



**SEAL TECHNOLOGY**  
PREMIUM-QUALITY SINCE 1867



# Elastomer seals

PHARMACEUTICAL INDUSTRY,  
FOOD, BIO AND MEDICAL TECHNOLOGY



[www.COG.de](http://www.COG.de)

# 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 250 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.



A handwritten signature in black ink, appearing to read 'Metzger'.

Jan Metzger  
Managing Director

A handwritten signature in black ink, appearing to read 'Metzger'.

Ingo Metzger  
Managing Director



More  
information at  
**[www.COG.de](http://www.COG.de)**  
or contact us  
directly.

## COG at a glance

- Founded in 1867 in Pinneberg, near Hamburg
- Independent family business employing over 250 staff
- 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
- Quality management to DIN EN ISO 9001
- Environmental management to DIN EN ISO 14001
- Close cooperation with leading manufacturers of raw materials
- Our own mixing and compound development facilities
- Tools available for over 23,000 different O-ring dimensions
- Our own toolshop
- Approvals/certifications for a wide variety of materials, including among others FDA, USP, 3-A Sanitary Standard, BfR, Elastomer Guideline, DVGW, NSF/ANSI, NORSOK and many more



## CONTENT

Material selection .....	Page 4
Sector-specific requirements .....	Page 6
Approvals.....	Page 10
EPDM materials.....	Page 12
Materials containing fluorine.....	Page 14
FFKM material .....	Page 16
NBR, HNBR and VMQ materials.....	Page 18
Special material solutions.....	Page 20
Screw fittings and connections .....	Page 22
Mouldings .....	Page 24
Special services .....	Page 25
COG's express production.....	Page 26



# Sensitive areas require special seals

The use of seals in equipment used in the biotechnology, 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.

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.

## Our expertise to help you with your application

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.



## 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.

# 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.

## 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. If you do not have precise specifications for your project, or should any other questions occur, our application technology department would be delighted to provide you with comprehensive expert advice!

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.

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? What temperatures do the media that need to be sealed off have? 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?

# 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.

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.



## Increasing demands being made of production processes

The food and pharmaceutical industries are increasingly making ever-more complex demands of elastomer seals. Due to the ever-increasing reduction or indeed elimination of preservatives, cleaning processes in pipelines, valves and pumps etc. are carried out using ever-improving cleaning agents in CIP (cleaning in place) procedures.

At the same time, it can be seen that production cycles are becoming shorter, in order to increase productivity. In order to shorten the cleaning process too, ever-more aggressive CIP media are being used. Although this represents a good solution with respect to efficient production, it presents an enormous challenge for the seal materials.

## Specially tested for the food and pharmaceutical industries

In partnership with the Ecolab company, 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.





### 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 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.







## 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.



The particularly high demands made of elastomer components in the pharmaceutical sector stem to a great extent from the material stress resulting from the interplay between the media being sealed off and the sometimes very aggressive detergents and disinfectants, plus the hot water vapour from the sterilisation process. To make matters even more complicated, the very purest water (DI and WFI water) is often also used, which places great demands on elastomer seals. Over the long term, only specially suited materials are up to the job which can be recognized by our symbol.

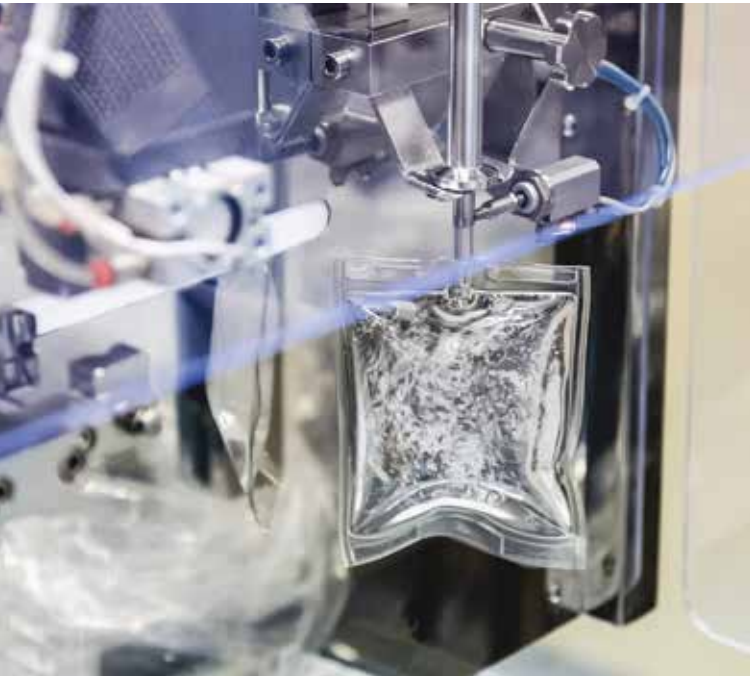


### DI and WFI water

DI water = deionised water  
WFI = water for injection

WFI is the very purest water, which has been completely demineralised. WFI puts enormous strain on materials, because it extracts the minerals from the materials it comes into contact with, therefore causing them great damage. So, for example, in just a short time, WFI water can make concrete porous and unusable. DI water is a precursor of WFI water and is also used in production environments. However, it is not as aggressive as WFI water. 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 at the same time having the necessary FDA and USP Class VI approvals.





## 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.

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.

## 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

## 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

### Overview of standards for the food and pharmaceutical industries

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. 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.

Expert advice is therefore always recommended. Therefore, you are welcome to contact our application technology department and harness their knowhow!

By telephone: +49 (0)4101 50 02-964 or  
email: [applicationtechnology@cog.de](mailto:applicationtechnology@cog.de)

## Food industry

Release/Test certificate/ Regulation	Application/Country	Criteria/Standards
<b>3-A Sanitary</b> (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
<b>BfR Recommendation</b> (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
<b>NSF Release</b> (National Sanitation Foundation)	Food and sanitary facilities Country of origin: USA	NSF standards and criteria
<b>Regulation (EC) No 1935/2004</b>	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
<b>FDA regulation CFR 177.2600</b> (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
<b>USP certification</b> (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
<b>ACS approval</b> 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)
<b>DVGW Release for water</b> (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
<b>DVGW W270 recommendation</b> (German Association for Gas and Water)	Materials in drinking water applications Country of origin: Germany	Microbiologic testing; proliferation of micro-organisms on materials
<b>Elastomer Guideline</b>	Elastomers in contact with drinking water Country of origin: Germany	Guideline for the hygienic evaluation of elastomers in contact with drinking water
<b>ÖNORM</b> (Austrian Standards Institute)	Materials in contact with drinking water and warm water Country of origin: Austria	Industry standards committee FNA 140 on water quality
<b>WRAS release</b> (Water Regulations Advisory Scheme)	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.



## The perfect basis for a broad selection

This peroxide-cured elastomer's possible applications are extremely varied, as demonstrated by COG's product range for EPDM-based materials. We have a vast array of different materials available especially for use in the food and pharmaceutical industries. The compounds all possess the relevant approvals determined by the respective requirements profiles. It is often the case that a particular material fulfils all relevant directives at the same time, offering maximum flexibility. The versatility of our EPDM and EPM products is also reflected in their operating temperatures, the media they seal against and their physical properties.

### EPDM

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

#### Properties/benefits:

- Base 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.

#### Properties/benefits:

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



### 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!



## EPDM and EPM materials

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperatures	Special properties	
<b>EPDM</b>	<b>AP 302</b>	70 Shore A	black	-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	
	<b>AP 306</b>	75 Shore A	black	-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, ISO 10993-5:2009 (cytotoxicity test), Regulation (EC) No 1935/2004	
	<b>AP 310</b>	70 Shore A	black	-50 °C to +140 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	
	<b>AP 312</b>	70 Shore A	black	-50 °C bis +140 °C	FDA 21. CFR 177.2600, Regulation (EC) No 1935/2004	
	<b>AP 313</b>	70 Shore A	white	-40 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 87 and Chapter 88	
	<b>AP 315</b>	70 Shore A	black	-40 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary Standard	
	<b>AP 318</b>	70 Shore A	black	-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, Regulation (EC) No 1935/2004	
	<b>AP 320</b>	80 Shore A	black	-50 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, 3-A Sanitary	
	<b>AP 323</b>	70 Shore A	black	-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 - WA/WB, ACS, NSF/ANSI Standard 51 and 61, WRAS BS 6920, ÖNORM B 5014-1, Regulation (EC) No 1935/2004	
	<b>AP 324</b>	70 Shore A	black	-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 W270, DIN EN 681-1, CLP, NSF/ANSI Standard 61	
	<b>AP 331</b>	70 Shore A	black	-50 °C to +150 °C	Elastomer Guideline, DVGW W270, DIN EN 681-1, CLP, WRAS BS 6920	
	<b>AP 332</b>	70 Shore A	black	-50 °C to +140 °C	FDA 21. CFR 177.2600, Elastomer Guideline	
	<b>AP 353</b>	50 Shore A	black	-40 °C to +140 °C	FDA 21. CFR 177.2600, USP Class VI bi +70 °C, Chapter 87 and Chapter 88	
	<b>AP 356</b>	50 Shore A	black	-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	
	<b>AP 372</b>	70 Shore A	black	-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	
<b>EPM</b>	<b>EP 390</b>	80 Shore A	black	-40°C to +140 °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. 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.

**Properties/benefits:**

- Base 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.

**Properties/benefits:**

- Base 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

**FKM and FEPM materials**

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperatures	Special properties
<b>FKM</b>	<b>Vi 327</b>	70 Shore A	black	-20 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88
	<b>Vi 665</b>	75 Shore A	blue	-15 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 87 and Chapter 88, Regulation (EC) No 1935/2004
	<b>Vi 770</b>	70 Shore A	white	-10 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 88
	<b>Vi 780</b>	80 Shore A	black	-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, Regulation (EC) No 1935/2004
	<b>Vi 971, W</b>	75 Shore A	nature white	-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
<b>FEPM</b>	<b>Vi 602</b>	75 Shore A	black	-10 °C to +230 °C	FDA 21. CFR 177.2600, USP Class VI to +121 °C, Chapter 88, Regulation (EC) No 1935/2004







## COG Resist®. And sealed.

### Premium compounds for high-performance applications

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.

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.

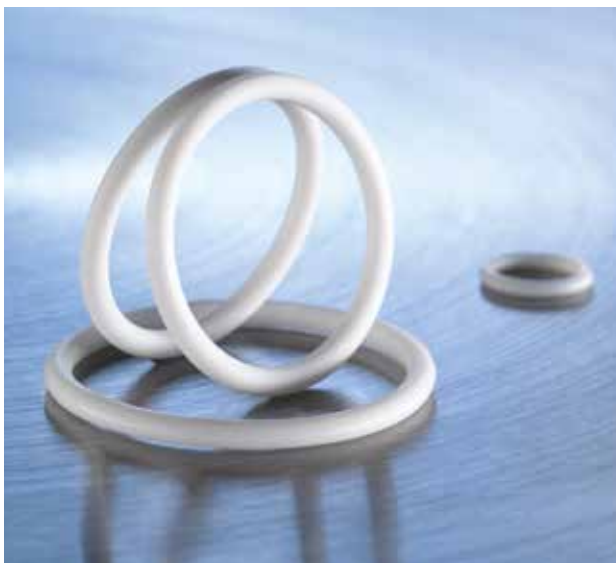
### The benefits of COG Resist®

- 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 top compound COG Resist® for the most sensitive production areas.



## The best properties in one material

The molecular structure of perfluoroelastomers 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.

## 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 pharmaceuticals (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.

## FFKM material

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperatures	Special properties
<b>FFKM</b>	<b>COG Resist® RS 75 HS</b>	75 Shore A	white	-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



# 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.



## 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.



## HNBR

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

### Properties/benefits:

- Base 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.

### Properties/benefits:

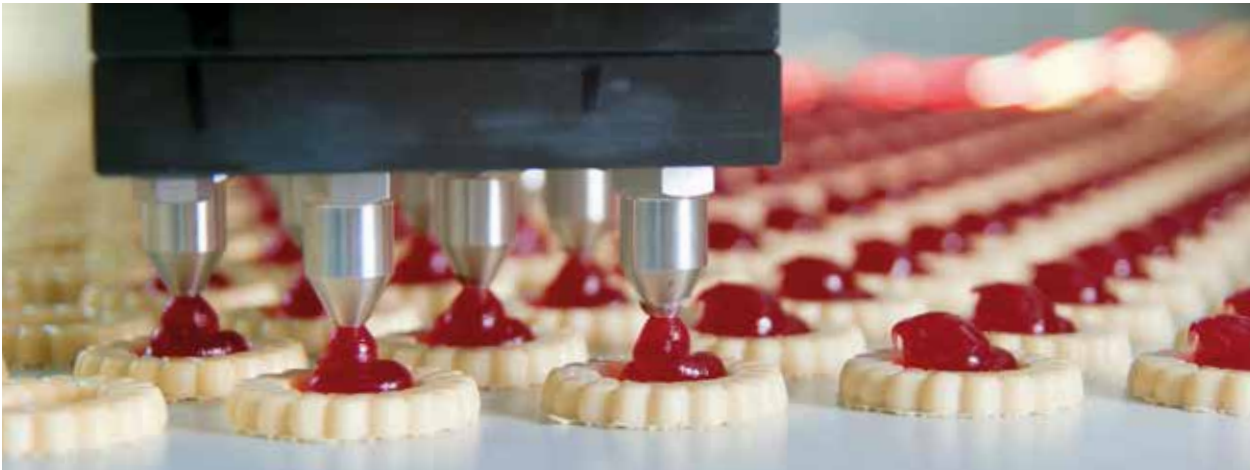
- Base elastomer: Acrylonitrile butadiene rubber
- Sulphur cured
- Good mechanical properties
- Good resistance to oil and fats
- Moderate resistance to many CIP media
- Not suitable for steam sterilisation (SIP)

## 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.

### Properties/benefits:

- Base 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



## HNBR, NBR and VMQ materials

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperatures	Special properties
<b>HNBR</b>	<b>HNBR 410</b>	70 Shore A	black	-20 °C to +150 °C	FDA 21. CFR 177.2600
	<b>HNBR 420</b>	90 Shore A	black	-20 °C to +150 °C	FDA 21. CFR 177.2600
<b>NBR</b>	<b>P 520</b>	70 Shore A	black	-25 °C to +120 °C	Elastomer Guideline, DVGW W 270, CLP, NSF/ ANSI Standard 61, WRAS BS 6920
	<b>P 521</b>	70 Shore A	black	-20 °C to +120 °C	FDA 21. CFR 177.2600, Elastomer Guideline, DVGW W 270, CLP, WRAS BS6920
	<b>P 581</b>	70 Shore A	black	-40 °C to +120 °C	FDA 21. CFR 177.2600, 3-A Sanitary Standard
	<b>P 582</b>	70 Shore A	black	-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
<b>VMQ</b>	<b>Si 50</b>	50 Shore A	blue	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 70, W</b>	70 Shore A	white	-60 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 87 and Chapter 88
	<b>Si 820</b>	70 Shore A	red	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 840</b>	65 Shore A	blue	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 870</b>	75 Shore A	blue	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 871, TR</b>	73 Shore A	trans- parent	-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
	<b>Si 971, B</b>	75 Shore A	blue	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 972, R</b>	70 Shore A	red	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 973, R</b>	70 Shore A	red	-60 °C to +200 °C	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004
	<b>Si 976, TR</b>	70 Shore A	trans- parent	-40 °C to +200 °C	FDA 21. CFR 177.2600, USP Class VI to +70 °C, Chapter 87 and Chapter 88





## Our expertise for your challenges

Particular requirements of components, a special environment or difficult media – We offer a multitude of special material solutions beyond our broad standard ranges.

### PTFE

PTFE is also a versatile material for the medical technology and pharmaceutical industries. This fully fluorinated polymer demonstrates extraordinarily high melting viscosity, whereby the thermal resilience in continuous use is also enormous. What's more, PTFE also offers virtually universal chemical resistance. Even aggressive acids such as aqua regia cannot corrode PTFE. Further properties include, among others, excellent electrical insulating capabilities, pronounced anti-adhesive behaviour, good dry-running properties and a low thermal conductivity. However, PTFE is a very hard and inelastic material, meaning that its use is not without limitations. PTFE also cannot be elongated, which should be noted during fitting. COG offers high warehouse availability for many dimensions of PTFE O-rings, and can therefore realise short delivery times. As well as the widest range of O-ring dimensions, our range of products also includes other types of PTFE seals, such as for example flat seals, piston and piston rod seals, bushing and back-up rings.

### The benefits of PTFE at a glance:

- Chemical resistance to almost all media, including alkaline solutions, acids and solvents
- Temperature resistant from -180 °C to +260 °C
- Optimum dielectric properties
- Low friction coefficient, even without lubrication (absolutely no adhesion)
- High mechanical resistance
- No water absorption
- Low thermal conductivity
- Physiologically harmless
- Outstanding resistance to weather and ageing



### FDA recommendation

Good to know: 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-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.

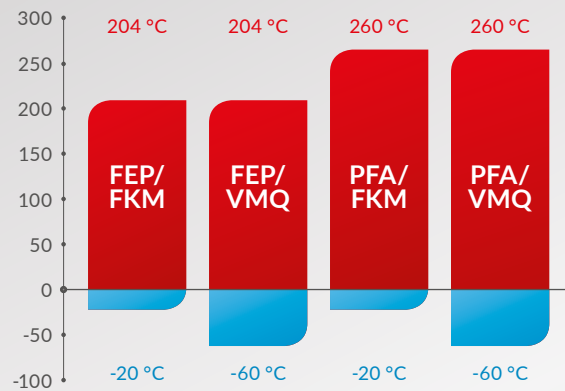
These FEP-coated O-rings can be used in diverse applications, including among others in areas of the petrochemical, chemical, pharmaceutical and food industries.

## 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.

### 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-coated O-rings

cross-section d <sub>2</sub>	groove depth	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, PFA and PTFE Materials

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperatures	Special properties
<b>FEP</b>	<b>FEP/FKM</b>	90 – 95 Shore A	black + transparent	-20 °C to +204 °C	FDA 21. CFR 177.1550
	<b>FEP/VMQ</b>	85 – 90 Shore A	red + transparent	-60 °C to +204 °C	FDA 21. CFR 177.1550
<b>PFA</b>	<b>PFA/FKM</b>	90 – 95 Shore A	black + transparent	-20 °C to +260 °C	FDA 21. CFR 177.1550
	<b>PFA/VMQ</b>	85 – 90 Shore A	red + transparent	-60 °C to +260 °C	FDA 21. CFR 177.1550
<b>PTFE</b>	<b>PT 950</b>	57 Shore D	white	-180 °C to +260 °C	FDA 21. CFR 177.1550

# A clean affair – Seals for screw fittings and connections

## Dairy pipe screw rings

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.

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



From left to right: Fig 1: Dairy pipe connection ring, Fig 2: Clamp seal, Fig 3: Cross-section of an aseptic screw pipe connection

## 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.



### Aseptic screw pipe connections

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 below provides an overview of the most common O-rings, with respect to pipe diameter as well as standards DIN 11853 and DIN 11864. There are also two further tables showing O-rings that are less commonly used, but which our application technology department would be pleased to supply on request.

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



## Much more than just O-rings

What many people don't realise: As well as our core business of precision O-rings, COG also produces moulded articles. Our decades of expertise in relation to elastomer seal materials are therefore 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 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.

### Our experts working for you

It goes without saying that our application engineers' expertise is available to you even in respect of moulded 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.

Telephone us on: **+49 (0)4101 50 02-964**  
or email: **applicationtechnology@cog.de**





O-ring mounted to a  
centre ring by COG

## Custom services for individual requirements

As a specialist in the complex area of elastomer seals, COG also offers you a broad spectrum of special services, even for special requirements.

### Series production expertise

Whether single parts, items in sets or a complete assembly – Working together, we will develop the optimum seal solution for your series production. As we do so, 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

Upon request, COG can also offer you a wide range of additional special services, of which only a few can be listed here. These include, among others:

- 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 < 80 mm)
- Special labelling (eg 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 550350 Part X, 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.

COG keeps five frequently used materials for the food and pharmaceutical industries continuously in 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 compounds 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

- Manufacturing time between 5 and 7 working days\*
- Continuous stock of a total of 5 material compounds for food and pharmaceutical use
- Maximum quantity depends on the size of the O-rings
- Express surcharge: flat fee of €250 plus VAT
- **Deadline guarantee:** Should COG not keep to the express delivery deadline, you pay only for the value of the goods

## Delivery times for COG's express production

COG material	ASTM	Hardness in Shore A	Colour	Properties	Delivery time* on orders placed	
					before 10 a.m.	before 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	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; Regulation (EC) No 1935/2004	6	7
Si 820	VMQ	70	red	FDA 21. CFR 177.2600, BfR-Recommendation XV, Regulation (EC) No 1935/2004	5	6

Please inquire for express production of **FFKM** and further materials.

## Maximum quantity

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

## Straightforward processing:

You pay only the normal price for the O-rings, plus a flat rate express surcharge of €250. Minimum item values and order values do not apply to this service.

\* In certain circumstances, working days can deviate from legally applicable working days as a result of company holidays, special holidays or other internal reasons. Our internal sales team can provide you with specific information about this.

COG material	FDA 21. CFR 177.2600	FDA 21. CFR 177.2400	FDA 21. CFR 177.1550	USP Chapter 87	USP Cl. VI to +121 °C, Chapter 88	USP Cl. VI to +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	Regulation (EC) No. 1935/2004	COG material	ASTM D 1418 ISO 1629	Hardness	Operating temperature range	Colour
AP 302	•			•	•		•																•	AP 302	EPDM	70 Shore A	-40 °C to +150 °C	black
AP 306	•			•	•		•	•															•	AP 306		75 Shore A	-40 °C to +150 °C	black
AP 310	•																						•	AP 310		70 Shore A	-50 °C to +140 °C	black
AP 312	•																						•	AP 312		70 Shore A	-50 °C to +140 °C	black
AP 313	•			•		•																		AP 313		70 Shore A	-40 °C to +140 °C	white
AP 315	•			•	•		•																	AP 315		70 Shore A	-40 °C to +140 °C	black
AP 318	•					•	•		•	•	•	•		•		•	•	•	•	•			•	AP 318		70 Shore A	-35 °C to +140 °C	black
AP 320	•																							AP 320		80 Shore A	-50 °C to +140 °C	black
AP 323	•					•	•		•	•	•	•		•		•	•	•	•				•	AP 323		70 Shore A	-45 °C to +140 °C	black
AP 324	•			•	•		•		•	•		•			•		•							AP 324		70 Shore A	-40 °C to +150 °C	black
AP 331									•	•		•			•			•						AP 331		70 Shore A	-50 °C to +150 °C	black
AP 332	•								•															AP 332		70 Shore A	-50 °C to +140 °C	black
AP 353	•			•		•																		AP 353		50 Shore A	-40 °C to +140 °C	black
AP 356	•								•	•	•				•		•	•	•	•				AP 356		50 Shore A	-50 °C to +140 °C	black
AP 372	•								•	•	•				•		•	•	•	•			•	AP 372		70 Shore A	-40 °C to +140 °C	black
EP 390	•																						•	EP 390	EPM	80 Shore A	-40 °C to +150 °C	black
Vi 602	•				•																		•	Vi 602	FEPM	75 Shore A	-10 °C to +230 °C	black
Vi 327	•			•	•																			Vi 327	FKM	70 Shore A	-20 °C to +200 °C	black
Vi 665	•			•	•																		•	Vi 665		75 Shore A	-15 °C to +200 °C	blue
Vi 770	•				•																			Vi 770		70 Shore A	-10 °C to +200 °C	white
Vi 780	•			•	•		•															•	•	Vi 780		80 Shore A	-10 °C to +200 °C	black
Vi 971, W	•			•		•	•																	Vi 971, W		75 Shore A	-20 °C to +200 °C	nature white
COG Resist® RS 75 HS	•	•		•	•		•																	COG Resist® RS 75 HS	FFKM	75 Shore A	-15 °C to +260 °C	white
HNBR 410	•																							HNBR 410	HNBR	70 Shore A	-20 °C to +150 °C	black
HNBR 420	•																							HNBR 420		90 Shore A	-20 °C to +150 °C	black
P 520									•	•					•		•	•						P 520	NBR	70 Shore A	-25 °C to +120 °C	black
P 521	•								•	•					•		•							P 521		70 Shore A	-20 °C to +120 °C	black
P 581	•						•																	P 581		70 Shore A	-40 °C to +120 °C	black
P 582	•								•	•			•		•		•	•	•				•	P 582		70 Shore A	-25 °C to +125 °C	black
Si 50	•																					•	•	Si 50	VMQ	50 Shore A	-60 °C to +200 °C	blue
Si 70, W	•			•		•																		Si 70, W		70 Shore A	-60 °C to +200 °C	white
Si 820	•																					•	•	Si 820		70 Shore A	-60 °C to +200 °C	red
Si 840	•																					•	•	Si 840		65 Shore A	-60 °C to +200 °C	bue
Si 870	•																					•	•	Si 870		75 Shore A	-60 °C to +200 °C	blue
Si 871, TR	•			•	•		•																	Si 871, TR		73 Shore A	-60 °C to +200 °C	transparent
Si 971, B	•																					•	•	Si 971, B		75 Shore A	-60 °C to +200 °C	blue
Si 972, R	•																					•	•	Si 972, R		70 Shore A	-60 °C to +200 °C	red
Si 973, R	•																					•	•	Si 973, R		70 Shore A	-60 °C to +200 °C	red
Si 976, TR	•			•		•																		Si 976, TR		70 Shore A	-40 °C to +200 °C	transparent
FEP/FKM			•																					FEP/FKM	FEP	90 – 95 Shore A	-20 °C to +204 °C	black
FEP/VMQ			•																					FEP/VMQ		85 – 90 Shore A	-60 °C to +204 °C	red
PFA /FKM			•																					PFA /FKM	PFA	90 – 95 Shore A	-20 °C to +260 °C	black
PFA /VMQ			•																					PFA /VMQ		85 – 90 Shore A	-60 °C to +260 °C	red
PT 950			•																				•	PT 950	PTFE	57 Shore D	-180 °C to +260 °C	white

## All information at a glance

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

# 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.**

PINNEBERG



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

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