (Double Acting)
E	Extended Heel
F	Silicone Fill Spring Cavity (Spring Energised Seals Only)
K	Axial Slot (FTOP & FTOR only)
L	Lubrication Pockets (Wear rings only)
M	-
N	Sidewall Notches
X	Special Design for Customer

Backing Rings

Backing rings are used where a combination of dynamic velocity, pressure and temperature otherwise may result in creep or flow of the seal material into an available clearance gap, typically that found between rods or pistons and their associated bores.

Backing rings can in some instances be used to allow the user to relax tolerance on hardware and ultimately save cost. For more demanding applications, a backing ring may be critical to preserving life of the PTFE seal itself.

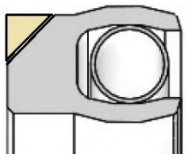
Backing rings are commonly and widely available in a range of engineered plastic materials.

Corner Reinforcement

Certain PTFE seals allow for corner reinforcement rings to be embedded within the seal section.

These corner reinforcements operate in a similar manner to the backing rings, using a rigid plastic material to prevent flow or extrusion into the sealed gap. Corner reinforcement rings demand less groove volume than a full height backing ring, and can often be fitted within closed bores, allowing for a simplified hardware design.

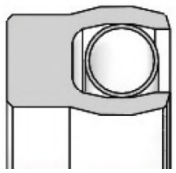
Single Corner Reinforcement is used in single acting seals, or double acting seals where pressure is applied only from one direction.



Double Corner Reinforcement is used in double acting seals, and where pressure is to be applied from either direction, or where a symmetrical seal is preferred to avoid the risk of orientation errors during assembly.

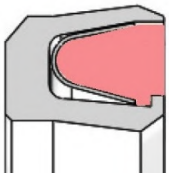
Extended Heel

For high pressure applications, seals with extended heels are used. The extended heel provides the seal with improved strength and a greater ability to withstand pressure. The effects of extrusion, should they occur are less prone, to affecting the seal performance.



Silicone Fill Spring Cavity

A silicone elastomer can be used to fill the spring cavity of a metal spring energised seal, embedding the spring within, and filling any voids. This is commonly used where the user wishes to prevent media entering and becoming trapped in or around the spring cavity, common within food and pharmaceutical applications.



Axial Slot

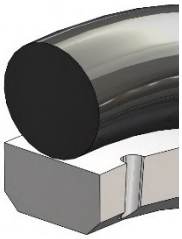
The axial slot within a rotary FTOR and FTOP seal allows lubricating media to enter a circumferential relief channel within the seal cap. This allows for enhanced lubrication and a smaller pressurised surface area in contact with the shaft. Together, this means reduced temperature and friction, and allows the user to operate with higher pressures and velocities. This can be used in double acting applications provided the relief channel is installed on the high pressure side.

Lubrication Pockets

Applicable to Ceetak bearing materials, these pockets help retain lubrication to improve the wear and friction of bearing materials.

Sidewall Notches

These should be used where the pressure is expected to rapidly change from one side of the seal to the other. The notches ensure that the system pressure is able to reach the elastomer energiser allowing effective energisation, preventing “blow by” where the pressure raises the cap of the seal and passes beneath.



Engineering request form

Contact

Company Name: ..... Date.....

Contact Name: .....

Tel: .....

Email: .....

Location: .....

Application sketch /

Specifications

Application: .....

Static ☐ Dynamic ☐

Reciprocating ☐ Rotary ☐ Oscillating ☐ Other: .....

Piston ☐ Rod ☐ Face ☐

Hydraulic ☐ Pneumatic ☐

Fluid Medium: .....

Surface speed: ..... Cycle rate: .....

Pressure

Minimum..... Maximum..... Normal operating .....

Single acting ☐ Double acting ☐

Temperature

Minimum..... Maximum..... Normal operating .....

Hardware

Mating hardware material: ..... Housing Type: Split ☐ Solid ☐ Open ☐ Stepped ☐

Nominal groove size .....

Mating hardware surface finish ..... Coating/ Treatment .....

Shaft surface hardness (Rockwell) .....

Part selection

Seal Type: ..... Existing part no: .....

Materials: .....

Additional Comments

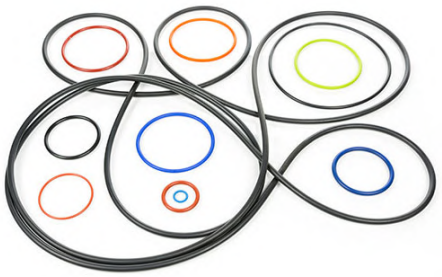
.....

.....

Our Seals

Metal Seals

Mouldings & Gaskets



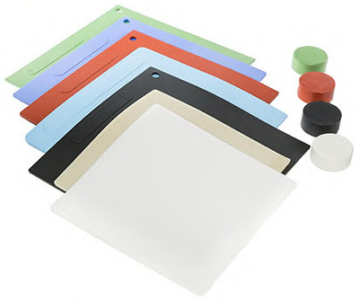
O-Rings

Rotary Seals

PTFE Seals

2-Shot Mouldings

Diaphragms



Engineered Materials

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