

Euxyl® PE 9010

PRODUCT INFORMATION

PRESERVATIVE FOR COSMETICS & TOILETRIES



Product

- ❑ Innovative cosmetic preservative based on phenoxyethanol
- ❑ Globally approved
- ❑ Stable to hydrolysis, temperature and pH
- ❑ Effective in pH-ranges up to 12

Use / Use-concentrations

- ❑ Leave-on products 0.5 – 1.0 %

Euxyl® PE 9010 – a sophisticated combination

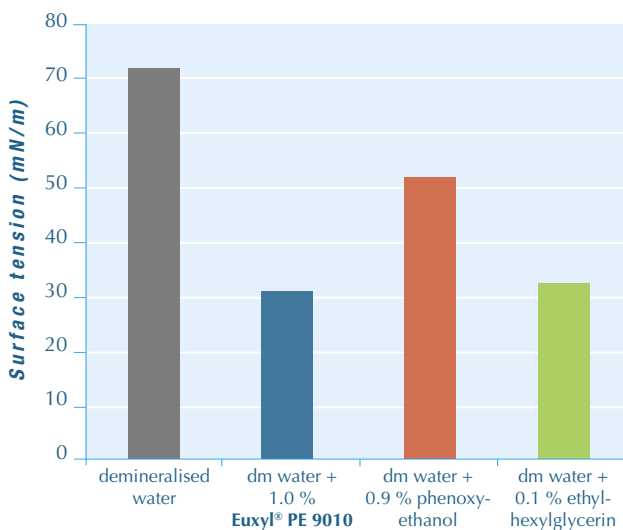
Phenoxyethanol is a well-known, accepted cosmetic preservative. With **Euxyl® PE 9010**, Schülke & Mayr breaks new ground: an innovative, multi-functional additive enhances the efficacy of phenoxyethanol. The addition of ethylhexylglycerin affects the interfacial tension at the cell membrane of microorganisms, improving the preservative activity of phenoxyethanol.

More product benefits:

- ▣ Patented liquid concentrate
- ▣ Broad spectrum effect
- ▣ Fast-acting, often within a few hours
- ▣ Ideal for the preservation of clear, transparent gels
- ▣ Extensive toxicological data of the ingredients



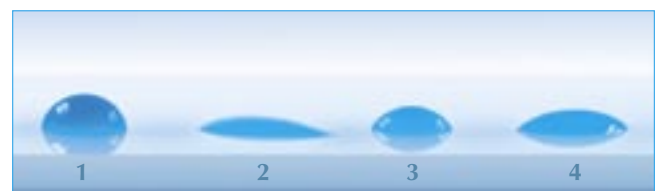
Surface tension of aqueous solutions



Euxyl® PE 9010 lowers the surface tension of water significantly. Despite the low surface tension, formation of foam was not observed.

Contact angle of aqueous solutions on polyethylene

Euxyl® PE 9010 reduces the contact angle of water significantly. The wetting of surfaces is improved. The picture clearly demonstrates this phenomenon on polyethylene. With ethylhexylglycerin the contact of phenoxyethanol with the cell membrane of microorganisms can also be optimized. The antimicrobial efficacy of phenoxyethanol is improved.



- drop 1:** demineralised water
- drop 2:** dm water + 1.0 % **Euxyl® PE 9010**
- drop 3:** dm water + 0.9 % phenoxyethanol
- drop 4:** dm water + 0.1 % ethylhexylglycerin



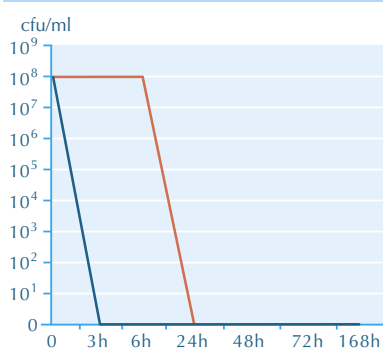
Superior gel clarity

Gels preserved with **Euxyl® PE 9010** stay clear and transparent.

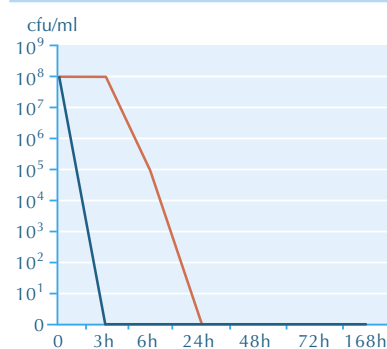
- gel 1:** Carbomer gel without preservative
- gel 2:** Carbomer gel with 1.0 % **Euxyl® PE 9010**
- gel 3:** Carbomer gel with 1.0 % of a standard paraben mixture in phenoxyethanol

Germ count reduction in tap water

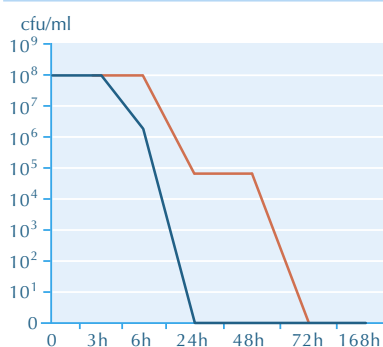
Pseudomonas aeruginosa



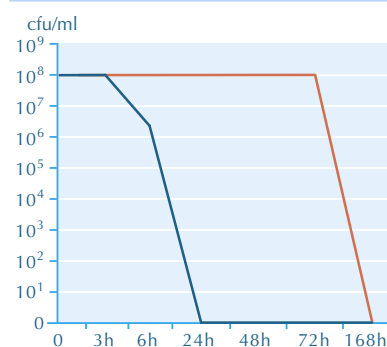
Escherichia coli



Candida albicans



Aspergillus niger



The antimicrobial efficacy of phenoxyethanol is accelerated by adding ethylhexylglycerin.

—	0.9 % phenoxyethanol
—	1.0 % Euxyl® PE 9010

cfu = colony forming units

International Approvals

Europe and USA

INCI Name (active ingredient): Phenoxyethanol

	C ₈ H ₁₀ O ₂ 138.17 g/mol
CAS no.:	122-99-6
INCI-name:	Phenoxyethanol
Name according to RL 76/768/EEC:	Phenoxyethanol
No. according to RL 76/768/EEC:	29
EINECS name:	2-Phenoxyethanol
EINECS no.:	204-589-7

INCI Name (auxiliary): Ethylhexylglycerin

	C ₁₁ H ₂₄ O ₃ 204.31 g/mol
CAS no.:	70445-33-9
CAS name:	3-[(2-Ethylhexyl)oxy]-1,2-propanediol
INCI-name:	Ethylhexylglycerin
ELINCS name:	Sensiva SC 50
ELINCS no.:	408-080-2

Australia

Phenoxyethanol: AICS; TGA
Ethylhexylglycerin: NICNAS (File No: NA/966); AICS; TGA

Canada

Phenoxyethanol: listed on DSL
Ethylhexylglycerin: listed on DSL

Japan

Japanese Cosmetic Legislation (2001)

Phenoxyethanol is approved as a cosmetic preservative up to 1.0 % for all types of cosmetics and toiletries without restrictions.

Japanese Cosmetic Licensing Standard (1999)

Product		Euxyl® PE 9010	
Ingredient names		2-Phenoxy-ethanol	2-Ethylhexyl-glycerylether
Ingredient Code		100125	532289
CLS Category	Cleansing Preparations	1.0	o
	Hair Care Preparations	1.0	o
	Treatment Preparations	1.0	o
	Makeup Preparations	1.0	o
	Fragrant Preparations	1.0	o
	Suntan & Sunscreen Preparations	1.0	o
	Nail Makeup Preparations	1.0	o
	Eyeline Preparations	1.0	–
	Lip Preparations	1.0	1.0
	Oral Preparations	1.0	–
	Bath Preparations	1.0	–

Attention:

The numerical values given are upper limits for the amount to be added. These numerical values indicate the weight %, volume %, weight to volume % or volume to weight %.

– = not approved
o = not limited

Source: The Comprehensive Licensing Standards of Cosmetics by Categories 1999 (CLS1999), YAKUJI NIPPO, LTD.

Use concentrations

	acc. S&M-recommendations	acc. EU-Cosmetic Directive	acc. CIR (USA)
Leave-on (i.e. creams, lotions etc.)	0.5 – 1.0 %	max. 1.1 %	max. 5.5 %
Rinse-off (i.e. shampoos, bath preparations, etc.)	–	max. 1.1 %	max. 5.5 %

The percentages according S&M recommendations relate to the complete formulation in each case. The values given are recommended guides. The individual use-concentration is dependent on the sensitivity of the product to microbial contamination, the choice of raw materials, and production hygiene. The efficacy and optimum use-concentrations should always be determined in the end product with the aid of a preservation efficacy test (i.e. Schülke & Mayr Technical Service Department and Microbiology).

Microbiological efficacy

Euxyl® PE 9010 is equally effective against bacteria, yeasts and mould fungi.

MIC-values

Determination of the minimum inhibitory concentration in the serial dilution test produced the following values:

Species	ATCC-No.	PE 9010 [%]	Phenoxy-ethanol
Gram-negative:			
Enterobacter gergoviae	33028	0.5	0.5
Escherichia coli	11229	0.5	0.5
Klebsiella pneumoniae	4352	0.25	0.5
Pseudomonas aeruginosa	15442	0.5	0.5
Pseudomonas fluorescens	17397	0.25	0.5
Pseudomonas putida	12633	0.5	0.5
Gram-positive:			
Staphylococcus aureus	6538	0.5	1.0
Staphylococcus epidermidis	12228	0.5	1.0
Mould fungi:			
Aspergillus niger	6275	0.25	0.5
Penicillium funiculosum	36839	0.25	0.25
Yeasts:			
Candida albicans	10231	0.25	0.5

Euxyl® PE 9010 is proven to have better efficacy against many microorganisms than phenoxyethanol alone.

Germ count reduction test

Dilutions of Euxyl® PE 9010 are prepared with sterile tap water. 50 ml portions of the end solutions are each inoculated with 0.5 ml microorganism suspension (initial microorganism count approx. 10⁸ cfu/ml) and stirred.

Test organisms	ATCC-No.
Pseudomonas aeruginosa	15442
Escherichia coli	11229
Candida albicans	10231
Aspergillus niger	6275

These solutions are streaked out onto tryptone soya agar or Sabouraud-dextrose 4 % agar after 3, 6, 24, 48, 72 and 168 hours depending on the test organism. The cultures are incubated for 48 hours at 37 °C, except for Aspergillus niger, which is incubated for 72 hours at 25 – 27 °C.

The evaluation is made on the basis of semi-quantitative assessment of the microbial growth of the streaks.

In the table below, the microorganism reduction achieved by Euxyl® PE 9010 as a function of the contact time and use-concentration is presented for the various test organisms:

Test organism	Use concentration [%]	Contact time [h]					
		3	6	24	48	72	168
Pseudomonas aeruginosa	0.0 (blank value)	C	C	C	C	C	C
	0.5	C	C	C	C	C	–
	0.75	C	++	–	–	–	–
	1.0	–	–	–	–	–	–
Escherichia coli	0.0 (blank value)	C	C	C	C	C	C
	0.5	C	C	–	–	–	–
	0.75	+	–	–	–	–	–
	1.0	–	–	–	–	–	–
Candida albicans	0.0 (blank value)	C	C	C	C	C	C
	0.5	C	C	C	C	C	–
	0.75	C	C	++++	+	–	–
	1.0	C	++++	–	–	–	–
Aspergillus niger	0.0 (blank value)	C	C	C	C	C	C
	0.5	C	C	C	C	C	–
	0.75	C	C	+++	+++	–	–
	1.0	C	++++	–	–	–	–

Symbol	Finding	cfu/ml
–	= no growth	< 100
+	= slight growth	approx.10 ²
++	= moderate growth	approx.10 ³
+++	= heavy growth	approx.10 ⁴
++++	= massive growth	approx.10 ⁵
C	= surface covered	> 10 ⁶

Repeated challenge test (S&M Koko Test)

This method is used to determine the preservative effect of chemical preservatives in cosmetic formulations, e.g. creams, lotions, and shampoos. For this, in various test series, the preservative to be tested is added in different concentrations to the unpreserved samples. A constant microorganism load is achieved by means of periodic inoculation (inoculation cycles) of the test preparations. Immediately before inoculation, samples of the individual preparations are streaked out onto nutrient media. The preservative effect is evaluated on the basis of the microorganism growth on the nutrient media. The longer the time before the occurrence of the first microbial growth, the more effective is the preservative. Experience has shown that a well preserved product should remain growth-free for six inoculation cycles in order to ensure the shelf-life required in practice (30 months).

Oil/water and water/oil systems preserved with use-concentrations of between 0.5 and 1.0 % Euxyl® PE 9010 proved to be well preserved even after three months storage at + 40 °C.

Indications for Use

General remarks

Euxyl® PE 9010 is stable to hydrolysis, temperature and pH. As a result of the good solubility of Euxyl® PE 9010, an easy dispersion in the various systems even at low temperature is possible. Euxyl® PE 9010 is effective in pH-ranges up to 12.

Emulsions

In practice, emulsions are preserved with 0.5 – 1.0 % Euxyl® PE 9010.

Solutions

Euxyl® PE 9010 is clearly soluble in use-concentrations of 0.5 – 1.0 %. It can tolerate high salt content. A high load of surfactants can result in a loss of efficacy.

Wet wipes

For wet tissues, good preservation results are achieved with 0.5 – 1.0 % Euxyl® PE 9010.

Natural products

Formulas containing natural raw materials have a higher risk for microbial contamination. Microorganisms introduced by this pathway are quickly eliminated by Euxyl® PE 9010.

Other applications

For other uses please contact us.

Physical-chemical Data

Appearance:	clear, colourless – nearly colourless liquid
Colour index (Gardner):	max. 2
Odour:	characteristic
Refractive index n_D^{20} :	approx. 1.53
Density (20 °C):	approx. 1.09 g/ml
Vapour pressure (20 °C):	< 1 hPa
Flash point (DIN 51 758):	> 100 °C
Flow time (DIN 53 211/20 °C):	< 15 DIN-Sekunden
Viscosity (Brookfield-RVT; 20 °C):	UL-Adapter/100 Upm: approx. 68 mPa s
Water solubility (20 °C):	approx. 10 g/l (at 60 °C approx. 15 g/l)

Product-specific properties

Chemical Compatibility

In general, it is possible for interactions to occur between various active ingredients and auxiliary substances in cosmetic formulations. Thus, certain incompatibilities of Euxyl® PE 9010 with other ingredients have been established, and are listed below.

General

Euxyl® PE 9010 shows a good compatibility with salts. Euxyl® PE 9010 can be used in pH-ranges up to 12.

Compatibility with surfactants

A high load of surfactants can lead to loss in effectiveness.

Discolouration

In general Euxyl® PE 9010 displays good compatibility with the ingredients of cosmetics. No discolourations have been detected.

Compatibility with sulphite ions

Euxyl® PE 9010 shows no interaction with sulphite ions.

Compatibility with pigments

Euxyl® PE 9010 shows no interaction with pigments such as TiO₂.

Material compatibility

Concentrate

In the material compatibility tests with the concentrate of Euxyl® PE 9010, stainless steel, brass, copper, zinc and aluminium as well as polyethylene (PE), polyoxymethylene (POM), polyamide (PA) and hard polyvinyl chloride (hard PVC) proved to be suitable materials for handling the undiluted product. Other non-metallic materials should be checked for their suitability. Polycarbonate (PC), polymethylmethacrylate (PMMA), polyethyleneterephthalate (PET) and acrylnitrilbutadienestyrolcopolymer (ABS) should not be used. As sealing material when handling undiluted Euxyl® PE 9010, fluorine rubber or ethylene-propylene terpolymers (EPDM) or polytetrafluorethylene (PTFE) should be preferred. Other sealing materials can show swelling or lead to pronounced discolouration of Euxyl® PE 9010.

Dilutions

The behaviour of Euxyl® PE 9010 in 1.0 % aqueous solution with regard to material compatibility was not significantly different from that of the tap water used for the dilution. No incompatibilities with plastics have been observed with products preserved with Euxyl® PE 9010.

Effect on surface tension

The surface tension of water is significantly reduced by the addition of Euxyl® PE 9010. A 1.0 % solution in water is 32.1 mN/m (water: 72.6 mN/m).

Foaming behaviour

In the foaming test in accordance with DIN 53 902, a 1.0 % solution of Euxyl® PE 9010 in demineralised water proved to be non-foaming.

Solubility

Euxyl® PE 9010 exhibits limited solubility in water. 100 g of water at 20 °C dissolves 1.0 g of Euxyl® PE 9010. In polar solvents such as 1,2-propylene glycol, propanol, or acetone, Euxyl® PE 9010 is readily soluble. In polyalcohols such as glycerol and sorbitol Euxyl® PE 9010 is moderately soluble. In aliphatic hydrocarbons with hydrophilic groups such as 2-octyldecanol and isopropyl myristate, Euxyl® PE 9010 exhibits limited solubility. In pure aliphatic solvents, it is slightly soluble.

Storage

We recommend storing in the original container at room temperature.

Toxicology

Euxyl® PE 9010 is used as a preservative for cosmetics and toiletries. The product is used at a recommended use-concentration of 0.5 – 1.0 %. In accordance with the conditions stipulated in Directive 76/768/EEC, Euxyl® PE 9010 may be used in cosmetic preparations (leave-on and rinse-off) in a use-concentration up to a maximum of 1.1 %.

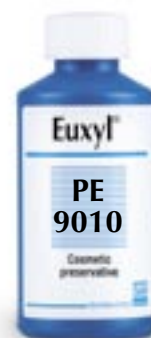
As active substance, phenoxyethanol (90 %) is used in Euxyl® PE 9010. As an auxiliary compound, the formulation additionally contains ethylhexylglycerin in a concentration of 10 %. Both substances have undergone extensive toxicological testing. On the basis of the results, with the given upper concentration limit of 1.1 %, Euxyl® PE 9010 can be considered safe for the preservation of cosmetics and toiletries.

Furthermore a skin tolerability study (occlusive patch test) of Euxyl® PE 9010 compared to phenoxyethanol showed that there is no difference in skin tolerability between Euxyl® PE 9010 and phenoxyethanol. During the entire test period no reactions neither to phenoxyethanol nor to Euxyl® PE 9010 used in the maximum use concentrations could be observed. This skin tolerability test has been carried out on Caucasian skin in Germany and on Japanese skin in Japan.

Environmental information

Schülke & Mayr has DIN EN ISO 9001 and DIN EN 46001 certification (Reg. No. 4567-01) and a validated environmental management system in accordance with the Eco Audit Regulation (Reg. No. DE-S-150 00003). The canisters and drums used by Schülke & Mayr are made of polyethylene (HDPE) and are labelled accordingly. The 1000 kg containers are affiliated to a recycling system that guarantees free pick-up and sensible utilisation of used containers throughout Europe. The labels are made of PE. S&M packaging materials contain no PVC, and are recyclable.

Samples of our products are supplied together with extensive information material and are supported by personal advice.



Literature

"A new Concept to Boost the Preservative Efficacy of Phenoxyethanol",
W. Beilfuss, M. Leschke, K. Weber, *SÖFW Journal*, 2005, 11, 30 – 36
(German edition).

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