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## Technical Information

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Supersedes issue dated October 2011

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08\_080609e-02/Page 1 of 8

WF-No. 3146

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# Protectol<sup>®</sup> PE

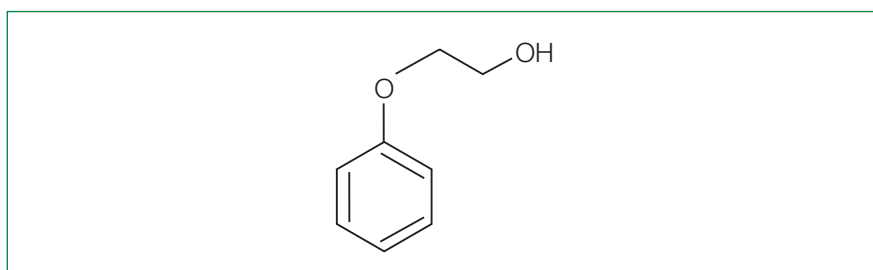
# Protectol<sup>®</sup> PE S

® = Registered trademark of BASF

**For use as a preservative and in disinfection.**

**Chemical nature****Common name** Phenoxyethanol (CTFA/INCI)**Chemical name** 2-Phenoxyethanol**Synonyms** Phenoxtol  
Ethylene glycol phenyl ether  
Ethylene glycol monophenyl ether**PRD-Nos.\*** Protectol® PE 30063180  
Protectol® PE S 30058260

\* BASF's commercial product numbers.

**Structural Formula****Molecular formula** C<sub>8</sub>H<sub>10</sub>O<sub>2</sub>**Molar Mass** 138.2 g/mol**CAS-No.** 122-99-6**EINECS-No.** 204-589-7

BASF offers a very high quality grade of phenoxyethanol. This is due to the unique BASF manufacturing process, which results in a product with high purity, very low odor, increased stability and little or no color.

Protectol® PE S is a special grade of Phenoxyethanol which fulfills the analytical requirements of the European Pharmacopoeia, United States Pharmacopoeia and the Japanese Standard of Quasi-Drug Ingredients. The product is not produced under GMP conditions and is not suitable for pharma applications.

Unless otherwise indicated, the following parameters are applicable for both Protectol® PE and Protectol® PE S.

**Properties**

	<b>Protectol® PE/PE S</b>
Description	Clear, colorless, odorless, liquid
Composition	min. 99.0%
Water content	max. 0.1%
pH	approx. 7.0
Density at 23 °C	approx. 1.10 g/cm <sup>3</sup>
Platinum – Cobalt Color	max. 10 Hazen units
Flashpoint	approx. 122 °C
Melting point	approx. 9 °C
Boiling point	approx. 245 °C

This information does not necessarily form part of the product specification. A detailed specification is available from your local BASF sales office.

**Solubility and Miscibility**

Phenoxyethanol is miscible with water (2.4% w/w) and a range of polar organic solvents, such as ethanol, propanol and propylene glycol. It can also be combined with other liquid Protectol biocides such as Protectol® GA 50 .

Phenoxyethanol can be readily incorporated into a variety of different formulations due to its solubility characteristics. It also possesses excellent solvent properties and, consequently, can be used to solubilise a variety of raw materials and active ingredients such as 2,4-dichlorobenzyl alcohol (Protectol® DA).

**Storage Stability**

BASF phenoxyethanol products are very stable over a wide pH and temperature range. Raised temperature storage trials have shown that there was no indication of instability even when stored at temperatures of up to 50 °C for 12 months. Under normal storage conditions shelf life is 2 years.

The products should be stored at ambient temperature in sealed containers as supplied, in dry conditions. For bulk storage, BASF phenoxyethanol products may be stored in tanks constructed of normal carbon steel (e.g. A283 grade) or stainless steel (e.g. AISI TP 321).

It is recommended that the products are stored under a blanket of dry nitrogen. If exposed to atmospheric oxygen, a small amount of decomposition may occur, the breakdown products being aldehydes and acids. This process can be accelerated by humidity resulting in a deterioration of quality, especially over long storage periods.

**Trace Metal Content**

Analysis of a representative number of batches of BASF phenoxyethanol products has shown that the manufacturing process is unlikely to give rise to trace metal contamination.

**Antimicrobial Activity**

Phenoxyethanol has moderate activity against a broad range of microorganisms. For this reason it is often used in combination with other active ingredients and can also be used to enhance the activity of other antimicrobials. Activity extends over a broad pH range, which means that they can be used in a wide variety of formulation types.

**MIC Values for Phenoxyethanol**

The Minimum Inhibitory Concentrations (MIC) for phenoxyethanol (% active ingredient) against a range of test organisms is shown below. MIC data was generated using in-house methodology.

	<b>Organism</b>	<b>References</b>	<b>% (a.i.)</b>
<b>Gram positive bacteria</b>	<i>Bacillus subtilis</i>	NCTC 10073	1.00
	<i>Staphylococcus aureus</i>	ATCC 6538	0.75
	<i>Staphylococcus epidermidis</i>	NCIB 9518	0.64
	<i>Streptococcus faecalis</i>	NCTC 8213	0.32
<b>Gram negative bacteria</b>	<i>Enterobacter cloacae</i>	(Pre. Ref. 146)	0.32
	<i>Escherichia coli</i>	NCIB 9517	0.32
	<i>Klebsiella aerogenes</i>	NCTC 418	0.50
	<i>Proteus vulgaris</i>	ATCC 14153	0.75
	<i>Pseudomonas aeruginosa</i>	NCTC 6750	1.00
	<i>Burkholderia cepacia</i>	NCIB 9085	1.00
	<i>Pseudomonas fluorescens</i>	NCIB 9046	1.50
	<i>Pseudomonas putida</i>	NCIB 9034	0.32
	<i>Pseudomonas stutzeri</i>	NCIB 9040	0.32
	<i>Salmonella typhimurium</i>	NCTC 74	0.32
	<i>Serratia marcescens</i>	(Industrial isolate)	0.32
<b>Yeasts</b>	<i>Saccharomyces cerevisiae</i>	NCYC 87	0.25
	<i>Candida albicans</i>	ATCC 10231	0.32
	<i>Candida tropicalis</i>	(Industrial isolate)	0.32
	<i>Spoilage yeast</i>	Y67	0.32
<b>Moulds</b>	<i>Aspergillus niger</i>	ATCC 16404	0.25
	<i>Chaetomium globosum</i>	IMI 45550	0.16
	<i>Cladosporium</i>	(Industrial isolate)	0.16
	<i>Penicillium funiculosum</i>	IMI 87160	0.06
	<i>Stachybotrys atra</i>	IMI 82021	0.06
	<i>Trichoderma viridae</i>	(Industrial isolate)	0.25

MIC data can give an indication of preservation efficiency. However, we recommend that the concentration of Protectol® PE required in practice is determined in special preservation loading tests with the formulated product.

**Application**

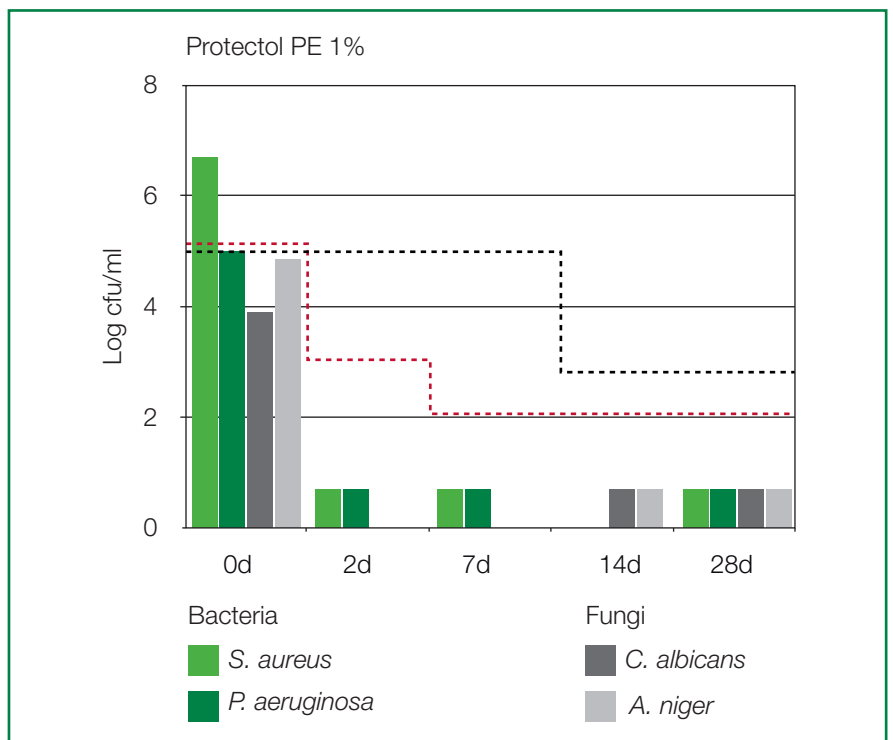
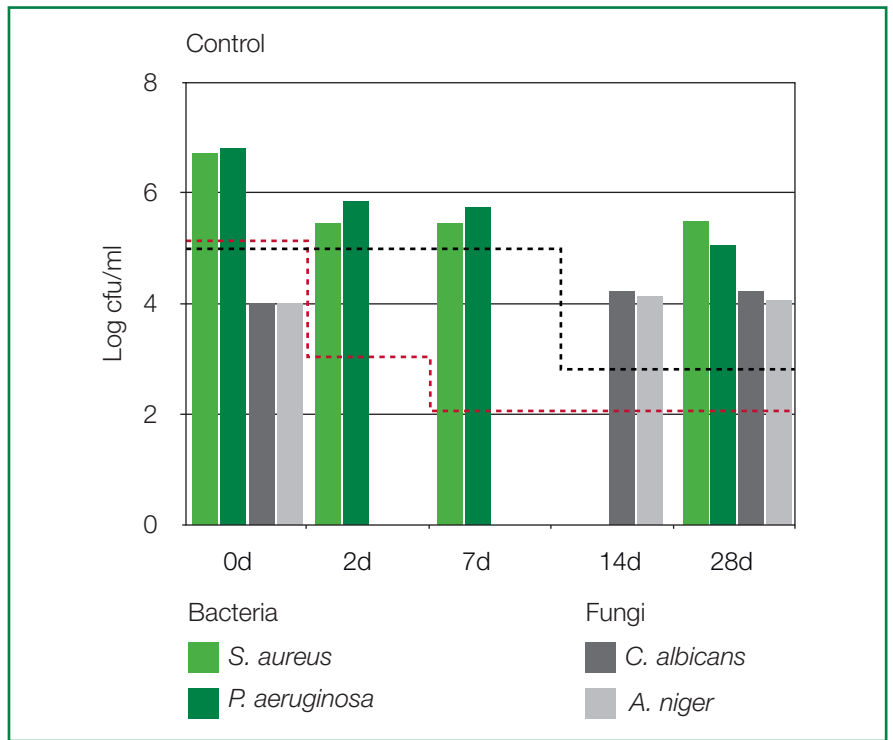
Protectol® PE can be used in a variety of application areas as described below: Phenoxyethanol is a slow evaporating glycol ether with high polymer solvency and excellent coalescing abilities.

**Consumer Products**

For the preservation of cosmetic, toiletry and household products and their raw materials. Effective against Gram positive and Gram negative bacteria and fungi. Phenoxyethanol is often used together with other active substances.

**Case Study**

A laboratory study was initiated to assess the efficacy of Protectol® PE to control microbial contamination in a manual dish wash product (market product). Protectol® PE was dosed at 1% into an unpreserved manual dish wash product. The efficacy of Protectol® PE in this product was evaluated due to the Preservation Challenge Test method describe in *Pharm. Eur. 7th* edition for topical products. In contrast to the unpreserved product, the manual dish wash containing 1% Protectol® PE could successfully fulfill all required criteria (A). The maximal acceptable microbial contamination due to criteria A of the *Pharm. Eur.* for topical products is illustrated by the red line in case of bacteria and in case of fungi by a black line. To pass the criteria, the germ load has to be lower than the indicated threshold during the whole test period.



## Industrial Products

For the preservation of products such as metalworking fluids, adhesives and industrial additives.

### Case Study

Protectol® PE is commonly used in Metal Working Fluids (MWF) to protect the diluted fluid from microbial spoilage during usage.

The following study was carried out to demonstrate the efficacy of Protectol® PE in this application area. The method used is an adaptation of the IBRG MWF Challenge Test Method to evaluate biocidal compounds in an aqueous based functional fluid.

A supplied Metal Working Fluid Concentrate was diluted to use levels (5% w/w). One part of this dilution was dosed with Protectol® PE at 1% while the other part was used unpreserved as control. Three different inocula were used in separate tests. On the one hand a mixed aerobic bacterial inoculum was used prepared from cultures of *Alcaligenes faecalis*, *Shewanella putrefaciens*, *Pseudomonas aeruginosa* and *Citrobacter freundii* containing  $10^8$  cfu/ml each. As a second inoculum a mixed fungal suspension of  $10^7$  cfu/ml was used prepared from cultures of *Rhodotorula rubra*, *Acremonium strictum* and *Fusarium solani*. A mycobacterial inoculum prepared from a culture of *Mycobacterium chelonae* was used as well ( $10^7$  cfu/ml).

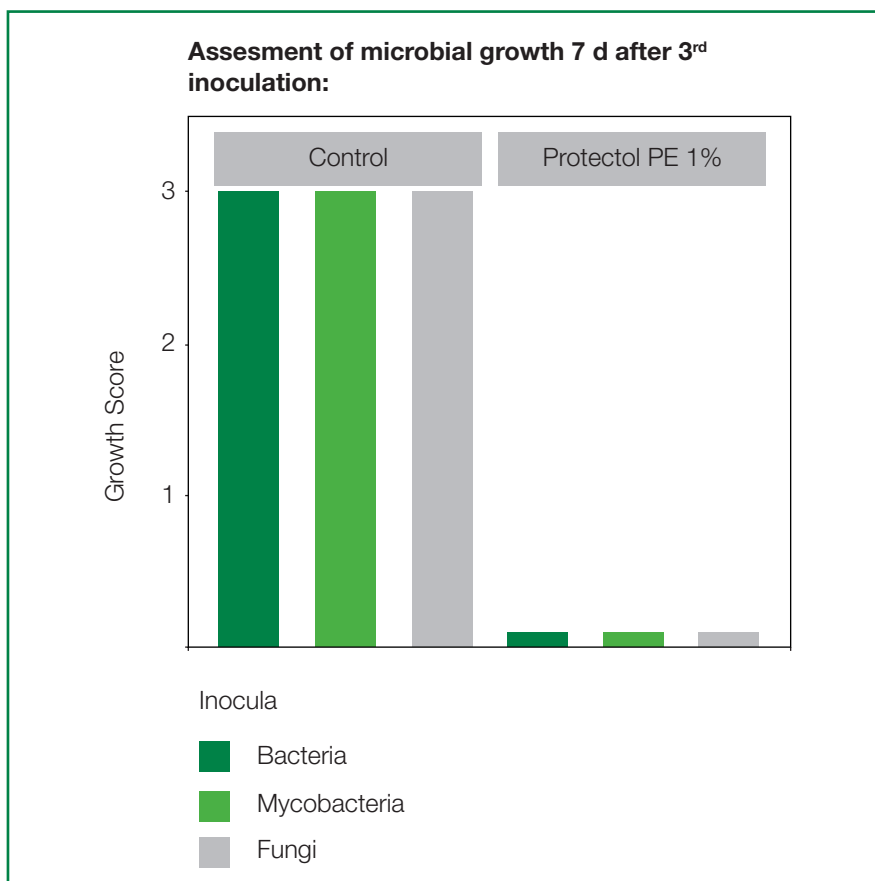
Aliquots of the preserved and the unpreserved diluted Metal Working Fluid were inoculated with each of the inoculi in separate samples (1:100 dilution resulting in a final germ load of  $10^5$  cfu/ml) and incubated for 7 days at room temperature. After 7 days the current microbial load was determined and the samples were reinoculated until three challenges were achieved. To determine the microbial load, the samples were streaked out on specific recovery media and incubated at relevant temperatures. The growth was assessed using the rating system described below. In accordance with the criteria described in the IBRG method, "control of microbial challenges" is defined as protecting the diluted working fluid from microbial spoilage for at least one more challenge than the inoculated control samples while the term "Protection" is defined as achieving a subjective score of 0 or 1 when the control has a subjective score of  $>2$ .

Criteria for assessment of microbial growth 7 days after inoculation:

Growth Score	Description	Germ Density
0	no growth	indicating $<10^3$ cfu/ml present in the sample
1	1 – 10 colonies	indicating approx. $10^3$ cfu/ml
2	11 – 100 colonies	indicating approx. $10^4$ cfu/ml
3	101 – 100 colonies	indicating approx. $10^5$ cfu/ml
4	$>1.000$ colonies	indicating $>10^5$ cfu/ml

The graph below shows the evaluation of the microbial growth of the control and the Metal Working Fluid furnished with 1% Protectol® PE 7 days after the third and last inoculation of this study.

The results demonstrate that the unpreserved diluted Metal Working Fluid was readily susceptible to microbial growth whereas addition of Protectol® PE at 1% to a diluted working fluid effectively controlled microbial contaminations.



#### Surface & Instrument

Used in combination with other active ingredients for the formulation of disinfectants and disinfectant cleaners for hard surfaces and for surgical instruments.

#### Registrations and Approvals

Detailed information on regional registration and approval status are available on request.

#### Safety

##### Toxicological and Environmental Data

For detailed information see MSDS.

##### Safety Notes

According to the experience gained over many years and to other information at our disposal, phenoxyethanol should not exert any harmful effects on health. This is provided that it is used properly, that due attention is given to the safety and industrial hygiene precautions necessary for handling chemicals and that the information and advice given on our Safety Data Sheets is observed.

Use biocides safely. Always read the label and product information before use.

##### Handling and Storage

Contact with eyes and skin should be avoided. Safety goggles must be worn when handling the concentrated product. The product should be stored in sealed containers as supplied, in dry conditions, at temperatures not exceeding 30 °C.

##### Labelling

Refer to the latest Safety Data Sheet for detailed information on product safety.

##### Classification according to UN criteria

Not classified as hazardous under transport regulations.

*Protectol® is a registered trademark of BASF Group.*

*Label recommendations supersede any claims made in this brochure.*

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