



SEAL TECHNOLOGY
PREMIUM-QUALITY SINCE 1867



Elastomer seals

FOR HIGHEST DEMANDS

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.



Jan Metzger
Managing Director

Ingo Metzger
Managing Director



More information at 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 DVGW, NORSOK Standard M-710, ISO 23936-2, BAM, FDA, USP, 3-A Sanitary Standard, BfR, Elastomer Guideline, NSF/ANSI and many more

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Highest demands on modern seals



Due to the continuous improvement of the manufacturing processes regarding effectiveness and efficiency the demands on elastomer seals are also constantly increasing. The demands however differ greatly depending on the utilisation, the application area as well as the industry. Even within a precisely determined industrial sector it is not uncommon to have various definitions of requirements for the sealings. There is a growing trend for individualisation of the sealing solutions. Only high-quality and precisely processed materials can meet the many individual requirements. Due to the decades of experience, our exquisite knowledge of the industry and last but not least our extraordinary customer relations, we at COG master that challenge. And on more than one occasion we have been able to pleasantly surprise our customers with new sealing solutions.

Standards for precision O-rings: ISO 3601

The basic prerequisite for our premium products is a continuously high quality in both the choice of materials as well as the manufacturing of the final products. COG exclusively produces and sells precision O-rings abiding by the standard ISO 3601. The ISO 3601 is an international standard for precision O-rings. For anybody involved in these matters the standard ISO 3601 offers a certain security in dealing with designers and buyers using the imperial system (i. e. measuring in inches).

Standards overview for industrial applications

In many applications different standards apply for the materials used. This can also apply to elastomer

sealings. In such cases certificates for the employed materials in those fields are indispensable.

Release/Test certificate/Regulation	Application	Criteria/Standards	Appropriate COG material
Recommendation made by Germany's Bundesanstalt für Materialforschung und -prüfung (BAM) (Federal Institute for Material Research and Testing)	Seals for oxygen armatures and different parts of oxygen plant	Regulation B 7 'oxygen' of the professional association for chemical industry	Vi 564, Vi 576 (applies for plants for gaseous oxygen)
DVGW release for gas (German Association for Gas and Water)	Sealing material made of elastomers for gas appliance and gas plants	DIN EN 549	P 549, P 550, Vi 569
DVGW release for gas (German Association for Gas and Water)	Sealing material made of elastomers for gas supply lines and gas pipelines	DIN EN 682	P 550, P 682, Vi 569, Vi 840

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 sealing 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!



Ask us!

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

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

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?



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?



3. Mechanical properties:

How will the seal be used? Will this be an inactive, stationary seal or will it be active and dynamic? For dynamic seals: How great is the mechanical stress? How often will the seal be moved? Seldom, regularly or continuously?



4. Approvals:

Which regulations and approvals apply to the respective production process, which must therefore apply to the seal materials used?



Our materials at a glance

For quick access to all COG compounds, you will find each of our materials with the most important characteristics and clearly sorted by base elastomer.

Further information and the detailed material table can be found on the pages in the last column.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties	Page
AU	PU 50	75 Shore A	black	from -30 °C to +125 °C	high abrasion resistance	14
	PU 460	90 Shore A	black	from -30 °C to +125 °C	high abrasion resistance	14
CR	Ne 450	50 Shore A	black	from -30 °C to +120 °C		24
	Ne 460	70 Shore A	black	from -5 °C to +120 °C		24
	Ne 471	70 Shore A	black	from -40 °C to +120 °C		24
	Ne 560	60 Shore A	black	from -30 °C to +120 °C		24
	Ne 570	70 Shore A	black	from -30 °C to +120 °C		24
EPDM	AP 300	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility	12, 21, 35
	AP 301	70 Shore A	violet	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility	21
	AP 350	80 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility	21
	AP 370	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility	12, 21
	AP 380	80 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility	21
	AP 540	70 Shore A	black	from -50 °C to +130 °C	sulfur-linked, can be used in dynamic applications	21
	AP 545	45 Shore A	black	from -45 °C to +140 °C	sulfur-linked, can be used in dynamic applications	21
	AP 550	50 Shore A	black	from -40 °C to +140 °C	sulfur-linked, can be used in dynamic applications	21
	AP 560	60 Shore A	black	from -40 °C to +130 °C	sulfur-linked, can be used in dynamic applications	21
	AP 580	80 Shore A	black	from -35 °C to +140 °C	sulfur-linked, can be used in dynamic applications	21

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties	Page
EPM	EP 380	80 Shore A	black	from -35 °C to +180 °C		21
EU	EU 90	90 Shore A	black	from -30 °C to +100 °C	good hydrolysis resistance	14
FEP/FKM	FEP	90-95 Shore A	black	from -20 °C to +204 °C	high resistance to chemicals, high heat resistance, FDA 21. CFR 177.1550, partially not EU origin	31
FEP/VMQ	FEP	85-90 Shore A	red	from -60 °C to +204 °C	high resistance to chemicals, high heat resistance, good coldness properties, FDA 21. CFR 177.1550, partially not EU origin	31
PFA/FKM	PFA	90-95 Shore A	black	from -20 °C to +260 °C	high resistance to chemicals, high heat resistance, FDA 21. CFR 177.1550, partially not EU origin	31
PFA/VMQ	PFA	85-90 Shore A	red	from -60 °C to +260 °C	high resistance to chemicals, high heat resistance, good coldness properties, FDA 21. CFR 177.1550, partially not EU origin	31
FEPM	AF 100	75 Shore A	black	from -10 °C to +230 °C	high resistance to chemicals and to H ₂ S containing media, high resistance to hot water and vapour to +200 °C	13, 19
	Vi 982	75 Shore A	black	from -10 °C to +230 °C	high resistance to chemicals	11, 19
FFKM	COG Resist® RS 75 AL	75 Shore A	black	from -15 °C to +325 °C	excellent chemical resistance, good mechanical properties, highest thermal load capacity	11, 13, 17, 25
	COG Resist® RS 80 AL	80 Shore A	black	from -15 °C to +260 °C	excellent chemical resistance, good mechanical properties	13, 14, 17
	COG Resist® RS 92 AED	92 Shore A	black	from -15 °C to +260 °C	high resistance to explosive decompression, NORSOK Standard M-710, NACE TM 0297	13, 17, 27
FKM	BF 750	75 Shore A	black	from -15 °C to +200 °C	high resistance to biogenic media	10, 11, 19
	HF 875	75 Shore A	grey brown	from -15 °C to +200 °C	high resistance to chemicals	19
	LT 170	70 Shore A	red	from -50 °C to +200 °C	very good low-temperature flexibility	12, 19, 35
	Vi 100, S	70 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility	12, 19
	Vi 110, S	80 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility	12, 19
	Vi 370	70 Shore A	black	from -20 °C to +200 °C	suited for the use in the vacuum technology	19, 25
	Vi 399	90 Shore A	black brown	from -15 °C to +200 °C	good chemical resistance	19
	Vi 400	65 Shore A	black brown	from -15 °C to +200 °C	good chemical resistance	19, 25
	Vi 455	55 Shore A	black	from -15 °C to +200 °C	good chemical resistance	19, 25
	Vi 465	67 Shore A	brown	from -15 °C to +200 °C	suited for endless vulcanisation	19, 25, 28
	Vi 480	80 Shore A	black	from -15 °C to +200 °C	high resistance to hot water and vapour	11, 19
	Vi 500	80 Shore A	black	from -15 °C to +200 °C	suited for endless vulcanisation and for the use in the vacuum technology	19, 25, 28, 34
	Vi 564	70 Shore A	black	from -15 °C to +230 °C	use to 230 °C, BAM tested (when used with gaseous oxygen, max. application until 150 °C/2 bar)	4, 13, 15, 19, 25, 34
	Vi 569	80 Shore A	black	from -15 °C to +200 °C	DVGW approval according to DIN EN 682 - GB and DIN EN 549 - H3/E1, suited for endless vulcanisation	4, 15, 19, 28
	Vi 576	80 Shore A	black	from -15 °C to +200 °C	BAM tested (when used with gaseous oxygen, max. application until 150 °C/2 bar)	4, 15, 19
	Vi 580	80 Shore A	black	from -15 °C to +200 °C	suited for the use in the vacuum technology	19, 25
	Vi 580, G	80 Shore A	green	from -15 °C to +200 °C	suited for the use in the vacuum technology	19, 25
	Vi 590	90 Shore A	black	from -15 °C to +200 °C	good chemical resistance	19
	Vi 600	70 Shore A	green	from -15 °C to +200 °C	increased chemical resistance	19
	Vi 650	75 Shore A	green	from -15 °C to +200 °C	suited for endless vulcanisation	19, 28

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties	Page
FKM	Vi 670	80 Shore A	green	from -15 °C to +200 °C	good chemical resistance	19
	Vi 675	75 Shore A	red	from -15 °C to +200 °C	good chemical resistance	19
	Vi 691, G	90 Shore A	green	from -15 °C to +200 °C	good chemical resistance	19
	Vi 700	90 Shore A	green	from -15 °C to +200 °C	good chemical resistance	19
	Vi 840	80 Shore A	black	from -46 °C to +200 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 13787, NORSOK Standard M-710, ISO 23936-2	4, 11, 15, 19, 27
	Vi 890	90 Shore A	black	from -20 °C to +210 °C	NORSOK Standard M-710, high resistance to explosive decompression, suited for endless vulcanisation	19, 27, 28
	Vi 895	90 Shore A	black	from -45 °C to +225 °C	NORSOK Standard M-710, NACE TM 0297 & TM 0187, ISO 10423 (API 6A), ISO 23936-2, high resistance to explosive decompression	19, 27
	Vi 896	90 Shore A	black	from -20 °C to +210 °C	NORSOK Standard M-710, high resistance to explosive decompression	19, 27
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	excellent low-temperature flexibility, NORSOK Standard M 710, API 6A & 6D, suited for endless vulcanisation	12, 13, 19, 27, 28, 34
	Vi 900	90 Shore A	black	from -50 °C to +200 °C	NORSOK Standard M-710, ISO 23936-2	19, 27
	Vi 965	65 Shore A	black	from -15 °C to +200 °C	good chemical resistance	19
	Vi 970, G	70 Shore A	green	from -20 °C to +200 °C	good chemical resistance	19
	Vi 970, GF	70 Shore A	black	from -15 °C to +200 °C	good chemical resistance	11, 19
	Vi 975	75 Shore A	black	from -20 °C to +200 °C	good chemical resistance	19
	Vi 975, G	75 Shore A	green	from -20 °C to +200 °C	good chemical resistance	19
FVMQ	Si 770, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals	12, 19, 34
	Si 970, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals	12, 19, 34
	Si 971, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals	12, 19
HNBR	HNBR 600	70 Shore A	black	from -20 °C to +150 °C		23
	HNBR 610	90 Shore A	black	from -20 °C to +150 °C	suited for endless vulcanisation	23, 28
	HNBR 895	89 °IRHD	black	from -25 °C to +180 °C	high resistance to explosive decompression, NORSOK Standard M-710, Nace TM 0297-97	23, 27
	HNBR 899	90 Shore A	black	from -17 °C to +150 °C	high resistance to explosive decompression, NORSOK Standard M-710	23, 27
NBR	P 370	80 Shore A	black	from -20 °C to +120 °C		23
	P 427	90 Shore A	black	from -20 °C to +120 °C		23
	P 430	45 Shore A	black	from -20 °C to +120 °C		23
	P 431, A	75 Shore A	black	from -10 °C to +120 °C		23
	P 465	65 Shore A	black	from -20 °C to +120 °C	suited for endless vulcanisation	23, 28
	P 520	70 Shore A	black	from -20 °C to +120 °C	Elastomer Guideline, CLP, NSF/ANSI Standard 61, WRAS BS 6920, DVGW W 270	23
	P 549	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 549 - H3/B2	4, 15, 23
	P 550	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 549 - H3/B1	4, 15, 23
	P 574	55 Shore A	black	from -20 °C to +120 °C		23
	P 583	70 Shore A	black	from -30 °C to +120 °C		23, 34
	P 583, RF	70 Shore A	black	from -30 °C to +120 °C		12, 23

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties	Page
NBR	P 584, RF	70 Shore A	black	from -50 °C to +120 °C	good low-temperature flexibility to -50 °C	12, 23
	P 670	70 Shore A	black	from -20 °C to +120 °C	suited for endless vulcanisation	23, 28
	P 682	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682	4, 15, 23
	P 700	70 Shore A	black	from -46 °C to +120 °C	good low-temperature flexibility to -46 °C	12, 23
	P 745	45 Shore A	black	from -20 °C to +120 °C		23
	P 750	50 Shore A	black	from -20 °C to +120 °C		23
	P 755	55 Shore A	black	from -20 °C to +120 °C		23
	P 760	60 Shore A	black	from -30 °C to +120 °C		23
	P 775	75 Shore A	black	from -25 °C to +120 °C		23
	P 780	80 Shore A	black	from -30 °C to +120 °C		23
	P 780, RF	80 Shore A	black	from -60 °C to +120 °C	good low-temperature flexibility to -60 °C	12, 23
	P 790	90 Shore A	black	from -20 °C to +120 °C		23
	P 870	70 Shore A	grey	from -20 °C to +120 °C	unplasticised	23
	P 880	80 Shore A	grey	from -20 °C to +120 °C	unplasticised	23
P 990	90 Shore A	black	from -20 °C to +120 °C		23	
NR	K 545	45 Shore A	black	from -45 °C to +100 °C		24
	K 570	65 Shore A	black	from -45 °C to +100 °C		24
	K 850	45 Shore A	black	from -45 °C to +100 °C		24
PTFE	PT 950	57 Shore D	white	from -180 °C to +260 °C	high resistance to chemicals, wide temperature operating range, FDA 21. CFR 177.1550	31
VMQ	Si 810, S	70 Shore A	black	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 850, R	50 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 850, B	50 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 850, TR	50 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 855, R	55 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 860, R	60 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 860, B	60 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 860, TR	60 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 970, B	75 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 970, R	70 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility	21
	Si 970, TR	70 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility	21



Resistant to highest demands

Developers, engineers and users often encounter difficulties when a technical equipment or machine comes into contact with especially aggressive media. Often enough this damages the more sensitive parts, such as e. g. the elastomer seals, resulting in shorter maintenance intervals, unplanned machine shutdowns or in the worst case even leakages, which may lead to production stop.

COG has designed various different materials for use in aggressive environments and can fulfil the most diverse requirements with their large product range.

Vi 982 (FEPM)

This Viton® Extreme-ETP sealing material is an interesting solution for users with very high demands. The Vi 982 compound is multi-purposely applicable due to its good physical and excellent mechanical properties. Moreover, the outstanding chemical resistance of fluoric rubber is improved further by the compound Vi 982. At the same time heat resistance and low-temperature flexibility persist.

Properties:

- High quality FEPM compound
- Very good resistance to chemicals
- Excellent mechanical values
- Excellent ageing resistance
- Good heat resistance and low-temperature flexibility
- Outstanding resistance to hot water and vapour
- Very good resistance to acids, bases, complex solvent mixtures, amine-containing additives and corrosion inhibitors
- Extremely multi-purposely applicable, e. g. in the chemical and lacquer industry

BF 750 (FKM)

This high performance material has been specially designed for use with aggressive media, and tests have proven its outstanding chemical resistance under extreme conditions. Even after contact with nitric acid, sodium hydroxide or biogenic media, only the very slightest changes could be determined, all of which lie within all tolerance values. What's more, with its operating temperature range of -15 °C to +200 °C and excellent mechanical properties, this material has proven itself to be extremely versatile with regard to its possible applications. This all-rounder also scores highly when it comes to costs, especially when compared to FFKM materials.

Properties:

- Multi-purposely applicable all-rounder
- Excellent properties when in use with biogenic and conventional fuels
- Excellent resistance to chemicals
- Good solvent resistance
- Very good resistance to vapour
- Low compression set
- High mechanical properties
- Broad operating temperature range from -15 °C to +200 °C



Vi 840 (FKM)

This FKM compound, with its low temperature flexibility, is perfectly suited to the wide range of applications in the valve industry. Thanks to its properties, the material complies with all industry-relevant standards such as DVGW DIN EN 682, DVGW DIN EN 13787 and its low temperature resistance down to $-46\text{ }^{\circ}\text{C}$ means it complies with DIN EN 14141 and the API 6A and 6D norms. Its other certifications and approvals include NORSOK Standard M-710 and ISO 23936-2, which means the material can also be used in applications in the oil and gas sector.

Properties:

- Excellent material for the valve, oil and gas industry
- Extremely broad operating temperature range from $-46\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$
- Outstanding low temperature stability: TR-10 value: $-40.1\text{ }^{\circ}\text{C}$
- Excellent low temperature compression set
- Excellent media resistance
- High chemical resistance
- Low gas permeability
- Numerous approvals available

COG Resist® RS 75 AL (FFKM)

High temperature? Hot water vapour or acidic environment? The right answer to such complex requirements is: COG Resist® RS 75 AL. This FFKM material comes up trumps thanks to its excellent mechanical properties, plus high levels of resistance to chemicals and acids. Whether for use in vacuums or with vapour, with amines or at high temperatures, COG Resist® RS 75 AL is an absolute all-rounder. Due to its low permeability the compound is also less prone to swelling and enables an extended in-service performance in valves, pumps and further applications.

Properties:

- Heat resistant to $+325\text{ }^{\circ}\text{C}$
- Excellent chemical resistance
- Good mechanical properties
- High purity
- Highly resistant to vapour
- Universally applicable
- Very good vacuum behaviour

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FKM	BF 750	75 Shore A	black	from $-15\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$	high resistance to biogenic media
	Vi 480	80 Shore A	black	from $-15\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$	high resistance to hot water and vapour
	Vi 840	80 Shore A	black	from $-46\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$	DVGW approval according to DIN EN 682 - GBL and DIN EN 13787, NORSOK Standard M-710, ISO 23936-2, DIN EN 14141 and API 6A & 6D
	Vi 970, GF	70 Shore A	black	from $-15\text{ }^{\circ}\text{C}$ to $+200\text{ }^{\circ}\text{C}$	good chemical resistance
FEPM	Vi 982	75 Shore A	black	from $-10\text{ }^{\circ}\text{C}$ to $+230\text{ }^{\circ}\text{C}$	high resistance to chemicals
FFKM	COG Resist® RS 75 AL	75 Shore A	black	from $-15\text{ }^{\circ}\text{C}$ to $+325\text{ }^{\circ}\text{C}$	excellent chemical resistance, good mechanical properties, highest thermal load capacity

Safety in all temperature ranges

Materials for low temperature applications

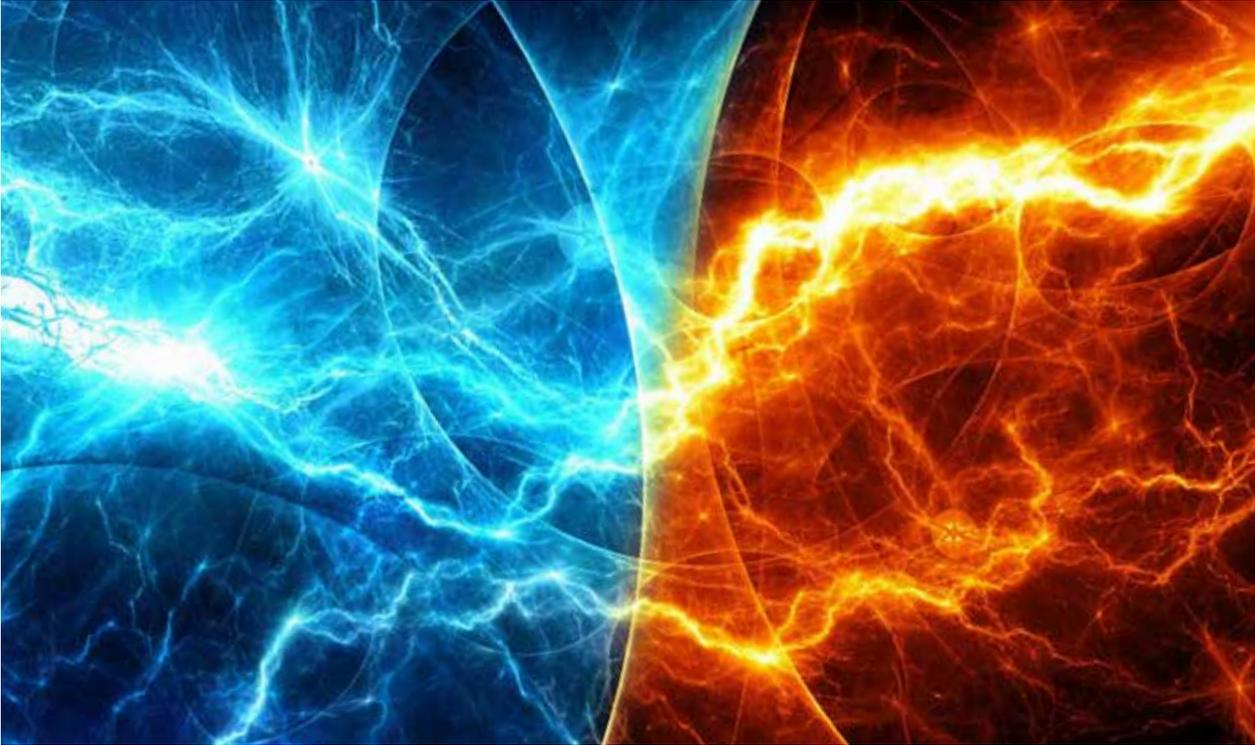
Sealing materials used in cold environments need to meet special requirements. Even in these conditions the seals used must possess the necessary flexibility in order to seal properly. In the field, users are confronted with various different definitions, therefore comparing materials by different manufacturers proves difficult.

Clarity regarding cold things

There are many different methods of measuring the material properties at low-temperatures. The methods usually disclose different results of

measurement. Therefore it is important to choose the method that gives accurate information on the functional efficacy of seals. For this reason the COG material data regarding the application in low-temperatures refers to the 'TR-10 value' (temperature retraction value), unless specifically stated otherwise. This value describes the behaviour of a material in low temperatures. The TR-10 value is the temperature at which an elastomer can recover 10 % of its elastomer restoring property. In certain applications some materials can even be used well below this value. The TR-10 value forms the dependable basis of our temperature specifications, enabling us to provide users with comparable and reliable statements in this regard.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
EPDM	AP 300	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 370	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
FKM	LT 170	70 Shore A	red	from -50 °C to +200 °C	very good low-temperature flexibility
	Vi 100, S	70 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility
	Vi 110, S	80 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	excellent low-temperature flexibility, NORSOK Standard M 710, API 6A & 6D
FVMQ	Si 770, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals
	Si 970, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals
	Si 971, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals
NBR	P 583, RF	70 Shore A	black	from -30 °C to +120 °C	good oil and grease resistance
	P 584, RF	70 Shore A	black	from -50 °C to +120 °C	good oil and grease resistance
	P 700	70 Shore A	black	from -46 °C to +120 °C	good oil and grease resistance
	P 780, RF	80 Shore A	black	from -60 °C to +120 °C	good oil and grease resistance
VMQ	VMQ compounds can be found on page 20/21				good low-temperature flexibility



Materials for high temperature applications

In many areas, seals must be resistant even at very high temperatures, e. g. when used in industrial furnaces, emission control systems or combined heat

and power plants. All data regarding the resistance in high and low temperatures apply to continuous application. Temperatures may peak a great deal higher.

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FEPM	AF 100	75 Shore A	black	from -10 °C to +230 °C	high resistance to chemicals and to H ₂ S containing media, high resistance to hot water and vapour to +200 °C
FFKM	COG Resist® RS 75 AL	75 Shore A	black	from -15 °C to +325 °C	excellent chemical resistance, good mechanical properties, highest thermal load capacity
	COG Resist® RS 80 AL	80 Shore A	black	from -15 °C to +260 °C	excellent chemical resistance, good mechanical properties
	COG Resist® RS 92 AED	92 Shore A	black	from -15 °C to +260 °C	high resistance to explosive decompression, NORSOK Standard M-710, NACE TM 0297
FKM	Vi 564	70 Shore A	black	from -15 °C to +230 °C	use to 230 °C, BAM tested (when used with gaseous oxygen, max. application until 150 °C/2 bar)
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	NORSOK Standard M 710, API 6A & 6D, excellent low-temperature flexibility,

Specialists for high mechanical stress

In certain applications the used elastomer seals must withstand mechanical strain. Not all elastomer materials are equally suited for these fields of application. The materials featured on this page all have good mechanical resistance. Yet this does not mean

they are generally applicable for all dynamic sealing applications. First of all it has to be determined how intense the mechanical strain is in the respective application. Is the seal in motion on the rare occasion or on a regular or even constant basis?

FFKM

Properties/advantages:

- Basic elastomer: Perfluoroelastomer
- Peroxidically cross-linked
- Maximum chemical resistance of all elastic sealing materials
- High thermal expansion coefficient
- High temperature stability up to +327 °C, depending on the grade used
- Wide range of approvals
- Low compression set
- Flexible in application



Ask us!

To be sure, please contact our application technology department. Our engineers will gladly advise you and are happy to choose the right material together with you.

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

AU

Properties/advantages:

- Basic elastomer: polyester urethane rubber
- Good mechanical properties
- Very good resilience
- High gas density
- Good resistance to fuels and many technically common oils, especially to oils with higher aromatic content
- Good low-temperature flexibility
- Excellent oxygen and ozone resistance

EU

Properties/advantages:

- Basic elastomer: polyether urethane rubber
- Good mechanical properties
- Very good resilience
- High gas density
- Good resistance to fuels and many technically common oils, especially to oils with higher aromatic content
- Good low-temperature flexibility
- Excellent oxygen and ozone resistance
- Good hydrolysis resistance
- Good resistance in watery media

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
AU	PU 50	75 Shore A	black	from -30 °C to +125 °C	high abrasion resistance
	PU 460	90 Shore A	black	from -30 °C to +125 °C	high abrasion resistance
EU	EU 90	90 Shore A	black	from -30 °C to +100 °C	good hydrolysis resistance
FFKM	COG Resist® RS 80 AL	80 Shore A	black	from -15 °C to +260 °C	excellent chemical resistance, good mechanical properties



Experts in contact with gases and oxygen

Sealing materials for gas and/or oxygen applications must meet special requirements. In Germany as well as other countries release certificates or certificates of approval are required in order to be able to use the

materials in certain applications. The materials featured here have at least one certificate of approval and were designed especially for the use in those applications.

NBR

Properties/advantages:

- Basic elastomer: Acrylnitrile-butadiene rubber
- Sulphur cross-linked
- Good mechanical properties
- Good resistance to oil and fat
- Good physical properties, e. g. high abrasion resistance and stability

FKM

Properties/advantages:

- Basic elastomer: Fluoroelastomer rubber
- Bisphenol cross-linked
- Very good media resistance
- Any kind of hydrocarbons (oils, fats, solvents)
- High chemical resistance
- Good hydrolysis resistance

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FKM	Vi 564	70 Shore A	black	from -15 °C to +230 °C	use to +230 °C, BAM tested (when used with gaseous oxygen, max. application until 150 °C/2 bar)
	Vi 569	80 Shore A	black	from -15 °C to +200 °C	DIN EN 682 - GB and DIN EN 549 - H3/E1, suited for endless vulcanisation
	Vi 576	80 Shore A	black	from -15 °C to +200 °C	BAM tested (when used with gaseous oxygen, max. application until 150 °C/25 bar)
	Vi 840	80 Shore A	black	from -46 °C to +200 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 13787, NORSOK Standard M-710, ISO 23936-2
NBR	P 549	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 549 - H3/B2
	P 550	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682 - GB and DIN EN 549 - H3/B1
	P 682	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682



COG Resist®. And sealed.

FFKM high-tech compound

This material group is based on perfluorelastomers (FFKM/FFPM). 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. This is especially important in applications where a single seal is exposed to various different chemicals. In such applications, the extreme operating temperatures, which range from extremely cold to extraordinarily hot, often place the greatest demands on the seals used.



Advantages of COG Resist®

- Maximum chemical resistance of all elastic sealing materials
- High temperature stability up to +327 °C, depending on the grade used
- Low compression set
- Excellent vacuum performance
- Flexible in application
- Suitable compound for a wide variety of demands
- Wide range of approvals

COG Resist® RS 75 AL

High temperature? Hot water vapour or acidic environment? The right answer to such complex requirements is: COG Resist® RS 75 AL. This FFKM material comes up trumps thanks to its excellent mechanical properties, plus high levels of resistance to chemicals and acids. Whether for use in vacuums or with vapour, with amines or at high temperatures, COG Resist® RS 75 AL is an absolute all-rounder. Due to its low permeability the compound is also less prone to swelling and enables an extended in-service performance in valves, pumps and further applications.

- Heat resistant to +325 °C
- Excellent chemical resistance
- Good mechanical properties
- High purity
- Highly resistant to vapour
- Universally applicable
- Very good vacuum behaviour

COG Resist® RS 80 AL

This high performance FFKM material demonstrates excellent resistance to acids, amines and media containing chlorine and solvents. It is heat resistant up to +260 °C and has excellent mechanical properties. What's more, its range of applications is correspondingly broad: whether in pressure tanks or diesel engines, couplings or valves – COG Resist® RS 80 AL demonstrates the necessary resistances.

- Heat resistant to +260 °C
- Excellent chemical resistance
- Outstanding mechanical properties
- Can be used universally in the chemical industry and also in refineries

COG Resist® RS 92 AED

The COG Resist® RS 92 AED material is high tech: it was especially developed and tested for use in environments where explosive decompression can occur. Wherever seal materials are exposed to high pressure and aggressive media, COG Resist® RS 92 AED provides the security you need. Because the compound combines extraordinary chemical resistance with excellent thermal resistance. These high-end properties, along with its low compression set, make it the number one choice for deep seawalves, pumps and compressor construction. In short, a material that satisfies the very highest demands.

- Excellent resistance to explosive decompression
- Tested to NORSOK standard M-710 and NACE TM 0297
- Operating temperature range from -15 °C to +260 °C
- Excellent chemical and thermal resistance
- Extraordinary resistance to methanol, hot water, vapour and oils
- High chemical resistance
- Very good compression set



ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FFKM	COG Resist® RS 75 AL	75 Shore A	black	from -15 °C to +325 °C	excellent chemical resistance, good mechanical properties, highest thermal load capacity
	COG Resist® RS 80 AL	80 Shore A	black	from -15 °C to +260 °C	excellent chemical resistance, good mechanical properties
	COG Resist® RS 92 AED	92 Shore A	black	from -15 °C to +260 °C	high resistance to explosive decompression, NORSOK Standard M-710, NACE TM 0297

Reliability under the toughest conditions

FEPM

Application areas:

Ideally suited for use in industrial applications where especially aggressive chemicals demand outstanding resistance.

Properties/advantages:

- Basic elastomer: Viton® Extreme-ETP or Aflas®
- Peroxidically cross-linked
- Applicable in temperatures: -10 °C to +230 °C, depending on the type
- Very good resistance to acids, bases, ammonia, H₂S gases or Amine-containing additives and corrosion inhibitors, alloyed motor and gear oils, brake fluids, etc.
- Very high resistance to hot water and vapour
- High resistance to chemicals

FKM

Application areas:

Perfect for a wide range of uses in demanding industrial applications that require high levels of chemical resistance.

Properties/advantages:

- Basic elastomer: Fluoroelastomer rubber
- Bisphenol or peroxidically cross-linked
- Very good media resistance
- Carbohydrates of all kinds (oils, fats, solvents)
- Low gas permeability
- Moderate resistance to vapour > +130 °C
- High resistance to chemicals

FFKM

Application areas:

Perfect for a wide range of uses in industrial processes that place enormous demands on elastomer seals.

Properties/advantages:

- Basic elastomer: Perfluoroelastomer
- Peroxidically cross-linked
- Maximum chemical resistance of all elastic sealing materials
- High temperature stability up to +325 °C, depending on the grade used
- High thermal expansion coefficient
- Low compression set
- Excellent vacuum performance

FVMQ

Application areas:

Well-suited for production processes that require a combination of good low temperature flexibility and high levels of chemical resistance.

Properties/advantages:

- Basic elastomer: fluorosilicone rubber
- Mostly peroxidically cross-linked
- Compared to silicone rubber an improved resistance against oils, fuels and solvents, especially when used in aromatic and chlorinated carbohydrates and alcohols, petrol and alcohol mixtures
- Resistance to aromatic und naphthenic oils and a number of chlorinated solvents



ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FEPM	AF 100	75 Shore A	black	from -10 °C to +230 °C	high resistance to chemicals and to H ₂ S containing media, high resistance to hot water and vapour to +200 °C
	Vi 982	75 Shore A	black	from -10 °C to +230 °C	high resistance to chemicals
FFKM	FFKM compounds can be found on page 16/17				
FKM	BF 750	75 Shore A	black	from -15 °C to +200 °C	high resistance to biogenic media
	HF 875	75 Shore A	grey brown	from -15 °C to +200 °C	high resistance to chemicals
	LT 170	70 Shore A	red	from -50 °C to +200 °C	very good low-temperature flexibility
	Vi 100, S	70 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility
	Vi 110, S	80 Shore A	black	from -30 °C to +200 °C	good low-temperature flexibility
	Vi 370	70 Shore A	black	from -20 °C to +200 °C	suited for the use in the vacuum technology
	Vi 399	90 Shore A	black brown	from -15 °C to +200 °C	good chemical resistance
	Vi 400	65 Shore A	black brown	from -15 °C to +200 °C	good chemical resistance
	Vi 455	55 Shore A	black	from -15 °C to +200 °C	good chemical resistance
	Vi 465	67 Shore A	brown	from -15 °C to +200 °C	suited for endless vulcanisation
	Vi 480	80 Shore A	black	from -15 °C to +200 °C	high resistance to hot water and vapour
	Vi 500	80 Shore A	black	from -15 °C to +200 °C	suited for endless vulcanisation and the use in the vacuum technology
	Vi 564	70 Shore A	black	from -15 °C to +230 °C	use to +230 °C, BAM tested (when used with gaseous oxygen, max. application until 150 °C/2 bar)
	Vi 569	80 Shore A	black	from -15 °C to +200 °C	DIN EN 682 - GB and DIN EN 549 - H3/E1, suited for endless vulcanisation
	Vi 576	80 Shore A	black	from -15 °C to +200 °C	BAM tested (when used with gaseous oxygen, max. application until 150 °C/25 bar)
	Vi 580	80 Shore A	black	from -15 °C to +200 °C	suited for the use in the vacuum technology
	Vi 580, G	80 Shore A	green	from -15 °C to +200 °C	good chemical resistance
	Vi 590	90 Shore A	black	from -15 °C to +200 °C	good chemical resistance
	Vi 600	70 Shore A	green	from -15 °C to +200 °C	increased chemical resistance
	Vi 650	75 Shore A	green	from -15 °C to +200 °C	suited for endless vulcanisation
	Vi 670	80 Shore A	green	from -15 °C to +200 °C	good chemical resistance
	Vi 675	75 Shore A	red	from -15 °C to +200 °C	good chemical resistance
	Vi 691, G	90 Shore A	green	from -15 °C to +200 °C	good chemical resistance
	Vi 700	90 Shore A	green	from -15 °C to +200 °C	good chemical resistance
	Vi 840	80 Shore A	black	from -46 °C to +200 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 13787, NORSOK Standard M-710, ISO 23936-2
	Vi 890	90 Shore A	black	from -20 °C to +210 °C	NORSOK Standard M-710, high resistance to explosive decompression, suited for endless vulcanisation
	Vi 895	90 Shore A	black	from -45 °C to +225 °C	NORSOK Standard M-710, NACE TM 0297 & TM 0187, ISO 10423 (API 6A), ISO 23936-2, high resistance to explosive decompression
	Vi 896	90 Shore A	black	from -20 °C to +210 °C	high resistance to explosive decompression, NORSOK Standard M-710
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	excellent low-temperature flexibility, NORSOK Standard M-710, API 6A & 6D, suited for endless vulcanisation
	Vi 900	90 Shore A	black	from -50 °C to +200 °C	NORSOK Standard M-710, ISO 23936-2
	Vi 965	65 Shore A	black	from -15 °C to +200 °C	good chemical resistance
	Vi 970, G	70 Shore A	green	from -20 °C to +200 °C	good chemical resistance
	Vi 970, GF	70 Shore A	black	from -15 °C to +200 °C	good chemical resistance
Vi 975	75 Shore A	black	from -20 °C to +200 °C	good chemical resistance	
Vi 975, G	75 Shore A	green	from -20 °C to +200 °C	good chemical resistance	
FVMQ	Si 770, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals
	Si 970, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals
	Si 971, FL	70 Shore A	blue	from -60 °C to +200 °C	very good low-temperature flexibility and resistance to chemicals

Multiply tried and tested

EPDM

Application areas:

Multi-purposely applicable, wherever high resistance to hot water and vapour is required.

Properties/advantages:

- Basic elastomer: Ethylene propylene diene rubber
- Peroxidically or sulphur cross-linked
- Good resistance in watery media
- Good resistance in many CIP-media
- Good resistance to hot water and vapour
- Very good ageing and ozone resistance
- Good low-temperature flexibility
- Partially unresistant to vegetable and animal oils/fats

EPM

Application areas:

Multi-purposely applicable material, also very good capabilities for the food industry.

Properties/advantages:

- Basic elastomer: Ethylene propylene rubber
- Peroxidically cross-linked
- Good resistance in watery media
- Good resistance to acids and bases
- Good resistance in many CIP-media
- Good resistance to hot water and vapour
- Partially unresistant to vegetable and animal oils/fats
- Very good ageing, UV and ozone resistance
- Good low-temperature flexibility



VMQ

Application areas:

Application in production methods with wide range of temperature.

Properties/advantages:

- Basic elastomer: Silicone rubber
- Mostly peroxidically cross-linked
- Physiologically inert
- Limited mechanical properties
- Weakness in certain acid media
- Weakness in the SIP-process
- Very good low-temperature Flexibility



ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
EPDM	AP 300	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 301	70 Shore A	violet	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 350	80 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 370	70 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 380	80 Shore A	black	from -50 °C to +150 °C	very good hot water and vapour resistance, good low-temperature flexibility
	AP 540	70 Shore A	black	from -50 °C to +130 °C	sulfur-linked, can be used in dynamic applications
	AP 545	45 Shore A	black	from -45 °C to +140 °C	sulfur-linked, can be used in dynamic applications
	AP 550	50 Shore A	black	from -40 °C to +140 °C	sulfur-linked, can be used in dynamic applications
	AP 560	60 Shore A	black	from -40 °C to +130 °C	sulfur-linked, can be used in dynamic applications
	AP 580	80 Shore A	black	from -35 °C to +140 °C	sulfur-linked, can be used in dynamic applications
EPM	EP 380	80 Shore A	black	from -35 °C to +180 °C	
VMQ (silicone)	Si 810, S	70 Shore A	black	from -60 °C to +200 °C	good low-temperature flexibility
	Si 850, R	50 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility
	Si 850, B	50 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility
	Si 850, TR	50 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility
	Si 855, R	55 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility
	Si 860, R	60 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility
	Si 860, B	60 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility
	Si 860, TR	60 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility
	Si 970, B	75 Shore A	blue	from -60 °C to +200 °C	good low-temperature flexibility
	Si 970, R	70 Shore A	red	from -60 °C to +200 °C	good low-temperature flexibility
	Si 970, TR	70 Shore A	transparent	from -60 °C to +200 °C	good low-temperature flexibility
	Si 970, TR	70 Shore A	transparent	von -60°C bis +200°C	good low-temperature flexibility



Multi-purposely applicable with robust materials

HNBR

Application areas:

A material with a comprehensive range of possible uses in the widest range of industrial applications, including among others in pneumatic and hydraulic applications.

Properties/advantages:

- Basic elastomer: Hydrated nitrile butadiene rubber
- Peroxidically cross-linked
- High resistance to additive-containing mineral oils
- Low gas and vapour permeability
- Good mechanical properties
- Good resistance to oil and fat

NBR

Application areas:

A material with a comprehensive range of possible uses in numerous sectors, including among others in pneumatic and hydraulic applications, or gas supply.

Properties/advantages:

- Basic elastomer: Acrylnitrile butadiene rubber
- Sulphur and as exception peroxidically cross-linked
- Good mechanical properties
- Good resistance to oil and fat
- Weakness with water vapour

ASTM D 1418 ISO 1629	COG- Werkstoff	Härte	Farbe	Einsatztemperatur	Besonderheiten
HNBR	HNBR 600	70 Shore A	black	from -20 °C to +150 °C	
	HNBR 610	90 Shore A	black	from -20 °C to +150 °C	suited for endless vulcanisation
	HNBR 895	89 °IRHD	black	from -25 °C to +180 °C	high resistance to explosive decompression, NORSOK Standard M-710, Nace TM 0297-97
	HNBR 899	90 Shore A	black	from -17 °C to +150 °C	high resistance to explosive decompression, NORSOK Standard M-710
NBR	P 370	80 Shore A	black	from -20 °C to +120 °C	
	P 427	90 Shore A	black	from -20 °C to +120 °C	
	P 430	45 Shore A	black	from -20 °C to +120 °C	
	P 431, A	75 Shore A	black	from -10 °C to +120 °C	
	P 465	65 Shore A	black	from -20 °C to +120 °C	suited for endless vulcanisation
	P 520	70 Shore A	black	from -20 °C to +120 °C	Elastomer Guideline, CLP, NSF/ANSI Standard 61, WRAS BS 6920, DVGW W 270
	P 549	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 549 - H3/B2
	P 550	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 549 - H3/B1
	P 574	55 Shore A	black	from -20 °C to +120 °C	
	P 583	70 Shore A	black	from -30 °C to +120 °C	
	P 583, RF	70 Shore A	black	from -30 °C to +120 °C	
	P 584, RF	70 Shore A	black	from -50 °C to +120 °C	good low-temperature flexibility to -50 °C
	P 670	70 Shore A	black	from -20 °C to +120 °C	suited for endless vulcanisation
	P 682	70 Shore A	black	from -20 °C to +120 °C	DVGW approval according to DIN EN 682
	P 700	70 Shore A	black	from -46 °C to +120 °C	good low-temperature flexibility to -46 °C
	P 745	45 Shore A	black	from -20 °C to +120 °C	
	P 750	50 Shore A	black	from -20 °C to +120 °C	
	P 755	55 Shore A	black	from -20 °C to +120 °C	
	P 760	60 Shore A	black	from -30 °C to +120 °C	
	P 775	75 Shore A	black	from -25 °C to +120 °C	
P 780	80 Shore A	black	from -30 °C to +120 °C		
P 780, RF	80 Shore A	black	from -60 °C to +120 °C	good low-temperature flexibility to -60 °C	
P 790	90 Shore A	black	from -20 °C to +120 °C		
P 870	70 Shore A	grey	from -20 °C to +120 °C	unplasticised	
P 880	80 Shore A	grey	from -20 °C to +120 °C	unplasticised	
P 990	90 Shore A	black	from -20 °C to +120 °C		





Exotics – for particular applications

CR

Application areas:

Multi-purposely applicable material for a variety of industrial areas.

Properties/advantages:

- Basic elastomer: chloroprene rubber
- Similar properties to NBR, yet slightly less resistant against acids, bases and media

NR

Application areas:

Despite the diversity of available types of synthetic rubbers with a great variety of material properties natural rubber is still sought after in certain niche areas.

Properties/advantages

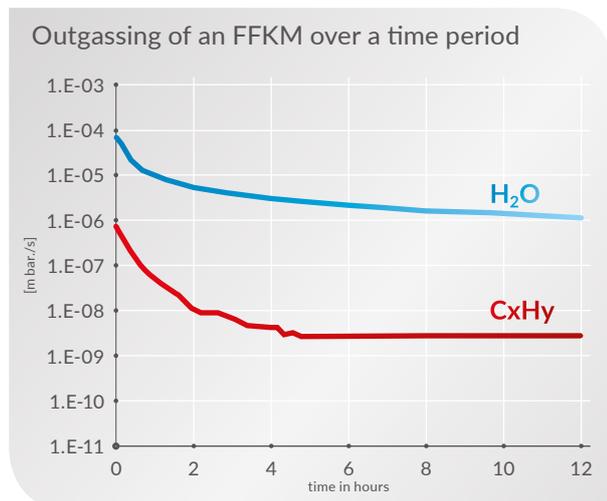
- Basic elastomer: natural rubber
- Highly flexible
- Excellent physical properties

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
CR	Ne 450	50 Shore A	black	from -30 °C to +120 °C	
	Ne 460	70 Shore A	black	from -5 °C to +120 °C	
	Ne 471	70 Shore A	black	from -40 °C to +120 °C	
	Ne 560	60 Shore A	black	from -30 °C to +120 °C	
	Ne 570	70 Shore A	black	from -30 °C to +120 °C	
NR	K 545	45 Shore A	black	from -45 °C to +100 °C	
	K 570	65 Shore A	black	from -45 °C to +100 °C	
	K 850	45 Shore A	black	from -45 °C to +100 °C	

Elastomer seals in vacuum technology

In general every material emits gas, no matter what the ambient pressure. However the emission rate generally increases as the ambient pressure is reduced. The highest emission occurs in a vacuum, therefore the lower the emission, the better the material is suited for applications in vacuum technology. Sealing materials applied in this field must meet exceptionally high demands. Our customers can choose from variety of tried and tested materials for applications in vacuum technology.

For O-rings with large inside diameter (min. 1,400 mm) we recommend the endless vulcanisation process (see p. 28). Our experienced engineers from the application technology department will gladly assist you in choosing the ideal material for your purposes.



 We are happy to advise you!

There are many aspects to consider when choosing the right material, especially in vacuum technology. Therefore, please contact our application technology department and harness our know-how!

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

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
FKM	Vi 370	70 Shore A	black	from -20 °C to +200 °C	
	Vi 400	65 Shore A	black brown	from -15 °C to +200 °C	good chemical resistance
	Vi 455	55 Shore A	black	from -15 °C to +200 °C	good chemical resistance
	Vi 465	67 Shore A	brown	from -15 °C to +200 °C	suited for endless vulcanisation
	Vi 500	80 Shore A	black	from -15 °C to +200 °C	suited for endless vulcanisation
	Vi 564	70 Shore A	black	from -15 °C to +230 °C	use to 230 °C, BAM tested
	Vi 580	80 Shore A	black	from -15 °C to +200 °C	good chemical resistance
	Vi 580, G	80 Shore A	green	from -15 °C to +200 °C	good chemical resistance
FFKM	COG Resist® RS 75 AL	75 Shore A	black	from -15 °C to +325 °C	excellent chemical resistance, good mechanical properties, highest thermal load capacity



High-tech compounds against explosive decompression

Special materials for extreme pressure changes

Many manufacturers and operators in the oil and gas industries as well as in the compressor manufacturing business and in compressed air conditioning have difficulties with explosive decompression and its consequences, since conventional elastomer seals cannot withstand the intense strain.

For the high demands on elastomer seals against explosive decompression (AED/Anti Explosive Decompression) COG offers with various tested compounds a wide range of AED products which were especially developed for use in this sector. All compounds have been tested successfully according to the Norsok Standard M-710 – the leading international standard for this field of application and renowned for safety for applications where explosive decompression may occur. These materials have already successfully prevented O-rings used in natural gas production of being damaged by explosive decompression, therefore also avoiding expensive leaks.

FKM AED materials

Due to a special recipe and performance the FKM compounds from COG are suitable for applications in gas environment and have a long-term sealing effect even when a drop in pressure occurs. Furthermore FKM compounds offer a high chemical and thermal resistance.

The compound Vi 890 has proven its ability in praxis for applications where explosive decompression may occur and scored the excellent Norsok rating of '1100'. COG has developed a further high-performance compound for the oil and natural gas industry that successfully passes the Norsok test to Standard M-710 with the best possible '0000' rating. What's more, its ISO 23936-2 certification also means that Vi 900 offers additional options for use.

The FKM compound Vi 895 offers a very good low temperature flexibility down to -45 °C as well as a high resistance to explosive decompression. Vi 895 fulfils some of the most important certifications for this sector: the Norsok Standard M-710, NACE TM 0297 (explosive decompression) and NACE TM 0187 (sour gas). Next to an excellent low temperature flexibility down to -46 °C the FKM compound Vi 899 offers high resistance to explosive decompression. Vi 899 is suitable for the use in API 6A & 6D compliant valves and wellhead equipment. Furthermore there is a selection of additional materials for the special requirements of the valves and fittings industry available.

HNBR AED materials

The HNBR 899 has passed the NORSOK test with the best possible rating of '0000'. This HNBR is a multi-purpose compound which is usable in different industrial applications. Due to the chemical resistance e. g. to mineral oils with additives or oil and grease in combination with a low gas or vapour permeability this compound is an optimal choice for many applications.

For users who require an HNBR compound, which in addition to the NORSOK standard M-710 has also been tested to NACE TM 0187 (sour gas), the HNBR 895 is suitable.

FFKM AED materials

The high-tech sealing compound COG Resist® RS 92 AED offers the exceptional chemical compatibility of an FFKM, combined with an excellent thermal resistance. The compound for highest requirements has been developed and tested to explosive decompression. Ideal preconditions for a use in all situations where the sealing material comes into contact with high pressure as well as with aggressive media, e. g. in subsea valves, pumps and compressors. A low compression set and an improved leak prevention complete the performance profile of this high-tech compound.

NORSOK

The NORSOK Standard M-710 was developed by the Norwegian oil and gas industry and is a test method for the resistance of sealing material to explosive decompression. Another part of the test is the examination of the effects of sour gas on the polymer.



ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
HNBR	HNBR 895	89 °IRHD	black	from -25 °C to +180 °C	high resistance to explosive decompression, NORSOK Standard M-710, Nace TM 0297-97
	HNBR 899	90 Shore A	black	from -17 °C to +150 °C	high resistance to explosive decompression, NORSOK Standard M-710
FFKM	COG Resist® RS 92 AED	92 Shore A	black	from -15 °C to +260 °C	high resistance to explosive decompression, NORSOK Standard M-710, NACE TM 0297
FKM	Vi 840	80 Shore A	black	from -46 °C to +200 °C	DVGW approval according to DIN EN 682 - GBL and DIN EN 13787, NORSOK Standard M-710, ISO 23936-2
	Vi 890	90 Shore A	black	from -20 °C to +210 °C	NORSOK Standard M-710, high resistance to explosive decompression
	Vi 895	90 Shore A	black	from -45 °C to +225 °C	NORSOK Standard M-710, NACE TM 0297 & TM 0187, ISO 10423 (API 6A), ISO 23936-2, high resistance to explosive
	Vi 896	90 Shore A	black	from -20 °C to +210 °C	high resistance to explosive decompression, NORSOK Standard M-710
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	excellent low-temperature flexibility, NORSOK Standard M 710, API 6A & 6D
	Vi 900	90 Shore A	black	from -50 °C to +200 °C	NORSOK Standard M-710, ISO 23936-2

Detailed material data and further information about these special materials can be found in the folder 'High-tech compounds against explosive decompression'.

Endless top quality

At COG we employ a special production method to produce precision O-rings according to ISO 3601 with a length of up to 3,000 mm, variable cord sizes and qualities of material. In this special production method of 'endless vulcanisation' the vulcanisation process is carried out in a consistently even and thorough way. O-rings produced this way match precision O-rings of smaller dimension produced with conventional methods.



Highest precision also with large diameters

Compared to the conventional methods of manufacturing special sized O-rings, such as O-rings with vulcanised or glued joints, this method keeps tolerances to a minimum and therefore grants very high precision. Its other big advantage over conventional methods is that, due to the consistency of the vulcanisation the joints no longer bear a weakness. This provides a more durable seal of considerably higher quality in a variety of applications, e. g. also in high vacuum areas or in gaseous media.

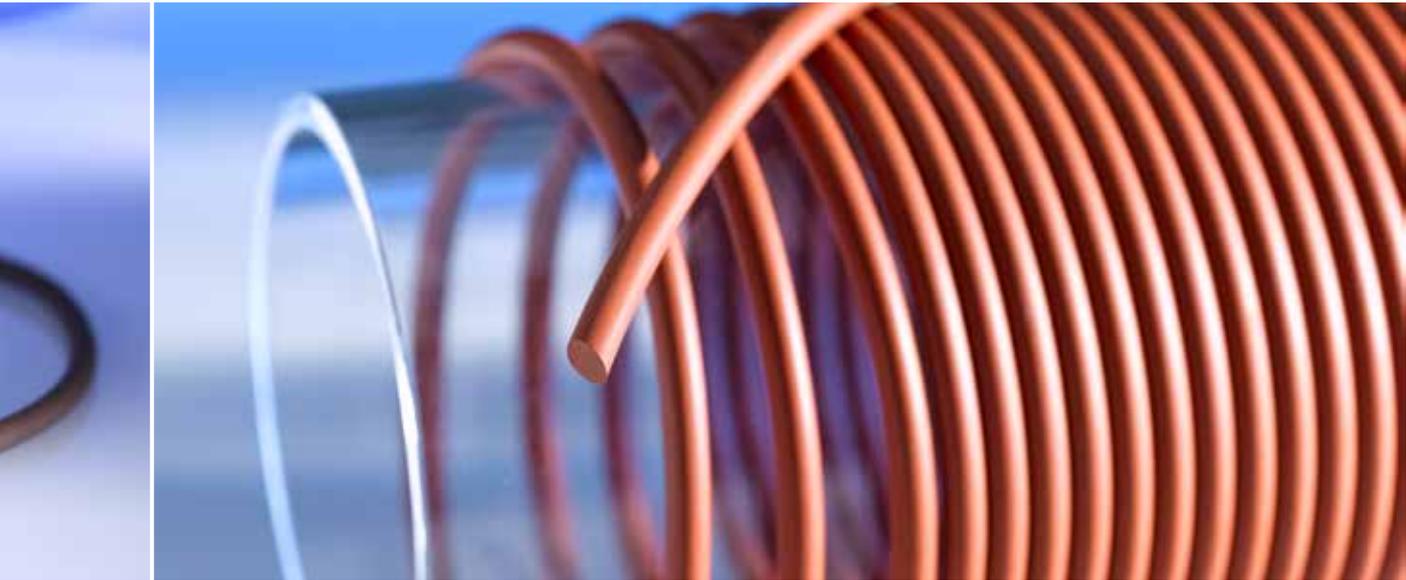
Advantages

- Very tight dimension tolerances according to ISO 3601
- Evenly sized cords throughout the O-ring-perimeter
- Very good surface quality
- Low cost of tools compared to compression moulded O-rings
- Any chosen inside diameter from approx. 1,400 mm to 3,000 mm producible

We can currently produce the following materials and cord sizes with the endless vulcanisation method:

ASTM D 1418 ISO 1629	COG material	Hardness	Colour	Operating temperature	Special properties
HNBR	HNBR 610	90 Shore A	black	from -20 °C to +150 °C	
FKM	Vi 465	67 Shore A	brown	from -15 °C to +200 °C	
	Vi 500	80 Shore A	black	from -15 °C to +200 °C	suited for the use in the vacuum technology
	Vi 569	80 Shore A	black	from -15 °C to +200 °C	DIN EN 682 - GB and DIN EN 549 - H3/E1
	Vi 650	75 Shore A	green	from -15 °C to +200 °C	
	Vi 890	90 Shore A	black	from -20 °C to +210 °C	NORSOK Standard M-710 , high resistance to explosive decompression
	Vi 899	90 Shore A	black	from -46 °C to +230 °C	excellent low-temperature flexibility, NORSOK Standard M 710, API 6A & 6D
NBR	P 465	65 Shore A	black	from -20 °C to +120 °C	
	P 670	70 Shore A	black	from -20 °C to +120 °C	

Cord sizes: HNBR, FKM and NBR qualities in the cord sizes 5 to 12 mm, larger cord sizes possible in agreement.
Other materials available upon request.



Not just suitable for round installations

Round cords for very different applications

COG round cords are always a good alternative if the material subject to sealing is not too aggressive or under too high pressure. In these cases, round cords can be used without reservation. On this occasion, the installation space is not required to be circular.

Round cords can be installed extremely well in grooves with a shift in direction and if required can be glued together at the cord ends. Thanks to sufficient resistance and elasticity in the sealing application the high-performance glues provide for a good material behaviour.

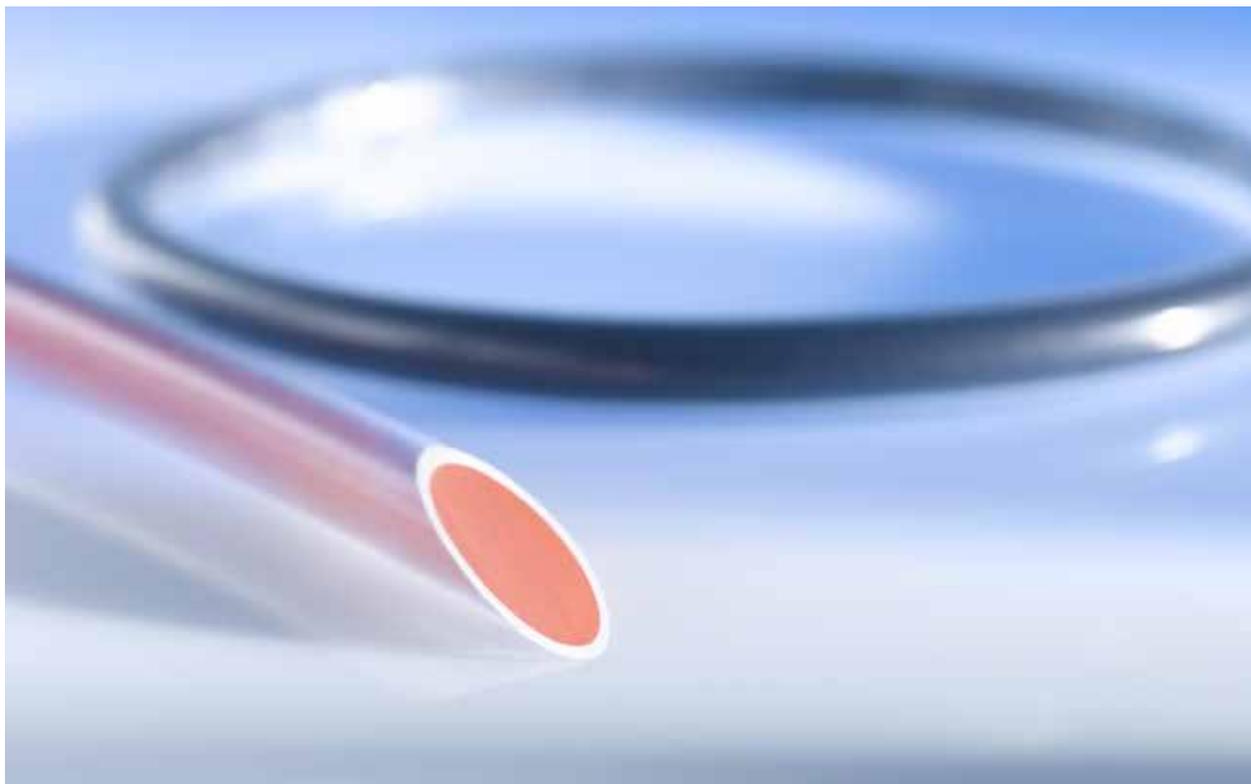
COG currently offers EPDM, FKM, NBR and VMQ materials with different cord sizes in the product line for round cords. For more information about materials and cord sizes please contact us directly.



Good to know

Glued O-rings are extruded cords whose cord ends are glued together at the straight butt. The disadvantage here is that the adhesive may possibly harden under the influence of heat and the round cord loses its elasticity. For round cords larger tolerances are allowed. The round cords offered by COG are manufactured according to DIN standard 3302 part 1 E2.

Round cords are often not suitable for demanding applications. The joints, whether glued or also butt-vulcanized, always represent the weak point when subjected to high loads on the seal. In particular, when bonding the ends of the cord, the adhesive does not have the same material properties as the sealing material. This can then lead to premature damage and failure of the seal. Thus, for example in vacuum chambers preferably endless vulcanized O-rings are installed in order to avoid the weak point of the joint in the round cords and a better sealing result.



Special materials for special requirements

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 a full fluoropolymer with an exceptionally high melt viscosity. Therefore the thermic resistance is tremendous even in continuous operation over many thousand hours. Additionally PTFE is nearly universally resistant to chemicals. Even aggressive acids such as aqua regia (nitrohydrochloric acid) cannot corrode PTFE.

Moreover, PTFE has many further positive qualities, such as excellent electrical insulation and anti-adhesive behaviour, good dry-running properties and low heat conductivity. However, since PTFE is a very hard and inelastic material, there are restrictions in the applicability. Furthermore PTFE cannot be elongated – a fact to be considered on assembly.

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

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 coating. 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_2	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 temperature	Special properties
PTFE	PT 950	57 Shore D	white	from -180 °C to +260 °C	high resistance to chemicals, wide temperature operating range, FDA 21. CFR 177.1550
FEP/FKM	FEP	90-95 Shore A	black	from -20 °C to +204 °C	high resistance to chemicals, high heat resistance, FDA 21. CFR 177.1550
FEP/VMQ	FEP	85-90 Shore A	red	from -60 °C to +204 °C	high resistance to chemicals, high heat resistance, good coldness properties, FDA 21. CFR 177.1550
PFA/FKM	PFA	90-95 Shore A	black	from -20 °C to +260 °C	high resistance to chemicals, high heat resistance, FDA 21. CFR 177.1550
PFA/VMQ	PFA	85-90 Shore A	red	from -60 °C to +260 °C	high resistance to chemicals, high heat resistance, good coldness properties, FDA 21. CFR 177.1550



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, colour-red coatings etc.
- 100% automatic optical dimensional check (external diameter < 80 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 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 eight frequently used materials continuously in stock, especially for our express service. These include EPDM, FKM, NBR and FVMQ 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 8 material compounds for industrial 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	Härte in Shore A	Farbe	Besonderheiten	Lieferzeit* bei Bestellung	
					bis 10 h	nach 10 h
AP 300	EPDM	70	black		5	6
LT 170	FKM	70	red	very good low-temperature flexibility	6	7
Vi 500	FKM	80	black	suited for endless vulcanisation and for the use in vacuum technology	6	7
Vi 564	FKM	70	black	use to 230 °C, BAM tested	6	7
Vi 899	FKM	90	black	excellent low-temperature flexibility, NORSOK Standard M 710, API 6A & 6D	6	7
P 583	NBR	70	black		5	6
Si 770, FL	FVMQ	70	blue	very good low-temperature flexibility and resistance to chemicals	5	6
Si 970, FL	FVMQ	70	blue	very good low-temperature flexibility and resistance to chemicals	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.



Expert dissemination of knowledge in the O-Ring-Akademie®

New technologies, product innovations and continuous optimisation measures constantly present developers, constructors and technicians, but also buyers and other decision-makers in management, with new challenges. For everyone involved in the decision-making process, this is tied to the necessity of acquiring comprehensive knowledge and always keeping this up to date. Only in this way can businesses generate an optimum benefit. Today, this is not always so easy, and sometimes, especially with sensitive components such as O-rings, it can also be very difficult.

For many years, COG has been successfully training employees from many different companies. In recent years, the demand for these training sessions has

continued to grow. Because the elementary aspects of these elastomer seals is of interest to, and affects, various departments of a business. It is precisely for this reason that COG established the O-Ring-Akademie®. This offers seasoned experts, but also technically or commercially orientated people at beginner level, the opportunity to learn about the complex subject of O-ring seals in various seminars. With varying focuses, our offerings are aimed at various different audiences, thus enabling the tailored acquisition of knowledge and increased competence.

Further information about the O-Ring-Akademie® and our current range of seminars and webinars can be found online at www.o-ring-akademie.de, or by contacting us directly.



The O-Ring-Akademie® as a webinar

As well as conventional seminars, the O-Ring-Akademie® also offers webinars. These are aimed not just at seasoned experts, but also technically or commercially orientated people who wish to learn about special topics relating to seal technology in short, compact and expert fashion.



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