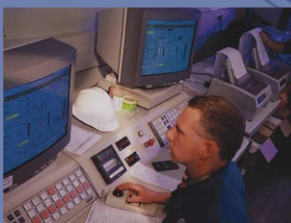


ELEMENTIS

SPECIALTIES

Specialty Surfactants



YOUR INNOVATIVE PARTNER IN SPECIALTY CHEMISTRY

INTRODUCTION

We value the relationship with our customers and work together to bring innovative solutions to the market needs. We believe that our strength lies in customer relationships.

The flexibility of our assets supports our ability to bring solutions to the market due to our technology and technical know-how.

Elementis Specialties Netherlands is ISO 9001-2000 certified and well equipped to handle various chemicals in a responsible way, such as ethylene oxide, propylene oxide, dimethyl sulphate, epichlorohydrin, formaldehyde, and acrylonitrile.

We are specialists in:

- Ethoxylation
- Propoxylation
- Phosphation
- Sulphation
- Quaternisation
- Polymerisation
- Oximation
- Condensation

The Delden site, the Netherlands, is highly suitable for the production of specialty chemicals and surfactants due to the presence of flexible manufacturing facilities, allowing for both continuous and batch processes (reactors with operating temperatures from -5°C to at least 250°C and pressures from 1 millibar to 10 bar). The installations are primarily multipurpose and the reactors can accept charges from 1 to 15 tons.

For relevant branches GMP-regulated and Kosher productions can be carried out.

ABBREVIATIONS

EO	= Ethylene oxide
PO	= Propylene oxide
TEA	= Triethanolamine
Na-salt	= Sodium salt
Ca-salt	= Calcium salt
HLB	= Hydrophilic / Lipophilic balance

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POLYGLYCOL ETHERS

The particular applications of each polyglycol ether can be indicated by looking at the calculated hydrophilic / lipophilic balance (HLB) of the molecule. This can be summarised as follows:

• **HLB-value : 5 - 9**

- anti-foaming agents in surfactant formulations
- detergents and/or dispersing agents in petroleum oils
- emulsifiers (water in oil)

• **HLB-value : 9 - 12.5**

- oil-soluble detergents
- dispersing agents
- emulsifiers (oil in water)

• **HLB-value : 12.5 - 14**

- wetting agents
- detergents for household and industrial purposes
- emulsifiers (oil in water)

• **HLB-value : 14 - 16**

- detergents and wetting agents for use at high temperatures and in high electrolyte concentrations
- emulsifiers for emulsion polymerisation

• **HLB-value : 16 - 19**

- dyeing aids
- dispersing agents of lime soap
- emulsifiers for emulsion polymerisation

Modified polyglycol ethers can be used as low foaming wetting agents.

The standard products are listed below. Other products may be available on request.

PRODUCT NAME	Description	HLB	Appearance at 20°C	Cloud point [°C]
SERDOX NBSQ 5/5	C9-C11 alcohol + 5 EO/5 PO	-	liquid	23 - 26 ¹⁾
SERDOX NASQ 5/2	C11 alcohol + 5 EO/2 PO	-	liquid	78 - 82 ⁴⁾
SERDOX NOL 2	oleyl alcohol + 2 EO	5	liquid	
SERDOX NOL 3	oleyl alcohol + 3 EO	6.5	liquid	58 - 62 ⁵⁾
SERDOX NES 3	C12-C15 alcohol + 3 EO	8	liquid	50 - 54 ⁵⁾
SERDOX NHL 4,7	oleyl alcohol + 4.7 EO	8	liquid	75 - 79 ⁶⁾
SERDOX NKL 6	tallow alcohol + 6 EO	10	solid	77 - 79 ⁵⁾
SERDOX NIS 5	C12 Guerbetalc. + 5 EO	10	liquid	81 - 85 ⁴⁾
SERDOX NOL 15	oleyl alcohol + 15 EO	12	wax	66 - 72 ⁸⁾
SERDOX NRL 7E	C13 alcohol + 7 EO (desalted)	12	liquid	72 - 75 ⁵⁾
SERDOX NBS 6.6/90	C9-C11 alcohol + 6.6 EO	13	liquid	60 - 64 ¹⁾
SERDOX NIS 8	C12 Guerbetalc. + 8 EO	13	solid	approx. 73 ⁵⁾
SERDOX NSP 14	tristyrylphenol + 14 EO	13	liquid	59 - 63 ²⁾
SERDOX ZLY 4	phenol + 4 EO	13	liquid	57 - 60 ³⁾
SERDOX NSL 30	stearyl alcohol + 30 EO	16.5	solid	77 - 81 ⁷⁾
SERDOX NLO 20	glycerine + 20 EO	18	liquid	> 90

1) 1% in water

2) 2% in water

3) 10% in water

4) 2% in 25% butyldiglycol solution

5) 10% in 25% butyldiglycol solution

6) 5% in 25% butyldiglycol solution

7) 1% in 10% NaCl solution

8) 2% in 10% NaCl solution

FATTY ACID POLYGLYCOL ESTERS and CASTOR OIL ETHOXYLATES

Almost all surfactants cause some irritation to the skin or eyes. Fatty acid polyglycol esters, however are very mild.

Fatty acid polyglycol esters have good emulsifying and lubricating properties. These properties combined with the above mentioned physiological aspects make these nonionic surfactants useful as emulsifiers for essential oils, cosmetics and agricultural products.

In the textile industry, fatty acid polyglycol esters are widely used because of their softening and anti-static properties. Ethoxylated castor oil products have also good emulsifying and lubricating properties, and are used for example in the textile, leather, paper and cosmetic industry.

The standard products are listed below. Other products may be available on request.

PRODUCT NAME	Description	Appearance at 20°C	Cloud point [°C]
SERDOX NOG 440	oleic acid + 10 EO	liquid	65 - 67 ²⁾
SERDOX NOG 600	oleic acid + 14 EO	liquid	71 - 75 ²⁾
SERDOX NSG 200	stearic acid + 4.5 EO	solid	58 - 62 ²⁾
SERMUL EN 24	castor oil + 17 EO	liquid	59 - 63 ⁴⁾
SERVIROX OEG 59E	castor oil + 31 EO	liquid	61 - 63 ⁵⁾
SERVIROX OEG 62	castor oil + 35 EO	liquid	71 - 76 ³⁾
SERVIROX OEG 68.5	castor oil + 46 EO	solid	80 - 84 ¹⁾
SERVOXYL VSUC 12/100	methyl-blocked fatty acid PEG ester	liquid	58 - 63 ¹⁾

- 1) 1% in water
- 2) 5 g + 25 g 25% butyldiglycol solution
- 3) 5% in 25% butyldiglycol solution
- 4) 10% in 25% butyldiglycol solution
- 5) 10% in 40% butyldiglycol solution

FATTY AMINE POLYGLYCOL ETHERS

Fatty amine polyglycol ethers are nonionic surfactants, but exhibit often a cationic character particularly under acidic conditions. This property can be influenced by the length of the hydrophilic polyglycol ether chain (amount of EO) in the fatty amine polyglycol ether molecule; the cationic character decreases when the length of polyglycol ether chain increases. Fatty amine polyglycol ethers are compatible with anionic surfactants.

Due to their cationic character, fatty amine polyglycol ethers are used for example to form emulsions that contain positive charged droplets. These droplets adhere to materials that have a negatively charged surface, such as wool or leather, thereby changing

the properties of these materials. Furthermore, positive charged fatty amine polyglycol ethers adhere to metals, and cell membranes of micro-organisms, thereby forming a mono-molecular layer on the surface. This is one of the main reasons why fatty amine polyglycol ethers possess for example corrosion inhibiting.

Furthermore, these ethers exhibit anti-static and levelling properties, and are therefore highly suitable to use in auxiliary products for the textile industry.

The standard products are listed below. Other products may be available on request.

PRODUCT NAME	Description	Appearance at 20°C	Cloud point [°C]
SERDOX NCA 2 G	cocoamine + 2 EO	liquid	Approx 49 ⁴⁾
SERDOX NCA 5 G	cocoamine + 5 EO	liquid	50 - 55 ¹⁾
SERDOX NCA 15 G	cocoamine + 15 EO	liquid	78 - 82 ¹⁾
SERDOX NJAD 10 S	tallowamine + 10 EO	liquid	70 - 72 ²⁾
SERDOX NJAD 20	tallowamine + 20 EO	solid	81 - 86 ³⁾
SERDOX NJAD 45/40	tallowamine + 45 EO	liquid	81 - 85 ²⁾
SERDOX NLAP 3	triethanolamine + 3 PO	liquid	-

1) 1% in water

2) 1% in 10% NaCl solution

3) 2% in 10% NaCl solution

4) 5 g + 25 g 25% butyldiglycol solution

ALKANOLAMIDES (ETHOXYLATED)

The (ethoxylated) alkanolamide products are based on: monoethanolamine or diethanolamine, and a fatty acid or a fatty acid ester.

Alkanolamides are used in many detergent and shampoo formulations in order to:

- improve the foaming properties and the foam stability,
- increase the viscosity,
- ensure re-fatting,
- keep calcium and magnesium soap in dispersion.

Alkanolamides can also be used as anti-static agents for plastics and as emulsifiers for mineral oils. Products based on diethanolamine can be subdivided into two groups:

- The so-called "Super-amide" type: Products having a 1 : 1 molar ratio of amine to fatty acid (ester).
- The so-called "Kritchevsky amide" type: Products having a 2 : 1 molar ratio of amine to fatty acid (ester). This latter type is better soluble in water.

The standard products are listed below. Other products may be available on request.

PRODUCT NAME	Description	Appearance at 20°C	Acid value [mg KOH/g]
SERDOLAMIDE POF 61	oleic acid diethanolamide	liquid	max. 7
SERDOLAMIDE PPF 67	coconut oil diethanolamide	liquid	max. 2.8
SERDOLAMIDE PQF 54	soya oil diethanolamide	liquid	13 - 15
SERDOLAMIDE PQJ 48	soya oil diethanolamide in TEA/water	liquid	13 - 15

PRODUCT NAME	Description	Appearance at 20°C	Cloud point [°C]
SERDOX NXC 3 (N)	oleic acid monoethanolamide + 3 EO	liquid	65 - 70 ¹⁾
SERDOX NXC 6	oleic acid monoethanolamide + 6 EO	liquid	78 - 82 ¹⁾
SERDOX NXC 14	oleic acid monoethanolamide + 14 EO	liquid	57 - 65 ²⁾

1) 10% in 25% butyldiglycol solution

2) 2% in 10% NaCl solution

3) product is a potassium salt

4) product is a sodium salt

PHOSPHATE ESTERS

Phosphate esters are anionic surfactants which are produced by phosphorylation of (ethoxylated) aliphatic or aromatic alcohols. The thus obtained acidic phosphate esters can be neutralised by using different kind of alkaline. The properties of phosphate esters are mainly determined by the following factors:

- the type of alcohol used as raw material,
- the degree of ethoxylation of the alcohol,
- the mono- di-ester ratio (normally 1: 1 molar ratio when produced by using phosphorous pentoxide under standard conditions, but specific mono-esters can be produced by using polyphosphoric acid),
- the type of neutralising agent.

The main advantages of products based on phosphate esters over many other surfactants are their stability in a broad pH range, their solubility and their corrosion

inhibiting properties. Phosphate esters are highly suitable to use as:

- Emulsifying agents in for example emulsion polymerisation, herbicide / pesticide formulations, cutting oils for metal treatment, resin dispersions (adhesives), and in cosmetics and personal care products,
- Wetting agents, bactericides, and/or hydrotropes in alkaline, neutral and acidic household and institutional cleaners,
- Anti-static agents in for example the textile-, paper-, electronic- and plastic industries,
- Corrosion inhibitors,
- Acidifying agents in acidic cleaners.

The standard products are listed below. Other products may be available on request.

PRODUCT NAME	Alcohol base	Appearance at 20°C	Acid value [mg KOH/g]
SERVOXYL VPAZ 100	C12-C14-alcohol	solid	225 - 245
SERVOXYL VPBZ 5/100	C12-C18-alcohol + 5 EO	liquid	110 - 120
SERVOXYL VPDZ 100	C13-alcohol	liquid	215 - 240
SERVOXYL VPDZ 3/100	C13-alcohol + 3 EO	liquid	140 - 150
SERVOXYL VPDZ 6/100	C13-alcohol + 6 EO	liquid	110 - 125
SERVOXYL VPDZ 9/100	C13-alcohol + 9 EO	liquid	87 - 96
SERVOXYL VPDZ 20/100	C13-alcohol + 20 EO	solid	48 - 58
SERVOXYL VPFZ 7/100	oleyl alcohol + 7 EO	liquid	83 - 100
SERVOXYL VPGP 4/65	phenol + 4 EO	liquid	³⁾
SERVOXYL VPGZ 6/100	phenol + 6 EO	liquid	150 - 180
SERVOXYL VPIZ 100	n-butanol	liquid	450 - 480
SERVOXYL VPNZ 6/100	nonylphenol + 6 EO	liquid	83 - 91
SERVOXYL VPNZ 7/100	nonylphenol + 7 EO	liquid	105 - 115
SERVOXYL VPNZ 9/100	nonylphenol + 9 EO	liquid	86 - 96
SERVOXYL VPNZ 20/30	nonylphenol + 20 EO	liquid	16 - 20
SERVOXYL VPPZ 100	iso-propanol	liquid	470 - 520
SERVOXYL VPQZ 14/100	tristyrylphenol + 14 EO	liquid	55 - 70
SERVOXYL VPRZ 6/100	tallow alcohol + 6 EO	solid	93 - 105
SERVOXYL VPRZ 11/100	tallow alcohol + 11 EO	solid	66 - 76
SERVOXYL VPTZ 100	2-ethylhexanol	liquid	300 - 330
SERVOXYL VPTZ 3/100	2-ethylhexanol + 3 EO	liquid	170 - 200
SERVOXYL VPT 3/85	2-ethylhexanol + 3 EO	liquid	⁴⁾
SERVOXYL VPVZ 12/100	C20-22-alcohol + 12 EO	solid	57 - 65
SERVOXYL VPXZ 100	iso-nonanol	liquid	280 - 310
SERVOXYL VQAZ 100	C18-Guerbet alcohol	liquid	168 - 183

MONO-ESTER PHOSPHATES

PRODUCT NAME	Alcohol base		Appearance at 20°C	Acid value [mg KOH/g]
SERVOXYL VMUZ 100	methanol		liquid	965 - 1010
SERVOXYL VMDZ 6/100	C13 alcohol	+ 6 EO	liquid	245 - 270
SERVOXYL VMNZ 9/100	nonylphenol	+ 9 EO	liquid	190 - 205

SULPHATES, SULPHONATES, SULPHOSUCCINATES

SULPHATES

The range of anionic surfactants also includes sulphates based on natural or synthetic alcohols, or alkyl(phenol) polyglycol ethers. Sulphates are often used because of their excellent emulsifying, wetting, lime soap dispersing, and foaming properties, and their high electrolyte tolerance.

Alkylsulphates

Alkylsulphates are known to be very effective for all kind of washing and cleaning applications due to their high interfacial activity. These surfactants are also highly suitable to use as emulsifier in emulsion polymerisation processes, particularly when acrylates, vinyl-acetates or vinyl-chlorides are used as monomers. Alkylsulphates are also used as collectors in flotation processes, as foaming agents in toothpaste formulations and as mercerising agents in the textile industry.

Alkylethersulphates

Alkylethersulphates are better water soluble and water hardness resistant than the corresponding alkylsulphates, due to the hydrophilic polyglycol ether chains. Alkylethersulphates exhibit excellent synergistic effects in combination with other surfactants, for example regarding the foaming power and the oil dispersing ability. Combinations of alkylethersulphates with sulphonates and/or alkanolamides

are often utilised in dishwashing and cleaning agents formulations.

Alkylethersulphates are often combined with sulphosuccinates, amphoteric surfactants or amine oxides in bubble bath and shampoo formulations.

SULPHONATES

Alkylbenzenesulphonates have excellent detergent properties and are easy to handle. Hence they are used in a wide variety of washing and cleaning formulations. The Ca-salts are used as emulsifiers in pesticide formulations.

Sulphonated castor oil, Turkish Redoil, is highly suitable to use as softening agent in textile finishes, as pasting agent in dyestuffs, as fat liquoring agent for leather or in general as an emulsifying agent.

SULPHOSUCCINATES

Sulphosuccinic di-esters based on 2-ethylhexanol are highly effective wetting agents which are used in many branches of industry. Both mono- and di-sulphosuccinates are applied as emulsifying agents in polymerisation processes.

The standard products are listed below. Other products may be available on request.

SULPHATES

PRODUCT NAME	Description	Appearance at 20°C	Active content [% (m/m)]
SERDET DLK 9/30	C13 polyglycol ether (9 EO) sulphate, Na-salt	Liquid	30
SERDET DFK 30	C12-C14-alcohol sulphate, Na-salt	Liquid	30
SERDET DSK 40	2-Ethylhexyl sulphate, Na-salt	Liquid	40
SERDET DSK 48	2-Ethylhexyl sulphate, Na-salt	Liquid	48
SERMUL EA 146	Nonylphenol polyglycol ether (15 EO) sulphate, Na-salt	Liquid	35
SERMUL EA 151	Nonylphenol polyglycol ether (10 EO) sulphate, Na-salt	Liquid	35
SERMUL EA 266	C13 polyglycol ether (15 EO) sulphate, Na-salt	Liquid	26

SULPHONATES

PRODUCT NAME	Description	Appearance at 20°C	Active content [% (m/m)]
SERMUL EA 27	Dodecylbenzene(branched) sulphonate, Ca-salt	liquid	65
SERMUL EA 88	Dodecylbenzene sulphonate, Ca-salt	liquid	65
SERVO BRILLANT OLIE BAZ 75	Castor oil sulphonate, Na-salt	liquid	77

SULPHOSUCCINATES

PRODUCT NAME	Description	Appearance at 20°C	Active content [% (m/m)]
SERWET WH 170	Di-2-ethylhexyl sulphosuccinate, Na-salt in ethanol/water	liquid	65
SERWET WH 172	Di-2-ethylhexyl sulphosuccinate, Na-salt in 1,2-monopropylene glycol/water	liquid	60
SERWET WH 175	Di-2-ethylhexyl sulphosuccinate, Na-salt in nonionic/water	liquid	65
SERMUL EA 176	Nonylphenol polyglycol ether (10 EO) monosulphosuccinate, di-Na-salt	liquid	23

CATIONIC SURFACTANTS

Many applications of cationic surfactants are based on their adsorption behaviour on negatively charged surfaces. The range of cationic surfactants comprises imidazolines and quaternary ammonium compounds. Imidazolines are highly suitable to use as adhesion agents for bitumen, because of their excellent heat stability. Furthermore, imidazolines can be used as corrosion inhibitor. This property can be explained by the adsorption of these compounds on metals, thereby forming a thin protective layer on the surface of the metals.

Quaternary ammonium compounds have a powerful bactericidal effect and are therefore highly suitable to use in disinfectant cleaners.

A special range of cationic surfactants are the SERVOSOFT fabric softeners. These esterquat products are based on quaternary triethanol ammonium fatty acid ester, quaternised with dimethylsulphate.

The standard products are listed below. Other products may be available on request.

IMIDAZOLINES

PRODUCT NAME	Description	Appearance at 20°C	Tertiary amine content [meq/g]
SERVAMINE KOO 330	Oleic acid + diethylenetriamine	liquid	2.0 - 2.4
SERVAMINE KOO 360	Oleic acid + aminoethylethanolamine	liquid	approx. 2.5

QUATERNARY AMMONIUM COMPOUNDS

PRODUCT NAME	Description	Appearance at 20°C	Active content [% (m/m)]
SERVAMINE KAC 458	Coco-Alkyltrimethyl ammonium methosulphate	liquid	45
SERVAMINE KW 50	Polyglycol ether (5 EO) cocoammonium methosulphate	liquid	min. 99
SERVAMINE KW 100	Polyglycol ether (15 EO) cocoammonium methosulphate	liquid	min. 99
SERVAMINE KZB 402	Quaternary polyamine	liquid	60

ESTERQUATS

PRODUCT NAME	Description	Appearance at 20°C	Active content [% (m/m)]
SERVOSOFT XW 445 PP	TEA-esterquat in propoxylated palm oil/water	dispersion	45
SERVOSOFT XW 490	TEA-esterquat in iso-propanol	paste	90
SERVOSOFT XW 490 ZT	TEA-esterquat in iso-propanol	paste	90
SERVOSOFT XW 690	TEA-esterquat in iso-propanol	liquid	90

TEA = triethanolamine

OTHER SPECIALITY PRODUCTS

PRODUCT NAME	Description	Application
SERPOL QPA 150	Polyacrylate, NH ₄ -salt	Dispersing agent
SERPOL QPA 160	Polyacrylate, Na-salt	Dispersing agent
SERFAX AK 330	Dimethylaminopropylamides of tallow fatty acids	Emulsifier for bitumen
SERFAX AK 500	Mixture of cationic condensation products	Emulsifier for bitumen
SERVON XGF	Glycerolformal	Special solvent for a.o. pharmaceutical and veterinary products
SERVON XRK 65	3-Chloro-2-hydroxypropyl trimethylammoniumchloride	Cationising agent for starch
SERVON XRK 69	3-Chloro-2-hydroxypropyl trimethylammoniumchloride	Cationising agent for starch



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