



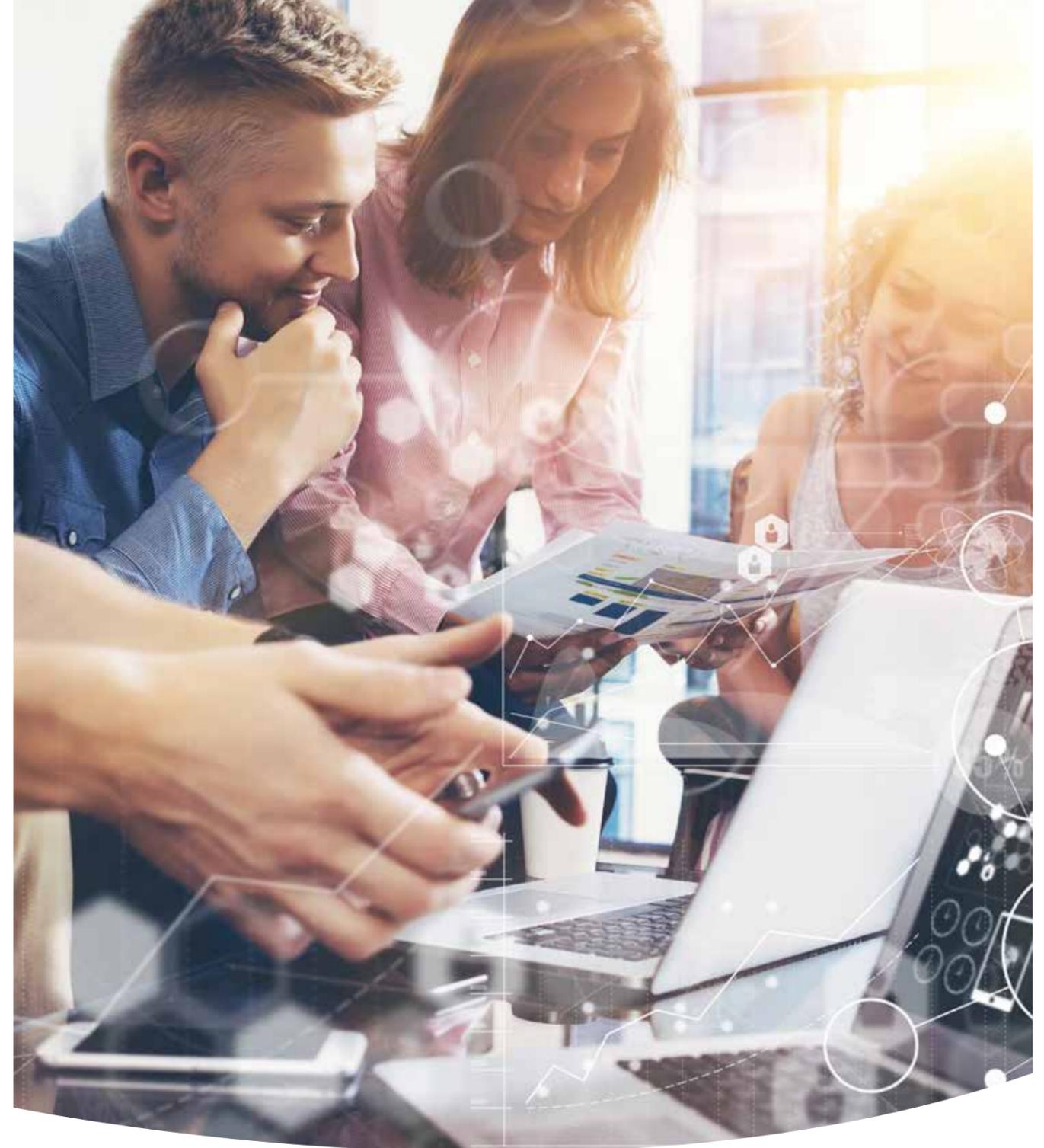
FREUDENBERG XPRESS® – CUSTOMIZED SEALS IN ORIGINAL FREUDENBERG QUALITY

FREUDENBERG
SEALING TECHNOLOGIES

 **FREUDENBERG**
INNOVATING TOGETHER

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INTRODUCTION



COMPANY

Founded in 1849, the Freudenberg group of companies is still family-owned, broadly diversified and globally present today. The resulting financial stability and social responsibility are key success factors that build trust with the customers.

Freudenberg is active in various industries and is therefore divided into different business groups with one goal: being close to the customer, and meeting the requirements of a market specialist and technology leader. Many research and development facilities make the long-term success of the innovative company as well as a short-term and rapid response to market- and customer-specific transformations possible.

Freudenberg Sealing Technologies is the largest business group of Freudenberg. Together with the partners of the NOK Corporation, the company forms a global network. This ensures a local offer of high-quality products – worldwide. The concept is supported by global manufacturing, innovation, occupational health and safety, and quality management strategies. It makes the company one of the world's leading specialists in sealing technology.

In order to offer specialized and market-specific solutions, Freudenberg Sealing Technologies is organizationally divided into independently operating market segments. From the standard seal to the tailor-made part, the company offers a unique product and service range in all segments – from the process industry to the heavy industry and fluid power applications. The basis of its success are the highly-developed materials and products.

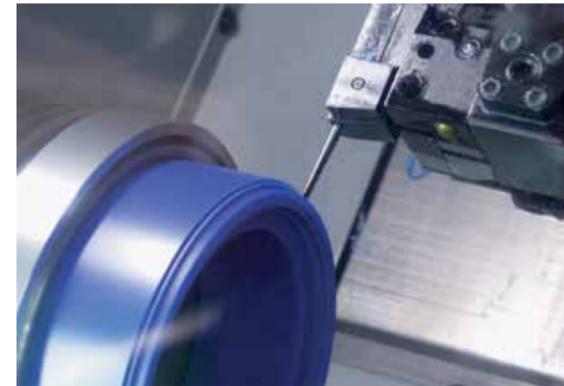
Freudenberg Xpress® is a service provider within Freudenberg Sealing Technologies' dedicated service organization "Freudenberg Industrial Services" that offers an extremely high quality for prototypes, small series and repair demands in the machined sealing market. It provides manufacturing capabilities for machining original Freudenberg profiles and materials as well as sealing products meeting the industrial standard quality. These solutions are the right choice for every industrial segment – fluid power, process industry, heavy industry, agriculture and many more.



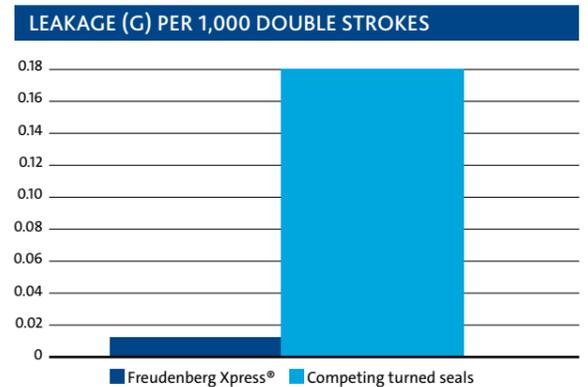
More information can be found at:



FREUDENBERG XPRESS® AT A GLANCE



As part of the Freudenberg Sealing Technologies network, you can benefit directly from more than 170 years of production know-how. The quality of a series product is achieved by using the original Freudenberg materials and profiles as well as best and up-to-date manufacturing technologies. These premium materials are the best solution for highly demanding and safety-critical applications. The very low leakage rate shown in the graphic below is a proof for the high-performance sealing solutions.



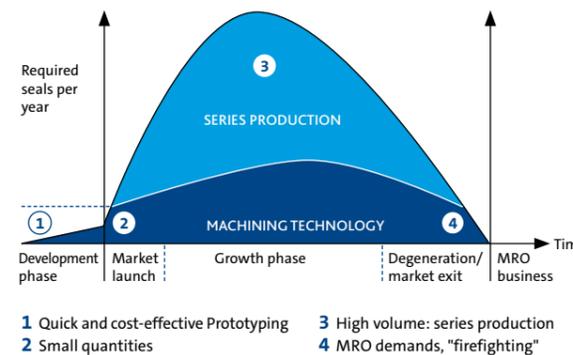
Test conditions: 400 bar (5,800 psi); 100 °C (212 °F); 0.3 m/s; 50,000 double strokes

Numerous studies prove: Freudenberg Xpress® achieves the best leakage values compared to the competition.

When Freudenberg parts need to be replaced in existing systems, you can choose from a wide range of original Freudenberg profiles. For areas where no special technical expertise is needed, a portfolio of catalog parts is available.

Prototyping, spare parts, small series and many more – as your service provider Freudenberg Xpress® supplies you with cost-effective high-quality sealing solutions. Freudenberg Xpress® minimizes your downtime and maximizes your flexibility by machining your seals – from standardized parts, complex plastic parts and customer-specific solutions to welded seals and cut-to-size products. Freudenberg Xpress® provides efficient solutions for every part of a product's lifecycle. This includes individual pieces as well as economical small series.

STAGES OF A PRODUCT'S LIFECYCLE



Freudenberg Xpress® offers a global network of local service centers throughout Europe, North America, Asia and Australia – available for you from only a short distance away (see page 38 for further information). These offer you machining technology that makes a fast delivery possible when it comes to urgent needs. If needed and with previous consultation, you can get your seals within 24 hours. Additionally, the service centers offer, for example, the possibility of reverse engineering, FEM simulations and diverse logistic services. A global network of local manufacturing partners completes this offer.

ADVANTAGES AT A GLANCE

- Customized sealing solutions
- Original Freudenberg profiles and materials as used in serial production
- Sealing solutions based on your drawing or Freudenberg-specific ones
- Expert consultation
- Fast delivery for quick maintenance needs
- Economic production of small batches
- Rapid Prototyping

SERVICE OFFER



FLEXIBILITY AND FAST DELIVERIES

The Freudenberg Xpress® production is very flexible. With the help of different production processes, the latest CNC technology and automation, customized solutions as well as catalog parts can be produced. For extremely urgent repair demands, e.g. when a seal fails during the production process, Freudenberg Xpress® offers very fast deliveries – with prior consultation even within 24 hours.



FROM PROTOTYPE TO SMALL SERIES

Without the costly and time-consuming tooling production, Freudenberg Xpress® offers an economic and fast production of prototypes, small series and spare parts. Automated processes, like five billet loaders worldwide, even increase the cost-effectiveness. What's more, the experts at Freudenberg Xpress® have made it possible to use "rapid prototyping" for elastomeric materials, which normally is not applicable.



COMPETENCE

The worldwide team of experts supports you with a profound market, application, material and product expertise. That helps customers to find the best solution for every individual application and for extremely demanding requirements. The experts can even come to your plant and give on-site application consultancy. With the help of a CAD/CAM (computer-aided design/computer-aided manufacturing) system, Freudenberg Xpress® makes an automated processing of 3-D-files possible. Additionally, a seal can be designed with the help of a STEP-file, a PDF drawing, a sample or application data. This process is called reverse engineering.



MARKET-SPECIFIC SERVICES

Once the seals are produced, they can be individually laser-marked or undergo a special washing treatment. Thanks to local production sites, kitting and single packaging of your seals as well as express deliveries are also possible.



HIGH QUALITY STANDARDS

In order to offer highest quality standards to the customer, Freudenberg Xpress® is doing many in-house quality controls in terms of surface, dimensions and treatments. The materials are constantly checked with regard to lifetime and possible leakages. This is complemented by a wide product and material expertise.



LABORATORY AND ENGINEERING ANALYSES

Thanks to its own test laboratories and in-house test plants, Freudenberg Xpress® is able to do FEM analyses, benchmark tests and specific analyses concerning the function and lifetime of the seal.



ONLINE SERVICES

Besides the online shop "EASY" and the integrated Xpress Configurator, Freudenberg Xpress® offers many other online services. In addition, we invest in creating CNC programs for all sites. This guarantees consistently high quality standards for our customers.



ALWAYS INFORMED

The latest Freudenberg Xpress® brochures, flyers and material overviews are provided online. The website also includes helpful information concerning materials, products and services as well as details about the industry segments that Freudenberg Xpress® is active in.

Additionally, you can receive the latest news, like new services or product offerings, in the Freudenberg Xpress® newsletter. Just register online.

In the movie you can get an overview of the Freudenberg Xpress® service – wide material and product portfolio, fast deliveries, global network and many more advantages.



INDUSTRY SEGMENTS

Freudenberg Xpress® offers high-quality sealing solutions for nearly every industrial sector – from the heavy industry and fluid technology area to the process industry, wind energy and many more. The goal is to support the customers with the best possible solution for every individual requirement.

The operating conditions in these industries vary greatly, even within one area. The seals have to withstand, among others, aggressive media, high temperature fluctuations, extreme pressures and harsh weather. In some sectors they have to comply with industry- and country-specific legal requirements.

Safety, reliability and efficiency also play an important role, especially for critical applications in the pharmaceutical, mobility, power, wind energy, food or beverage industries.

SEGMENTS AT A GLANCE

- Distribution
- Fluid Technologies
- Heavy Industry
- Process Industry
- Mobile Machinery
- Mobility
- Power
- Energy



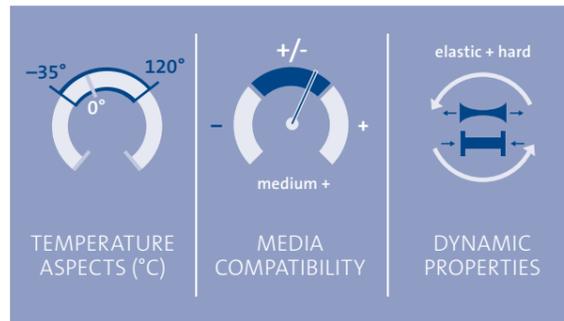
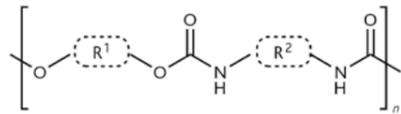
MATERIAL PORTFOLIO

MATERIALS AT A GLANCE

SHORT TERM	QUALITY	AVAILABILITY	PHYSICAL PROPERTY				CERTIFICATION REPORT									
			Color	Temperature range [°C]	Temperature range [°F]	Hardness DIN ISO 7619-1 Shore A and Shore D	FDA	EG (Reg.) 1935/2004	EU (Reg.) 10/2011	GB 4806 & 9685	3-A [®] Sanitary Standard	ADI free	USP Chapter 87	USP Chapter 88	NSF 61	NSF 51
POLYURETHANE																
92 AU 21100	Original Freudenberg material	from stock	●	-50 to +110	-58 to +230	A 92 ± 3										
93 AU V167	Original Freudenberg material	from stock	●	-20 to +110	-4 to +230	A 94 ± 3	+	+	+							
94 AU 30000	Original Freudenberg material	from stock	●	-35 to +120	-31 to +248	A 94 ± 3										
94 AU 925	Original Freudenberg material	from stock	●	-30 to +110	-22 to +230	A 94 ± 3										
94 AU 21730	Original Freudenberg material	from stock	●	-25 to +110	-13 to +230	A 94 ± 3	+	+	+							
95 AU V142	Original Freudenberg material	from stock	●	-30 to +110	-22 to +230	A 94 ± 3										
95 AU 21421	Freudenberg Xpress [®] standard material	from stock	●	-20 to +110	-4 to +230	A 95 ± 3	+	+	+							
95 AU 38588	Freudenberg Xpress [®] standard material	from stock	●	-20 to +115	-4 to +239	A 95 ± 5	+	+								
96 AU 20805	Freudenberg Xpress [®] standard material	on request	●	-20 to +110	-4 to +230	A 96 ± 5										
98 AU 20806	Freudenberg Xpress [®] standard material	on request	●	-30 to +110	-22 to +230	D 55 ± 3										
ELASTOMERIC MATERIALS																
70 EPDM 291	Original Freudenberg material	from stock	●	-40 to +150	-40 to +302	A 70 ± 5	+	+							+	+
85 EPDM 292	Original Freudenberg material	from stock	●	-40 to +150	-40 to +302	A 85 ± 5	+	+								+
75 Fluoroprene [®] XP 41	Original Freudenberg material	from stock	●	-15 to +200	+5 to +392	A 75 ± 5	+	+								+
85 Fluoroprene [®] XP 43	Original Freudenberg material	from stock	●	-15 to +200	+5 to +392	A 85 ± 5	+	+								+
85 VMQ 38493	Freudenberg Xpress [®] standard material	from stock	●	-60 to +200	-76 to +392	A 82 ± 5										
85 VMQ 38068	Freudenberg Xpress [®] standard material	from stock	○	-60 to +260	-75 to +500	A 82 ± 5	+	+								
70 FKM 576	Original Freudenberg material	from stock	●	-15 to +200	+5 to +392	A 70 ± 5										
75 FKM 585	Original Freudenberg material	from stock	●	-30 to +200	-22 to +392	A 75 ± 5										
82 FKM 33991	Freudenberg Xpress [®] standard material	from stock	●	-20 to +200	-4 to +392	A 82 ± 5										
85 FKM 33995	Freudenberg Xpress [®] standard material	on request	●	-20 to +210	-4 to +410	A 85 ± 5										
70 NBR 438	Original Freudenberg material	from stock	●	-25 to +100	-13 to +212	A 70 ± 5	+	+								
80 NBR 38512	Freudenberg Xpress [®] standard material	on request	●	-50 to +110	-58 to +230	A 80 ± 5										
85 NBR 436	Original Freudenberg material	on request	●	-25 to +100	-13 to +212	A 85 ± 5	+	+								
85 NBR 33994	Freudenberg Xpress [®] standard material	from stock	●	-20 to +100	-13 to +212	A 85 ± 5										
90 NBR 38212	Freudenberg Xpress [®] standard material	on request	●	-30 to +110	-22 to +230	A 90 ± 5										
82 HNBR 38179	Freudenberg Xpress [®] standard material	on request	●	-30 to +150	-22 to +302	A 82 ± 5	+									
85 HNBR 33993	Freudenberg Xpress [®] standard material	from stock	●	-20 to +140	-4 to +284	A 85 ± 5										
90 HNBR 33996	Freudenberg Xpress [®] standard material	from stock	●	-20 to +115	-4 to +239	A 90 ± 5	+									
PLASTICS AND LAMINATED FABRICS																
PTFE C104	Original Freudenberg material	from stock	●	-200 to +260	-328 to +500	D 60 ± 3										+
PTFE GM 201	Original Freudenberg material	on request	●	-200 to +260	-328 to +500	D 62 ± 3										
PTFE W FLON	Freudenberg Xpress [®] standard material	from stock	○	-200 to +260	-328 to +500	D 60 ± 3	+		+							+
PTFE G FLON	Freudenberg Xpress [®] standard material	from stock	●	-200 to +260	-328 to +500	D 68 ± 3										
PTFE B FLON	Freudenberg Xpress [®] standard material	from stock	●	-200 to +260	-328 to +500	D 61 ± 3										
PTFE C FLON	Freudenberg Xpress [®] standard material	from stock	●	-200 to +260	-328 to +500	D 64 ± 3										+
PTFE EF FLON	Freudenberg Xpress [®] standard material	from stock	●	-200 to +260	-328 to +500	D 57 ± 3	+	+								
PTFE GF FLON	Freudenberg Xpress [®] standard material	on request	○	-200 to +260	-328 to +500	D 60 ± 3										+
PTFE GR FLON	Freudenberg Xpress [®] standard material	on request	●	-200 to +260	-328 to +500	D 60 ± 3										
PEEK 23310	Freudenberg Xpress [®] standard material	on request	●	-50 to +250	-58 to +482	D 83 ± 3	+		+							
POM 23023	Freudenberg Xpress [®] standard material	from stock	○	-45 to +100	-49 to +212	D 85 ± 3										
PA 23013	Freudenberg Xpress [®] standard material	from stock	○	-40 to +100	-49 to +212	D 83 ± 5										
HG 517	Original Freudenberg material	from stock	●	-40 to +120	-49 to +248	D 62 ± 3										
PE 23200	Freudenberg Xpress [®] standard material	on request	○	-200 to +80	-328 to +176	D 61 ± 3	+									

POLYURETHANE

PU, TPU | GENERAL PROPERTIES



Thermoplastic polyurethane (TPU) is produced by a polyaddition reaction of difunctional diisocyanates with divalent alcohols or polyols. This reaction creates a urethane bond, being the reason for the material's name. Depending on the kind of manufacturing method, the material can be hard and brittle or soft and elastic. It offers a high elasticity as well as a very good mechanical strength and wear resistance. Nevertheless, polyurethane reaches its limits in polar media, lyes and brake fluids. The flexibility stays good even at low temperatures. The material is also extremely resistant to ozone, oxidation, petroleum products and many more. The temperature range for standard versions is from -30 °C to +80 °C. Freudenberg Sealing Technologies has developed a special polyurethane material, 94 AU 30000, which offers a significantly higher service life and withstands a greater range of extreme temperatures (-35 °C to +120 °C).

Areas of application

Polyurethane is a preferred material for hydraulic applications. The Freudenberg compound 94 AU 30000 can be used universally. For example, it is suited to construction and agricultural machinery as well as materials-handling technology. In comparison to other polyurethanes, 94 AU 30000 is also resistant to hydrolysis which makes a use in biochemical applications possible. It can be used at industrial plants worldwide.

Materials available:

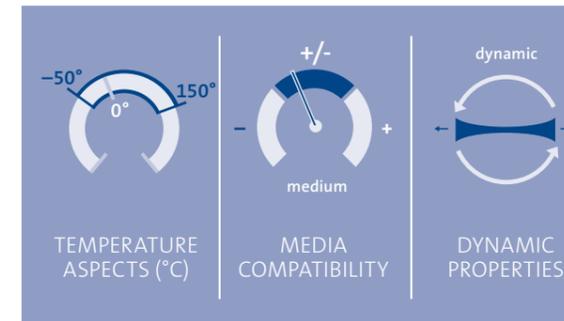
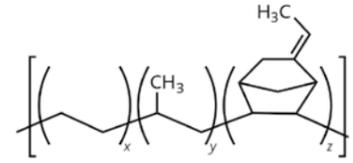
- 92 AU 21100
- 93 AU V167
- 94 AU 30000
- 94 AU 925
- 94 AU 21730
- 95 AU V142
- 95 AU 21421
- 95 AU 38588
- 96 AU 20805
- 98 AU 20806

PROPERTIES AT A GLANCE

- Very good resistance to oil, ozone, oxidation and petroleum products
- Special materials have an excellent temperature resistance from -35 °C to +120 °C
- High tensile strength and elongation at break
- High elasticity
- Very good mechanical strength and abrasion resistance

ELASTOMERIC MATERIALS

EPDM | GENERAL PROPERTIES



EPDM (Ethylene Propylene Diene Rubber Monomer) offers an excellent resistance to water and aqueous systems, polar and oxidative media, brake fluids, the flame-resistant hydraulic fluids HFC and HFD, and many more. It is suitable for high and low temperatures as well as for use in hot water, steam, acids and alkaline solutions. The material cannot be used in pure fats, oils, non-polar solvents, gasoline and hydrocarbons.

Areas of application

EPDM can be used for almost all sealing products. With a share of about 70%, it is the most widely used material for the food and beverage production and processing – especially the peroxide-cured types. Certain EPDM-materials conform with different industry-specific legal requirements, such as those of the FDA (Food and Drug Administration), EU (Reg.) 1935/2004 and USP Class VI. This is why the material is not only recommended for the food and beverage but also for the pharmaceutical industry. Due to its heat and weathering resistance, EPDM is also a preferred material for the construction sector. Additionally, it is widely used in washing machines and dishwashers as well as in plumbing fittings. It is also available for products in the energy sector, such as cables, and the building engineering area, e.g. for a lot of window seals in buildings.

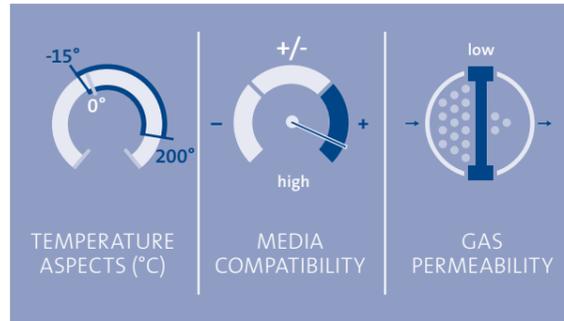
Materials available:

- 70 EPDM 291
- 85 EPDM 292

PROPERTIES AT A GLANCE

- Very good resistance to aging, ozone, light, water, polar and oxidative media
- Wide temperature range from approx. -50 °C to +150 °C
- Good tensile elongation and strength
- High abrasion resistance
- Good elastic behavior

FLUOROPRENE® XP | GENERAL PROPERTIES



Areas of application

Fluoroprene® XP makes a replacement of EPDM, VMQ and FKM materials possible in applications with foodstuffs and pharmaceuticals. The amount of necessary materials can thus be reduced significantly. Fluoroprene® XP is a universal solution for many different areas of application. It is the preferred material for extreme CIP/SIP cleaning processes. The properties of Fluoroprene® XP make it particularly suitable for use in dairy applications as well as filling machines with different flavorings. The uncompromising purity of the material makes it also the material of choice for pharmaceutical applications, such as valves or mixers.

Materials available:

- 75 Fluoroprene® XP 41
- 85 Fluoroprene® XP 43

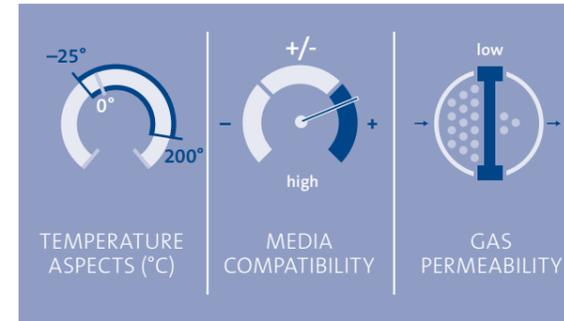
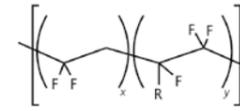
Fluoroprene® XP is a highly fluorinated sealing material, developed by Freudenberg Sealing Technologies, that narrows the gap to a perfluoroelastomer. It offers very good temperature, ozone, weathering, aging, oxygen and CIP/SIP resistance. Fluoroprene® XP combines an ability to withstand fatty media with a high resistance to water vapor. Its excellent behavior in polar as well as non-polar media makes it an all-rounder for many different applications, especially in the process industry. Since it hardly absorbs any flavorings at all, it is the ideal material when it comes to preventing flavor transfer. Additionally, it offers an impressively long service life at an attractive price level.

PROPERTIES AT A GLANCE



- Very good resistance to aging, ozone, weathering, oxygen, oils and fats
- Resistant to polar as well as non-polar media (also CIP/SIP cleaning media)
- Excellent temperature resistance up to +200 °C (also in steam)
- Low gas permeability

FKM | GENERAL PROPERTIES



Areas of application

FKM is suitable for petroleum production, chemical applications, the aerospace sector and many other industries. Due to its high media resistance it is also a good choice for the food and specific parts of the pharmaceutical industries. For highly sensitive applications in these areas it is very important to contact our material experts in advance. In the general industry the material is ideal wherever there are high rotational speeds and high temperatures. This occurs, for example, in pumps and transmissions.

Materials available:

- 70 FKM 576
- 70 FKM 585
- 82 FKM 33991
- 85 FKM 33995

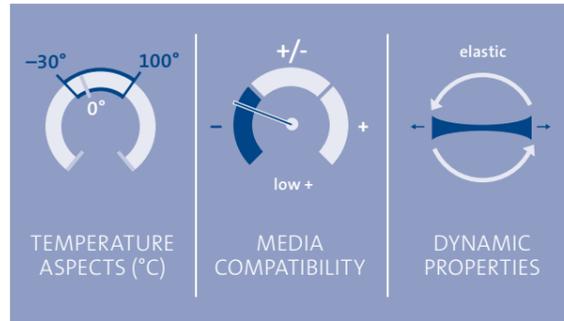
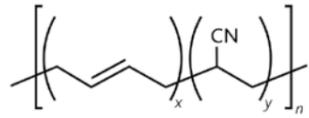
FKM (Fluororubber) is made of highly fluorinated hydrocarbons. It shows very good resistance to ozone, aging, fuels, petroleum-based oils, greases, aliphatic and aromatic hydrocarbons, whereas in polar solvents, formic and acetic acid, glycol-based brake fluid, ammonia gas, amines, alkalis and superheated steam it reaches its limits. Due to the fact that FKM is based on copolymers, terpolymers and tetrapolymers with varying fluorine content, the material can be precisely designed for specific requirements. The temperature range reaches from a minimum of -25 °C to a maximum of +200 °C.

PROPERTIES AT A GLANCE



- Very good resistance to aging, ozone, weathering, oxygen, various types of oils, different kinds of fats and non-polar media
- Excellent temperature resistance from -25 °C to +200 °C
- High chemical stability
- Low gas permeability

NBR | GENERAL PROPERTIES



Areas of application

As one of the most important sealing materials in the engineering sector, NBR is very suitable for applications with mechanical stress as well as for oils, fats, waxes and fuel. These conditions often appear in the heavy and mobility industry. Due to its resistance to fatty media and abrasion, the material is also used for certain applications in the process industry. Thanks to the low gas permeability, NBR contributes to the environmental protection and offers a high safety in these critical areas.

NBR (Nitrile Butadiene Rubber) is a synthetic rubber that is fabricated through the co-polymerization of acrylonitrile (ACN) and 1.3-butadiene. The attributes of NBR, such as media resistance and low-temperature flexibility, mainly depend on the proportion of ACN. The material offers a good resistance to oils, greases, silicones, hydraulic fluids (HFA, HFB and HFC) and aliphatic hydrocarbons (propane, butane, gasoline and diesel fuel). On the other side, it displays only low resistance to polar media, glycol-based brake fluid, super-heated steam, HFD pressure fluids, ultraviolet light and ozone. It is a highly elastic material which exhibits a good deformation behavior. Furthermore, it convinces with a low gas permeability.

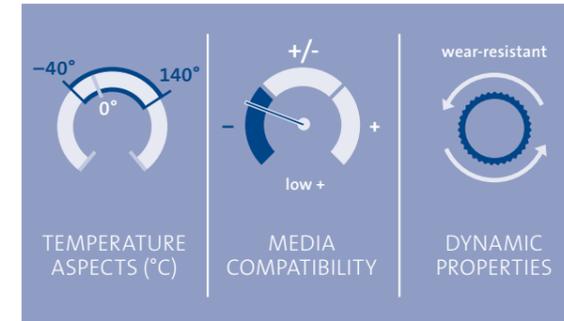
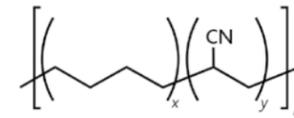
Materials available:

- 70 NBR 438
- 80 NBR 38512
- 85 NBR 33994
- 85 NBR 436
- 90 NBR 38212

PROPERTIES AT A GLANCE

- Very good resistance to different kinds of oils, greases, silicones, hydraulic fluids, aliphatic hydrocarbons and fuels
- Very good abrasion resistance
- Good behavior in diluted acids and alkaline solutions at room temperature
- High elasticity and good deformation behavior
- Temperature resistance between -30 °C and +100 °C
- Low gas permeability

HNBR | GENERAL PROPERTIES



Areas of application

The properties of HNBR make it not only a good choice for the heavy industry. The material is also used in other applications where a resistance to high temperatures, mechanical strength and good media resistance (e.g. to CIP/SIP cleaning agents and especially fats) are necessary. For example, in the process industry there are various options for usage – from dairy applications to breweries and beverage production.

HNBR (Hydrogenated Nitrile Rubber) is produced through full or partial hydrogenation of NBR by removing the reactive double bonds. This prevents the molecule chain from reacting to oxygen easily, and makes HNBR more heat-oxidation- and wear-resistant than NBR. The material is also resistant to different kinds of media, such as fats, steam, hot and ultrapure water. Furthermore, it shows very good mechanical stability. Its temperature range reaches from -40 °C to +140 °C.

Materials available:

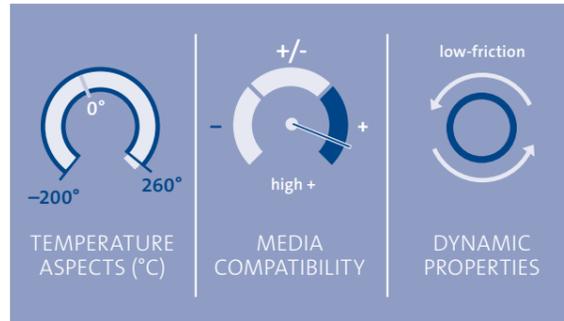
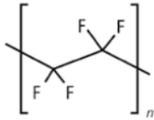
- 82 HNBR 38179
- 85 HNBR 33993
- 90 HNBR 33996

PROPERTIES AT A GLANCE

- Very good resistance to fats, steam, hot and ultrapure water
- Excellent heat, oxidation and mechanical stability
- Very high abrasion resistance
- Wide temperature range from approx. -40 °C to +140 °C

PLASTICS AND LAMINATED FABRICS

PTFE | GENERAL PROPERTIES



Areas of application

PTFE is the ideal material for use in dynamic sealing solutions, such as pumps or gears. It is suitable when aggressive media are part of the process, for example, in the chemical industry. Due to the conformity with different legal requirements, e.g. those of the FDA (Food and Drug Administration) or the BfR (German Federal Institute for Risk Assessment), as well as the extreme purity, selected variants are also a preferred solution for the food, beverage and pharmaceutical industries.

PTFE (Polytetrafluoroethylene) is made of a strong bond between carbon and fluorine atoms, and is unable to react with other materials. Its chemical resistance is nearly universal. It withstands many different polar and non-polar media, such as gasoline, acids, alcohols, water, lyes and brake fluids. PTFE only reaches its limits in strong reducing or oxidizing agents and under high energy radiation. The high-performance plastic offers an extremely wide temperature range from -200 °C to +260 °C. It is barely elastic and tends to creep, especially at temperature increases, but offers a high hardness. Another advantage is the lack of stick-slip effect. PTFE slides on PTFE almost as well as wet ice on wet ice. In order to further improve the properties of the material, it can be mixed with various additives, such as glass fiber, carbon or bronze.

Materials available:

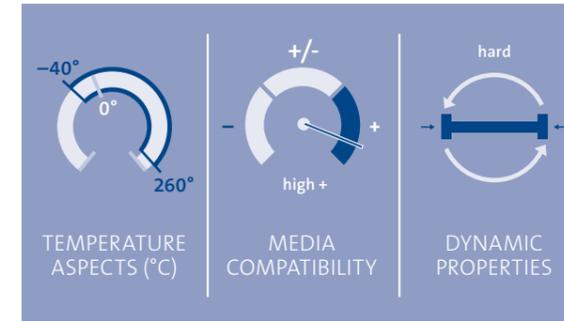
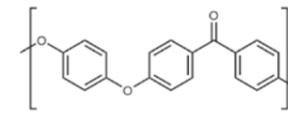
- PTFE B602
- PTFE C104
- PTFE GM 201
- PTFE GF FLON
- PTFE GR FLON
- PTFE W FLON
- PTFE G FLON
- PTFE B FLON
- PTFE C FLON
- PTFE EF FLON

PROPERTIES AT A GLANCE



- Almost universal resistance (e.g. to gasoline, acids, alcohols, water, lyes, brake fluids, oils and ketones)
- Extremely wide temperature range from -200 °C to +260 °C
- High hardness
- Very low friction coefficient

PEEK | GENERAL PROPERTIES



Areas of application

PEEK is constantly growing in popularity. It is often used in hot water or steam environment. Due to its high chemical and temperature resistance, it is especially suited for process industry applications. Selected material variants also have conformities for the food and beverage industry. Additionally, PEEK is a good choice for gears, compressor and pump components, drives, valves and many more. As the material is not elastic, it is only of limited use for seals. Nevertheless, it is very suitable for the production of back-up rings for O-rings under high pressure, for thrust rings and for v-packing support rings.

While the almost universal chemical resistance of PEEK (Polyetheretherketone) is close to that of PTFE, it shows improved mechanical properties. PEEK offers a wide temperature range with a continuous operating temperature of -40 °C to +260 °C. This makes it one of the most robust thermoplastic materials in terms of temperature resistance. Just like PTFE, the characteristics of PEEK can be further improved by using different fillers, like, for example, glass or carbon fibers. One big advantage in comparison with PTFE is the possibility of injection molding as production method.

Materials available:

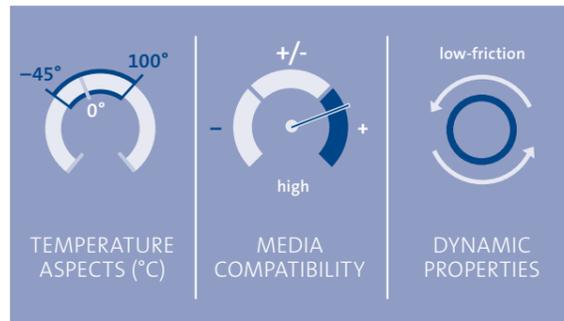
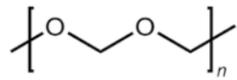
- PEEK 23310

PROPERTIES AT A GLANCE



- Almost universal chemical resistance
- Extremely wide temperature range from approx. -40 °C to +260 °C
- High hardness

POM | GENERAL PROPERTIES



Areas of application

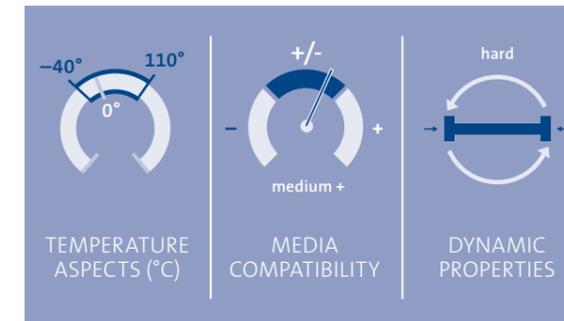
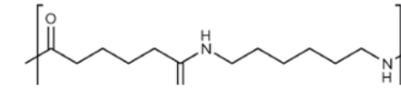
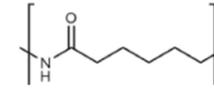
POM can be used for a wide range of engineering applications. It is especially suited for spring elements, as it offers a good resilience even with repeated stresses. Due to its low water absorption and high chemical resistance, some material variants with conformities are predestined for use in the food and beverage industry.

Materials available:

- POM 23023

POM (Polyoxymethylene) offers a high rigidity and hardness as well as a low friction coefficient. Its dimensional stability is also very good. It offers high strength and stiffness and a low tendency to creep. These properties are maintained over a wide range of temperatures (approx. -45 °C to +100 °C). Besides a high abrasion resistance, the material shows a good chemical resistance and a low water absorption.

POLYAMIDE | GENERAL PROPERTIES



Areas of application

Due to its high strength, PA is suitable for mechanical elements, such as gears, friction bearings or guide rails. In this area it is mostly used for back-up rings for a wide variety of sealing elements. Furthermore the material is a good choice for chemical applications as it shows a very good resistance to different chemical media.

Materials available:

- PA 23013

Polyamide (PA) is a family of amides, like, for example, PA 6, PA 66 and PA 46. Mostly, it is a semi-crystalline thermoplastic polymer. It stands out for its high wear resistance, good damping capacity and emergency running properties. It shows a low tendency to creep as well as a good friction behavior and mechanical strength. This means, it offers a high rigidity and durability. These properties can be further improved by adding fillers, such as glass or carbon fibers. Additionally, the material is resistant to different chemical media, and convinces with a low water absorption as well as a wide temperature range from -40 °C to +110 °C.

PROPERTIES AT A GLANCE



- Very good wear resistance
- Very good friction behavior
- Low water absorption
- High media resistance (e.g. to acids, diluted lyes, oils and greases)

PROPERTIES AT A GLANCE



- High mechanical strength (rigidity, durability)
- Very good wear resistance and friction behavior
- Good damping power and emergency running properties
- Good dry running properties
- Low tendency to creep
- Excellent media resistance
- Wide temperature range from approx. -40 °C to +110 °C

LAMINATED FABRIC GENERAL PROPERTIES



Laminated fabric is a fiber-plastic-composite that is able to withstand different aggressive media. Besides its very good wear and temperature resistance (approx. -40 °C to +120 °C) it offers a very high durability, flexibility and electrical insulating. Additionally, the material offers an outstanding friction behavior showing nearly no stick-slip-effect.

Areas of application

Due to its very good chemical and dynamic properties, laminated fabric is suitable for many different challenging applications. It is mostly used for guiding elements in the heavy industry, for example in hydraulic cylinders.

Materials available:

- HG 517

PROPERTIES AT A GLANCE

- Excellent wear and temperature resistance
- Very high durability
- Electrical insulating
- Very good media resistance
- High flexibility
- Favorable friction behavior
- Wide temperature range from approx. -40 °C to +120 °C



POLYETHYLENE GENERAL PROPERTIES



Polyethylene (PE) is a semi-crystalline thermoplastic material that shows a very good wear resistance and friction behavior as well as good isolation properties. It is able to withstand different media, such as acids, diluted lyes, oils and greases. Additionally, PE offers a low water absorption, which makes it a suitable material for the process industry. The temperature range is from approx. -200 °C to +80 °C.

Areas of application

PE is mostly used for applications in the process industry. There, it is an especially good choice for the food sector as its water absorption is extremely low. In addition, it is a suitable material for the agricultural industry.

Materials available:

- PE 23200

PROPERTIES AT A GLANCE

- Very high wear resistance
- Excellent friction behavior
- Low tendency for a stick-slip-effect
- Very good isolation properties
- Low water absorption
- High media resistance (e.g. to acids, diluted lyes, oils and greases)
- Higher flexibility than other thermoplastics, like for example PA, POM and PEEK



STORAGE CONDITIONS FOR SEALS

GENERAL PRINCIPLES

The physical properties of seals made of elastomeric materials and technical plastics can change during long-term storage. Due to the aging process, surface changes can sometimes lead to defects. Measures can be taken to minimize influencing factors such as humidity, heat, light, oxygen and ozone. These are laid down in international standards, such as ISO 2230.

STORAGE DURATION

Different types of sealing materials have different storage and service lives. It is important to check the materials after these periods. If there is no damage, the storage time can be extended. Depending on the geometry, pre-assembled parts must be checked at least every six months. To achieve the longest possible service life for seals, they should be stored and shipped in packaging made of PE-coated wrapping paper, aluminum foil or opaque PE film.

MATERIAL	STORAGE TIME	EXTENSION
PTFE	15 years	5 years
PA, POM, PE	10 years	5 years
FKM, EPDM, Fluoroprene® XP	10 years	5 years
NBR, HNBR	7 years	3 years
AU	5 years	2 years

INFLUENCE FACTORS



HUMIDITY

No condensation is to be allowed to occur in storage rooms for seals. A relative humidity of less than 70 % is ideal.



METALS

Some metals can have critical effects on elastomers and technical plastics in certain situations.



TEMPERATURE

Sealing materials should be stored at a temperature of +5 °C to +25 °C. Parts should not be exposed to sources of heat or cold, to prevent stiffening, for example.



NON-METALS

Seals made of different materials should be stored separately. Contact with PVC should also be avoided. This often contains harmful plasticizers.



LIGHT

Direct sunlight and artificial ultraviolet light are harmful to sealing materials. It is therefore important to use UV-protected bags for packaging.



CLEANING

The use of chlorinated solvents for cleaning should be avoided. Instead, small amounts of denatured alcohol and water are preferable.



OXYGEN AND OZONE

Airtight packaging can protect the seals from harmful oxygen and ozone.



CHANGE OF SHAPE

During storage and transport, care should be taken to ensure stress-free packaging to prevent possible deformation and ozone cracks in the seals.



GREASES

It is recommended that you protect the materials from contact with incompatible greases. These can lead to swelling.



RADIOACTIVE RADIATION

Protection against radioactive radiation is important to prevent possible damage to the seals.



LIQUIDS

Contact with liquids, such as solvents, must be avoided.



PRODUCT PORTFOLIO

CATALOG PARTS



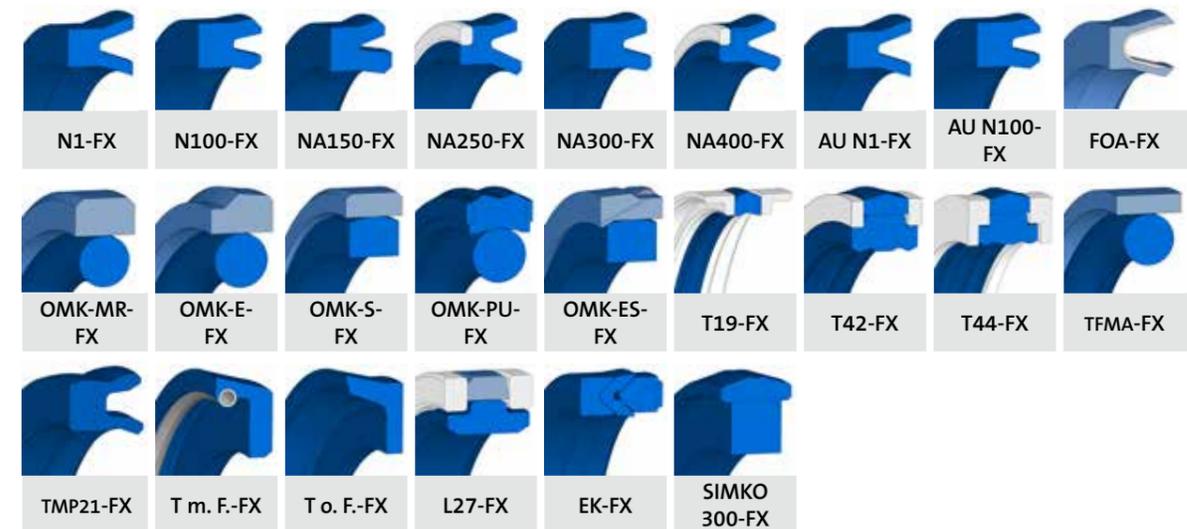
PISTON SEALS

Piston seals are used for sealing the piston against the cylinder wall in pneumatic and hydraulic cylinders. This guarantees that the cylinder tube moves reliably with least possible friction and no drift and prevents the fluid from leaving the application. Piston seals from Freudenberg Xpress® meet high quality standards and offer a long lifetime. With their high functionality they are suitable for various requirements in all kinds of industry sectors.

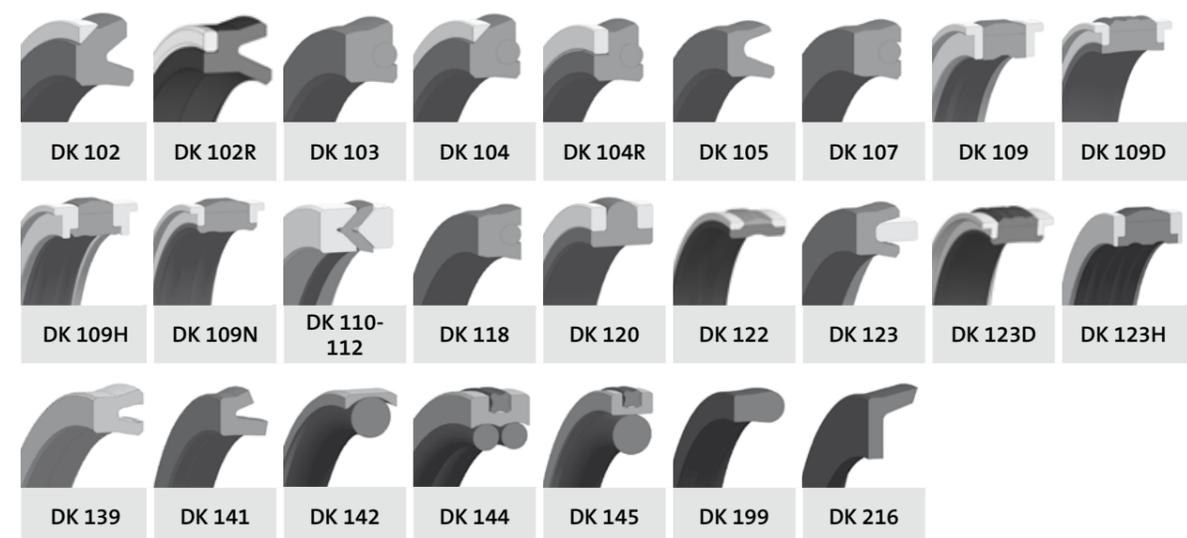
ADVANTAGES AT A GLANCE

- Minimum friction and no drift
- Long lifetime
- High functionality
- Suitable for different industry sectors

ORIGINAL FREUDENBERG PROFILES



FREUDENBERG XPRESS® STANDARD PROFILES



Additional profiles on demand

ROD SEALS



Rod seals are used for sealing the reciprocating movements of the cylinder rods in pneumatic and hydraulic cylinders. They ensure that the operating medium stays within the cylinder and thus prevent contamination. Freudenberg Xpress® offers rod seals with a high efficiency and long lifetime, making them a good choice for various industries.

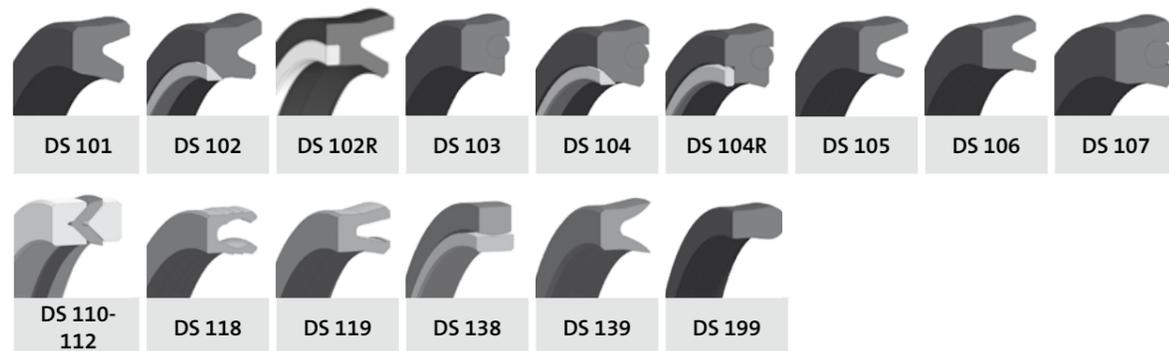
ADVANTAGES AT A GLANCE

- High efficiency
- Long lifetime
- Suitable for different industry sectors

ORIGINAL FREUDENBERG PROFILES



FREUDENBERG XPRESS® STANDARD PROFILES



Additional profiles on demand

ROTARY SEALS



There are different kinds of rotary seals, which are used for reliably sealing axles and shafts under high pressure and with very good seal tightness. For example, the task of a radial shaft seal is to seal a rotating shaft against the housing of an assembly. Providing a static and dynamic sealing function at the same time it is suitable for different industry sectors, such as the heavy, agricultural or process industries.

ADVANTAGES AT A GLANCE

- Very good seal tightness
- Withstand high pressure loads
- Easy to assemble
- Suitable for different industry sectors

ORIGINAL FREUDENBERG PROFILES



FREUDENBERG XPRESS® STANDARD PROFILES



Additional profiles on demand

WIPERS

In different challenging applications, wipers reliably protect the inside of the cylinder in pneumatic and hydraulic cylinders from contamination. Freudenberg Xpress® offers wipers with a very long lifetime. The portfolio also includes customized products and double wipers. These are available with or without metal reinforcement or pressure relief.

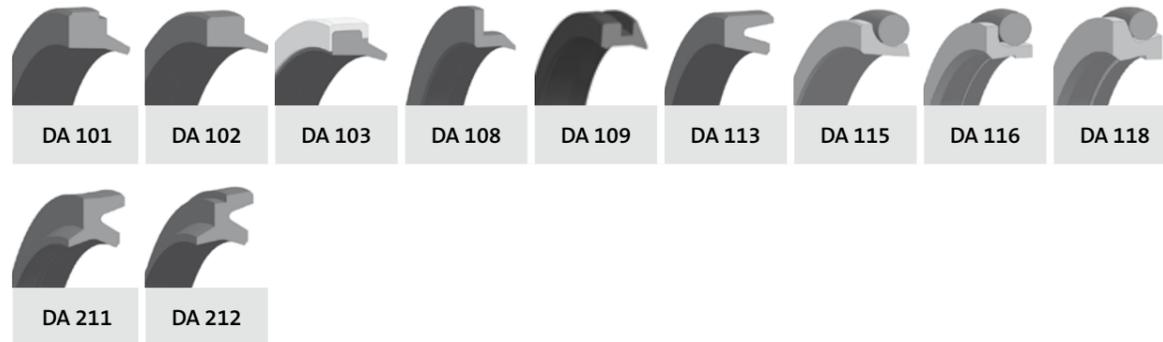
- ADVANTAGES AT A GLANCE**
- Customized versions available
 - With or without metal reinforcement or pressure relief
 - Long lifetime
 - Suitable for different industry sectors



ORIGINAL FREUDENBERG PROFILES



FREUDENBERG XPRESS® STANDARD PROFILES



Additional profiles on demand

GUIDES

Guides are used for guiding rods and pistons in pneumatic and hydraulic cylinders to ensure a distance between these and the metallic cylinder housing. Depending on the load, a wide range of materials can be suitable – PTFE, PA, laminated fabric etc. Guides from Freudenberg Xpress® are able to withstand high transverse forces and provide the advantage of a good durability and reliability. The portfolio includes guide rings and guide bands.

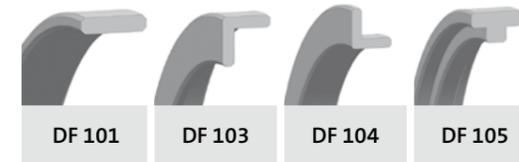
- ADVANTAGES AT A GLANCE**
- Various materials available
 - Good durability and reliability
 - Withstand high forces



ORIGINAL FREUDENBERG PROFILES



FREUDENBERG XPRESS® STANDARD PROFILES



Additional profiles on demand

BACK-UP RINGS



In order to prevent gap extrusion, leakages in the machines or damages of the seals, back-up rings support radially sealing O-rings. This makes a use of O-rings possible for different applications with various shapes. Back-up rings from Freudenberg Xpress® are available in diverse materials, such as PTFE, POM, PA, PEEK and Polyurethane. This makes them suitable for different industry sectors.

ADVANTAGES AT A GLANCE

- Various materials available
- Support of radially sealing O-rings
- Suitable for different industry sectors

STATIC RINGS



With the help of static rings, dynamic applications as well as static machine parts are sealed against liquids and gases. The application area is very diverse. As the products can be optimized in different ways, they are suited to nearly every industry sector. Even though the classic static ring in form of an O-ring is round, it is also available in other shapes, like X-rings. Static rings can be produced in various materials, such as NBR, EPDM, Fluoroprene® XP or FKM. Freudenberg Xpress® offers different shore hardnesses, down to 70 Shore A. The portfolio of Freudenberg Xpress® includes ISO3601-certified O-rings in various sizes – standardized in conformity with different norms, such as DIN 11864 for pipe connections, or intermediate.

ADVANTAGES AT A GLANCE

- Available in different sizes and shapes
- Various materials available
- Suitable for nearly all industry sectors

ORIGINAL FREUDENBERG PROFILES



SPR-FX



PU82-FX



PU83-FX

FREUDENBERG XPRESS® STANDARD PROFILES



DST 108



DST 109



DST 111



DST 113



O-Ring



X-Ring



DFL 108

Additional profiles on demand

Additional profiles on demand

CUSTOMER-SPECIFIC SOLUTIONS

“EVERYTHING IS POSSIBLE”

Some complex applications with special operating conditions require customized sealing solutions with individual sizes and design. This makes a precise match to the respective application possible. A tailor-made seal can be produced by either modifying a standard component, like an O-ring, or by designing a completely new solution. In order to comply with the Hygienic Design Standards and prevent dead spaces or microfilms, special adjustments are possible. The materials can vary greatly – from elastomers like EPDM, Fluoroprene® XP or NBR to high-performance plastics such as PTFE or PEEK. At Freudenberg Xpress® customized sealing solutions up to 2,500 mm can be machined. The portfolio of Freudenberg Xpress® also includes flat gaskets in different materials, dimensions and thicknesses.



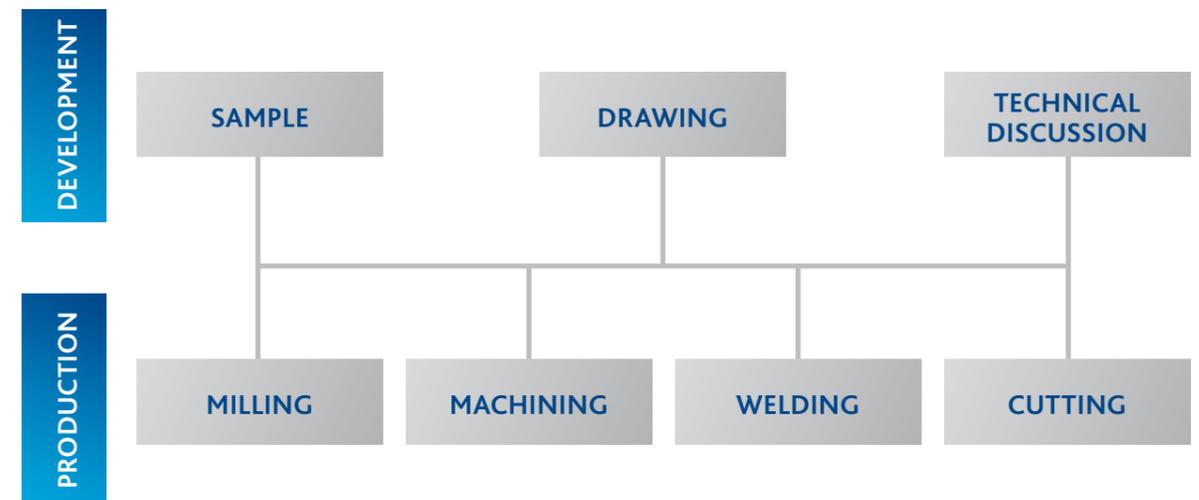
The Freudenberg Xpress® service is the solution when the manufacturing of a series tool is too expensive or not possible because of the special design of the seal. A sample or drawing is enough for the experts to develop a seal according to your individual needs. This makes prototyping easier and faster. The samples or sometimes even the first small series are available for use in the respective machines in a very short time.

Additionally, an in-house test plant makes a range of technical tests possible during the sampling phase. A competent consulting during the whole development process is also provided. The team of experts even visits your plant in order to get the best possible impression of your applications and requirements.

ADVANTAGES AT A GLANCE

- Unique machining and milling methods make the realization of individual designs possible
- Cost-effectiveness and faster production due to missing tooling costs
- Faster and easier prototyping
- Production based on a drawing or sample possible
- Various dimensions and materials available
- Highly competent consulting and testing service

DEVELOPMENT AND PRODUCTION PROCESS



MERKEL RADIAMATIC® RPM 41



WELDED SEALS



With the innovative Merkel Radiamatic® RPM 41, Freudenberg Xpress® offers an optimized customer-specific sealing solution for work rolls in steel mills. It is made of a specially developed NBR-material with integrated steel element, offering very good resistance to oil and fatty media.

The sealing lip, which is made of pure elastomer, does not need any spring support. The clamping part enables additional outside lubrication by featuring radial and circumferential grooves. Due to an integrated reinforcing element, it provides a self-retaining fit. With the Merkel Radiamatic® RPM 41, minimized friction and a maximum sealing effect can be guaranteed. Dimensions of 200 to 1,000 mm are available for the below listed profiles at short notice.

AVAILABLE PROFILES

S [mm]	L [mm]	S [mm]	L [mm]
15.0	16.0	25	16
19.1	16	25	18
19.1	18	25	20
20	16	25	22
20	18	25	25
20	20	30	30
22	20	32	25

ADVANTAGES AT A GLANCE

- Customized sealing solution
- Original Freudenberg profile and material
- Self-retaining fit
- Optimized wear resistance
- No spring needed
- Very good resistance to oil and fatty media
- Broad portfolio of dimensions available at short notice



For very large sealing profiles welding technology is the optimal production method. Extruded or machined seal profiles are the basis here. Using this process even profiles with a diameter of 20 meters or more can be produced. Besides standard profiles, customized solutions are possible.

Freudenberg Xpress® provides you with welded TPU seals in nearly every dimension – very fast and meeting highest quality standards. These TPUs are original Freudenberg materials and suitable for a wide range of different temperatures and media. Thanks to a specially developed advanced welding technology, the welded seams are of extremely high quality. This ensures a long lifetime and excellent mechanical properties.

ADVANTAGES AT A GLANCE

- Original Freudenberg materials
- Advanced and automated production process
- Specially developed welding technology makes high-quality seams possible
- Very large dimensions available
- Long lifetime and outstanding mechanical properties despite the weld seam
- Customized versions available



MARKET-SPECIFIC SOLUTIONS

HEAVY INDUSTRY

Pressures of up to 2,500 bar or aggressive media are only some of the many challenging conditions in the heavy industry. This makes especially durable and reliable customized sealing solutions necessary.

The portfolio of Freudenberg Xpress® for the heavy industry includes ten product lines based on original Freudenberg designs and made from original Freudenberg materials. These can be produced as endless, cut-to-size or precision-joined version. While the basic rings come from series production, the guide belts and v-seal set packings are delivered as open versions, after being cut-to-size. Thanks to a specially developed joining method from Freudenberg individual diameter specifications are possible for wipers, v-seal set packings and radial shaft seals.

ADVANTAGES AT A GLANCE

- Different production methods (continuous, cut-to-size, precision-joined)
- Specially developed joining method makes individual diameter specifications possible
- Various dimensions and materials available
- Highly competent consulting and testing service



PROCESS INDUSTRY

The challenging operating conditions in the process industry include aggressive cleaning and process media as well as extreme temperatures and high pressures. Additionally, sealing solutions in the food, beverage and pharmaceutical sectors have to comply with the Hygienic Design Standards and country-specific legal regulations, such as those of the FDA (Food and Drug Administration) or EU (Reg.) 1935/2004.

Freudenberg Xpress® offers specially developed original Freudenberg materials for the demanding requirements of the different areas of the process industry. They are highly resistant to CIP/SIP (Cleaning in Place/Sterilization in Place) processes using aggressive cleaning agents and water vapor, fatty media, high temperatures and many more. For usage with direct contact to foods and pharmaceuticals the high-performance materials conform to all relevant legal requirements, even the Chinese GB 9685 and GB 4806.

ADVANTAGES AT A GLANCE

- Original Freudenberg designs and materials
- Compliance with industry- and country-specific legal requirements
- Highly resistant to aggressive media, extreme temperatures and high pressures
- Various dimensions and materials available
- Highly competent consulting and testing service



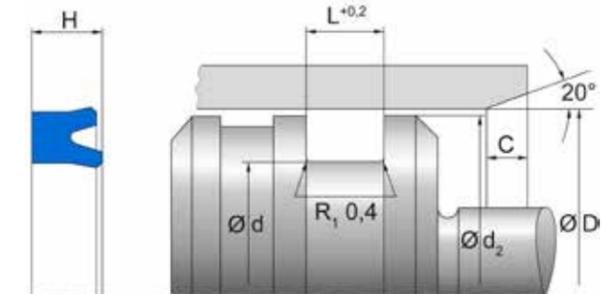


INSTALLATION RECOMMENDATIONS

INSTALLATION RECOMMENDATIONS

PISTON SEALS (EXAMPLE NA300)

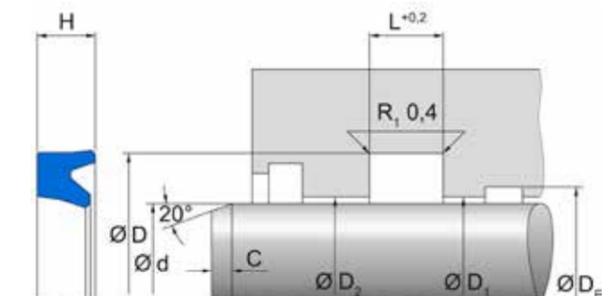
SURFACE ROUGHNESS	R_{Max}	R_a
Running surface	$\leq 2.5 \mu m$	0.05-0.3 μm
Bottom of groove	$\leq 6.3 \mu m$	$\leq 1.6 \mu m$
Sides of groove	$\leq 15 \mu m$	$\leq 3 \mu m$



Download the installation videos!

ROD SEALS (EXAMPLE T20)

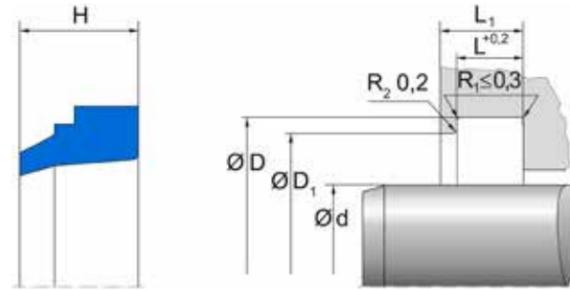
SURFACE ROUGHNESS	R_{Max}	R_a
Running surface	$\leq 2.5 \mu m$	0.05-0.3 μm
Bottom of groove	$\leq 6.3 \mu m$	$\leq 1.6 \mu m$
Sides of groove	$\leq 15 \mu m$	$\leq 3 \mu m$



Download the installation videos!

WIPERS (EXAMPLE ASOB)

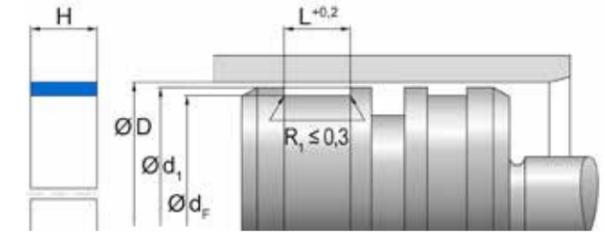
SURFACE ROUGHNESS	R_{Max}	R_a
Running surface	$\leq 2.5 \mu m$	0.05-0.3 μm
Bottom of groove	$\leq 6.3 \mu m$	$\leq 1.6 \mu m$
Sides of groove	$\leq 15 \mu m$	$\leq 3 \mu m$



Download the installation videos!

GUIDES (EXAMPLE KB)

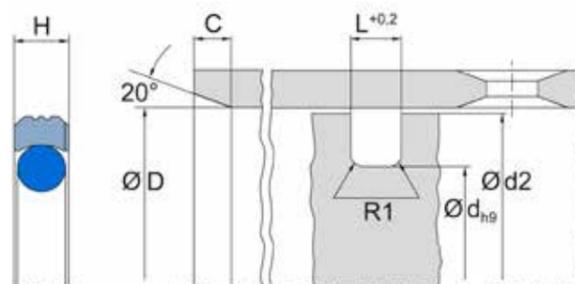
SURFACE ROUGHNESS	R_{Max}	R_a
Running surface	$\leq 2.5 \mu m$	0.05-0.3 μm
Bottom of groove	$\leq 6.3 \mu m$	$\leq 1.6 \mu m$
Sides of groove	$\leq 15 \mu m$	$\leq 3 \mu m$



Download the installation videos!

RADIAL SHAFT SEALS (EXAMPLE M16)

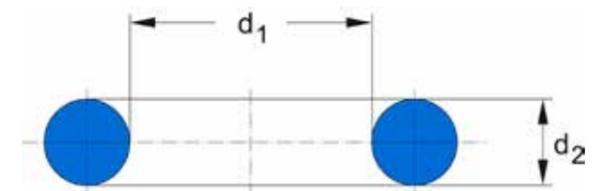
SURFACE ROUGHNESS	R_{Max}	R_a
Running surface	$\leq 2.5 \mu m$	0.6 μm
Bottom of groove	$\leq 15 \mu m$	$\leq 4 \mu m$



Download the installation videos!

O-RINGS

The O-ring Configurator helps you to find the right O-ring for your application. In order to define the relevant data, such as media selection, groove position and design space, the online assistant guides you through different steps and choices.



Try the O-ring Configurator!

FREUDENBERG XPRESS® LOCATIONS

NOTES



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NORTH AMERICA

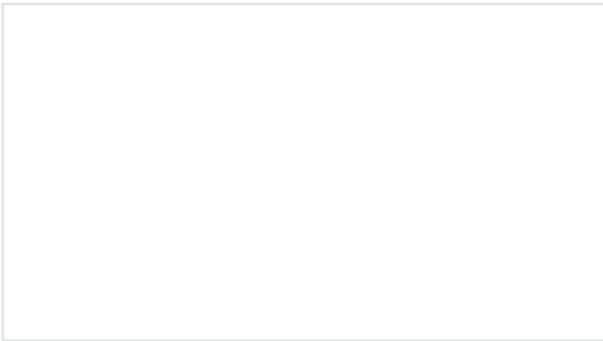
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