C. OTTO GEHRCKENS
SEAL TECHNOLOGY

Elastomer seals

Pharmaceutical industry, food, bio and medical technology

COG.de/en

For our customers' advantage

The world's largest O-ring warehouse

COG is your independent manufacturer and leading supplier of precision O-rings and elastomer seals. As an owner-managed family business now in its fifth generation, we draw on more than 150 years' expertise. Because only with in-depth knowledge of the subject can we respond to our customers' complex requirements – and satisfy you with our solutions.

Our dialogue with you forms our central focus. Your wishes and challenges provide our impetus. At the same time, our experience in the development and manufacture of materials forms the basis for being able to offer you proven products in dependable high quality – And at the same time to notch up innovations that set new standards for your sector.

More than 270 employees are committed to this objective, monitoring the market and tackling relevant topics, in order to be able to rapidly react to new challenges with solutions-based approaches. In addition, delivery capability and flexibility are of highest importance. We serve our customers from the world's largest O-ring warehouse. The manufacture of the smallest series also forms part of our service, in order to realise the perfect product for your requirements.

There's always lots involved. We will assist in your success. And delight you with our unparalleled expertise.

Jan Metzger
Managing Director

Ingo Metzger
Managing Director

Please visit our website ***www.cog.de/en*** *for more information or contact our sealing experts directly.*

COG at a glance

- Founded in 1867 in Pinneberg, near Hamburg
- Owner managed family business employing over 270 staff
- Supplier and independent manufacturer of O-rings and precision seals
- World's largest O-ring warehouse (over 45,000 items kept in stock for immediate delivery)
- State of the art logistics centre for maximum delivery capability
- Tools available for over 23,000 different O-ring dimensions
- Close cooperation with leading manufacturers of raw materials
- Approvals/certifications for a wide variety of materials, including among others DVGW, NORSOK Standard M-710, ISO 23936-2, BAM, FDA, USP, 3-A Sanitary Standard, BfR, Elastomer Guideline, NSF/ANSI and many more
- Our own mixing and compound development facilities
- Our own toolshop
- COG's technology centre for material development
- Quality management to DIN EN ISO 9001
- Environmental management to DIN EN ISO 14001
- Climate-neutral business operations according to PRIMAKLIMA

Sustainability plays an important role at COG:
For many years we have been working successfully on minimizing the environmental impact and were one of the first companies in the industry to receive the "climate-neutral business operation" certification in 2020.

Content

Sensitive areas require special seals

The use of seals in equipment used in the bio-technology, medical technology, pharmaceutical and food processing industries presents some of the most challenging applications for seal technology. The seals used in these applications need to fulfil extremely specific conditions that conventional seal materials cannot meet. Furthermore, the materials used must also possess the relevant compulsory approvals and certifications.

Our expertise to help you with your application

The selection of the correct material for applications in the food and pharmaceutical industries, along with their related sectors, therefore presents an enormous challenge. When doing so, not only the unavoidable material certifications must be kept in mind, but many other factors too. Because first of all the materials used for seals must fulfil their primary purpose and provide a secure seal, even though in many cases, several influencing factors play a decisive role. As well as general resistance to the materials being sealed off, the relevant parameters that must be considered also include how the material interacts with others or in certain situations, for example in cleaning or sterilisation processes, with the temperatures used and the material's mechanical properties.

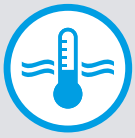
As an O-ring and elastomer seal specialist, COG offers reliable sealing solutions for the widest range of requirements in the demanding and often highly sensitive production areas in the food and pharmaceutical sectors. What our customers can depend on:

- High degree of expertise thanks to decades of experience and knowhow
- Our own development, mixing and manufacturing departments
- The strictest quality assurance procedures, including by external test labs
- Extremely broad range of material certifications
- Comprehensive special services, including for example packing and packaging etc.
See page 25 for more information.

Selecting the correct material

Especially with regard to critical components in machine construction, such as for example the seals, the question of which material to use is often the first that must be addressed. To be on the safe side, developers must often choose an extremely high quality material for the initial installation, for example FFKM. This material demonstrates outstanding resistance to most media – even in the high temperature range – and its physical properties guarantee optimum sealing performance. However, the cost of this material is usually higher than planned, which in certain circumstances can lead to the price of the end product not being competitive. Precise tests are therefore essential when selecting the material, in order to provide the optimum seal solution for the respective application.

Four requirements profiles must be examined before selecting the material:



1. Operating temperature:
At what temperature range will the seal be used in? How high are the minimum and maximum temperatures? Are these temporary peaks or will the seals be continuously exposed to these temperatures?

3. Mechanical properties:
How will the seal be used? Will this be a static seal or a dynamic seal? For dynamic seals: How great is the mechanical stress? How often will the seal be moved? Seldom, regularly or continuously?

2. Chemical resistance:
Which media must the seal be resistant against yet seal perfectly? Will there be interactions, such as for example use in both acids and alkalis? Will oils or grease be used when fitting?

4. Approvals:
Which regulations and approvals apply to the respective production process, which must therefore apply to the seal materials used? As well as meeting material requirements, must the material also comply with the requirements of hygienic design?

Just ask us!

To be on the safe side, we recommend a non-binding consultation with the engineers from our application technology department. Thanks to their years of experience and daily dealings with a wide array of our customers' problems, they are well versed in selecting the appropriate materials. Even at the planning stage, our experts are available to you for development meetings and detailed constructive advice. When selecting the most suitable material, our application technology department even assists you with material research and the required tests.

The type of seal is decisive

As well as selecting the correct material, questions relating to the very best type of seal, such as its construction, geometry, seal size or design of the groove can also be decisive factors. Especially in the food and pharmaceutical sectors, additional high demands are made of system components. Because all materials that come into contact with food or medicinal products as they are being produced must comply with defined standards and certifications, in order to guarantee product safety. In such cases, COG offers a broad spectrum of suitable materials that have the relevant approvals and certifications.

Robust materials for challenging tasks

Due to constantly improving production processes, the requirements in today's food industry are also constantly growing. As well as general resistance to different media, for example for use in fatty media or flavourings and essential oils, many elastomer seals must also be suitable for use in today's CIP (cleaning in place) and SIP (sterilisation in place) procedures.

Specially tested for the food and pharmaceutical industries

In partnership with one of the leading manufacturers of CIP media, COG has subjected various high-performance seal materials for use in the food and pharmaceutical industries to thorough material tests.

These particularly resistant compounds for the use with SIP and CIP applications can be recognized by our symbols. Engineers and users in the food and pharmaceutical industries can rely on having comprehensively tested seals – in the food and pharmaceutical sectors, simply a must when it comes to safety.

The interactions between the media that must be sealed off and the often very aggressive disinfection/cleaning agents, or the hot water vapour used in the sterilisation process, whose temperature can sometimes be over +150 °C, place enormous stress on the materials used. For this reason, many of the elastomer seals used in these applications fail over the course of long-term use. More regular servicing, increased maintenance work or even production downtime are the expensive results.

Clean planning: Hygienic Design

In today's food and pharmaceutical industries, hygienic design is indispensable. This term refers to comprehensive requirements whose aim is to ensure that machines, systems, parts and components are designed and constructed so they are easy to clean. To achieve this, the necessary cleaning processes must be taken into account even when developing and constructing the systems. EU Regulation No 1935/2004 provides the framework for this.

All materials and components that come into contact with foodstuffs must fulfil the requirements of hygienic design. Above all, this stipulates the prevention of areas where deposits that cannot be safely removed by the cleaning processes could build up, and which would therefore endanger the safety of the product. As well as reducing these so-called dead spaces, effective and reliable cleaning of production systems also requires easy-to-clean

The increasing demands of modern production processes

The food and pharmaceutical industries are increasingly making ever-more complex demands of elastomer seals. The shortened production cycles necessary for increased productivity demand quicker cleaning processes, meaning pipelines, valves and pumps etc are cleaned using CIP (cleaning in place) procedures.

Evermore aggressive CIP media are being used as cleaning agents, with the ongoing reduction in the use of preservatives driving this development forwards. Although this represents a good solution with respect to efficient production, it presents an enormous challenge for the seal materials.

components. With these stipulations, hygienic design plays an important role in securing product quality in the food and pharmaceutical industries.

A clean solution: COG HygienicSeal quality label

With HygienicSeal, COG has developed a range of materials especially to meet the high requirements of the food and pharmaceutical industries, and which offers users the maximum degree of safety. These high quality top compounds are ideally suited for use where hygienic design must be taken into consideration. This guarantees that the specific materials have not only the relevant approvals and certifications, but also the material properties required to ensure they play a safe role in the respective production processes. In the meantime, HygienicSeal has become a much sought-after hallmark of quality on the market.

HygienicSeal

High-performance compounds for the very highest degree of safety

As a result of the central importance of product safety in these areas, medical technology, biotechnology and the pharmaceutical industry all place greater demands on seal components than for example the food industry does. In pharmaceutical manufacturing, new scientific advances in particular, along with evolving application processes and constantly changing regulations in many respects lead to the requirements profile for the seals used becoming more demanding.

Tested for maximum resistance

A considerable share of the stress that elastomer seals in the pharmaceutical industry are subjected to results from the frequent use of the very purest water (DI water and WFI). Because only specially selected materials are able to resist this over the long term, COG also offers compounds that have been tested for use in this sector, which you can recognise by our test icon.

Special seals to prevent serious risk

A central aspect in the pharmaceutical production is the avoidance of contamination by the seal material. Because next to the base polymer, a material also comprises several other ingredients. When under stress, softeners and processing aids in particular can escape from the material. In highly sensitive production areas such as the manufacture of medicines, with their complex formulas, the outward migration of chemical components can have fatal consequences and can lead to the active substance changing without this being noticed. The use of special seal materials, whose resistance to migration has been proven in extraction tests, can minimise this risk.

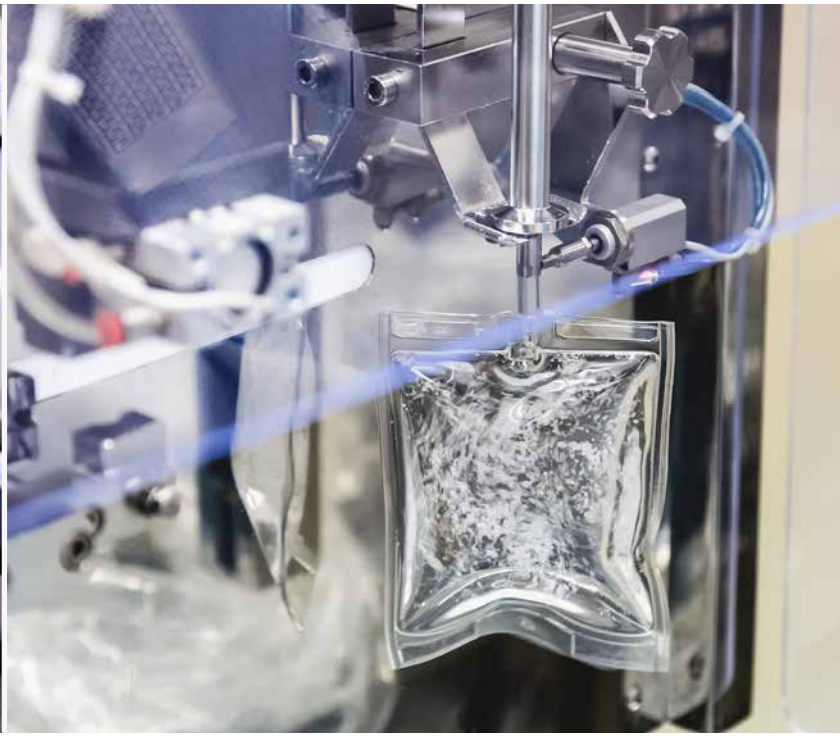
The danger lies on the surface

When it comes to contamination, even the surface finish of the components used in the production systems can play an important role. Irregular, rough surfaces can encourage the microorganisms that can lead to severe contamination to take hold. While there are regulations governing the roughness values of metals, which make contamination by microorganisms impossible, there are no similar regulations governing elastomer seals.

WFI and DI water

WFI = water for injection: *This is the very purest water, which has been completely demineralised. WFI puts a strain on materials and damages them, because it extracts the minerals from the materials it comes into contact with. So, for example, in just a short time, WFI water can make concrete porous.*

DI = deionised water: *DI water is a precursor of WFI water, but not quite as aggressive, and is frequently used. Both media place enormous strain on elastomer materials. At the same time, only a small number of seal materials are suitable for long-term use with these media, while also having the necessary FDA and USP Class VI approvals.*



In certain special production processes in medicine manufacture or cell cultivation, the danger of contamination by microbes is of central importance. In this context, the surface finish of O-rings can be therefore of extreme importance. Because a surface that is sealed and as smooth as possible, as demanded by some applications, is not possible without additional work at the production stage.

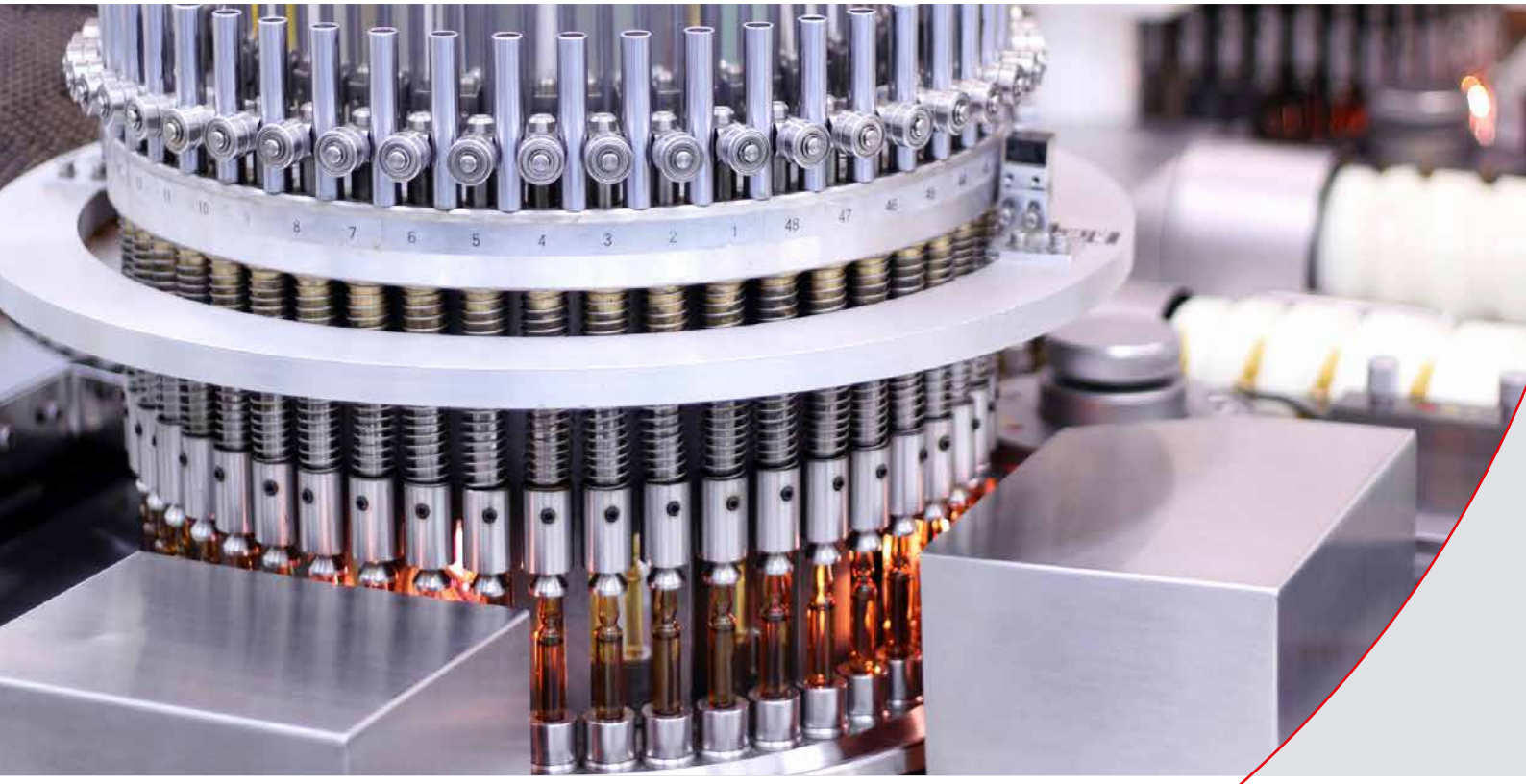
Safety for all environments

COG offers materials perfectly tailored to meet these high requirements, and which have not just the required certification and approvals but also the relevant material properties. So that seals are optimally tailored to your environment, both EPDM and FKM-based high-performance compounds are supplied.

For maximum safety, we also have materials that have been tested for cytotoxicity (in accordance with ISO 10993 Part 5). Independent series of tests and experiments prove that these compounds fulfil specific safety requirements with consistent high quality.

All the important approvals for your requirements

Because contaminated products in the food and medical sectors could have fatal consequences for users, legislators make the highest demands of equipment used in these sectors.



Overview of standards for the food and pharmaceutical industries

All materials that come into contact with food or medicinal products as they are being produced must comply with defined standards and certifications.

Next to the material certifications and standards, such as for example the internationally recognised FDA and USP approvals or the EU Regulation No 1935/2004, there are also regulations governing construction that must be considered. In particular, these relate to all aspects of hygienic design.

Global standards and national requirements

Numerous certifications in the food and pharmaceutical sectors are based on scientifically proven, internationally recognised directives, including among others the US Food and Drug Administration (FDA) and the United States Pharmacopeia (USP). Next to these, there are also numerous national and EU-wide regulations to observe.

Food industry

Release/Test certificate/Regulation	Application/Country	Criteria/Standards
3-A Sanitary (3-A Sanitary Standard Inc.)	Materials for use in hygienic dairy and food industry plants Country of origin: USA	3-A Sanitary Standards and criteria, Class I to IV
BfR Recommendation (Federal Institute for Risk Assessment)	Plastics in contact with foods Country of origin: Germany	BfR regulations "Plastics coming into contact with foods", Various sections depending on use of seal element
NSF Release (National Sanitation Foundation)	Food and sanitary facilities Country of origin: USA	NSF standards and criteria
Regulation (EC) Nr. 1935/2004	Materials and articles intended to come into contact with food Origin: Europe	Regulation (EC) No 1935/2004 of the European Parliament and of the Council

Food, medical and pharmaceutical industries

Release/Test certificate/Regulation	Application/Country	Criteria/Standards
FDA regulation § 177.2600 (Food and Drug Administration)	Materials for use in food and pharmaceutical industries Country of origin: USA	Including 'White List' (list of formulated ingredients) as specified in Federal Regulation 21. CFR 177.2600
USP certification (United States Pharmacopeia, USA)	Use in medical and pharmaceutical industries Country of origin: USA	Varying testing requirements: USP Class I to VI, Chapter 88, USP Chapter 87

Drinking water (no other use)

Release/Test certificate/Regulation	Application/Country	Criteria/Standards
ACS approval French Standard NF XP P41-250, parts 1 – 3	Plastics in contact with drinking water Country of origin: France	Testing of formulation based on 'Synoptic Documents' – storage test (microbe test)
DVGW Release for water (German Association for Gas and Water)	Materials and components for drinking water: Seal materials for drinking water plants Country of origin: Germany	DVGW W 534
DVGW W270 recommendation (German Association for Gas and Water)	Materials in drinking water applications Country of origin: Germany	Microbiologic testing; proliferation of micro-organisms on materials
KTW-BWGL, Annex D* **(successor to the Elastomer Guideline)** **During the transition period, a test report in accordance with the Elastomer Guideline can be used*	Seals in drinking water installation Country of origin: Germany	Assessment of the hygienic suitability of elastomers in contact with drinking water
ÖNORM (Austrian Standards Institute)	Materials in contact with drinking water and warm water Country of origin: Austria	Industry standards committee
WRAS Release (Water Regulations Advisory Scheme)	FNA 140 on water quality Plastics in contact with drinking water Country of origin: Great Britain	British Standard BS 6920

The proven all-rounder for versatile use

Its excellent resistance to hot water, water vapour, as well as a multitude of acids, alkaline solutions and oxidising agents makes EPDM rubber an optimum material for equipment used in the food and pharmaceutical industries. EPDM materials are ideally suited to resist the high material stress resulting from the complex cleaning processes involving CIP and SIP media. In combination with its high resistance to ageing and its UV resistance, EPDM rubber also ensures a longer service life.

Good to know

Many of our USP-tested EPDM materials are not just tested to the usual +70 °C, but have to prove themselves at temperatures of up to +121 °C – for maximum safety!

The range of applications this peroxide-cured elastomer can be used in is extremely varied, as is COG's product range for EPDM-based materials for use in equipment used in the food and pharmaceutical industries. Depending on precise requirements, a material often possesses all relevant approvals, therefore offering maximum flexibility and optimal physical properties.

EPDM

The economically efficient material for the widest range of applications and media, which is also especially flexible in use.

- Basic elastomer: Ethylene propylene diene rubber
- Peroxide cured
- Good resistance to aqueous media, many CIP media plus hot water and water vapour
- Very good resistance to ageing and ozone resistance
- Good low temperature flexibility
- Partially non-resistant to plant and animal oils and fats

EPM

A proven compound for all non-oily applications where hot water and water vapour in particular present great stress.

- Basic elastomer: Ethylene propylene rubber
- Peroxide cured
- Good resistance to aqueous media and many CIP media, as well as outstanding resistance to steam and hot water
- Good resistance to acids and alkalis
- Partially non-resistant to plant and animal oils and fats
- Very good resistance to UV, ageing and ozone
- Good low temperature flexibility

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties	
EPDM	AP 302	70 Shore A	black	from -40 °C to +150 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard, Regulation (EC) No 1935/2004	HygienicSeal
	AP 307	75 Shore A	black	from -40 °C to +150 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, ISO 10993-5:2009 (cytotoxicity test)	
	AP 310	70 Shore A	black	from -50 °C to +140 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	
	AP 311	70 Shore A	black	from -50 °C to +150 °C	FDA 21. CFR 177.2600	
	AP 312	70 Shore A	black	from -50 °C to +140 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	
	AP 318	70 Shore A	black	from -35 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 88, 3-A Sanitary Standard, Elastomer Guideline, DVGW W 270 and W 534, DIN EN 681-1, ACS, NSF/ANSI Standard 51 and 61, WRAS BS 6920, ÖNORM B 5014-1, AS/NZS 4020:2005	HygienicSeal
	AP 320	80 Shore A	black	from -50 °C to +140 °C	FDA 21. CFR 177.2600	
	AP 323	70 Shore A	black	from -45 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 88, 3-A Sanitary Standard, Elastomer Guideline, DVGW W 270 and W 534, DIN EN 681-1, ACS, NSF/ANSI Standard 51 and 61, WRAS BS 6920, ÖNORM B 5014-1, Regulation (EC) No 1935/2004	HygienicSeal
	AP 324	70 Shore A	black	from -40 °C to +150 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and 88, 3-A Sanitary Standard, Elastomer Guideline, DVGW W 270 and W 534, WRAS BS 6920, DIN EN 681-1, CLP, NSF/ANSI Standard 61	HygienicSeal
	AP 331	70 Shore A	black	from -50 °C to +150 °C	Elastomer Guideline, DVGW W270, DIN EN 681-1, CLP, WRAS BS 6920	
	AP 332	70 Shore A	black	from -50 °C to +140 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270	
	AP 333	70 Shore A	black	from -50 °C to +150 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W270, DIN EN 681-1, WRAS BS 6920, CLP	
	AP 356	50 Shore A	black	from -50 °C to +140 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270 and W 534, CLP, NSF/ANSI Standard 61, WRAS BS 6920, ÖNORM B 5014-1, AS/NZS 4020:2005	
	AP 360	60 Shore A	black	from -40 °C to +140 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270 and W 534, ÖNORM B 5014/1, AS/NZS 4020:2005, NSF/ANSI Standard 61, WRAS BS 6920, CLP	
	AP 372	70 Shore A	black	from -40 °C to +140 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270 and W 534, CLP, NSF/ANSI Standard 61, WRAS BS 6920, ÖNORM B 5014-1, AS/NZS 4020:2005, Regulation (EC) No 1935/2004	
EPM	EP 390	80 Shore A	black	from -40 °C to +150 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	

Quality for the very highest demands

Oils, fats, propellants or solvents – materials containing fluorine demonstrate their extraordinary high resistance to various media, especially when in contact with all manner of hydrocarbons.

These groups of materials also prove themselves to be especially resistant to various chemicals such as acids or weak alkalis.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FKM	Vi 327	70 Shore A	black	from -20 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88
	Vi 665	75 Shore A	blue	from -15 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, ISO 10993-5:2009 (cytotoxicity test), 3-A Sanitary Standard, Regulation (EC) No 1935/2004
	Vi 770	70 Shore A	white	from -10 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to 121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard, Regulation (EC) No 1935/2004
	Vi 780	80 Shore A	black	from -10 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard, BAM tested
	Vi 971, W	75 Shore A	nature white	from -20 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard
FEPM	Vi 602	75 Shore A	black	from -10 °C to +230 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 88, Regulation (EC) No 1935/2004
	AF 680	80 Shore A	black	from -10 °C to +230 °C	FDA 21. CFR 177.2600

In combination with very low levels of gas permeability, high levels of mechanical resistance and good resistance to ageing, FKM and FEPM materials therefore prove themselves to be extremely high quality and reliable seal elastomers.

This applies above all to use in fatty media, as happens in many areas in the food and pharmaceutical industries. In such cases, COG offers a broad spectrum of suitable FKM materials that have the relevant certifications. Some of the high performance compounds demonstrate extraordinarily low degrees of swelling, and are therefore ideal for use in the tight installation spaces in sterile screw connections.

FKM of the finest class

Elastomer materials comprise various different components. But in contrast to steel, whose composition is standardised and binding, manufacturers of elastomers produce their products to their own specifications. Not only does each material therefore have its own specific characteristics, but the quality of the material can also vary considerably. Just as with all COG's materials, we also guarantee that our high quality FKM compounds have a constant composition, which is strictly monitored – In order that you can rely on consistently high quality products.

FKM

The versatile material with high resistance levels, especially for the high demands presented by fatty/oily media.

- Basic elastomer: Fluorocarbon rubber
- Bisphenol or peroxide cured
- Very good media resistance
- All types of hydrocarbons (oils, fats, solvents)
- Low gas permeability
- Weaknesses with alkaline CIP media
- Good resistance to water vapour > + 150 °C (peroxide cured types)

FEPM

A special compound for extreme requirements, which also resists aggressive CIP and SIP processes at up to over +200 °C.

- Basic elastomer: Viton® Extreme-ETP
- Peroxide cured
- In certain respects comparable to FFKM, but considerably cheaper
- Operating temperature range: -10 °C to +230 °C
- Outstanding resistance to CIP and SIP procedures
- Good resistance to essential oils, fatty and oily substances as well as flavourings

COG Resist®. And sealed.

This material group is based on perfluorelastomers (FFKM). These premium compounds have been designed for high-performance applications, special applications and also for very long periods of use, where there is often no alternative material available: COG Resist® is extremely resistant, even with changing media.

Premium compounds for high-performance applications

In many applications, a single seal may be exposed to various different chemicals. During the cleaning process, this seal then also comes into intensive contact with hot water vapour and solvents. In such cases, a universal sealing material of the very highest quality is absolutely essential. So it's good to know that you can rely on COG Resist® products.

Ask us!

For a competent consultation you are welcome to contact our application technology department and harness our know-how.

Email: applicationtechnology@cog.de

The benefits of COG Resist®

- *The highest chemical resistance of all the flexible seal materials*
- *Stable at high temperatures of up to +325 °C, depending on type used*
- *Low compression set*
- *Excellent vacuum behaviour*
- *Flexible in its application*
- *Suitable materials for the widest variety of requirements*
- *Large number of certifications*
- *Ring diameters of up to 2,000 mm possible*

The best properties in one material

The molecular structure of perfluorelastomers is similar to that of polytetrafluoroethylenes (PTFE) and represents outstanding thermal stability and chemical resistance. But at the same time, perfluoroelastomers also demonstrate the elasticity (resilience) and sealing properties of an elastomer. The combination of these properties makes COG Resist® a flexible – and in especially demanding applications indispensable – all-rounder.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FFKM	**COG Resist® RS 75 HS**	75 Shore A	white	from -15 °C to +260 °C	FDA 21. CFR 177.2600, FDA 21. CFR 177.2400, USP Class VI to +121 °C, Chapter 87 and 88, 3-A Sanitary Standard

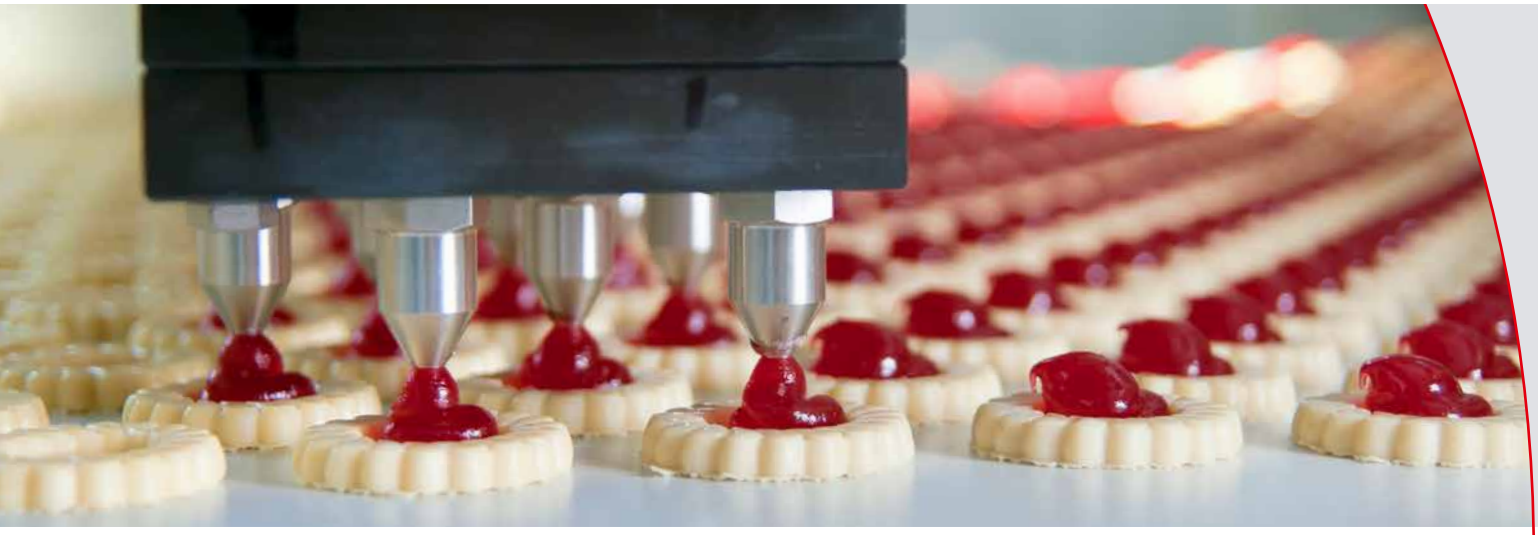
COG Resist® for food and pharma

COG's FFKM compounds offer top performance and fulfil the highest demands made by the food and pharmaceutical sectors. These also include excellent resistance to the active ingredients in pharmaceutics (AIPs) and the renunciation of animal ingredients (ADI free). These materials can of course also be used in CIP and SIP processes, and can be used in dry, aqueous and also fatty media.

With FDA 21. CFR 177.2600, USP Class VI +121 °C and 3-A Sanitary Standard, industry pros are able to meet all their important demands. And over the long term, their extremely high resistance brings financial benefits thanks to a long service life and lower maintenance expenditure.

Specialists for the food and drinking water industry

With a wide range of different HNBR and NBR compounds, as well as silicone materials, COG also offers high quality seal solutions for specific applications and uses in the food production sector.



HNBR

Thanks to its good temperature stability, this material is ideal for long-term use in production processes where high temperatures are present.

- Basic elastomer: Hydrogenated nitrile rubber
- Peroxide cured
- Good mechanical properties
- Suitable for steam sterilisation (SIP)
- Weaknesses when used with some CIP media

NBR

A versatile elastomer that is above all used in the meat processing industry. Numerous materials are also approved for use with drinking water.

- Basic elastomer: Acrylonitrile butadiene rubber
- Sulphur cured
- Good mechanical properties
- Good resistance to oil and fats
- Moderate resistance to many CIP media
- Not suitable for steam sterilisation (SIP)

VMQ (Silicone)

High elasticity combined with good temperature stability means that silicone materials make a versatile elastomer, which is above all used in procedures involving high temperatures.

- Basic elastomer: Silicone rubber
- Mostly peroxide cured
- Physiologically inert
- Wide range of operating temperatures
- Reasonable mechanical properties
- Weaknesses when used with some acidic media
- Weaknesses when used with some SIP media

Just ask us!

You are always welcome to speak to us directly, so that together we can see how we can help.

Email: applicationtechnology@cog.de

Resistance for good drinking water

In order not to jeopardise drinking water quality and therefore also harm people and the environment, strict reference values must be adhered to. In Germany the Elastomer Guideline applies, which makes great demands of all materials that come into contact with drinking water. COG offers several NBR compounds that comply with the requirements relating to drinking water resistance.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
HNBR	HNBR 410	70 Shore A	black	from -20 °C to +150 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004
	HNBR 420	90 Shore A	black	from -20 °C to +150 °C	FDA 21. CFR 177.2600
NBR	P 300	70 Shore A	black	from -20 °C to +120 °C	FDA 21. CFR 177.2600, 3-A Sanitary Standard
	P 521	70 Shore A	black	from -20 °C to +120 °C	FDA 21. CFR 177.2600, Elastomer Guideline, CLP, WRAS BS6920
	P 582	70 Shore A	black	from -25 °C to +125 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270, DIN EN 549 - H3 / B1, CLP, NSF/ANSI Standard 61, WRAS BS 6920, ÖNORM B 5014-1, Regulation (EC) No 1935/2004
	P 690	85 Shore A	black	from -40 °C to +100 °C	FDA 21. CFR 177.2600, 3-A Sanitary Standard 18-03, Class 2
VMQ	Si 50	50 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	Si 51	50 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 820	70 Shore A	red	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	Si 840	65 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	Si 870	75 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	Si 871	75 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 871, TR	73 Shore A	translucent	from -60 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard
	Si 971, B	75 Shore A	blue	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 972, R	70 Shore A	red	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 973, R	70 Shore A	red	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 976, R	75 Shore A	red	from -60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV
	Si 976, TR	70 Shore A	translucent	from -40 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 87 and Chapter 88

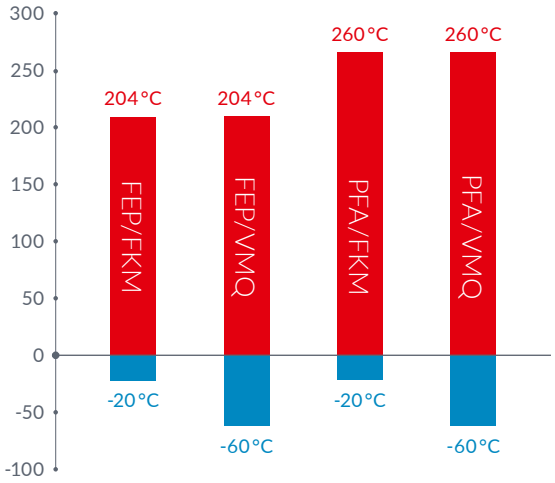
HygienicSeal

Our expertise for your challenges

Whether extraordinary requirements of the components, an extremely special environment or difficult media – we offer a wide range of special material solutions beyond our broad standard ranges. These also include our wide range of FEP and PFA-coated O-rings for special applications.

FEP and PFA-coated O-rings' heat resistance and low temperature flexibility

Material combination external/internal casing



Installation notes

When it comes to fitting FEP and PFA-coated O-rings, virtually the same recommendations apply as for standard elastomer O-rings. However, when fitting them, bear in mind that because of their coatings, the O-rings should be subjected to only minimum stretching and compression.

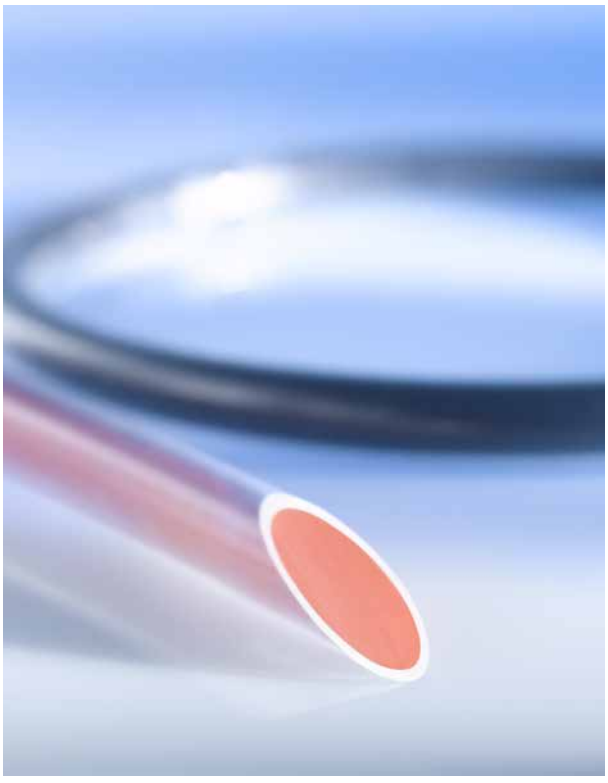
Installation spaces for FEP-/PFA-coated O-rings

cross-section d_2	groove deepth	groove width
1.78	1.30	2.30
2.62	2.00	3.40
3.53	2.75	4.50
5.33	4.30	6.90
7.00	5.85	9.10

FEP-coated O-rings

FEP-coated O-rings offer the best of both worlds: Very high resistance to the widest range of media and at the same time good elasticity. This is because of these O-rings' two-component system. FEP-coated O-rings have an elastic core made from FKM or silicone (VMQ). The respective elastic core is seamlessly coated all around with a thin covering of FEP. Thanks to this combination of outstanding resistance and good elastic properties, new types of application are possible. While the O-ring's core provides the necessary elasticity, the FEP coating is resistant to chemical media.

These FEP-coated O-rings can be used in diverse applications, including among others in areas of the petro-chemical, chemical, pharmaceutical and food industries.



FDA recommendation

FEP, PFA and PTFE are recognised materials (in accordance with FDA Regulation 21. CFR 177.1550) for parts or components that come into contact with foodstuffs, and which are used in the manufacture, processing, conveying and storage of foodstuffs. Generally speaking, FEP- and PFA-coated O-rings with a silicone core are available in ring thicknesses of 1.5 to 19 mm. These O-rings have the widest range of uses in applications in the pharmaceutical and food industries.

FEP, PFA and PTFE materials

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FEP/FKM	**FEP/FKM**	90 – 95 Shore A	black + translucent	from -26 °C to +205 °C	FDA 21. CFR 177.1550, Regulation (EC) No 1935/2004
FEP/VMQ	**FEP/VMQ**	85 – 90 Shore A	red + translucent	from -60 °C to +205 °C	FDA 21. CFR 177.1550, Regulation (EC) No 1935/2004
PFA/FKM	**PFA/FKM**	90 – 95 Shore A	black + translucent	from -26 °C to +205 °C	FDA 21. CFR 177.1550, Regulation (EC) No 1935/2004
PFA/VMQ	**PFA/VMQ**	85 – 90 Shore A	red + translucent	from -60 °C to +260 °C	FDA 21. CFR 177.1550, Regulation (EC) No 1935/2004
PTFE	**PT 950**	57 Shore D	white	from -180 °C to +260 °C	FDA 21. CFR 177.1550

PFA-coated O-rings

For the very highest temperatures: As well as FEP coatings, COG also offers PFA casing. PFA possesses virtually the same chemical resistance and the same properties as PTFE. However, PFA-coated O-rings can be used at higher temperatures than FEP-coated O-rings, while their low temperature flexibility is the same. Generally speaking, PFA-coated O-rings with a silicone core are available in ring thicknesses of 1.5 to 19 mm.

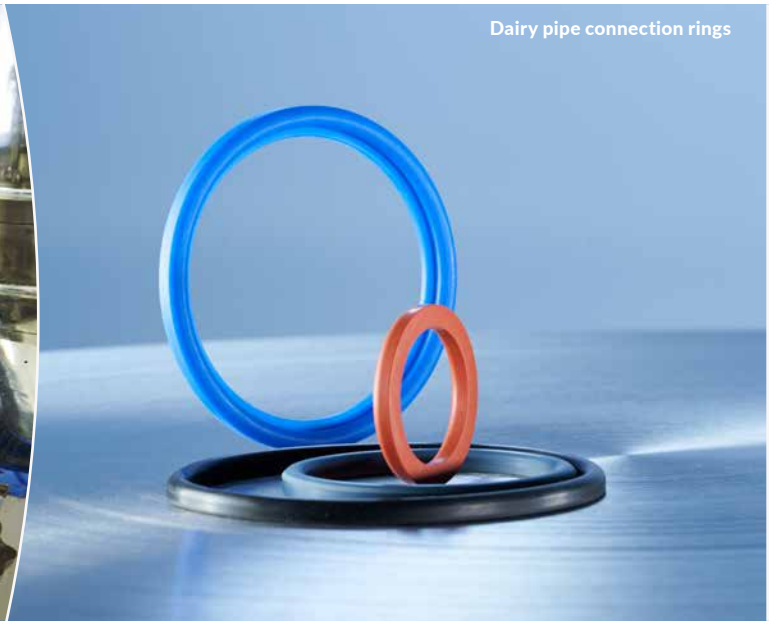
PTFE

PTFE is also used for a wide range of applications in the medical technology and pharmaceutical industries. This fully fluorinated polymer demonstrates extremely high melting viscosity, whereby the thermal resilience in continuous use is also enormous. This is complemented by almost universal chemical resistance, even to aggressive acids such as aqua regia.

- Chemical resistance to almost all media
- Temperature resistance -180 °C to +260 °C
- Optimum dialectric properties
- High mechanical resistance
- Low friction coefficient, even without lubrication (absolutely no adhesion)
- No water absorption
- Low thermal conductivity
- Physiologically harmless
- Inelastic, so cannot be stretched for installation
- Various sealing geometries

A clean affair – Seals for screw fittings and connections

The law also makes the greatest demands of the reliability of seals used in the various screw fittings and connections. It is therefore extremely important to ensure seals fit perfectly into the respective installation space.



Dairy pipe connection rings

Dairy pipe screw rings

The following dimensions can be produced as standard:

Nominal size DN	10	15	20	25	32	40	50	66	80	100	125	150
Inner diameter	12	18	23	30	36	42	54	71	85	104	130	167
Outer diameter	20	26	33	40	46	52	64	81	95	114	142	155
Height	4.5	4.5	4.5	5	5	5	5	5	5	6	7	7

Sealing rings for dairy pipe screws are used in an enormous array of applications and must meet high demands. DIN 11851: 'Stainless steel fittings for the food and chemical industry' specifies the permitted dimensions, designs and materials. They are also referred to as 'dairy pipe connections'. However, the sealing element in these cases is not an O-ring, rather a shape G sealing ring.

All materials that possess FDA approval are suitable for the manufacture of dairy pipe connection rings. In such cases, and depending on your specific requirements, COG offers a wide range of different materials, in order that we can tailor the seal to your respective requirements.

Clamp seal for clamp connections

The DIN 32676 standard 'Stainless steel fittings for the food, chemical and pharmaceutical industries – Clamp connections for stainless steel pipes – Weld-on type' describes so-called 'clamp connections'. Even though this term does is not defined by an official standard, in practice it has however become established. Clamp connections are characterised by high hygienic standards, can easily be disconnected and fitted and are suitable for CIP and SIP processes.

In these cases too, COG offers a broad spectrum of various materials that have the FDA certification required for use in clamp seals.

Clamp seal

Cross-section of an aseptic screw pipe connection

Aseptic screw pipe connections

Pipe nominal diameter for the DIN 11853 and DIN 11864 standards:

Nominal size DN	10	15	20	25	32	40	50	65	80	100
Inner diameter	12	18	22	28	34	40	52	68	83	102
Cord thickness	3.5	3.5	3.5	3.5	5	5	5	5	5	5

The DIN 11864 standard 'Stainless steel fittings for the food and chemical industry' is divided into three sections:

1. **Aseptic screw pipe connections**
2. **Aseptic flange connections**
3. **Aseptic clamp connections**

The prefix 'aseptic' makes clear that the materials to which it applies can not only be used in the production of foodstuffs, but also in the pharmaceutical industry. It indicates extremely high quality materials. The term as used in this standard relates solely to the stainless steels used, and not elastomers!

Furthermore, the DIN 11853 standard for 'hygienic connections' is also of relevance when it comes to hygienic design. The seals recommended for use in modern hygienic design are predominantly O-rings, because they are especially suitable for this application thanks to their material properties and ease of use.

The table above provides an overview of the most common O-rings, with respect to pipe diameter as well as standards DIN 11853 and DIN 11864.

Much more than just O-rings

What many people don't realise: As well as our core business of precision O-rings, COG decades of expertise in relation to elastomer seal materials are also deployed for the manufacture of moulded parts. We can produce rotation-symmetrical items as well as specific geometries on the basis of customer drawings, and from almost all standard materials.

Our experts working for you

Our own tool-making facilities enable us to produce even smaller quantities economically. Among other things, these moulded parts include flat seals, groove rings, profile seals, dairy pipe connections, clamp connections and sealing collars.

It goes without saying that our application engineers' expertise is available to you even in respect of moul ded parts. As part of comprehensive development meetings, we provide you with continuous advice, from planning to production – for achieving optimum results.

Just ask us!

Whether you are looking for moulded parts or special services – You are always welcome to speak to us directly, so that together we can see how we can help you.

Email: applicationtechnology@cog.de

Customized services

As a specialist in the complex area of elastomer seals, COG also offers you a broad spectrum of special services, even for special requirements. Whether single parts, items in sets or a complete assembly – Working together, we will develop the optimum seal solution for your series production.

Series production expertise

Our experts remain right by your side, providing expert support from the initial idea to the start of production. You can also entrust us with the serial assembly of single components, modules or systems made from the widest variety of materials, spanning right up to complex assemblies. If required, we would also be pleased to assume responsibility for the necessary purchasing management.

Other special services

- Colour coding of O-rings
- Sub-packaging and individual packaging
- Subsequent washing in deionised water
- Other special treatments: Molybdenum coating, graphitisation, Teflon coating, siliconisation, coloured coatings etc.
- 100% automatic optical dimensional check (external diameter AD < 70 mm)
- Special labelling (e. g. for customer-specific barcodes)
- By arrangement, EDI connection for electronic data exchange
- Presentation of various certificates and certification, such as factory certification in accordance with EN 10204-2.2 or manufacturer's certificate M in accordance with DIN 55350 Part 18, and many more

When speed is of the essence

In emergency cases, when a time delay is simply not acceptable, COG offers our customers an express manufacturing service. This special service is designed to help users out of a sticky situation. So we can manufacture high quality precision O-rings that are not kept in warehouse stock within 5 – 7 working days*. These orders are produced in the 'fast lane' of our sophisticated production process, and are supplied to our customers within the shortest possible time.

Delivery times for COG's express production

COG material	ASTM	Hardness in Shore A	Colour	Special properties	Delivery time* on orders placed	
					before 10 a.m.	after 10 a.m.
AP 302	EPDM	70	black	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard, Regulation (EC) No 1935/2004	5	6
AP 310	EPDM	70	black	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	5	6
Vi 665	FKM	75	blue	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, Regulation (EC) No 1935/2004, ISO 10993-5:2009 (cytotoxicity test), 3-A Sanitary Standard	6	7
Vi 780	FKM	80	black	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard, BAM tested	6	7
Si 820	VMQ	70	red	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004	5	6
FFKM and other materials are also available as part of our express service – please enquire.						

** The company's internal circumstances, such as capacity bottlenecks or company holidays or special holidays, can sometimes mean that production times vary considerably. For more precise information about this, please see cog.de/en/express.*

Maximum quantity

External diameter in mm	Maximum quantity
≤ 220	60
221 - 550	40
551 - 1400	25

You can find our current prices and production times at cog.de/en/express

Straightforward processing: You pay only the normal price for the O-rings, plus a flat rate express surcharge. Minimum item values and order values do not apply to this service.

COG keeps a total of five materials used in the food and pharmaceutical industries in continuous stock, especially for our express service. These include EPDM, FKM and VMQ compounds. Of course, we can also produce other compounds in our express service, provided that the necessary materials are in stock. Our deadline guarantee applies to all express orders – Should we fail to supply by the promised deadline, we will waive the express surcharge, meaning you pay only the value of the goods. If required, please get in touch!

Express production – basic information

- Our current prices and production times can be found at cog.de/en/express
- Continuous stock of a total of 5 material compounds for food and pharmaceutical use
- Maximum quantity depends on the size of the O-rings
- Deadline guarantee: Should COG not keep to the express delivery deadline, you pay only for the value of the goods

All information at a glance

Here you can find an overview of all COG materials, clearly arranged into groups with properties and approvals.

COG material	FDA 21. CFR 177.2600	FDA 21. CFR 177.2400	FDA 21. CFR 177.1550	USP Chapter 87	USP Cl. VI bis +121 °C, Chapter 88	USP Cl. VI bis +70°C, Chapter 88	3-A Sanitary Standard	ISO 10993-5:2009 (cytotoxicity test)	Elastomer Guideline	DVGW W270	DVGW W 534	DIN EN 681-1*	DIN EN 549 - H3 / B1	ACS	CLP	NSF/ANSI Standard 51	NSF/ANSI Standard 61	WRAS BS 6920	ÖNORM B 5014-1	AS/NZS 4020:2005	BAM tested	BfR Recommendation XV	VO (EG) Nr. 1935/2004
AP 302	•			•	•		•																•
AP 307	•			•	•			•															
AP 310	•																						•
AP 311	•																						
AP 312	•																						•
AP 318	•					•	•		•	•	•	•		•		•	•	•	•	•			
AP 320	•																						
AP 323	•					•	•		•	•	•	•		•		•	•	•	•				•
AP 324	•			•	•		•		•	•	•	•			•		•	•					
AP 331									•	•		•			•			•					
AP 332	•								•	•													
AP 333	•								•	•		•			•			•					
AP 356	•								•	•	•				•		•	•	•	•			
AP 360	•								•	•	•				•		•	•	•	•			
AP 372	•								•	•	•				•		•	•	•	•			•
EP 390	•																						•
Vi 602	•				•																		•
AF 680	•																						
Vi 327	•			•	•																		
Vi 665	•			•	•		•	•															•
Vi 770	•			•	•		•																•
Vi 780	•			•	•		•														•		
Vi 971, W	•			•		•	•																
COG Resist® RS 75 HS	•	•		•	•		•																
HNBR 410	•																						•
HNBR 420	•																						
P 300	•						•																
P 521	•								•						•			•					
P 582	•								•	•			•		•		•	•	•				•
P 690	•						•																
Si 50	•																					•	•
Si 51	•																					•	
Si 820	•																					•	•
Si 840	•																					•	•
Si 870	•																					•	•
Si 871	•																					•	
Si 871, TR	•			•	•		•																
Si 971, B	•																					•	
Si 972, R	•																					•	
Si 973, R	•																					•	
Si 976, R	•																					•	
Si 976, TR	•			•		•																	
FEP/FKM			•																				•
FEP/VMQ			•																				•
PFA /FKM			•																				•
PFA /VMQ			•																				•
PT 950			•																				

COG material	ASTM D 1418 ISO 1629	Hardness	Operating temperature range	Colour
AP 302	EPDM	70 Shore A	from -40 °C to +150 °C	black
AP 307		75 Shore A	from -40 °C to +150 °C	black
AP 310		70 Shore A	from -50 °C to +140 °C	black
AP 311		70 Shore A	from -50 °C to +150 °C	black
AP 312		70 Shore A	from -50 °C to +140 °C	black
AP 318		70 Shore A	from -35 °C to +140 °C	black
AP 320		80 Shore A	from -50 °C to +140 °C	black
AP 323		70 Shore A	from -45 °C to +140 °C	black
AP 324		70 Shore A	from -40 °C to +150 °C	black
AP 331		70 Shore A	from -50 °C to +150 °C	black
AP 332		70 Shore A	from -50 °C to +140 °C	black
AP 333		70 Shore A	from -50 °C to +150 °C	black
AP 356		50 Shore A	from -50 °C to +140 °C	black
AP 360		60 Shore A	from -40 °C to +140 °C	black
AP 372		70 Shore A	from -40 °C to +140 °C	black
EP 390	EPM	80 Shore A	from -40 °C to +150 °C	black
Vi 602	FEPM	75 Shore A	from -10 °C to +230 °C	black
AF 680		80 Shore A	from -10 °C to +230 °C	black
Vi 327	FKM	70 Shore A	from -20 °C to +200 °C	black
Vi 665		75 Shore A	from -15 °C to +200 °C	blue
Vi 770		70 Shore A	from -10 °C to +200 °C	white
Vi 780		80 Shore A	from -10 °C to +200 °C	black
Vi 971, W		75 Shore A	from -20 °C to +200 °C	nature white
COG Resist® RS 75 HS	FFKM	75 Shore A	from -15 °C to +260 °C	white
HNBR 410	HNBR	70 Shore A	from -20 °C to +150 °C	black
HNBR 420		90 Shore A	from -20 °C to +150 °C	black
P 300	NBR	70 Shore A	from -20 °C to +120 °C	black
P 521		70 Shore A	from -20 °C to +120 °C	black
P 582		70 Shore A	from -25 °C to +125 °C	black
P 690		85 Shore A	from -40 °C to +100 °C	black
Si 50	VMQ	50 Shore A	from -60 °C to +200 °C	blue
Si 51		50 Shore A	from -60 °C to +200 °C	blue
Si 820		70 Shore A	from -60 °C to +200 °C	red
Si 840		65 Shore A	from -60 °C to +200 °C	blue
Si 870		75 Shore A	from -60 °C to +200 °C	blue
Si 871		75 Shore A	from -60 °C to +200 °C	blue
Si 871, TR		73 Shore A	from -60 °C to +200 °C	translucent
Si 971, B		75 Shore A	from -60 °C to +200 °C	blue
Si 972, R		70 Shore A	from -60 °C to +200 °C	red
Si 973, R		70 Shore A	from -60 °C to +200 °C	red
Si 976, R		75 Shore A	from -60 °C to +200 °C	red
Si 976, TR		70 Shore A	from -40 °C to +200 °C	translucent
FEP/FKM	FEP	90 – 95 Shore A	from -26 °C to +205 °C	black
FEP/VMQ		85 – 90 Shore A	from -60 °C to +205 °C	red
PFA /FKM	PFA	90 – 95 Shore A	from -26 °C to +205 °C	black
PFA /VMQ		85 – 90 Shore A	from -60 °C to +260 °C	red
PT 950	PTFE	57 Shore D	from -180 °C to +260 °C	white

** Please observe the specifications for this certification that are stated on the official datasheet.*

Direct access to your contact person

Questions about usage or materials? More information needed about the required approvals, or about the O-ring type and size? Require information about our special services? Our internal sales team would be pleased to assist.

COG's experts would be delighted to use their knowhow and experience to answer your questions about our O-rings: **Mondays to Thursdays from 8:00 am until 5:00 pm and Friday from 8:00 am until 3:00 pm.**

Simply give us a call or send us an email – Our team in your sales group would be delighted to help you!

Fon +49 (0)4101 50 02-963
Fax +49 (0)4101 50 02-863

Mail sales-export@cog.de

More information can be found at
www.cog.de/en

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