

Classification of sealing materials

In sealing technology, mainly representatives of two groups of macromolecular (polymer) substances are used, i.e. substances of the groups of **Elastomers** and **Thermoplastics**.

Macromolecular substances are organic compounds whose molecules exist of several thousands, often even millions, of atoms which are known as macro, giant, string or chain molecules. They can be created either by modification of highly molecular natural materials (e.g. natural rubber) or by depositing low-molecular elements (so called monomers) through various chemical reactions (synthetic materials, plastics).

Elastomers ECORUBBER, ECOPUR, ECOSIL,...

Elastomers are materials that can be highly expanded by exerting relatively little power. Because of their structure, elastomers have a high retractibility, which means the remaining deformation is very small. There are two main groups of elastomers, the chemically cross-linked materials (rubber materials) and thermo- plastic elastomers.

The rubber materials are polymers, which are formed by cross-linked macromole- cules with various vulcanization additives. Due to their chemical bonds they do not melt and they begin to decompose at high temperatures. In addition the cross-link ensures that rubber materials do not dissolve and, depending on the medium, do suffer more or less intensive swell or shrinkage.

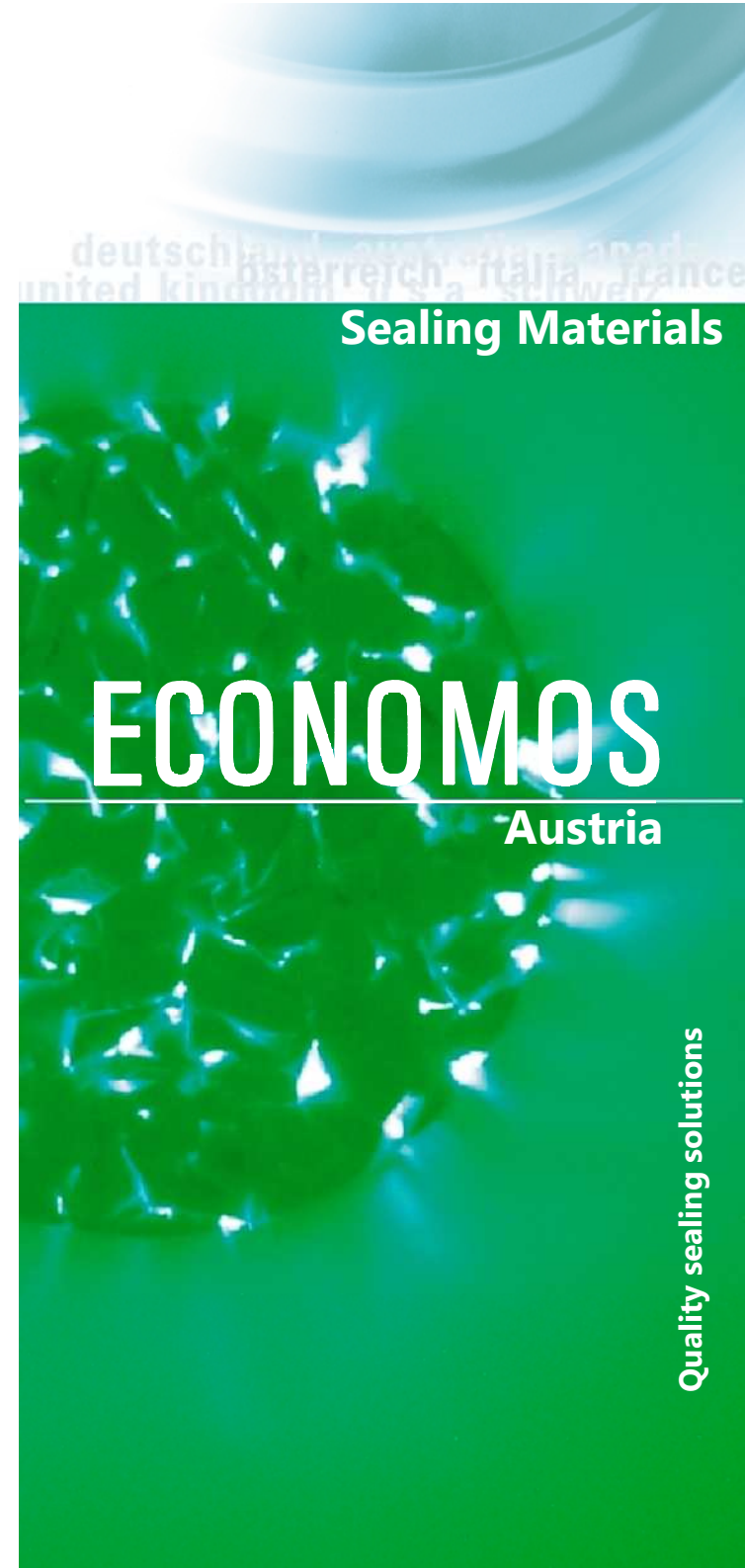
The thermoplastic elastomers demonstrate the characteristic properties of elasto- mers over a wide temperature range. They are physically but not chemically cross-linked, therefore they can be melted at higher temperature and can be pro-cessed with traditional thermoplastic processing techniques. Thermoplastic elastomers are soluble, generally, they swell less in comparison to their chemically cross-linked equivalents.

Thermoplastics ECOTAL, ECOMID, ECOFLON, ECOPAЕК,...

Thermoplastics can be melted. They are polymer materials, which are essentially harder and rigid at their application temperature compared to elastomers. Depending on the chemical structure, the properties vary from hard, to stiff, to ductile and flexible. Due to the morphological structure, extensive stretching is non-reversible and moulded parts remain in the deformed state. Thermoplastics are therefore called Plastomers.

properties	DIN standard	unit	Ecopur TPU	H-Ecopur TPU	G-Ecopur CRU	T-Ecopur TPU	S-Ecopur TPU	Ecourubber 1 NBR	Ecourubber-H H-NBR	Ecourubber 2 FKM, FPM	Ecourubber 3 EPDM	Ecosil MVQ	Ecotal POM	Ecoflon 1 PTFE virgin	Ecoflon 2 PTFE glass 15% black	Ecoflon 3 PTFE Bronze 40%	Ecoflon 4 PTFE Carbon 25%	Ecomid PA	Ecopack PEEK
colour			green	red	red	blue	grey-black	black	black	brown	black	reddish brown	black	white	grey	brown	black	black	cream
hardness Shore A	53505	Shore A	95±2	48±3	47±3	95±2	48±3	85±5	85±5	88±5	85±5	85±5	82	57	60	64	65	77	86
hardness Shore D	53505	Shore D	48±3	48±3	47±3	48±3	48±3						1.41	2.17	2.25	3.00	2.10	1.15	1.32
density	53479	g/cm³	1.2	1.2	1.2	1.17	1.24	1.31	1.22	2.3	1.22	1.52	1.41	2.17	2.25	3.00	2.10	1.15	1.32
100% modulus	53504	N/mm²	≥ 12	≥ 13	≥ 11	≥ 12	17	≥ 11	≥ 10	≥ 5	≥ 9	≥ 5	≥ 5						
tensile strength/ yield stress	53504 53455	N/mm²	≥ 40	≥ 50	≥ 45	≥ 50	50	≥ 16	≥ 18	≥ 8	≥ 12	≥ 7	62	27	18	22	15	65	97
elongation at break	53504 53455	%	≥ 430	≥ 330	≥ 280	≥ 450	380	≥ 130	≥ 180	≥ 200	≥ 110	≥ 130	40	300	200	280	180	120	≥ 50
modulus of elasticity tensile test	53457	N/mm²											2600					1800	3600
compression set 70oC/24h 20%Def.		%	≤ 30	≤ 27	≤ 30	≤ 27	25												
100oC/24h 20%Def		%	≤ 35	≤ 33	≤ 40	≤ 33	≤ 30												
100oC/2h	53517	%						≤ 15	≤ 22										
175oC/24h	53517	%																	
rebound resilience	52512	%	42	29	43	50	28												
tear strength	53515	N/mm	≥ 100	≥ 100	≥ 40	≥ 80	120	20	30	21	15	8							
abrasion	53516	mm³	18	17	25	15	17	90	90	150	120								
min. service temperature		°C	-30	-20	-30	-50	-20	-30	-25	-20	-50	-60	-50	-200	-200	-200	-200	40	260
max. service temperature		°C	110	110	110	110	110	100	150	200	150	200	100	260	260	260	260	100	260

MATERIAL DATA OVERVIEW



deutschland, osterreich, italia, japan, united kingdom, usa, schweiz

Sealing Materials

ECONOMOS
Austria

Quality sealing solutions



Sealing Materials–

Introduction

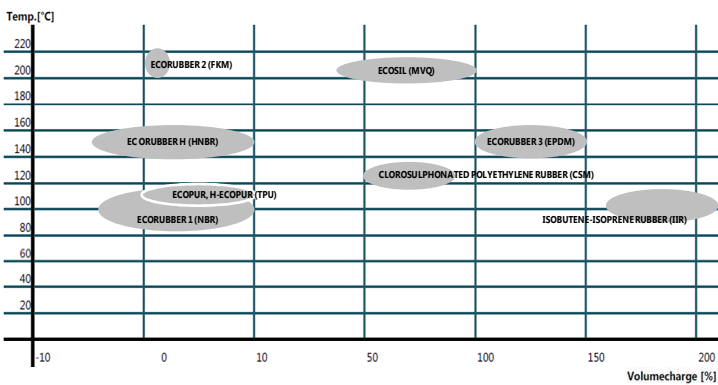
Due to increasing requirements in the sealing technology, materials are gaining more and more importance. Sealing materials are facing higher temperatures and pressures, higher sliding speeds and poorer lubricating fluids. The new generation of fluids like synthetic hydrocarbons and ester, biological degradable pressure fluids and pressure fluids with a water basis present new challenges to develop new sealing materials.

We at Economos acknowledged this with the transfer of our R&D from a standard solution provider to a developer of special, tailor-made solution. We also accepted, that those projects with close client co-operation succeeded best in achieving the optimal sealing solution.

Economos has recognised all the advantages of Polyurethane in sealing technology. From our point of view, all the superior characteristics of these materials are under utilised. We expect in the future a much stronger trend in this direction.

We are offering 15 standard materials in our product range. These materials are featured in this brochure. All materials have been developed by ECONOMOS and are satisfying standard customer needs. In addition, we supply special materials like AFLAS, thermoplastics like mineral re-inforced Polyamides, high temperature lastics like Polyphenylsulfide, etc..

Application temperature limits and resistance in mineral oil



FKM, FPM Fluororubber
 H-NBR Hydrogenated nitrile rubber
 NBR Acrylonitrile-butadiene rubber
 TPU Thermoplastic polyurethane elastomer
 MVQ Vinyl-methyl silicone rubber
 EPDM Ethylene-propylene diene rubber

In the following chapter "Landmark Sealing Material Technology" we will describe in detail all our standard materials.

Landmark Sealing Material Technology

ECOPUR (TPU) green

Ecopur is a thermoplastic polyurethane elastomer, which has an unusually highabrasive resistance, low compression set, high physical properties and tear strength. In sealing technology Ecopur is mostly used for U-rings, lip seals, wipers and chevron packings, but it may also be used for dampers and other machined parts. Products made from this material can be used in mineral oil, in water up to 40°C and in biodegradable hydraulic oils like vegetable oils and synthetic esters up to 60°C (in these hydraulic fluids its better to use H-Ecopur instead of Ecopur). Depending on the seal design and the installation housing seals made of Ecopur can be used up to 400 bar (for higher pressure anti-extrusion-rings are necessary).

H-ECOPUR (TPU) red

H-Ecopur is a hydrolysis-resistant thermoplastic polyurethane elastomer. It combines the engineering properties of Ecopur with a high resistance to hydrolysis (hydrolysis is degradation in water) which is otherwise rarely found in polyurethane's. It is stable in water up to +90°C and has an outstanding stability in mineral oil. Because of its resistance to hydrolysis H-Ecopur can be used for water hydraulic and for applications in mining, tunnelling and manufacturing of presses. H-Ecopur is particularly recommended for the use in pure and seawater, for HFA and HFB fluids and biologically degradable hydraulic fluids (vegetable oils and synthetic esters) and food articles. H-Ecopur is KTW approved and meets the FDA standards.

G-ECOPUR (CPU) red

G-Ecopur is a cast hydrolysis-resistant polyurethane-elastomer with similar properties to H-Ecopur especially regarding its chemical stability. G-Ecopur can be used in the same hydraulic fluids as H-Ecopur. Generally, G-Ecopur is used for seals with a diameter from 540mm up to 4000 mm.

T-ECOPUR (TPU) blue

T-Ecopur is a thermoplastic polyurethane-elastomer, which is modified for deep temperature applications. The properties of T-Ecopur are similar to those of Ecopur, but the minimum service temperature is extended to -50°C. For that reason T-Ecopur should be used under severe climatic conditions and for applications in freezing plants.

S-ECOPUR (TPU) grey

The new polyurethane brand has been optimised in regard of the tribological characteristics (friction and wear), achieved by an addition of a synergetic combination of solid lubricants. This special material is therefore best suited for most severe applications in the water hydraulics as well as in the oil-free pneumatics.

ECORUBBER 1 (NBR) black

Ecorubber 1 is an elastomer based on acrylonitrile-butadiene rubber which is used for U-rings, chevron packings, special seals and various components. This material has a good resistance to mineral oils and greases and HFA, HFB and HFC pressure fluids. However, the material is not resistant to glycol-based brake fluids, HFD fluids, aromatic fluids (such as benzene), esters, ketones and amines or concentrated acids and bases.

ECORUBBER-H (H-NBR) black

Ecorubber-H is a hydrogenated or saturated acrylonitrile-butadiene rubber, which is suitable for applications in aliphatic hydrocarbons like propane or butane and mineral oils and greases (for short times up to 170°C) and also for sulfonated crude oil. Furthermore, it can be used in many diluted acids and bases and salt solutions even at elevated temperatures and in glycol-water mixtures. Ecorubber-H is not compatible with fuels with a high content of aromatic hydrocarbons (premium blend petrol), gasoline's (petrol/alcohol blends) ketones, esters, ethers and chlorinated hydrocarbons like trichloroethylene and tetrachloroethy-lene.

ECORUBBER 2 (FPM,FKM) brown

Ecorubber 2 is an elastomer based on fluororubber (VITON: registered tradeis suitable for applications in aliphatic hydrocarbons like propane or butane and mineral oils and greases (for short times up to 170°C) and also for sulfonated crude oil. Furthermore, it can be used in many diluted acids and bases and salt solutions even at elevated temperatures and in glycol-water mixtures. Ecorubber-H is not compatible with fuels with a high content of aromatic hydrocarbons (premium blend petrol), gasoline's (petrol / alcohol blends) ketones, esters, ethers and chlorinated hydrocarbons like trichloroethylene and tetrachloroethy-lene.

ECORUBBER 3 (EPDM) black

Ecorubber 3 is an elastomer based on ethylene-propylene rubber, which can be used for U-seals, lip seals and chevron packings. Ecorubber 3 has an outstanding stability against hot water, steam, washing agents and polar organic solvents. Ecorubber 3 is not resistant against mineral oil and other unpolar media. The stability to weathering, ozone and ageing is good. If it is intended to use Ecorubber 3 in glycol-based brake fluids, national regulations have to be adhered to.

ECOSIL (MVQ) reddish brown

Ecosil is a silicone rubber, which can be used for O-rings, gaskets and special seals. Owing to the poor mechanical properties, which are noticeably lower in comparison to other rubbers, Ecosil is mostly used for static (non-moving) applications. Ecosil is highly resistant against weathering, ozone and ageing. The compatibility with mineral oils depends on the content of aromatic hydrocarbons in the oil.



ECOFLOX 1 (PTFE-virgin) white

Ecoflon 1 is a thermoplastic on the basis of polytetrafluoroethylene that is used for back-up rings, chevron packings, O-rings, rotary seals and gaskets. Ecoflon 1 has the widest application range of all sealing materials. Seals made of Ecoflon 1 will only be attacked by molten alkali metals and elementary Fluor at high temperatures. Using PTFE seals, it should be noted that creeping occurs at relative low loads (pressures).

ECOFLOX 2 (PTFE-with fillers) grey

Ecoflon 2 is a polytetrafluoroethylene filled with glass fibres and molybdenum disulphide and can be used for U-rings, glide (slide) rings, anti-extrusion rings, back-ups, for chevron packings and guide rings. Because of its special composition, Ecoflon 2 has good physical properties and distinctly better creep behaviour than virgin PTFE. The chemical resistance is similar to virgin PTFE; some ingredients can cause destruction of the fillers.

ECOTAL (POM) black

Ecotal is a semi-crystalline polyacetal-copolymer which is used for anti-extrusion rings, guide ring bushes, scrapers and for precision-machined parts with tight tolerances. Ecotal is one of the most important engineering thermoplastics with good physical properties, low water absorption and good chemical resistance. Ecotal can be used in mineral oils, in water-based fire-resistant hydraulic fluids (HFA, HFB and HFC fluids). Concentrated acids and bases will attack and destroy it.

ECOPAEEK (PEEK)

Ecopeak is a polymer with high tensile strength, stiffness, high heat distortion temperature and good sliding and friction behaviour. As far as strength and stiffness are concerned, Ultrapek exceeds most technical plastics especially at high temperatures.