Material Guide

Content

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Material Guide

A Introduction

Equipment manufacturers and end users expect sealing systems to operate leak free and to maintain long service life. Reliability is crucial to effective low maintenance cost operations. To find the perfect sealing solution in each individual case both material performance and seal design are critically important.

On the basis of many years of experience in the manufacture and application of sealing systems we can offer a large variety of different high-quality materials.

This catalogue provides the necessary support for the right material selection.

B Elastomers

One of the main used material groups for sealings are the elastomers. They show good properties like elasticity or good chemical compatibility.

The following tables provide a summary of the various elastomer material groups. We can offer a large number of materials within each group.

Table I Elastomers

Designation	Trade Name*	Abbreviation		
		ISO 1629	ASTM 1418	B + S
Acrylonitrile–Butadiene Rubber (Nitrile Rubber)	Europrene® Krynac® Nipol N® Perbunan NT Breon®	NBR	NBR	N
Hydrogenated Acrylonitrile–Butadiene Rubber	Therban® Zetpol®	HNBR	HNBR	H
Polyacrylate Rubber	Noxtite® Hytemp® Nipol AR®	ACM	ACM	A
Chloroprene Rubber	Baypren® Neoprene®	CR	CR	WC
Ethylene Propylene Diene Rubber	Dutral® Keltan® Vistalon® Buna EP®	EPDM	EPDM	E
Silicone Rubber	Elastoseal® Rhodorsil® Silastic® Silopren®	VMQ	VMQ	S
Fluorosilicone Rubber	Silastic®	FVMQ	FVMQ	F
Tetrafluorethylene–Propylene Copolymer Elastomer	Aflas®	FEPM	TFE / P**	WT
Butyl Rubber	Esso Butyl®	IIR	IIR	WI
Styrene–Butadiene Rubber	Buna S® Europrene® Polysar S®	SBR	SBR	WB

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Designation	Trade Name*	Abbreviation		
		ISO 1629	ASTM 1418	B + S
Natural Rubber		NR	WR	WR
Fluorocarbon Rubber	Dai–El® Fluorel® Tecnoflon® Viton®	FKM	FKM	V
Perfluoro Rubber	Isolast®	FFKM	FFKM	J
Polyester Urethane Polyether Urethane	Adiprene® Pellethan® Vulcollan® Desmopan®	AU EU	AU EU	WU WU
Chlorosulphonated Polyethylene Rubber	Hypalon®	CSM	CSM	WM
Polysulphide Elastomer	Thiokol®	-	TWT	WY
Epichlorohydrin Elastomer	Hydrin®	-	-	WO

* Selection of registered trade names
** Abbreviation not yet standardised.

ASTM = American Society for Testing and Materials
ISO = International Organisation for Standardisation

Table II The most important types of synthetic rubber, their grouping and abbreviations

Chemical name	Abbreviation	
	DIN / ISO 1629	ASTM D - 1418
M - Group (saturated carbon molecules in main macro-molecule-chain)		
– Polyacrylate Rubber	AC**M**	AC**M**
– Ethylene Acrylate Rubber	AE**M**	
– Chlorosulphonated Polyethylene Rubber	CS**M**	CS**M**
– Ethylene Propylene Diene Rubber	EPD**M**	EPD**M**
– Ethylene Propylene Rubber	EP**M**	EP**M**
– Fluorocarbon Rubber	FK**M**	FK**M**
– Perfluoro Rubber	FFK**M**	FFK**M**
O - Group (with oxygen molecules in the main macro-molecule chain)		
– Epichlorohydrin Rubber	C**O**	C**O**
– Epichlorohydrin Copolymer Rubber	EC**O**	EC**O**
R - Group (unsaturated hydrogene carbon chain)		
– Chloroprene Rubber	C**R**	C**R**
– Butyl Rubber	II**R**	II**R**
– Nitrile Butadiene Rubber	NB**R**	NB**R**
– Natural Rubber	N**R**	N**R**
– Styrene Butadiene Rubber	SB**R**	SB**R**
– Hydrogenated Nitrile Butadiene Rubber	HNB**R**	HNB**R**
Q - Group (with Silicone in the main chain)		
– Fluorosilicone Rubber	FVM**Q**	FVM**Q**
– Methyl Vinyl Silicone Rubber	VM**Q**	VM**Q**
U - Group (with carbon, oxygen and nitrogen in the main chain)		
– Polyester Urethane	A**U**	A**U**
– Polyether Urethane	E**U**	E**U**

B.1 Application parameters of elastomers

Elastomers as all other organic chemicals have limited use. External influences such as various media, oxygen or ozone as well as pressure and temperature will affect the material properties and therefore their sealing capability.

Elastomers will amongst others swell, shrink or harden and develop cracks or even tears.
The following information illustrates the different application parameters.

B.1.1 Elastomer heat resistance / swelling in oil

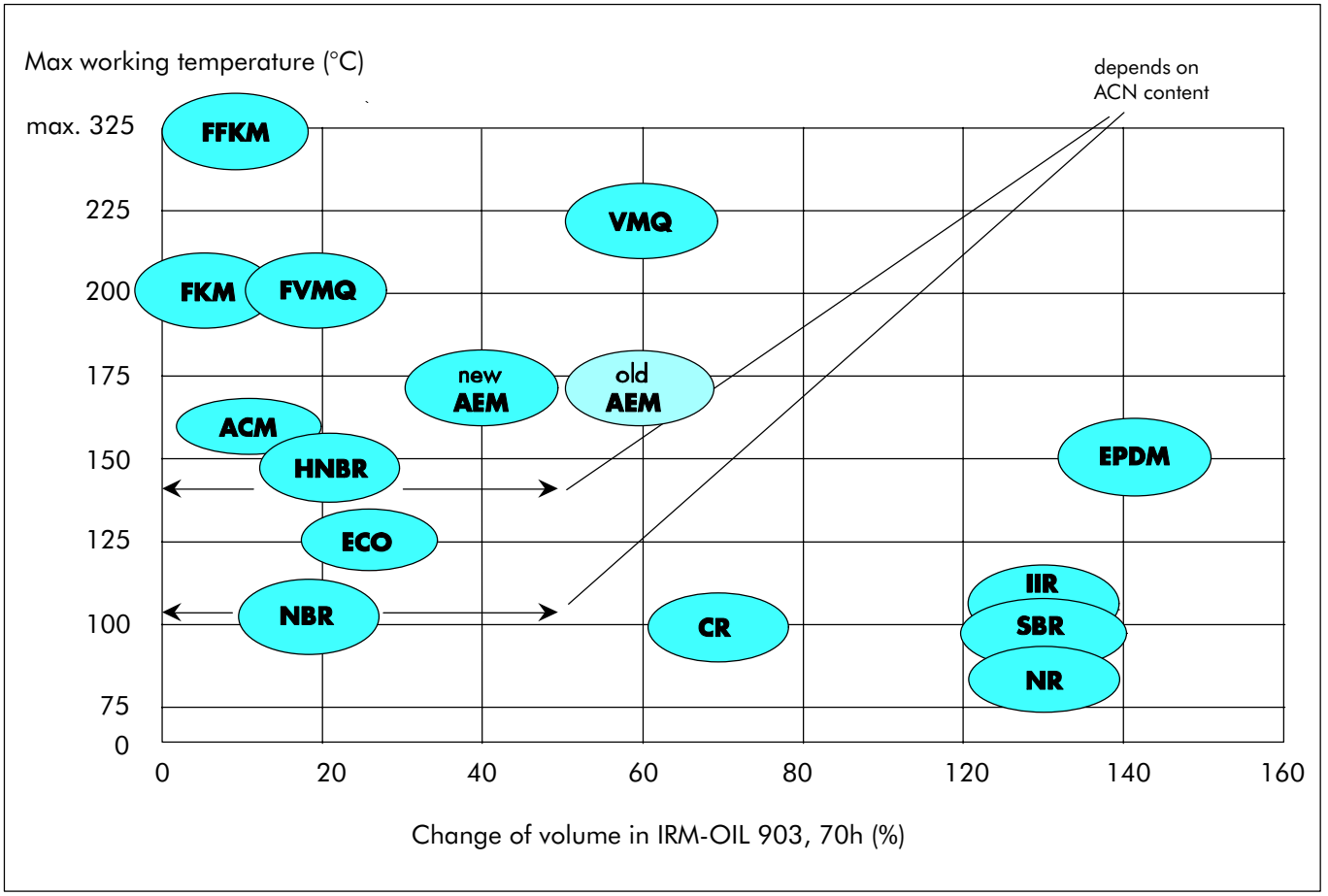

Figure 1 Change of volume in IRM-Oil 903 (old ASTM-Oil No 3)

B.1.2 Temperature range

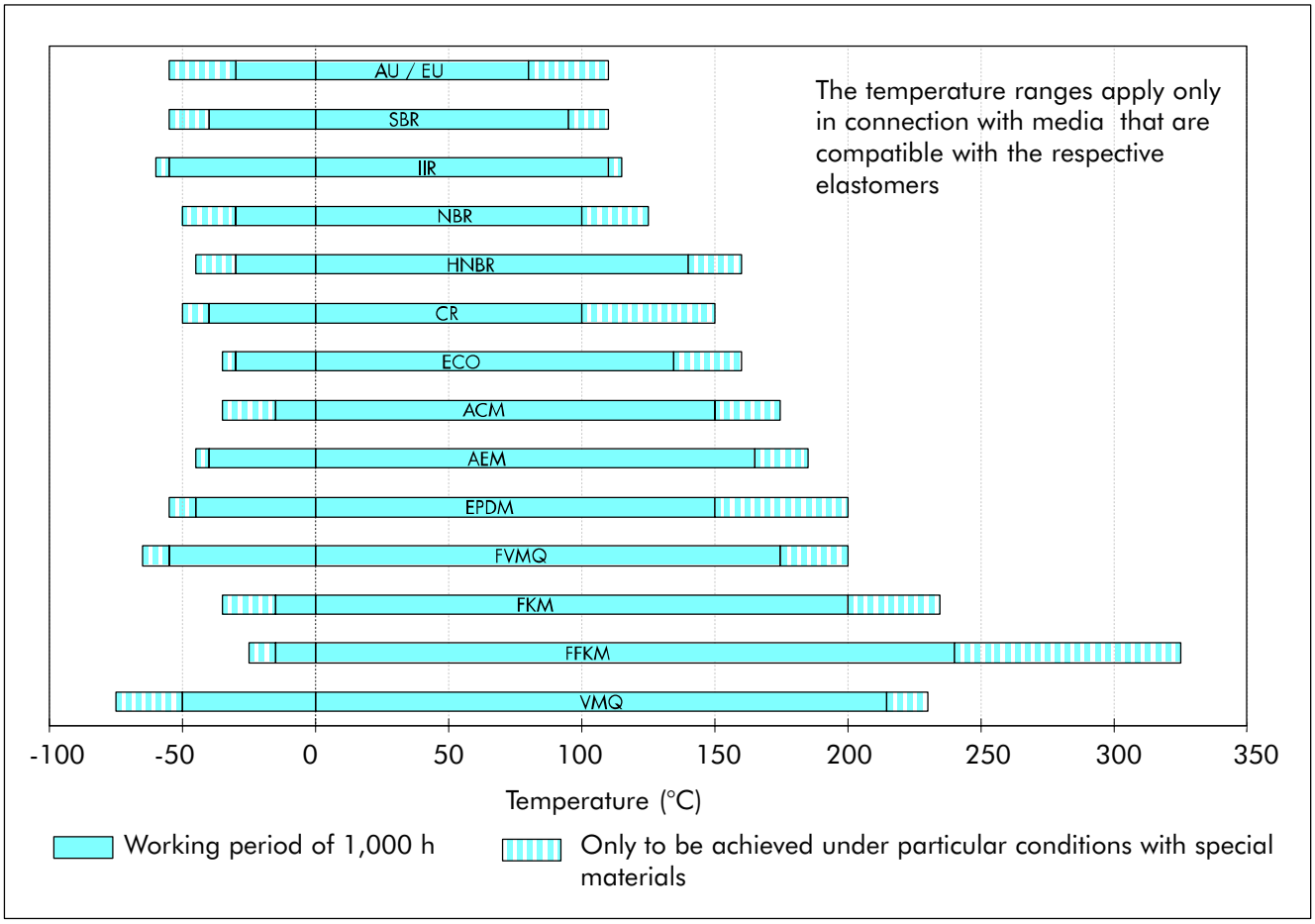

Figure 2 Temperature range of various elastomers

General field of application

Elastomer materials are used to cover a large number of fields of application. Details regarding resistance in special media are shown in chapter "B.1.4 Chemical compatibility", page 9.

The various elastomers can be characterised as follows:

NBR (Nitrile Butadiene Rubber):

The properties of the Nitrile Rubber depend mainly on the ACN content which ranges between 18% and 50%. In general they show good mechanical properties. The operating temperatures range between -30 °C and +100 °C (for a short period of time up to +120 °C). Suitable formulated NBR can be used down to -60 °C. NBR is mostly used with mineral based oils and greases.

FKM (Fluorocarbon Rubber)

Depending on structure and fluorine content FKM materials can differ with regards to their chemical resistance and cold-flexibility.

FKM is known especially for its non-flammability, low gas permeability and excellent resistance to ozone, weathering and aging.
The operating temperatures of the Fluorocarbon Rubber range between -20 °C and +200 °C. (for a short period of time up to +230 °C). Suitable formulated FKM can be used down to -35 °C. FKM is also often used with mineral based oils and greases at high temperatures.

EPDM (Ethylene Propylene Diene Rubber)

EPDM shows good heat, ozone and aging resistance. In addition they also exhibit high levels of elasticity good low temperature behaviour as well as good insulating properties.
The operating temperatures of applications for EPDM range between -45 °C and +150 °C (for a short period of time up to +175 °C). With sulphur cured types the range is reduced to -45 °C and +120 °C (for short period of time up to +150 °C).
EPDM can often be found in applications with brake fluids (based on glycol) and hot water.

HNBR (Hydrogenated Nitrile Butadiene Rubber)

HNBR is made via selective hydrogenation of the NBR butadiene groups. The properties of the HNBR rubber depend on the ACN content which ranges between 18% and 50% as well as on the degree of saturation. HNBR shows good mechanical properties.
The operating temperature of HNBR ranges between -30 °C and +140 °C (for a short period of time up to +160 °C) in contact with mineral oils and greases. Special types can be used down to -40 °C.

Q (Silicone Rubber)

Silicone rubber shows excellent heat resistance, cold flexibility, dielectric properties and especially good resistance against oxygen and ozone.
Depending on the compound the operating temperatures ranges between -60 °C and +200 °C (for a short period of time even up to +230 °C). Special types can be used down to -90 °C. There are also some types with narrow temperature ranges. Silicone is often used in the medical- and food industry.

CR (Chloroprene Rubber)

In general the CR materials show relatively good resistances to ozone, weathering, chemicals and aging. Also they show good non-flammability, good mechanical properties and cold flexibility.
The operating temperatures range between -40 °C and +100 °C (for a short period of time up to +120 °C). Special types can be used down to -55 °C.
CR materials are found in sealing applications such as refrigerants, for outdoor applications and in the glue industry.

ACM (Polyacrylate Rubber)

ACM shows excellent resistance to ozone, weathering and hot air, although it shows only a medium physical strength, low elasticity and a relatively limited low temperature capability.
The operating temperatures range from -20 °C and +150 °C (for a short period of time up to +175 °C). Special types can be used down to -35 °C.
ACM-materials are mainly used in automotive applications which require special resistance to lubricants containing many additives (incl. sulphur) at high temperatures.

FFKM (Perfluoro Rubber)

Perfluoroelastomers show broad chemical resistance similar to PTFE as well as good heat resistance. They show low swelling with almost all media.
Depending on the compound the operating temperatures range between -25 °C and +240 °C. Special types can be used up to +325 °C.

Applications for FFKM can be mostly found in the chemical and process industries and in all applications with either aggressive environments or high temperatures.

B.1.4 Chemical compatibility

It is important to recognise that when using this guide, the ratings shown are based on published data and immersion tests. These tests are conducted under laboratory conditions and may not represent adequately the conditions in the field. Relative short term laboratory tests may not pick up all the additives and impurities which may exist in long term service applications.

Care must be taken to ensure that all aspects of the application are considered carefully before a material is selected. For example at elevated temperatures some aggressive fluids can cause a much more marked effect on an elastomer than at room temperature.

Physical properties as well as fluid compatibility need to be considered. Compression set, hardness, abrasion resistance and thermal expansion can influence the suitability of a material for a particular application.

It is recommended that users conduct their own tests to confirm the suitability of the selected material for each application.

Our experienced technical staff can be consulted for further information on specific applications.

Rating system

A Very good suitability
Elastomer shows little or no effect from exposure. Little effect on performance and physical properties. Very good resistance.

B Good suitability.
Some effects from exposure with some loss of physical properties. Some chemical swelling.

C Limited suitability.
Significant swell and loss of physical properties after exposure.
Additional tests should be done.

U The elastomer is unsuitable for application in this media.

— Insufficient information available for service in this media.

Table III Chemical Compatibility Guide

A

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Acet Aldehyde	U	U	-	B	U	U	U	U	-
Acet Amide	-	-	A	A	U	A	A	A	B
Acetyl Acetone	U	U	U	A	U	U	U	U	U
Acetyl Chloride	U	U	U	U	A	A	U	U	U
Acetic Acid	C	U	B	A	C	C	C	C	B
Acetic Acid Chloride	U	U	U	U	A	A	U	U	U
Acetic Acid Vapors	U	U	C	A	U	C	U	U	U
Acetic Acid, 96-99.5% (Glacial)	U	U	U	B	U	U	U	U	B
Acetic Anhydride	U	U	C	B	U	C	U	U	B
Acetone	U	U	U	A	U	U	U	U	U
Acetophenone	U	U	U	A	U	U	U	U	U
Acetylene Gas	A	-	B	A	A	A	A	A	B
Acetylene Tetrabromide	-	U	B	A	A	-	U	U	-
Acrolein	U	U	C	A	U	-	C	C	-
Acrylonitrile	U	U	U	U	U	U	U	U	U
Adipic Acid	U	U	A	A	A	A	A	A	A
Adipic Aciddiethylester	-	-	-	A	U	-	U	U	-
Aero Lubriplate	A	A	A	U	A	A	A	A	B
Aero safe 2300	U	U	U	A	U	U	U	U	U
Aero safe 2300 W	U	U	U	A	U	U	U	U	U
Aero Shell 1 AC Grease	A	A	B	U	A	A	A	A	B
Aero Shell 17 Grease	A	A	B	U	A	A	A	A	B
Aero Shell 7 A Grease	A	A	B	U	A	A	A	A	B
Aero Shell 750	B	U	U	U	A	B	B	B	U
Aero Shell Fluid 4	B	B	U	U	A	A	A	A	U
Aerozene 50 (50% Hydrazine, 50% UDMH)	-	U	U	A	U	U	U	U	U
Air	A	A	A	A	A	A	A	A	A
Alcohol (Methanol)	U	U	A	A	U	A	A	A	A
Alkyl Arylsulphonic Acid	U	U	C	A	U	U	C	C	U
Alkyl Benzene	U	U	U	U	A	A	U	U	U
Allyl Alcohol (2-Propene-1-ol)	U	U	A	A	B	U	B	B	U
Allyl Chloride (3-Chloro-1-Propene)	-	U	U	U	-	-	U	U	A
Allyl Ketone	U	U	C	A	U	U	U	U	B
Aluminium Acetate	U	U	B	A	U	U	B	B	U
Aluminium Bromide	A	U	A	A	A	A	A	A	A
Aluminium Fluoride	-	U	A	A	A	A	A	A	B
Aluminium Nitrate	U	U	A	A	A	-	A	A	B
Aluminium Phosphate	A	U	A	A	A	A	A	A	A
Aluminium Sulfate	U	U	A	A	A	A	A	A	A
Aluminium-Potassium-sulfate Solution	-	-	-	A	-	-	-	-	-
Aluminum Chloride Solution	A	C	A	A	A	A	A	A	B
Aluminum Hydroxide Solution	U	U	A	A	A	A	A	A	A
Aluminum Sulphate Solution	U	-	A	A	A	A	A	A	A
Ambrex 33 (Mobile)	A	B	B	U	A	U	A	A	U
Ambrex 830 (Mobile)	A	A	B	U	A	A	A	A	B
Amines, Primary (such as Methyl, Ethyl, Propyl, Allyl)	U	U	U	A	U	U	U	U	C
Aminoacetic Acid	U	U	A	A	A	U	B	B	U
Ammonia - Lithium	U	U	U	B	U	U	B	B	U
Ammonia (gas)	U	U	A	A	U	U	A	A	A
Ammonia (gas, hot)	U	U	B	B	U	U	U	U	U
Ammonia (liquid)	U	U	-	A	U	-	B	B	-
Ammonia Solution	U	U	-	A	U	-	B	B	-
Ammonia, anhydrous	U	U	A	A	U	U	A	A	B
Ammonia, aqueous Solution	U	U	A	A	U	U	C	C	C
Ammonium Acetate	-	U	B	A	U	-	A	A	-
Ammonium Carbonate	-	U	B	A	U	-	A	A	-
Ammonium Carbonate Solution	-	-	B	A	-	-	U	U	-
Ammonium Chloride	B	U	A	A	A	A	A	A	A

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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ammonium Chloride Solution	-	-	A	A	-	-	A	A	-
Ammonium Fluoride	U	U	B	A	B	B	A	A	A
Ammonium Hydroxide	U	U	A	A	U	-	U	U	-
Ammonium Hydroxide Solution	U	U	A	A	U	-	U	U	-
Ammonium Nitrate Solution	U	-	A	A	-	-	A	A	-
Ammonium Nitrite	-	-	B	A	-	-	A	A	B
Ammonium Phosphate, monobasic, etc.	-	-	A	A	-	-	A	A	A
Ammonium Sulfate Solution	U	U	A	A	U	B	A	A	B
Ammonium Sulfide	U	U	B	A	U	B	B	B	B
Ammonium Thiocyanate	-	B	-	A	-	-	A	A	A
Amyl Acetate	U	U	U	A	U	U	U	U	U
Amyl Alcohol	U	U	B	A	B	B	B	B	U
Amyl Borate	-	-	A	U	-	-	A	A	-
Amyl Chloride	U	U	U	U	A	B	U	U	U
Amyl Naphtalene	U	U	U	U	A	A	U	U	U
Anderol L-774	A	U	U	U	A	A	A	A	U
Aniline Chlorohydrate	U	U	B	B	B	B	B	B	U
Aniline Liquid	U	U	U	A	U	U	U	U	U
Animal Fats	A	A	B	B	A	A	A	A	B
Anisole	U	U	U	U	U	U	U	U	U
Antimony Chloride	B	U	B	A	A	A	A	A	B
Antimony Chloride, dry	B	B	A	A	A	A	A	A	A
Aqua Regia (Nitric Acid/Hydrochloric Acid)	U	U	U	U	U	U	U	U	U
Argon Gas	A	A	A	A	A	A	A	A	A
Aromatic Fuels (up to 50% Aromatic)	B	B	U	U	A	A	A	A	U
Aromatic Hydrocarbons (100% Aromatic)	U	U	U	U	A	A	U	U	U
Arsenic Acid	C	C	A	A	A	A	A	A	A
Arsenic Acid Solution	C	C	A	A	A	A	A	A	A
Asphalt, Emulsion	B	B	B	U	A	B	B	B	U
ASTM Test Fuel A	B	A	B	U	A	A	A	A	U
ASTM Test Fuel B	U	U	U	U	A	A	A	A	U
ASTM Test Fuel C	U	U	U	U	A	B	B	B	U
ASTM-Oil IRM 902	A	B	B	U	A	A	A	A	B
ASTM-Oil IRM 903	A	B	U	U	A	A	A	A	B
ASTM-Oil No.1	A	B	B	U	A	A	A	A	A
ASTM-Oil No.2	A	B	B	U	A	A	A	A	B
ASTM-Oil No.3	A	B	U	U	A	A	A	A	B
ATM-Brake Fluid (Glycolbased)	U	U	B	A	U	A	U	U	A
Automatic-Transmission Fluid	U	A	B	U	A	A	A	A	B
Automotive Gasoline	C	B	U	U	A	A	A	A	U

B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Barium Carbonate	-	A	-	A	A	A	A	A	A
Barium Chloride Solution	U	A	A	A	A	A	A	A	A
Barium Hydroxide Solution	U	U	A	A	A	A	A	A	A
Barium Nitrate Solution	U	A	A	A	A	A	A	A	A
Barium Sulfate	A	A	A	A	A	A	A	A	A
Barium Sulfide Solution	U	A	A	A	A	A	A	A	A
Battery Acid (Sulfuric Acid Diluted)	U	U	U	A	A	U	U	U	U
Beef Tallow	C	-	B	U	A	B	A	A	B
Beer	U	C	A	A	A	A	A	A	A
Beet Sugar Sap	U	-	B	A	A	A	A	A	A
Benzaldehyde	U	U	U	B	U	U	U	U	B
Benzenesulfonic Acid	U	U	B	-	A	B	U	U	U
Benzine (Gasoline)	C	B	U	U	A	A	A	A	U
Benzine 50 / Benzene 30 / Ethanol 20	U	U	U	U	B	B	U	U	U

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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Benzine 50 / Benzene 50	U	U	U	U	B	B	U	U	U
Benzine 60 / Benzene 40	U	U	U	U	B	B	U	U	U
Benzine 70 / Benzene 30	U	U	U	U	A	A	B	B	U
Benzine 80 / Benzene 20	U	U	U	U	A	A	B	B	U
Benzoic Acid, Solution	B	U	B	B	A	A	B	B	B
Benzol (Benzene)	U	U	U	U	B	B	U	U	U
Benzophenone	U	U	-	B	A	A	-	-	-
Benzyl Alcohol	U	U	B	B	A	B	U	U	B
Benzyl Chloride	U	U	U	U	A	A	U	U	U
Biphenyl	U	-	U	U	A	B	U	U	U
Bitumen	U	B	U	U	A	A	U	U	U
Black Liquor	U	U	B	B	B	-	B	B	-
Blast Furnace Gas	B	U	U	U	A	B	U	U	A
Bleach Solution	U	U	U	A	A	B	U	U	U
Bleaching Powder Solution	U	U	B	A	A	B	C	C	B
Boiler Feed Water	U	U	C	A	B	B	B	B	C
Bone Oil	A	A	U	U	A	A	A	A	U
Borax (Sodiumborate)	A	U	B	A	A	A	B	B	A
Borax Solutions	U	U	U	A	B	B	B	B	B
Boric Acid	U	B	B	A	A	A	A	A	A
Brake Fluids	U	U	B	A	U	U	U	U	U
Bromine	U	U	U	U	B	B	U	U	U
Bromine Solution in Water	U	U	U	U	A	B	U	U	U
Bromine Vapour	U	U	U	U	B	B	U	U	U
Bromobenzene	U	U	U	U	A	B	U	U	U
Bromochloro Trifluoro Ethan	U	U	U	U	A	B	U	U	U
Bunker Oil	A	B	U	U	A	A	B	B	B
Butadiene	U	U	U	U	B	B	U	U	U
Butandiol	-	U	B	A	U	U	A	A	U
Butane	A	B	B	U	A	A	A	A	U
1-Butanethiol	U	-	U	U	A	U	U	U	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Butanole	U	U	B	B	A	A	A	A	B
Butantriol	A	B	B	A	A	A	A	A	A
Butene	U	B	U	U	A	B	B	B	U
Buthylphenol	U	U	U	U	B	-	U	U	U
Butter	B	B	B	B	A	A	A	A	B
Buttermilk	U	A	A	A	A	A	A	A	A
Butyl Acetate	U	U	U	b	U	U	U	U	U
Butyl Acrylate	U	-	U	U	U	U	U	U	-
Butyl Alcohol	U	U	B	A	A	A	A	A	B
Butyl Amine	U	U	U	-	U	U	U	U	C
Butyl Benzoate	U	-	U	A	A	A	U	U	-
Butyl Carbitol	U	-	C	A	C	U	U	U	U
Butyl Cellosolve	U	U	C	A	U	U	C	C	-
Butyl Diglycol	-	-	-	A	A	-	A	A	-
Butyl Ether	U	U	U	U	U	U	U	U	U
Butyl Phthalate	U	U	U	A	U	A	U	U	A
Butyl Pyrocatechol	U	-	-	B	A	B	U	U	-
Butyl Stearate	-	A	U	U	A	B	B	B	B
Butylene	b	B	C	U	A	A	A	A	U
Butyraldehyd	U	-	U	B	U	U	U	U	U
Butyric Acid	U	U	C	U	A	B	B	B	U
Butyric Acid Butyl Ester	U	-	U	B	B	B	U	U	-

C

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Calcium Acetate	U	B	B	A	U	U	B	B	U
Calcium Bisulfate	-	A	-	A	A	A	A	A	A
Calcium Bisulfide Solution	C	C	B	A	B	C	B	B	C
Calcium Carbonate	-	A	A	A	A	-	A	A	A

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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Calcium Carbonate Slurry	U	U	A	A	A	A	A	A	A
Calcium Chloride	B	B	A	A	A	A	A	A	A
Calcium Chloride, brine	U	B	A	A	A	A	A	A	A
Calcium Cyanide	-	-	A	A	-	-	A	A	A
Calcium Hydroxide Solution	U	B	A	A	A	A	A	A	A
Calcium Hypochlorite Solution	U	U	B	A	A	A	C	C	B
Calcium Nitrate	B	B	A	A	A	A	A	A	B
Calcium Oxide	U	A	-	A	A	A	A	A	B
Calcium Phosphate Slurry	U	U	B	A	A	A	A	A	A
Calcium Silikate	-	-	A	A	A	-	A	A	-
Calcium Sulfate	-	A	-	A	A	A	A	A	A
Calcium Sulfide	U	A	A	A	A	A	A	A	B
Calcium Sulfite	U	A	A	A	A	A	A	A	A
Calcium Thiosulfate	U	A	A	A	A	A	B	B	A
Caliche Solution (Sodium Nitrate)	U	B	B	A	A	A	B	B	B
Campher	U	U	B	U	B	U	A	A	U
Campher Oil	-	-	U	U	B	-	A	A	-
Cane Sugar Sap	U	-	-	A	A	A	A	A	A
Carbitol	-	U	B	B	B	B	B	B	B
Carbolic Acid (Penole)	U	C	U	B	A	A	U	U	U
Carbolineum	U	U	-	B	A	U	B	B	U
Carbon Dioxide, dry	B	U	B	B	A	B	A	A	B
Carbon Dioxide, wet	U	U	B	B	A	B	A	A	B
Carbon Disulfide	U	U	U	U	A	C	U	U	U
Carbon Monoxide	A	A	B	A	B	B	A	A	A
Carbonic Acid	U	B	B	A	A	B	A	A	B
Carboxylic Acids	-	A	A	A	A	A	A	A	A
Casein	-	-	A	B	A	A	A	A	A
Castor Oil	A	A	A	B	A	A	A	A	A
Cellosolve (2-Ethoxyethanol)	U	U	U	B	U	U	U	U	U
Cellulose	U	B	B	B	U	B	B	B	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Cellulose Acetat	-	A	U	B	U	-	A	A	A
Chile Salpetre (Sodium Nitrate)	U	B	B	A	A	A	B	B	B
Chinawood Oil	-	C	B	U	A	A	A	A	U
Chloracetic Acid	U	U	U	A	U	B	U	U	U
Chloracetic Acid Ethyl Ester	U	U	U	U	A	B	U	U	U
Chloric Acid	U	U	U	B	B	U	U	U	U
Chloride of Lime	U	U	U	A	A	A	U	U	B
Chlorine Dioxide	U	-	U	C	A	B	U	U	-
Chlorine gas, anhydrous	-	-	C	A	A	-	C	C	-
Chlorine Water	U	U	U	B	A	U	U	U	U
Chlorine, liquid	U	U	U	B	A	C	U	U	U
Chloro Aamine	U	U	A	A	U	U	A	A	U
Chloro Acetaldehyde	U	U	U	A	U	C	U	U	U
Chloro Acetone	B	U	U	A	U	U	U	U	U
Chloro Benzene	U	U	U	U	B	B	U	U	U
Chloro Bromo Methane	U	U	U	B	B	B	U	U	U
Chloro Butadiene	U	U	U	U	B	B	U	U	U
Chloro Methyl Ether	U	U	U	C	U	U	U	U	U
Chloro Naphthalene	U	U	U	U	A	B	U	U	U
Chloro Sulfonic Acid	U	U	U	C	U	U	U	U	U
Chloroform	U	U	U	U	B	C	U	U	U
o-Chlorophenol	U	U	U	U	A	U	U	U	U
Chlorothene	U	U	U	U	B	B	U	U	U
Chlorotoluene	U	U	U	U	A	B	U	U	U
Chrome Alum	U	-	A	A	A	-	A	A	A
Chromic Acid	U	U	U	C	A	C	U	U	C
Chromo sulfuric Acid	U	U	U	U	A	U	U	U	U
Cider	U	U	B	A	B	A	A	A	B
Citric Acid	U	U	A	A	A	A	A	A	A
Citrous Oils	-	U	B	U	A	-	B	B	B
Coal Tar	-	U	-	U	B	A	B	B	B
Cobalt Chlorite	B	B	A	A	A	A	A	A	B
Coca-Cola	U	B	B	A	B	A	A	A	A

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Cocoa Butter	-	B	B	U	A	B	A	A	C
Coconut grease	A	B	B	U	A	A	A	A	A
Coconut Oil	A	A	B	U	A	A	A	A	A
Coconut, Fatty Acid	A	A	B	U	A	A	A	A	A
Cod-liver Oil	A	A	B	B	A	A	A	A	B
Coffee	U	U	A	A	A	A	A	A	A
Coffee Extract	U	U	A	A	A	A	A	A	A
Coke Oven Gas	U	U	U	U	A	B	U	U	B
Copper Acetate Solution	U	U	C	B	U	U	U	U	U
Copper Ammonium Acetate	U	U	C	B	U	U	U	U	U
Copper Chloride, Solution	U	B	B	A	A	A	A	A	A
Copper Cyanide	A	B	A	A	A	A	A	A	A
Copper Fluoride	U	-	B	A	A	U	B	B	U
Copper Nitrate	U	U	B	A	A	U	B	B	U
Copper Sulfate (Blue Vitriol) Solution	U	U	A	A	A	A	A	A	A
Corn Oil	B	A	B	U	A	A	A	A	B
Cotton Oil	A	A	C	C	A	A	A	A	A
Cottonseed Oil	A	A	B	U	A	A	A	A	B
Cresol	U	U	U	U	A	C	U	U	U
Cronton Aldehyde	U	U	U	A	U	U	U	U	U
Crude Oil	-	U	U	U	A	A	B	B	U
Cumene	U	U	U	U	A	U	U	U	U
Cuprous Ammonia Acetate Solution	U	U	U	A	U	U	U	U	U
Cyanic Acid	U	-	B	A	A	B	B	B	-
Cyanic Acid Solution	U	-	B	A	A	B	B	B	-
Cyclo Hexane	B	A	C	U	A	A	A	A	U
Cyclo Hexanole	-	-	U	U	A	A	B	B	-
Cyclo Hexanone	U	U	U	U	U	U	U	U	U
Cyclo Hexylamine	U	U	U	C	U	U	U	U	U
p-Cymene	U	U	U	U	A	B	U	U	U

D

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
DDT Solutions (Kerosene Solvent)	B	B	C	U	A	A	A	A	U
DDT Solutions (Toluene Solvent)	U	U	U	U	A	A	U	U	U
Decalin (Decahydronaphtalene)	B	U	U	U	A	A	U	U	U
Decane	A	U	U	U	A	A	A	A	B
Dextrin	U	U	A	A	A	A	A	A	A
Dextrose	B	B	-	A	A	A	A	A	A
Diacetone	-	B	-	A	U	U	-	-	-
Diacetone Alcohol	U	U	B	A	U	U	U	U	U
1.2-Diaminoethane	U	U	B	A	U	U	B	B	U
Diamylamine	U	U	U	A	U	U	U	U	U
Diazinone	-	-	U	U	B	B	U	U	U
Dibenzyl Ether	C	B	-	B	C	-	U	U	B
Dibenzyl Sebacate	U	B	U	B	B	U	U	U	U
Dibromo Difluoro Methane	U	U	U	B	-	U	U	U	U
Dibromo Methyl Benzene	U	U	U	U	A	B	U	U	U
Dibutyl Amine	U	U	U	U	U	U	U	U	U
Dibutyl Ether	U	U	U	U	U	U	U	U	U
Dibutyl Phthalate	U	-	U	B	C	B	U	U	C
Dibutyl Sebacate	U	U	U	B	B	B	U	U	B
Dichloro Acetic Acid	U	U	U	U	U	-	U	U	U
Dichloro Acetic Acid Methylester	U	U	U	A	U	U	U	U	U
Dichloro Benzene	U	U	U	U	A	B	U	U	U
Dichloro Butane	U	U	U	U	A	B	B	B	U
Dichloro Butylene	U	U	U	U	B	U	U	U	U
Dichloro Ethane	U	U	U	U	B	U	U	U	U
Dichloro Ethylene	-	U	U	U	B	-	U	U	U
Dichloro Methane	U	U	U	U	B	B	U	U	U
Dichloro Pentane	U	U	U	U	A	C	U	U	U
3,1-Dichloropropene	-	U	U	U	-	-	U	U	A
Dichloro Iso-Propylene Ether	U	B	U	U	U	U	U	U	U

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Dicyclo Hexyl Amine	U	U	U	U	U	U	U	U	U
Diesel Fuel	U	B	U	U	A	A	A	A	U
Diesel Oil	B	A	U	U	A	A	A	A	U
Diethanol Amine	U	U	U	B	U	U	U	U	U
Diethyl Amin	U	U	U	B	U	U	U	U	B
Diethyl Aniline	U	U	U	A	U	U	U	U	U
Diethyl Benzene	U	U	U	U	A	A	U	U	U
Diethyl Carbonate	U	U	U	U	A	B	U	U	U
Diethyl Ether	U	B	U	U	U	U	U	U	U
Diethyl Formaldehyde	U	U	U	A	U	U	U	U	U
Diethyl Hydrazine	U	U	C	A	U	U	C	C	U
Diethyl Maleate	U	U	C	A	U	U	C	C	U
Diethyl Sebacate	U	U	U	B	B	B	U	U	B
Diethyl Sulfate	-	U	-	-	U	-	U	U	U
Diethylene Glycol	U	U	A	A	A	A	A	A	B
Diethylene Triamine	U	U	U	A	U	U	U	U	U
Diglycolic Acid	U	-	B	A	A	U	U	U	U
Dihexyl Phthalic Acid Ester	U	-	U	-	U	-	U	U	U
1,4-Dihydroxybenzene	B	-	U	B	U	B	U	U	U
Dihydroxy Tartaric Acid (Tartaric Acid)	U	U	A	B	A	A	A	A	A
Di-Isobutyl Ketone	U	U	U	A	U	U	U	U	U
Di-Isobutylene	U	U	U	U	A	C	B	B	U
Di-Isooctyl Sebacate	U	U	U	B	B	U	U	U	U
Di-Isopropyl Benzene	U	U	U	U	A	A	U	U	U
Di-Isopropyl Ketone	U	U	U	A	U	U	U	U	U
Dimethyl Amine	U	U	U	B	U	U	U	U	U
Dimethyl Aniline	U	U	U	B	U	U	U	U	U
Dimethyl Ether	U	B	U	B	U	U	U	U	U
Dimethyl Formamide	U	U	U	B	U	B	B	B	B
Dimethyl Hydrazine	-	-	B	A	U	U	B	B	U
Dimethyl Ketone	U	U	U	A	U	U	U	U	U
Dimethyl Phenol	-	-	U	U	U	U	U	U	U
Dimethyl Phthalate	U	U	U	B	B	B	U	U	-

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Dimethylbutane	A	-	B	U	A	A	A	A	U
Dinitro Toluene	U	U	U	U	U	U	U	U	U
Dinitrogen Oxid	A	A	A	B	A	A	A	A	A
Dioctyl Amine	U	U	U	A	U	U	U	U	U
Dioctyl Phthalate	U	B	U	B	B	B	U	U	B
Dioctyl Sebacate	U	B	U	B	B	U	U	U	U
Dioxane	U	U	U	B	U	U	U	U	U
Dioxolane	-	U	U	B	U	U	U	U	U
Dipentene	U	U	U	U	A	U	B	B	U
Diphenyl	U	U	U	U	A	B	U	U	U
Diphenyl Ether	U	U	U	U	B	B	U	U	U
Diphenyle Oxide	-	U	-	U	A	B	U	U	U
Dipropylene Glycol	B	B	B	B	B	B	B	B	B
Dithionite	-	-	B	A	A	U	B	B	U
Divinyl Benzene	U	U	U	U	A	B	U	U	U
DMT (Dimethyl Terephthalate)	U	U	U	A	A	B	U	U	U
DNCB (Dinitrochlorobenzene)	U	U	U	U	A	B	U	U	U
Dodecanol	-	-	A	B	A	-	B	B	-
Domestic Fuel Oils	A	A	B	U	A	A	A	A	U
Dowtherm A	U	U	U	U	A	B	U	U	U
Dowtherm E	U	U	U	U	A	B	U	U	U

E

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Epichlor Hydrin	U	U	U	B	U	U	U	U	U
Essential Oils	U	B	U	U	B	B	U	U	U
Ethane	A	B	B	U	A	A	A	A	B
Ethanol Amine	U	U	C	B	U	U	C	C	C
Ether	U	U	U	C	U	U	U	U	U
Ethyl Acetate	U	U	U	B	U	U	U	U	U

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ethyl Acrylate	U	U	U	-	U	U	U	U	U
Ethyl Alcohol, Ethanol	U	U	A	A	U	A	A	A	B
Ethyl Benzene	U	U	U	U	B	B	U	U	U
Ethyl Bromide	U	U	U	U	A	A	B	B	U
Ethyl Cellulose	U	U	B	B	U	U	B	B	U
Ethyl Chloride	U	U	B	B	B	A	U	U	U
Ethyl Chloro Acetate	-	U	B	B	A	U	B	B	U
Ethyl Hexanole	U	U	A	A	A	A	A	A	B
Ethyl Oxalate	U	A	U	B	A	B	U	U	U
Ethyl Pentachloro Benzene	U	U	U	U	A	B	U	U	U
Ethyl Pyridine	U	U	U	A	U	U	U	U	U
Ethyl Sulfate (Diethyl Sulfate)	U	U	A	A	U	C	U	U	A
Ethylene	B	B	C	U	A	A	A	A	U
Ethylene Bromide	U	U	U	C	A	C	U	U	U
Ethylene Chloride	-	-	B	B	B	-	-	-	U
Ethylene Chlorohydrin	U	U	B	B	U	B	U	U	U
Ethylene Diamine	U	U	U	A	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	A	C	U	U	U
Ethylene Dichloride	U	U	U	U	A	C	U	U	U
Ethylene Glycol	C	B	B	A	A	A	A	A	C
Ethylene Glycol Ethyl Ether (Cellosove)	U	U	U	B	U	U	U	U	U
Ethylene Oxide	U	U	U	b	U	U	U	U	U
Ethylene Silicate	-	B	A	A	A	A	A	A	-
Ethylene Trichloride	U	U	U	C	b	B	U	U	U

F

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Fats (animal/vegetable)	A	A	A	U	A	A	A	A	B
Fatty Acids	A	A	B	U	A	A	B	B	B
Ferric Chloride Solution	-	A	B	A	A	A	A	A	B
Ferric Nitrates	B	B	A	A	A	A	A	A	B
Ferric Sulfate (Ferric Vitrinol)	B	B	A	A	A	A	A	A	B
Ferric Sulfate Solution	-	A	A	A	A	A	A	A	B
Fir Oil	U	B	U	U	A	A	B	B	U
Fish Oil	A	B	B	U	A	A	A	A	U
Fluorine	U	-	-	U	C	U	U	U	U
Fluoro Benzene	U	-	U	U	B	B	U	U	U
Fluorosilicic Acid	-	-	B	A	A	U	B	B	U
Formaldehyde (Formalin-Solution)	U	U	U	A	U	U	C	C	C
Formaldehyde (Methanal)	U	U	U	A	B	U	B	B	B
Formamide	-	U	U	B	B	-	B	B	-
Formic Acid	U	U	B	B	U	U	U	U	U
Freon 11	-	U	U	U	B	B	A	A	U
Freon 112	-	B	B	U	B	B	B	B	U
Freon 113	-	B	A	U	B	U	A	A	U
Freon 114	-	A	A	A	B	B	A	A	U
Freon 114 B2	-	B	B	U	B	B	B	B	U
Freon 115	-	B	A	A	B	B	A	A	U
Freon 12	-	B	A	B	B	U	B	B	U
Freon 13	-	B	A	A	B	U	A	A	U
Freon 13 B1	-	B	A	A	B	U	A	A	U
Freon 134 a	-	-	-	A	-	-	A	-	-
Freon 14	-	A	A	A	B	B	A	A	U
Freon 142 b	-	-	A	A	U	-	A	A	U
Freon 152 a	-	-	A	A	U	-	A	A	-
Freon 21	U	B	B	U	U	B	U	U	U
Freon 218	-	-	A	A	A	-	A	A	-
Freon 22	B	U	A	A	U	U	U	U	U
Freon 31	-	B	A	A	U	B	U	U	U
Freon 32	-	B	A	A	U	B	A	A	U
Freon 502	-	-	A	A	B	-	B	B	A
Freon BF	-	U	B	U	A	-	B	B	U
Freon C316	-	-	A	A	-	-	A	A	U

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Freon C318	-	-	A	A	B	B	A	A	U
Freon MF	-	B	U	U	B	-	B	B	U
Freon PCA	-	A	A	U	B	-	A	A	U
Freon TA	-	A	A	A	U	-	A	A	A
Freon TC	-	A	A	B	A	-	A	A	U
Freon TF	-	A	A	U	A	U	A	A	U
Freon TMC	-	B	B	B	A	-	B	B	U
Freon T-P35	-	A	A	A	A	-	A	A	A
Freon TWD602	-	A	B	A	A	U	B	B	-
Fruit Juices	U	U	B	A	B	A	B	B	A
Fumaric Acid	U	-	B	-	A	A	A	A	B
Furan	U	U	U	U	U	U	U	U	U
Furfural (Furfurylaldehyde)	-	C	-	-	-	-	C	C	-
Furfurylalcohol	-	C	-	-	-	-	-	-	-

G

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Gallic Acid	U	U	B	B	A	A	A	A	A
Gas Oil	A	A	B	U	A	A	A	A	B
Gasoline / Alcohol Mix	U	U	U	U	B	U	b	B	U
Gasoline, 100 Octane	U	B	U	U	A	A	A	A	U
Gasoline, 130 Octane	U	B	U	U	A	A	A	A	U
Gasoline, Aromatic	U	A	U	U	A	A	A	A	U
Gasoline, Ethyl and Regular	U	B	U	U	A	A	A	A	U
Gasoline, Refined	U	B	U	U	A	A	A	A	U
Gasoline, Sour	U	B	U	U	A	A	A	A	U
Gasoline, with Mercaptan	U	B	U	U	A	A	A	A	U
Gelatin	U	U	A	A	A	A	A	A	A
Generator Gas	B	A	B	U	A	B	A	A	B
Glaubers Salt	U	U	B	B	A	A	U	U	b

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Glucose solution	U	U	A	A	A	A	A	A	A
Glucose, aqueos	C	A	A	A	A	A	A	A	A
Glycerin (Glycerol)	U	U	A	A	A	A	A	A	A
Glycerol	U	U	A	A	A	A	A	A	A
Glycerol Chlorohydrin	-	-	U	B	B	-	U	U	-
Glycerol Triacetate (Triacetin)	U	U	B	A	U	U	B	B	B
Glycerol Trinitrate (Nitroglycerin)	U	U	B	A	A	U	U	U	U
Glycine	U	U	A	A	A	U	B	B	U
Glycol, Diethylene	U	U	A	A	A	A	A	A	A
Glycol, Ethylene	U	B	A	A	A	A	A	A	A
Glycol, Propylene	U	U	A	A	A	A	A	A	A
Glycolic Acid	U	U	B	A	B	A	A	A	A

H

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
HEF-3	U	U	U	U	A	B	B	B	U
Helium Gas	A	A	A	A	A	A	A	A	A
Heptane	A	B	B	U	A	A	A	A	C
Hexa Fluoro Silicic Acid	U	U	B	B	A/B	-	B	B	U
Hexachloro Acetone	U	U	U	A	U	U	U	U	U
Hexachloro Butadiene	U	B	U	U	A	U	U	U	U
Hexachloro Cyclohexane (Lindane)	U	B	U	U	A	U	-	-	U
1-Hexadecanol	-	-	A	A	-	-	A	A	-
Hexaldehyd	-	U	B	A	U	U	U	U	B
Hexalin, Cyclohexanol	-	-	B	U	A	A	A	A	U
Hexamine	U	U	U	A	U	U	U	U	U
Hexanal (Capronaldehyde)	U	U	-	B	U	U	-	-	B
Hexane	A	B	B	U	A	A	A	A	C
Hexanetriol	B	U	B	A	A	A	A	A	A

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Hexene	A	B	B	U	A	A	B	B	U
Hexyl Alcohol	U	U	B	B	A	B	A	A	B
Hydrazine	C	U	B	A	C	B	B	B	U
Hydrazine Hydrate	C	U	B	A	C	B	B	B	U
Hydrobromic Acid	U	U	U	A	A	C	U	U	U
Hydrochlorique Acid (Muriatic Acid) 37%	U	U	U	B	A	U	U	U	U
Hydrocyanic Acid	U	-	B	A	A	B	B	B	-
Hydrofluoric Acid (cold)	U	U	U	B	b	U	U	U	U
Hydrofluoric Acid (hot)	U	U	-	U	U	U	U	U	U
Hydrogen Chloride Gas	-	-	C	A	A	U	U	U	U
Hydrogen Fluoride	U	U	U	B	-	U	U	U	U
Hydrogen Peroxide, concentrated	U	U	U	U	A	B	U	U	B
Hydrogen Sulfide	U	U	B	A	A	U	C	C	U
Hydrogen, Gas	B	A	A	A	A	C	A	A	C
Hydrogene Bromide, anhydrous	U	U	U	U	A	U	U	U	B
Hydrogensulfite Leach	B	U	B	A	A	-	U	U	-
Hydroquinone	B	-	U	B	U	B	U	U	U
Hydroxy Acetic Acid	U	U	U	A	U	U	U	U	B
Hydroxyl Amine	-	-	-	A	A	A	A	A	A
Hydroxyl Amine Sulfate	-	-	B	A	A	A	A	A	A
Hypochlorous Acid	U	-	U	B	A	-	U	U	-

I

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ink	A	A	A	A	B	A	A	A	A
Iodine	-	-	U	B	A	A	B	B	-
Iodine tincture	U	U	B	B	A	B	B	B	B
Iodoform	-	-	-	A	A	-	-	-	-
Iodoform	-	-	-	A	A	-	-	-	-
Iso-Butane	A	A	U	U	A	A	A	A	U
Iso-Butyl Alcohol	U	U	A	A	B	A	B	B	A
Iso-Butyl Methyl Ketone	U	U	U	A	U	U	U	U	U
Iso-Butylene	U	U	U	U	A	A	A	A	U
Iso-Butyraldehyde	U	U	U	A	U	U	U	U	U
Iso-Cyanate	-	-	-	A	-	-	-	-	-
Iso-Dodecane	U	U	B	U	A	A	A	A	U
Iso-Octane	A	B	B	U	A	A	A	A	U
Iso-Pentane	A	B	U	U	A	A	A	A	U
Iso-Propyl-Acetate	U	U	U	B	U	U	U	U	U
Iso-Propyl-Alcohol	U	U	B	A	A	A	B	B	A
Iso-Propyl-Benzene	U	U	U	U	A	B	U	U	U
Iso-Propyl-Chloride	U	U	U	U	A	B	U	U	U
Iso-Propyl-Ether	U	U	U	-	U	U	U	U	U

J

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Jet Fuel JP3	B	B	U	U	A	A	A	A	U
Jet Fuel JP4	B	B	U	U	A	B	A	A	U
Jet Fuel JP5	B	B	U	U	A	B	A	A	U
Jet Fuel JP6	B	B	U	U	A	B	A	A	U
JP3 (Fuel)	U	B	U	U	A	A	A	A	U
JP4 (Fuel)	U	B	U	U	A	B	A	A	U
JP5 (Fuel)	U	B	U	U	A	B	A	A	U
JP6 (Fuel)	B	B	U	U	A	B	A	A	U
JPX (Fuel)	-	-	B	U	U	U	A	A	U

K

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Kerosene	C	B	U	U	A	b	A	A	U
Ketchup	U	B	A	A	A	A	A	A	A

Material Guide

L

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Lactams	U	U	C	U	U	U	U	U	U
Lactic Acid	U	B	A	B	A	A	B	B	B
Lanolin	A	A	B	U	A	A	A	A	B
Latex	U	U	A	A	A	A	A	A	A
Laughing Gas (N2O)	A	A	A	B	A	A	A	A	A
Lavender Oil	B	U	U	U	A	B	B	B	U
Lead Acetate Salt Solution	U	U	U	A	U	U	C	C	U
Lead Arsenate	-	A	-	A	-	-	A	A	A
Lead Nitrate	-	U	B	A	A	A	A	A	B
Lead Nitrate Solution	-	-	A	A	-	A	A	A	B
Lead Sulfate	U	A	A	A	A	A	B	B	B
Lemon Juice	U	-	B	A	A	-	A	A	A
Ligroin	-	B	B	U	A	A	A	A	U
Lindol	U	U	U	A	U	C	U	U	C
Linoleic Acid	-	B	-	U	B	-	B	B	B
Linseed Oil	B	B	B	C	A	B	A	A	B
Liqueurs	B	B	A	A	A	A	A	A	A
Lithium Bromide Brine	U	U	A	A	A	A	A	A	A
Lithium Chloride	U	U	A	A	A	A	A	A	A
Lithium Hydroxide	U	U	U	A	C	U	U	U	U

M

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Machinery Oil (mineral)	A	A	B	U	A	A	A	A	B
Maganese Chloride (Solution)	U	U	A	A	A	A	A	A	A
Magnesium Acetate Solution	U	U	U	A	U	U	U	U	U
Magnesium Chloride Solution	-	U	A	A	A	A	A	A	A
Magnesium Hydroxide (Solution)	U	U	B	A	B	B	B	B	B
Magnesium Silicate (Talcum)	A	A	A	A	A	A	A	A	A
Magnesium Sulfate (Epson Salts)	U	U	A	A	A	A	A	A	A
Maleic Acid	C	C	B	A	A	b	B	B	C
Maleic Anhydride	U	-	U	U	B	-	U	U	-
Malic Acid	U	U	B	B	A	A	A	A	B
Margarine	A	B	B	U	A	A	A	A	B
Mayonaise	-	U	U	U	U	U	A	A	A
Menthol	U	U	B	B	A	U	B	B	U
Mercaptans	U	U	U	A	U	U	U	U	U
Mercuric Chloride Solution	-	-	A	A	A	A	A	A	A
Mercury	A	A	A	A	A	A	A	A	A
Mercury Nitrate	-	-	A	A	-	-	A	A	A
Mesityl Oxide	U	U	U	A	U	U	U	U	U
Methacrylic Acid	U	U	U	B	U	U	U	U	U
Methanal	U	U	U	A	B	U	B	B	B
Methane	A	U	B	U	A	B	A	A	B
Methanol	U	U	B	A	U	A	B	B	A
Methoxy Benzene	U	U	U	U	U	U	U	U	U
Methoxy Butanol	-	-	B	B	A	-	A	A	-
Methyl Acetate	U	U	B	B	U	U	U	U	U
Methyl Acetoacetate	U	U	C	B	U	U	U	U	U
Methyl Acrylate	U	U	U	B	U	U	U	U	U
Methyl Alcohol	U	U	B	A	U	A	B	B	A
Methyl Amine	U	U	U	A	U	U	U	U	U
Methyl Aniline	U	U	U	B	B	-	U	U	-
Methyl Bromide	U	U	U	U	A	A	U	U	U
Methyl Butyl Ketone	U	U	U	A	U	U	U	U	U
Methyl Carbonate	U	U	U	U	U	B	U	U	U
Methyl Cellosolve	U	U	U	B	U	U	U	U	U
Methyl Cellulose	U	B	B	B	B	U	B	B	B
Methyl Chloride	U	U	U	U	B	B	U	U	U
Methyl Cyclopentane	U	U	U	U	B	B	U	U	U

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Methyl Ethyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Formate	-	-	U	B	U	-	U	U	-
Methyl Glycol	U	U	U	B	U	U	U	U	U
Methyl Glycol Acetate (Ethyleneglycol)	U	U	U	B	U	-	U	U	B
Methyl Iso-Butyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Iso-Propyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Methacrylate	U	U	U	U	U	U	U	U	U
Methyl Methacrylic Acid Ester	U	U	U	U	U	U	U	U	U
Methyl Oleate	-	-	-	B	A	B	U	U	-
2-Methylpentane+A2	A	U	-	U	A	U	A	A	U
3-Methylpentane	A	U	-	U	A	U	A	A	U
Methyl Phenyl Ether (Anisole)	U	U	U	U	U	U	U	U	U
Methyl Pyrrolidone	-	U	-	A	U	-	U	U	B
Methyl Salicylate	-	-	U	B	-	-	U	U	-
Methylene Chloride	U	U	U	U	B	C	U	U	U
Milk	U	B	A	A	A	A	A	A	A
Milk of Lime	U	U	B	A	B	B	U	U	B
Mine Gas (Methane)	A	U	B	B	A	A	A	A	A
Mineral Oil	A	A	B	U	A	A	A/B	A/B	B
Mineral Spirits	c	B	C	U	A	A	A	A	U
Molasses	U	U	B	A	A	A	A	A	A
Monobromo Benzene	U	U	U	U	B	U	U	U	U
Monochloro Benzene	U	U	U	U	B	B	U	U	U
Monochloroacetic Acid	U	U	U	A	U	U	U	U	U
Monochloroacetic Acid Ethyl Ester	U	U	U	B	U	U	U	U	U
Monoethanol Amine	U	U	U	B	U	U	U	U	U
Mononitro Chloro Benzene	U	U	U	U	A	A	U	U	U
Morpholine	U	U	C	B	-	-	U	U	U
Muriatic Acid (HCl) (Hydrochloric Acid)	U	U	-	B	A	-	U	U	U
Muriatic Acid (HCl), diluted	U	U	B	A	A	-	B	B	B

N

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Naphtha	B	B	U	U	A	B	U	U	U
Naphthalene	U	U	U	U	A	B	U	U	U
Naphthenic Acid	-	-	U	U	A	A	B	B	-
Naphtolen ZD	U	-	U	U	A	-	B	B	U
Natural Gas	A	B	B	U	A	A	A	A	U
Neats Foot Oil	A	A	U	B	A	A	A	A	B
Neon Gas	A	A	A	A	A	A	A	A	A
Nickel Acetate	U	U	B	A	U	U	B	B	U
Nickel Chloride	C	C	B	A	A	A	A	A	A
Nickel Nitrate	-	-	A	A	A	-	A	A	A
Nickel Sulfate	U	C	A	A	A	A	A	A	A
Nitrating Acids	U	U	U	A	U	U	U	U	U
Nitric Acid, concentrated	U	U	U	U	B	U	U	U	U
Nitric Acid, fuming	U	U	U	U	B	U	U	U	U
Nitro Benzene	U	U	U	U	U	U	U	U	U
Nitro Glycerin	U	U	C	A	A	U	U	U	U
Nitro Glycol	U	U	B	A	A	U	U	U	U
Nitro Methane	U	U	U	B	U	U	U	U	U
Nitro Propane	U	U	U	B	U	U	U	U	U
Nitro Toluene	U	U	U	U	U	U	U	U	U
Nitrogen Gas	A	A	A	A	A	A	A	A	A
Nitrogen Tetroxide	U	U	U	U	U	U	U	U	U
Nonanol	-	U	-	A	A	-	U	U	B
Nut Oil	A	B	B	U	A	A	A	A	B

O

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Octadecane	B	B	B	U	A	A	A	A	U
Octal	U	B	U	B	B	C	U	U	C

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Octane	U	U	U	U	A	B	B	B	U
Octanol (Octylalcohol)	U	U	B	A	A	B	B	B	B
Octylcresol	U	U	U	U	B	U	C	C	U
Oil of Turpentine	U	U	U	U	A	B	B	B	U
Olefin, crude	A	A	U	U	A	A	A	A	U
Oleic Acid	-	-	U	U	A	-	A	A	U
Oleic Alcohol	U	U	A	A	A	U	A	A	U
Oleum (Sulfuric Acid, 0 to 50%)	U	U	U	A	A	U	U	U	U
Olive Oil	A	U	B	U	A	B	A	A	B
Ortho Dichloro Benzene	U	U	U	U	A	B	U	U	U
Oxalic Acid	-	-	B	A	A	A	B	B	B
Ozone	B	A	B	A	A	A	B/C	U	A

P

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Palm Kernel Oil	A	-	A	U	A	-	A	A	-
Palm Oil	A	A	U	U	A	A	A	A	U
Palmitic Acid	U	B	B	C	A	A	B	B	U
Para Dichloro Benzene	U	U	-	U	A	B	U	U	U
Paraffin	A	B	A	U	A	A	A	A	B
Paraffin Oil	A	B	A	U	A	A	A	A	B
Peanut Oil	A	A	U	U	A	A	A	A	B
Pectin	A	A	A	A	A	A	A	A	A
Penta Chloro Diphenyl	U	U	U	U	C	U	U	U	U
Penta Chloro Phenol	-	U	-	B	-	-	U	U	U
Pentane	A	U	B	U	A	U	A	A	U
Pentanol	U	U	A	A	B	A	B	B	U
Perchloric Acid	U	U	B	B	A	C	U	U	U
Perchloro Ethylene	U	U	U	U	B	B	U	U	U
Petroleum	B	B	B	U	A	B	A	A	B
Petroleum Ether	A	B	B	U	A	B	A	A	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Phenol	C	U	U	U	B	-	U	U	U
Phenyl Benzene	-	U	U	U	B	-	U	U	-
Phenyl Ether	U	U	U	U	U	U	U	U	U
Phenyl Hydrazine	U	U	U	U	B	U	U	U	U
Phosphine	U	U	B	A	B	U	U	U	-
Phosphor Trichloride	U	U	U	A	A	-	U	U	U
Phosphoric Acid	-	U	U	B	A	C	U	U	C
Phosphoric Acid 45%	C	U	B	A	A	A	B	B	B
Photgraphic Developing Bath	-	B	A	B	A	A	A	A	A
Phthalic Acid	-	-	B	A	B	-	B	B	A
Phthalic Anhydride	-	-	-	A	-	-	-	-	-
Picoline, alpha	-	-	-	A	U	-	-	-	-
Picric Acid, Aqueous Solution	-	B	A	B	A	B	B	B	-
Pine Oil	A	A	U	U	A	A	B	B	U
Pineapple Juice	U	U	A	A	A	A	A	A	A
Pinene	U	B	B	U	A	B	B	B	U
Piperidine	U	U	U	U	U	U	U	U	U
Polyvinyl Acetates	-	-	B	A	U	-	-	-	-
Potassium Acetate	U	B	B	A	B	U	B	B	U
Potassium Aluminium Sulfat	-	-	-	A	-	-	-	-	-
Potassium Bicarbonite	U	U	A	A	A	A	A	A	B
Potassium Bisulfate	U	U	B	A	A	B	A	A	B
Potassium Borate	C	U	B	A	A	B	A	A	B
Potassium Bromate	C	U	B	A	A	B	A	A	B
Potassium Bromide	U	U	B	A	A	U	A	A	U
Potassium Carbonate	C	U	B	A	A	A	A	A	A
Potassium Chlorate	U	U	B	A	A	-	U	U	-
Potassium Chloride	C	C	B	A	A	A	A	A	A
Potassium Chromate	U	U	B	A	A	-	B	B	-
Potassium Cyanide	U	U	B	A	A	A	A	A	A
Potassium Dichromate	U	C	B	A	A	U	A	A	B
Potassium Hydroxide (Solution 50%)	U	U	B	A	C	C	B	B	C
Potassium Hydroxide, Potassium Lye	U	U	B	A	U	U	B	B	U

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Potassium Hypochlorite (Javelle Water)	U	U	-	B	A	B	B	B	B
Potassium Iodide	U	U	B	A	A	A	A	A	A
Potassium Nitrate	C	C	B	A	A	A	B	B	A
Potassium Perchlorate	U	U	B	A	A	-	U	U	-
Potassium Perfluoroacetate	-	-	B	A	U	U	B	B	-
Potassium Permanganate	C	B	B	A	A	U	U	U	U
Potassium Persulfate	U	U	B	A	A	U	U	U	U
Potassium Phosphate	-	-	-	A	A	-	A	A	U
Potassium Sulfate	U	C	B	A	A	B	A	A	B
Potassium Sulfite	U	C	A	A	A	A	A	A	A
Propane	B	B	B	U	A	B	A	A	U
Propanol	U	U	A	A	A	A	B	B	B
2-Propanone (Acetone)	U	U	U	A	U	U	U	U	U
2-Propene-1-ol	U	U	A	A	A	U	B	B	U
Propinyl Alcohol	U	-	A	A	A	-	A	A	-
Propion Aldehyde	U	U	U	A	U	U	U	U	U
Propionic Acid	C	U	B	-	A	U	A	A	U
Propyl Acetate	U	U	U	B	U	U	U	U	U
Propyl Acetone	U	U	U	A	U	U	U	U	U
Propyl Amine	U	U	U	U	U	U	U	U	U
Propyl Nitrate	U	U	U	B	U	U	U	U	U
Propylene	U	U	U	U	A	B	U	U	U
Propylene Dichloride	-	-	-	U	-	-	U	U	U
Propylene Glycol	U	U	A	A	A	-	A	A	-
Propylene Oxide	U	U	U	B	U	U	U	U	U
Pyridine	U	U	U	U	U	U	U	U	U
Pyrrole	U	U	U	U	U	B	U	U	B

R

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Rapeseed Oil	B	B	B	U	A	B	B	B	U
Roast Gas (dry)	A	-	B	A	A	A	A	A	A
Rosin (Colophony)	U	U	A	A	A	A	A	A	A

S

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Salicylic Acid	-	A	A	A	A	-	B	B	-
Sea Water	U	U	B	A	B	A	A	A	B
Sewage	-	-	B	A	A	A	A	A	A
Silcone grease	A	A	A	A	A	A	A	A	U
Silicic Acid	U	-	B	A	A	-	A	A	-
Silicon Dioxide	-	A	-	A	A	-	A	A	A
Silicone Oil	A	A	A	A	A	A	A	A	U
Silver Cyanide Solution	U	U	A	U	A	A	U	U	U
Silver Nitrate	B	-	B	A	A	A	B	B	A
Silver Salts	U	U	A	A	A	A	A	A	A
Skydrol 500	U	U	U	A	U	U	U	U	U
Skydrol 7000	U	U	U	A	B	U	U	U	U
Soap Solution	B	B	B	A	A	A	A	A	A
Soda (Natrium Carbonate)	U	U	A	A	A	A	A	A	A
Sodium Acetate	U	U	B	A	U	U	B	B	B
Sodium Benzoate	U	U	B	A	A	A	A	A	A
Sodium Bicarbonate Solution	U	U	A	A	A	A	A	A	A
Sodium Bisulfate Solution	U	U	A	A	A	A	A	A	A
Sodium Bisulfite Solution	U	U	A	A	A	A	A	A	A
Sodium Borate (Borax)	U	U	A	A	A	A	B	B	A
Sodium Carbonate (Soda Ash)	U	U	A	A	A	A	A	A	A

Material Guide

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Sodium Carbonate Solution	-	-	A	A	A	A	A	A	A
Sodium Chlorate	U	B	B	A	A	U	B	B	U
Sodium Chloride (Common Salt)	U	U	A	A	A	A	A	A	A
Sodium Chloride Solution	-	-	A	A	A	-	A	A	-
Sodium Chlorite	-	-	U	A	A	-	U	U	-
Sodium Cyanide Solution	-	-	A	A	-	-	B	B	A
Sodium Dichromate	U	U	A	A	A	-	B	B	B
Sodium Fluoride	-	B	-	A	A	-	A	A	B
Sodium Hydroxide	C	C	B	A	C	C	B	B	C
Sodium Hydroxide, Caustic Soda	B	B	B	A	B	B	B	B	A
Sodium Hypochlorite Solution	U	U	B	A	A	B	B	B	B
Sodium Nitrate	U	U	B	A	A	A	B	B	B
Sodium Nitrite	U	U	B	A	A	U	U	U	U
Sodium Peroxide Solution	U	U	B	A	A	A	B	B	U
Sodium Phosphate	-	-	B	A	A	-	A	A	U
Sodium Silicate Solution	-	-	A	A	A	-	A	A	-
Sodium Sulfate (Glauber's Salts)	U	U	B	A	A	A	B	B	A
Sodium Sulfhydrate Solution	U	-	A	A	A	A	A	A	A
Sodium Sulphide	U	U	B	A	A	A	B	B	B
Sodium Sulphite Solution	U	U	A	A	A	A	A	A	A
Sodium Tetraborate Solution	U	-	B	A	A	A	B	B	B
Sodium Thiosulfate (Antichlor)	-	-	A	A	A	-	B	B	-
Soy Bean Oil	B	B	B	U	A	A	A	A	B
Sperm Oil	-	-	-	B	A	-	A	A	-
Spermaceti	U	U	B	U	A	U	A	A	U
Spirits	B	B	A	A	A	B	A	A	A
Stannic Chloride Solution	-	-	U	A	A	A	A	A	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Starch	B	B	A	A	A	A	A	A	A
Stearic Acid	A	A	B	B	A	A	B	B	B
Stoddard Solvent	A	A	B	U	A	A	A	A	U
Styrene	U	U	U	U	A	C	U	U	U
Succinic Acid	U	U	B	A	A	-	A	A	A
Sucrose Sap	U	U	B	A	A	A	A	A	A
Sugar Solutions	U	U	B	A	A	A	A	A	A
Sulphur	U	-	A	A	A	b	U	U	B
Sulphur Hexafluoride (SF6)	B	-	A	A	B	B	B	B	-
Sulphur Chloride	U	U	U	U	A	B	U	U	U
Sulphur Dioxide (SO2)	U	U	U	A	B	B	U	U	B
Sulphur Dioxide Liquid (anhydrous)	U	-	U	A	U	B	U	U	B
Sulphur Dioxide, gaseous	U	-	U	A	U	B	U	U	B
Sulphuric Acid (0 to 50%)	U	U	U	A	A	U	U	U	U
Sulphuric Acid, diluted	U	U	U	A	A	U	B	B	U
Sulphurous Acid	U	U	-	B	A	-	-	-	U

T

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Talcum	-	A	-	A	A	A	A	A	A
Tallow	U	B	B	B	A	U	A	A	B
Tannins	U	B	B	B	A	A	B	B	B
Tar	U	U	U	U	B	C	U	U	-
Tartaric Acid	U	U	B	B	A	A	A	A	A
Tetrachloroethane	U	U	U	U	B	C	U	U	U
Tetrachloromethane	-	U	U	U	A	B	U	U	U
Tetrachoroethylene	U	U	U	U	A	B	U	U	U
Tetraethyl Lead	-	U	U	U	A	B	B	B	U
Tetrahydrofuran	U	U	U	U	U	U	U	U	U
Thionyl Chloride	U	U	U	B	A	U	U	U	U
Thiophene	U	U	U	U	U	U	U	U	U

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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Titanium Tetrachloride	U	U	B	B	B	B	B	B	U
Toluene (Toluol)	U	U	U	U	B	B	U	U	U
Town Gas	U	U	U	U	A	B	B	B	B
Transformer Oil	B	A	U	U	A	A	B	B	B
Triacetin (Glycerine Triacetate)	U	U	B	A	U	U	B	B	B
Triaryl Phosphate	U	U	U	A	A	B	U	U	U
Tributoxy Ethyl Phosphate	B	-	B	B	B	-	U	U	U
Tributyl Marcaptane	U	-	U	U	A	U	U	U	U
Tributyl Phosphate	U	U	U	B	U	U	U	U	U
Trichloro Benzene	U	U	U	-	A	U	-	-	U
Trichloro Ethane	U	U	U	U	A	B	U	U	U
Trichloro Ethyl Phosphate	-	-	U	-	U	-	U	U	-
Trichloro Ethylene	U	U	U	U	B	B	U	U	U
Trichloroacetic Acid	U	U	U	B	U	U	B	B	B
Tricresyl Phosphate	U	U	U	B	B	B	U	U	U
Triethanolamine	U	U	-	A	-	-	-	-	U
Triethyl Borane	-	-	-	-	A	-	-	-	-
Triethyl Glycol	C	-	-	A	A	-	A	A	A
Triethylaluminium	-	-	-	U	B	-	-	-	-
Trifluoro Ethane	U	U	U	U	A	B	U	U	U
Tri-Iso-Propyl Benzene	A	A	U	U	A	-	A	A	U
Trinitrotoluene (TNT)	U	B	B	U	B	B	U	U	-
Trioctyl Phosphate	U	U	U	A	B	B	U	U	U
Trisodium Phosphate Solution	C	B	B	A	A	A	A	A	A
Turpentine	B	C	U	U	A	A	A	A	U

U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Urea	B	U	B	A	A	A	A	A	A

V

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Vaseline	B	B	B	U	A	A	A	A	B
Vaseline Oil	U	U	B	U	A	B	A	A	B
Vegetable Juices	U	U	B	A	A	A	A	A	A
Vegetable Oils	B	-	B	U	A	A	A	A	B
Vinegar	U	U	B	A	B	B	B	B	A
Vinyl Acetate	-	-	-	-	-	-	-	-	-
Vinyl Chloride, liquid	-	-	-	-	-	-	-	-	-
Vinylidene Chloride	U	U	U	U	B	U	U	U	U

W

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Waste Gas (cont. Carbon Dioxide)	A	-	A	A	A	A	A	A	A
Waste Gas (cont. Carbon Monoxide)	A	A	A	A	A	A	A	A	A
Waste Gas (cont. Hydrogen Chloride)	-	-	A	A	A	-	B	B	-
Waste Gas (cont. Hydrogen Fluoride)	-	-	A	A	A	-	A	A	A
Waste Gas (cont. Nitrous Fumes)	U	-	A	A	A	B	-	-	U
Waste Gas (cont. Sulfur Dioxide)	-	-	A	A	A	-	B	B	-
Waste Gas (cont. Sulfuric Acid)	-	-	B	A	A	-	U	U	-
Water 135 °C	U	U	C	A	C	A	C	U	U
Water 80 °C	U	U	B	A	B	A	A	B	B
Water vapour < 140 °C	U	U	U	A	U	B	C	U	B
Water vapour < 150 °C	U	U	U	A	U	B	U	U	B
Water vapour > 140 °C	U	U	U	B	U	B	U	U	B
Water vapour > 150 °C	U	U	U	B	U	U	U	U	U
Wax Alcohols	A	-	B	U	A	-	A	A	A

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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Wine + Whiskey	U	U	A	A	A	A	A	A	A
Wood Spirit	U	U	U	B	U	U	U	U	-

X

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Xenon	A	A	A	A	A	A	A	A	A
Xylene (Xylol)	U	U	U	U	B	U	U	U	U
Xylidines (aromatic Amines)	U	U	U	B	U	U	U	U	U

Y

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Yeast	B	U	A	A	A	A	A	A	A

Z

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Zeolites	-	-	A	A	A	-	A	A	-
Zinc Acetate	U	U	B	A	U	U	B	B	U
Zinc Chloride Solutions	U	U	A	A	A	A	A	A	-
Zinc Sulfate	U	U	A	A	A	A	A	A	A

B.2 Special requirements – authorities and approvals

Seals often have to meet the highest performance standards and the most stringent of environment and safety demands.
Also official authorities and associations make great demands on seals or materials which are to be used in their industries. This is often the case if seals are used for water or gas applications.
The following table shows common authorities and their requirements.

Table IV Authorities and approvals

Approval / Examination Certificate / Guideline	Application	Criteria / Standards	Tests / Examinations / Contents	Authorities / Associations	Institutes / Laboratories
ACS Licensing	Polymers exposed to drinking water	French Standard AFNOR XP P41-250, part 1-3	- Analysis of dispensing according "Synoptic Documents" - Storage test (microbe analysis)	ACS (Accréditation de conformité sanitaire)	3 certified test laboratories in France: Paris / Vandoevre / Lille
BgVV Release (former: BGA)	Polymers exposed to food	BgVV Guidelines ("Polymers exposed to food") various paragraphs, depending on the application of the seal	- Chemical and physical tests - Biological tests - Sterilisation tests - Taste tests	BgVV (Bundesinstitut für gesundheitlichen Verbraucher-schutz und Veterinärmedizin)	BAM, Berlin
DVGW Release for Gas	Seals for gas services and gas applications	EN 549 DIN 3535 Part 3		DVGW, Bonn (Deutscher Verein des Gas und Wasserfaches e.V.)	DVGW Research Department Test Laboratory for Gas, Karlsruhe
DVGW Release for drinking water	Seals for processing storage and distribution of drinking water	BgVV Guidelines ("Polymers exposed to food")	Various classifications and tests - depending on the application	DVGW, Bonn (Deutscher Verein des Gas und Wasserfaches e.V.)	Environmental Hygiene Institute, Gelsenkirchen TZW, Karlsruhe
FDA guideline (Release also possible)	Materials for food and pharmaceutical	"White List" (Register of permitted dispensing components) according to 21. CFR Part 177.2600	- Component test according "White List" - Extended for foods containing water or oil Extraction test for polar / non polar solvents	FDA (Food and Drug Administration)	In house or external laboratories
International Military Releases	Applications for military devices	Various military specifications and standards depending on the application	- Depending on application and specification		Various test laboratories
KTW certificate	Polymers exposed to drinking water, Cold- warm- and hot water	BgVV Guidelines ("Polymers exposed to food") part 1.3.13	- Extraction test - Odour- and taste test - Register of permitted components	DVGW, Bonn (Deutscher Verein des Gas und Wasserfaches e.V.)	Environmental Hygiene Institute, Gelsenkirchen TZW, Karlsruhe BAM, Berlin
NSF Release	Food and Sanitary	NSF Standard criteria	- Test of components - Test of component group - Physical and chemical Material tests - Toxicological and micro biological tests depending on application	NSF (National Sanitation Foundation)	NSF, USA UL, USA
UL Listing	Application of seals for electrical equipment + appliances	UL-guidelines	- Chemical comparability test - Additional tests depending on application	UL (Under-writers Laboratory)	Underwriters laboratory in USA/England
WRAS Release (former: WRC)	Polymers exposed to drinking water	British Standard BS 6920 BS 2494	- Dispensing test - Microbe test - Extraction test - Hot water test	WRAS (Water Regulations Advisory Scheme)	Various accredited test laboratories in England

C Materials

The following tables show the most important materials for different applications. Apart from this we offer further numerous materials for special applications. Please contact your local B+S company.

The listed materials are structured according to their main purpose. Owing to the versatility of the materials exact organisation is not possible. Therefore for example materials with institutional approvals in the main are listed in one chapter even if they are used for special industrial applications.

Due to the different conditions in the field, e. g. different media, the given material properties could be affected and changed. Tests should be done for each application.

C.1 Standard materials

The following tables show the physical properties of standard materials. They contain minimum values. That means that a standard material meets at least the given values. Many of the materials (even when defined as standard) have better physical properties.

If there are no special requirements concerning the material, automatically one of those standard materials according to the mentioned material group will be supplied (see also table X).

Table V Material specification for standard NBR

				NBR 70 Shore A	NBR 80 Shore A	NBR 90 Shore A
Hardness		DIN 53 505 ASTM D 2240	Shore A	70 ± 5	80 ± 5	90 ± 5
Tensile strength		DIN 53 504 ASTM D 412	MPa N/mm²	> 14	> 12	> 10
Elongation at break		DIN 53 504 ASTM D 412	%	> 200	> 150	> 100
Compression set	24h / 100 °C	DIN ISO 815B ASTM D 395B	%	< 25	< 30	< 30
Heat aging	72h / 100 °C	DIN 53 508 ASTM D 573				
Change of hardness			Shore A	max +8	max +8	max +8
Change of tensile strength			%	max -25	max -25	max -30
Change of elongation at break			%	max -25	max -25	max -30
Resistance in ASTM-Oil # 1	72h / 100 °C	DIN 53 521 ASTM D 471				
Change of hardness			Shore A	max +6	max +6	max +6
Change of volume			%	max -8	max -8	max -8
Resistance in ASTM-Oil # 3	72h / 100 °C	DIN 53 521 ASTM D 471				
Change of hardness			Shore A	max -10	max -10	max -10
Change of volume			%	max +15	max +15	max +15
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-30 °C to +100 °C	-25 °C to +100 °C	-25 °C to +100 °C

Table VI Material specification for standard EPDM

				EPDM 70 Shore A sulphur cured	EPDM 70 Shore A peroxide cured	EPDM 75 Shore A peroxide cured
Hardness		DIN 53 505 ASTM D 2240	Shore A	70 ± 5	70 ± 5	75 ± 5
Tensile strength		DIN 53 504 ASTM D 412	MPa N/mm²	> 10	> 10	> 10
Elongation at break		DIN 53 504 ASTM D 412	%	> 150	> 125	> 125
Compression set	24h / 100 °C	DIN ISO 815B ASTM D 395B	%	< 20		
	24h / 150 °C		%		< 30	< 30
Heat aging	72h / 100 °C	DIN 53 508 ASTM D 573		x		
	72h / 150 °C				x	x
Change of hardness			Shore A	max +10	max +10	max +10
Change of tensile strength			%	max -10	max -20	max -20
Change of elongation at break			%	max -20	max -20	max -20
Resistance in water	72h / 100 °C	DIN 53 521 ASTM D 471				
Change of hardness			Shore A	max -10	max -3	max -3
Change of volume			%	max +10	max +3	max +3
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-45 °C to +120 °C	-45 °C to +140 °C	-45 °C to +140 °C

Table VII Material specification for standard Silicone

				Silicone 60 Shore A	Silicone 70 Shore A
Hardness		DIN 53 505 ASTM D 2240	Shore A	60 ± 5	70 ± 5
Tensile strength		DIN 53 504 ASTM D 412	MPa N/mm²	> 5	> 5
Elongation at break		DIN 53 504 ASTM D 412	%	> 100	> 100
Compression set	24h / 175 °C	DIN ISO 815B ASTM D 395B	%	< 35	< 35
Heat aging	72h / 225 °C	DIN 53 508 ASTM D 573			
Change of hardness			Shore A	max +15	max +15
Change of tensile strength			%	max -40	max -40
Change of elongation at break			%	max -40	max -40
Resistance in ASTM-Oil # 1	72h / 100 °C	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max -10	max -10
Change of volume			%	max +20	max +20
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-55 °C to +200 °C	-55 °C to +200 °C

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Table VIII Material specification for standard FKM

				FKM 70 Shore A	FKM 75 Shore A	FKM 80 Shore A	FKM 90 Shore A
Hardness		DIN 53 505 ASTM D 2240	Shore A	70 ± 5	75 ± 5	80 ± 5	90 ± 5
Tensile strength		DIN 53 504 ASTM D 412	MPa N/mm²	> 10	> 10	> 10	> 10
Elongation at break		DIN 53 504 ASTM D 412	%	> 125	> 125	> 120	> 100
Compression set	24h / 175 °C	DIN ISO 815B ASTM D 395B	%	< 20	< 20	< 20	< 20
Heat aging	72h / 250 °C	DIN 53 508 ASTM D 573					
Change of hardness			Shore A	max +10	max +10	max +10	max +10
Change of tensile strength			%	max -25	max -25	max -25	max -25
Change of elongation at break			%	max -25	max -25	max -25	max -25
Resistance in ASTM-Oil # 3	72h / 150 °C	DIN 53 521 ASTM D 471					
Change of hardness			Shore A	max -5	max -5	max -5	max -5
Change of volume			%	max +5	max +5	max +5	max +5
Resistance in ASTM-FUEL C	72h / RT	DIN 53 521 ASTM D 471					
Change of hardness			Shore A	max -5	max -5	max -5	max -5
Change of volume			%	max +10	max +10	max +10	max +10
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-18 °C to +200 °C	-18 °C to +200 °C	-18 °C to +200 °C	-15 °C to +200 °C

Table IX Material specification for standard HNBR

				HNBR 70 Shore A partially saturated	HNBR 75 Shore A partially saturated
Hardness		DIN 53 505 ASTM D 2240	Shore A	70 ± 5	75 ± 5
Tensile strength		DIN 53 504 ASTM D 412	MPa N/mm²	> 15	> 15
Elongation at break		DIN 53 504 ASTM D 412	%	> 250	> 250
Compression set	24h / 125 °C	DIN ISO 815B ASTM D 395B	%	< 35	< 35
Heat aging	72h / 150 °C	DIN 53 508 ASTM D 573			
Change of hardness			Shore A	max +10	max +10
Change of tensile strength			%	max -30	max -30
Change of elongation of break			%	max -30	max -30
Resistance in ASTM-Oil # 1	72h / 150 °C	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max +10	max +10
Change of volume			%	max -10	max -10
Resistance in ASTM-Oil # 3	72h / 150 °C	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max -15	max -15
Change of volume			%	max +20	max +20
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-30 °C to +130 °C	-30 °C to +130 °C

Table X Standard materials

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (±5)	Operating temperature range	Description
NBR Nitrile Butadien Rubber	N7003	-	-	black	70	-30 °C to +100 °C	Standard NBR, good overall performance, **mainly metric sizes**
	N7024	-	-	black	70	-30 °C to +100 °C	Standard NBR, good overall performance
	N7027	-	-	black	70	-30 °C to +100 °C	Standard NBR, good overall performance, **KTW approval (as well in combination with DF-Treatment)**
FKM Fluorocarbon Rubber	V70G1	-	-	green	70	-18 °C to +200 °C	Standard FKM, good overall performance, **DVGW**
	V70G2	-	-	green	70	-18 °C to +200 °C	Standard FKM, good overall performance
	V8003	-	-	black	80	-18 °C to +200 °C	Standard FKM, good overall performance
	V80G2	-	-	green	80	-18 °C to +200 °C	Standard FKM, good overall performance, **mainly inch sizes**

C.2 Materials with broad area of application

What makes these materials stand out is the wide spectrum of use. They can be used for standard applications as well as for special industrial applications.

O-Rings manufactured in these materials are available in different sizes and different quantities.

Table XI Materials with broad area of application

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
ACM Polyacrylate Rubber	A7002	-	-	black	70	-15 °C to +150 °C	Polyacrylate rubber with **good oil resistance**
CR Chloroprene Rubber	C6T40	6460047	-	black	60	-40 °C to +100 °C	Good overall performance
	C7T40	6470049	-	black	70	-35 °C to +100 °C	Good overall performance
EPDM Ethylene Propylene Diene Rubber	E6T40	7060011	-	black	60	-45 °C to +125 °C	**Peroxide cured** rubber with **very low compression set** and durability in hot water and steam. Excellent resistance to ozone and outdoor conditions. Can be used in contact with copper and brass.
	E7002	-	-	black	70	-45 °C to +125 °C	**Sulphur cured**, Good overall performance
	E762A	7070012	-	black	70	-45 °C to +125 °C	**Peroxide cured** rubber with **very low compression set** and durability in hot water and steam. Excellent resistance to ozone and outdoor conditions. Can be used in contact with copper and brass.
	ECT31	-	2064	black	75	-40 °C to +135 °C	**Peroxide cured, good coolant resistance,** highly resistant to oxygen, ozone and weathering, excellent resistance to water/steam, good resistance to chemicals, **WRAS approved** ASTM D2000 M2: DA 710 A26 B36 EA14 Z1
FKM Fluorocarbon Rubber	V70GA	-	-	green	70	-20 °C to +200 °C	Good overall performance, **DVGW, BAM,** mainly inch sizes
	V7671	-	-	black	70	-20 °C to +200 °C	Good overall performance
	V7T30	-	9770	black	70	-20 °C to +200 °C	Good overall performance ASTM D2000 M2: HK 710 A1-10 B37 EF31 F15
	V7T40	6770025	-	green	70	-15 °C to +200 °C	Combines high temperature resistance with good resistance to oils, fuels and chemicals. Limited low temperature flexibility. **WRAS approved.**
	VCT33	-	9775	black	75	-20 °C to +200 °C	Good overall performance, Good resistance to many chemicals, mineral oils and fuels and natural gas. ASTM D2000 M2: HK 710 A1-10 B37 EF31 F15 Z1
	VCT37	-	9732	black	75	-20 °C to +200 °C	Good overall performance
	V8T40	6780026	-	black	80	-18 °C to +200 °C	Combines high temperature resistance with good resistance to oils, fuels and chemicals. **Improved abrasion resistance.**
	V90G1	-	-	green	90	-15 °C to +200 °C	Good overall performance

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Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
HNBR Hydrogenated Nitrile Butadiene Rubber	H7001	-	-	black	70	-30 °C to +130 °C	**Improved fuel resistance**
NBR Nitrile Butadiene Rubber	N5T30	-	4450	black	50	-30 °C to +100 °C	**Pneumatic applications,** Mineral based hydraulic oils and greases, engine oils S.A.E. 10 and 40, **medium ACN-content,** ASTM D2000 M2: BG 510 A14 B14 EO34
	N5T4P	635051	-	black	50	-30 °C to +100 °C	Soft NBR / PVC material for moulded products
	N6T30	-	4460	black	60	-30 °C to +100 °C	**Pneumatic applications,** Mineral based hydraulic oils and greases, engine oils S.A.E. 10 and 40, **medium ACN-content,** ASTM D2000 M2: BG 610 A14 B14 EO34
	N6T40	6360028	-	black	60	-30 °C to +100 °C	Good overall performance with **normal ACN-content**
	N6T41	6360037	-	black	60	-30 °C to +100 °C	Good overall performance with **high ACN-content**
	N7017	-	-	black	70	-35 °C to +100 °C	Good overall performance, improved low-temperature flexibility
	N7083	-	-	black	70	-20 °C to +100 °C	Standard NBR, very good overall performance, **mainly inch sizes**
	N762A	6370001	-	black	70	-30 °C to +100 °C	Good overall performance, approved according to Swedish Standard for O-Rings and O-Ring materials **SMS 1587**
	N7T30	-	4470	black	70	-30 °C to +100 °C	Good performance with water, **Sea water,** water-soluble oil emulsions, water/ethylene-glycol, **medium ACN-content,** ASTM D2000 M2: BG 710 A14 B14 EO14 EO34
	NCT31		5575	black	75	-30 °C to +100 °C	Gear-oils S.A.E. 70 to 120, Ester-based lubricants, Paraffin and Petrol and natural gases, **high ACN-content.**
	N862A	6380038	-	black	80	-35 °C to +100 °C	Good overall performance with medium-low ACN-content, **good abrasion resistance**
	N8T30	-	4480	black	80	-30 °C to +100 °C	**Pneumatic applications,** Mineral based hydraulic oils and greases, engine oils S.A.E. 10 and 40, **medium ACN-content** ASTM D2000 M2: BG 810 A14 B14 EO14 EO34
	N9T30	-	4490	black	90	-30 °C to +100 °C	**Pneumatic applications,** Mineral based hydraulic oils and greases, engine oils S.A.E. 10 and 40, **medium ACN-content,** ASTM D2000 M2: BG 910 A14 B14 EO14 EO34
	N9T40	6390097	-	black	90	-20 °C to +100 °C	**Hard** NBR with **standard ACN-content. For injection moulding.**

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
VMQ Methyl Vinyl Silicone Rubber	S4T40	6840012	-	brown-red	40	-55 °C to +200 °C	**Extremely good ageing properties in dry air** even at high temperatures. Very good low-temperature flexibility.
	S5T40	6850013	-	brown-red	50	-55 °C to +200 °C	**Extremely good ageing properties in dry air** even at high temperatures. Very good low-temperature flexibility
	S6T40	6860014	-	brown-red	60	-55 °C to +200 °C	**Extremely good ageing properties in dry air** even at high temperatures. Very good low-temperature flexibility
	S70R2	-	-	red	70	-55 °C to +200 °C	Good overall performance
	S76RC	6870015	-	brown-red	70	-55 °C to +200 °C	**Extremely good ageing properties in dry air** even at high temperatures. Very good low-temperature flexibility
	S8T40	6880016	-	brown-red	80	-55 °C to +200 °C	**Extremely good ageing properties in dry air** even at high temperatures. Very good low-temperature flexibility

C.3 Materials with special area of application

These specialised materials are used in applications where the conditions are more demanding. In the following they are subdivided into two groups: materials for automotive use and materials for different industrial applications.

The listed materials are again structured according to their main purpose. Owing to the versatility of the materials exact organisation is not possible.

C.3.1 Materials for industrial applications

Table XII Special materials for industrial applications

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
CR Chloroprene Rubber	C7T80	-	7770	black	70	-30 °C to +80 °C	**Resistant to weathering,** oxidation and ozone, resistant to light oils and grease
	WC704	-	-	black	75	-40 °C to +100 °C	**Good resistance to refrigerants** in good overall performance
EPDM Ethylene Propylene Diene Rubber	E7T41	7070017	-	black	70	-45 °C to +150 °C	**Peroxide cured, extremely low compression set** in hot water and steam. Excellent resistance to ozone and outdoor conditions. Can be used in contact with copper and brass..

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Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
FFKM Isolast® Perfluoro Elastomer	J9505	-	-	white	70	-20 °C to +240 °C	Recommended for "clean" processes, **pharmaceutical and food applications** with no FDA compliancy
	J9515	-	-	black	70	-15 °C to +240 °C	**FDA compliant grade** according to paragraph 21 CRF §177.2600 (e, f) "rubber articles intended for repeated use". Broadest chemical resistance, excellent in hot water/steam and sterile environment
	J9503	-	-	black	75	-25 °C to +240 °C	**Broadest chemical resistance** for almost all applications; also in ethylene-/propylene oxide, amines and hot water/steam
	J8325	-	-	black	75	-15 °C to +325 °C	**High temperature compound,** not recommended in amines, hot water/ steam and ethylene-/propylene oxide
	J9501	-	-	white	80	-20 °C to +240 °C	Recommended for "clean" processes, **pharmaceutical and food applications** with no FDA compliancy
	J9509	-	-	black	90	-20 °C to +240 °C	**Broadest chemical resistance** for almost all applications; also in ethylene-/propylene oxide, amines and hot water/steam
FKM Fluorocarbon Rubber	V7T41	6770020	-	black	70	-30 °C to +200 °C	Fluorocarbon rubber with **good low temperature properties.**
	VC302	-	-	black	75	-25 °C to +200 °C	**Highly fluorinated** FKM Rubber with good cold flexibility and good chemical resistance at the same time
	VC602	-	-	black	75	-5 °C to +200 °C	Very good and **broad chemical resistance**
FVMQ Fluorosilicone Rubber	F76L1	-	-	blue	70	-55 °C to +175 °C	Good **cold-flexibility and fuel-resistance**
	F76L3	-	-	blue	70	-55 °C to +175 °C	Good **resistance to oil and good cold flexibility**
HNBR Hydrogenated Nitrile Butadiene Rubber	H7201	-	-	black	70	-40 °C to +130 °C	Good **low-temperature properties**
	H7503	-	-	black	70	-35 °C to +140 °C	**Low compression set** with good low-temperature properties and heat resistance at the same time
	H7T30	-	2716	black	70	-30 °C to 140 °C	**Recommended for air-conditioning applications,** good resistance to mineral oils and greases at higher temperatures and good hot water resistance with excellent gas and water impermeability, excellent resistance to oil additives and amine corrosion inhibitors.
	H7T40	6370087	-	black	70	-15 °C to +140 °C	**Improved ozone resistance and heat-ageing.** Better mechanical properties than FKM up to 140 °C.
	H7T41	6370098	-	black	70	-32 °C to +140 °C	**Improved low temperature flexibility,** ozone resistance and heat-ageing properties.

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Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
NBR Nitrile Butadiene Rubber	N7013	-	-	black	70	-30 °C to +100 °C	**Improved fuel- resistance**
	N7201	-	-	black	70	-50 °C to +80 °C	**Very good low-temperature flexibility**
	N762C	6370003	-	black	70	-40 °C to +100 °C	Good low temperature flexibility. Used in contact with mineral- and hydraulic oils. **Approved by the Swedish airforce.**
	N7T40	6370084	-	black	70	-55 °C to +100 °C	"Polar", **extremely good low temperature properties.** Used for static applications in mineral oil.
	N7T41	6370015	-	black	70	-20 °C to +110 °C	**Peroxide cured,** good heat-ageing properties and low compression set.
VMQ Methyl Vinyl Silicone Rubber	S76I1	-	-	ivory-coloured	70	-55 °C to +200 °C	**Conductive Rubber,** volume resistance 5 x 10^{-3} Ωcm
	S7T31	-	8858	grey	70	-60 °C to +200 °C	**Extreme temperature** compound, but with limited oil and fuel resistance, good resistance to hot air and satisfactory for use in hot water
Special O-Ring materials and production processing							
AU Polyester Urethane	WU7T1	-	-	virginal	70	-30 °C to +80 °C	**For Polyurethane O-Rings** (see O-Ring catalogue); Up to 110 °C / 120 °C for short times (ask our specialists)
	WU9T2	-	-	virginal	92	-30 °C to +80 °C	**for Polyurethane O-Rings** (see O-Ring catalogue); Up to 110 °C / 120 °C for short times (ask our specialists)
EPDM Ethylene Propylene Diene Rubber	ED665	-	-	black	65	-40 °C to +120 °C	**For Round cord rings, butt-joint** (see O-Ring catalogue); Peroxidcured, very good resistance to Ozone and very good ageing properties, for critical chemical/ mechanical use, special sizes.
FKM Fluorocarbon Rubber	VC665	-	-	black	75	-10 °C to +200 °C	**For Round cord rings, butt-joint** (see O-Ring catalogue); Very good resistance to Ozone and very good ageing properties, special sizes
NBR Nitrile Butadiene Rubber	N7665	-	-	black	70	-30 °C to +100 °C	**For Round cord rings, butt-joint** (see O-Ring catalogue); Short time use up to +130 °C, very good with mineral oil and grease, special sizes
VMQ Methyl Vinyl Silicone Rubber	SE6R5	-	-	red	55	-40 °C to +200 °C	**For Round cord rings, butt-joint** (see O-Ring catalogue); According to FDA, suitable for medical/technical applications and for food industry, physiological harmless

C.3.2 Materials for automotive applications

These materials are mainly used with automotive applications. Small quantities normally are not available.

Table XIII Materials for automotive applications

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A (± 5)	Operating temperature range	Description
EPDM Ethylene Propylene Diene Rubber	E7T30	-	2662	black	70	-40 °C to +150 °C	Brake-Systems, ABS Systems
	EC5V1	-	-	violet	75	-50 °C to +150 °C	Air Conditioning Equipment, R 134 A and PAG oil
	ECT3V	-	2907	violet	75	-40 °C to +150 °C	Air Conditioning Equipment
	E8503	-	-	black	80	-45 °C to +150 °C	Special compound for Brake-Systems with DOT 4
	E8T30	-	2700	black	80	-40 °C to +150 °C	Brake Systems, ABS Systems
	E8T31	-	2772	black	80	-40 °C to +150 °C	Brake-Systems, ABS Systems
FKM Fluorocarbon Rubber	V6T30	-	9706	green	60	-20 °C to +200 °C	Fuel Quick Connectors
	V7T33	-	9761	black	70	-30 °C to +200 °C	Fuel Injectors
	V7T34	-	9700	green	70	-20 °C to +200 °C	Oil Free compressors
	VC301	-	-	black	75	-18 °C to +200°C	Fuel Injection Pumps, improved fuel-resistance
	VCT31	-	2666	green	75	-30 °C to +200 °C	Fuel Injectors
	VCT32	-	2777	black	75	-30 °C to +200 °C	Fuel Injectors
	VCT34	-	9787	blue	75	-40 °C to +200 °C	Fuel Injectors
	VCT38	-	9788	green	75	-20 °C to +200 °C	Fuel Injectors, Diesel pumps
	VCT72	-	2888	brown	75	-30 °C to +200 °C	Fuel Injectors
	VCT73	-	9777	black	75	-40 °C to +200 °C	Fuel Injectors
	VCT7B	-	9800	green	75	-20 °C to +200 °C	Fuel Quick Connectors
FVMQ Fluorosilicone Rubber	F7T31	-	8975	yellow	70	-60 °C to +200 °C	Fuel Quick Connectors, CNG Vehicles
	F7T32	-	8970	blue	70	-60 °C to +200 °C	Fuel Injectors, CNG Vehicles
	FCTV1	-	9809	brown-red	75	-50 °C to +200 °C	Fuel Quick Connectors
	FBTV1	-	9807	black	85	-50 °C to +200 °C	Fuel Quick Connectors
HNBR Hydrogenated Nitrile Butadiene Rubber	H7T33	-	2709	light green	70	-30 °C to +135 °C	Air Conditioning Equipment
	H7T3R	-	2920	red	70	-20 °C to +140 °C	Air Conditioning Equipment
	HCT31	-	3055	black	75	-25 °C to +140 °C	Air Conditioning Equipment

C.4 Materials with institutional approvals

All following given approvals are valid at the time of publication. The period of validity of the approvals is limited. They are prolonged only if necessary.

Therefore please ask our experts to check the relevance of an approval in the individual case.

Table XIV Materials with institutional approvals

Material-Type	Material code	Reference Skega	Reference Dowty	Colour	Hardness Shore A	Operating temperature range	Approvals
CR Chloroprene Rubber	C6T40	6460047	-	black	60	-40 °C bis +100 °C	UL 50 § 43,2 Applies to swell in IRM 903 < 25%
EPDM Ethylene Propylene Diene Rubber	E7502	-	-	black	70	-45 °C to +150 °C	KTW, WRAS, FDA
	E7515	-	-	black	70	-45 °C to +140 °C	KTW and FDA, Peroxid cured, good overall performance
	E7594	-	-	black	70	-45 °C to +150 °C	KTW, WRAS, NSF
	E7T42	7070026	-	black	70	-45 °C to +120 °C	WRAS approval, Peroxid cured rubber with very low compression set and durability in hot water and steam. Excellent resistance to ozone and outdoor conditions. can be used in contact with copper and brass..
	E7T43	7070007	-	black	70	-40 °C to +125 °C	FDA and KTW Peroxide cured rubber with very low compression set and durability in hot water and steam. Excellent resistance to ozone and outdoor conditions. can be used in contact with copper and brass.
FKM Fluorocarbon Rubber	V70GA	-	-	green	70	-20 °C to +200 °C	DVGW, BAM, mainly inch sizes, good overall performance
	V7T40	6770025	-	green	70	-20 °C bis +200 °C	WRAS
	V7T43	6770018	-	black	70	-20 °C bis +200 °C	WRAS
	V8605	-	-	black	80	-20 °C to +200 °C	FDA, suitable for filling stations for drinking water applications and food industry
FVMQ Fluorosilicone Rubber	F6T40	6860018	-	white	60	-60 °C bis +175 °C	BGA; Part A Silicone BG BI, FDA
NBR Nitrile Butadiene Rubber	N7007	-	-	black	70	-30 °C to +100 °C	DVGW, KTW, WRAS, FDA, NWC, DIN 3335/142
	N7027	-	-	black	70	-30 °C to +100 °C	KTW approval in combination with DF-Treatment, good overall performance
	N762A	6370001	-	black	70	-35 °C bis +100 °C	SMS 1587
	N7T43	6370019	-	black	70	-40 °C bis +100 °C	FDA (Fat)
VMQ Methyl Vinyl Silicone Rubber	S70RA	-	-	red	70	-55 °C to +200 °C	FDA approval, good overall performance
	S7T41	6870024	-	trans-parent	70	-50 °C bis +200 °C	FDA

D General quality criteria and storage guidelines

D.1 Quality criteria

The cost-effective use of seals and bearings is highly influenced by the quality criteria applied in production. Seals and bearings from Busak+Shamban are continuously monitored according to strict quality standards from material acquisition through to delivery.

Certification of our production plants in accordance with international standards QS 9000 / ISO 9000 meets the specific requirements for quality control and management of purchasing, production and marketing functions.

Our quality policy is consistently controlled by strict procedures and guidelines which are implemented within all strategic areas of the company.

All testing of materials and products is performed in accordance with accepted test standards and specifications, e.g. random sample testing in accordance with DIN ISO 2859, part 1.

Inspection specifications correspond to standards applicable to individual product groups (e.g. for O-Rings: ISO 3601).

Our sealing materials are produced free of chlorofluorinated hydrocarbons and carcinogenic elements.

The tenth digit of our part number defines the quality characteristics of the part. A hyphen indicates compliance with standard quality criteria outlined in this catalogue. Customer-specific requirements are indicated by a different symbol in this position. Customers who require special quality criteria should contact their local Busak+Shamban sales office for assistance. We have experience in meeting all Customer quality requirements.

D.2 Storage and shelf life

Seals and bearings are often stored as spare parts for prolonged periods. Most rubbers change in physical properties during storage and ultimately become unserviceable due, e.g., to excessive hardening, softening, cracking, crazing or other surface degradation. These changes may be the result of particular factors or combination of factors, such as the action of deformation, oxygen, ozone, light, heat, humidity or oils and solvents.

With a few simple precautions, the shelf life of these products can be considerably lengthened.

Fundamental instructions on storage, cleaning and maintenance of elastomeric seal elements are described in international standards, such as:
DIN 7716 / BS 3F68:1977,
ISO 2230 or
DIN 9088

The standards give several recommendations for the storage and the shelf life of elastomers, depending on the material classes.

The following recommendations are based on the several standards and are intended to provide the most suitable conditions for storage of rubbers. They should be observed to maintain the optimum physical and chemical values of the parts:

Heat

The storage temperature should preferable be between +5 °C and +25 °C. Direct contact with sources of heat such as boilers, radiators and direct sunlight should be avoided.
If articles are taken from low temperature storage, care should be taken to avoid distorting them during handling at that temperature as they may have stiffened. In this case the temperature of the articles should be raised to approximately +20 °C before they are put into service.

Humidity

The relative humidity in the store room should be below 70 %. Very moist or very dry conditions should be avoided. Condensation should not occur.

Light

Elastomeric seals should be protected from light sources, in particular direct sunlight or strong artificial light with an ultraviolet content. The individual storage bags offer the best protection as long as they are UV resistant.
It is advisable to cover any windows of storage rooms with a red or orange coating or screen.

Radiation

Precaution should be taken to protect stored articles from all sources of ionising radiation likely to cause damage to stored articles.

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Oxygen and ozone

Where possible, elastomeric materials should be protected from circulating air by wrapping, storage in airtight containers or by other suitable means.
As ozone is particular deleterious to some elastomeric seals, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury vapour lamps, high voltage electrical equipment, electric motors or other equipment which may give rise to electric sparks or silent electrical discharges. Combustion gases and organic vapour should be excluded from storage rooms alas they may give rise to ozone via photochemical processes.

Deformation

Elastomeric materials should, wherever possible, be stored in a relaxed condition free from tension, compression or other deformation. Where articles are packed in a strain-free condition they should be stored in their original packaging.

Contact with liquid and semi-solid materials

Elastomeric seals should not be allowed to come into contact with solvents, oils, greases or any other semi-solid materials at any time during storage, unless so packed by the manufacturer.

Contact with metal and non-metals

Direct contact with certain metals, e.g. manganese, iron and particularly copper and its alloys, e.g. brass and compounds of these materials are known to have deleterious effects on some rubbers. Elastomeric seals should not be stored in contact with such metals.
Because of possible transfer of plasticisers or other ingredients, rubbers must not be stored in contact with PVC. Different rubbers should preferably be separated from each other.

Cleaning

Where necessary, cleaning should be carried out with the aid of soap and water or methylated spirits. Water should not, however, be permitted to come into contact with fabric reinforced components, bonded seals (because of corrosion) or polyurethane rubbers. Disinfectants or other organic solvents as well as sharp-edged objects must not be used. The articles should be dried at room temperature and not placed near a source of heat.

Shelf life and shelf life control

The useful life of a elastomeric seals will depend to a large extend on the type of rubber. When stored under the recommended conditions (above sections) the below given shelf life of several materials should be considered.

AU, thermoplastics	4 years
NBR, HNBR, CR	6 years
EPDM	8 years
FKM, VMQ, FVMQ	10 years
FFKM, Isolast®	18 years
PTFE	unlimited

Elastomeric seals should be inspected after the given period. After this giving an extension period is possible.

Rubber details and components less than 1.5 mm thick are liable to be more seriously affected by oxidation degradation even when stored in satisfactory conditions as recommended. Therefore they may be inspected and tested more frequently than it is mentioned above.

Rubber details / seals in assembled components

It is recommended that the units should be exercised at least every six months and that the maximum period a rubber detail be allowed to remain assembled within a stored unit, without inspection, be a total of the initial period stated above and the extension period. Naturally this will depend on the design of the unit concerned.