

TEGO® Care PSC 3

A natural, cost-efficient O/W emulsifier with excellent performance

Intended use

O/W emulsifier

Benefits at a glance

- Completely based on natural raw materials
- Suitable for all types of cosmetic O/W emulsions, including natural formulations
- Forms stable emulsions between pH 3.5 and 8.5
- Applicable for "natural" preservation systems
- No polyacrylate-based thickeners needed for stabilization
- Low usage concentration of 1.5 – 3.0%

INCI (PCPC name)

Polyglyceryl-3 Dicitrate/Stearate

Chemical and physical properties (not part of specifications)

Form	pellets
HLB value	approx. 11

Properties

TEGO® Care PSC 3 is a non-ionic, PEG-free emulsifier that is completely based on renewable raw materials. TEGO® Care PSC 3 is based on glycerol, stearic acid and citric acid. In a first step, a polycondensation reaction of glycerol to polyglycerol-3 is carried out. Polyglycerol-3 is subsequently esterified with stearic acid and a substoichiometric amount of citric acid.

- TEGO® Care PSC 3 provides excellent stabilization for all types of classical O/W creams and lotions.
- TEGO® Care PSC 3 is suitable for the formulation of O/W creams and lotions with all types of cosmetic oils at a pH of 3.5 to 8.5.
- The recommended usage concentration of TEGO® Care PSC 3 is approx. 3.0% in creams and 1.5 – 3.0% in lotions.
- Typical oil phase contents of emulsions based on TEGO® Care PSC 3 are 20 – 35% for creams and 10 – 25% for lotions.
- TEGO® Care PSC 3 has been optimized to build up viscosity (by forming lamellar structures) in cosmetic emulsions, together with consistency enhancers like Glyceryl Stearate, Stearyl Alcohol or Stearic Acid.
- Typical combinations for O/W creams are 3.0% TEGO® Care PSC 3 with 2.5 – 4.0% consistency enhancers. Suitable combinations include TEGIN® M Pellets (Glyceryl Stearate) and TEGO® Alkanol 18 (Stearyl Alcohol) in a ratio of 70:30 or 50:50. In most O/W lotions, 2 – 3% of TEGO® Care PSC 3 is already sufficient to obtain the desired viscosity and stability profile, without additional consistency enhancers.
- TEGO® Care PSC 3 can either be used in combination with polyacrylate-based thickeners or, in natural formulation types, without using polyacrylates.

- It is recommended to combine TEGO® Care PSC 3 with Xanthan Gum (0.2% for creams and 0.3 to 0.5% for lotions) in order to optimize the texture and stability of the emulsions. In order to avoid a negative impact on the lamellar structures formed by the emulsifier and consistency enhancers, it is recommended to add Xanthan Gum below 40 °C to the emulsions.
- The addition of Carbomers can provide further benefits in terms of flexibility, stability and texture. It is recommended to use 0.1 – 0.2% of TEGO® Carbomer 134 in creams and 0.1 – 0.3% of TEGO® Carbomer 141 for lotions. As the amount of consistency enhancers can be reduced when using Carbomers, the overall sensory profile can change towards a lighter skin feel.
- TEGO® Care PSC 3 is suitable for systems preserved with natural preservatives such as organic acids (e. g. Benzoic Acid and Sorbic Acid). When using organic acids for the preservation, it is recommended to add them below 40 °C to the emulsion. In order to prevent partial crystallization of the organic acids, it is recommended that the necessary amount of Sodium Hydroxide to neutralize those acids be incorporated in the emulsion prior to adding such natural preservatives. After addition of the acids, it is recommended to adjust to a final pH of 5.0 – 5.5.
- In general, the sensory profile of O/W emulsions based on TEGO® Care PSC 3 can be adapted by altering the oil phase content, the consistency enhancer content, the polymer thickener content and the type of oils.
- TEGO® Care PSC 3 is particularly recommended for the formulation of face and body care products. As it is a natural based emulsifier, it also represents an interesting option for baby care products.
- Emulsions based on TEGO® Care PSC 3 in general have a good compatibility with active ingredients and UV filters.

Preparation

TEGO® Care PSC 3 belongs to the group of the so called lipid emulsifiers. As lipid emulsifiers are optimized to form lamellar structures in O/W emulsions, they have a lower HLB compared to classical ethoxylated emulsifiers such as PEG-100 Stearate or Cetareth-25. Therefore some adjustments in the production process might be necessary.

It is recommended to avoid the addition of the hot water phase into the hot oil phase while stirring. This “inverse” processing is likely to lead to the formation of a W/O emulsion (recognizable by high viscosity). During the cooling process, this emulsion converts to an unstable oil-in-water emulsion with a large particle size.

For the preparation of creams and lotions, the oil and water phases should be heated separately to 70 to 80 °C. It is suggested to add the hot oil phase to the hot water phase **while stirring**. The coarsely dispersed pre-emulsion is then homogenized.

If the above mentioned processing is not possible, the hot water phase should be added to the hot oil phase **without stirring** (to avoid the building of the water-in-oil form) and start afterwards with the homogenization. During the homogenization process the homogenizer must be placed in the water phase to ensure that the oil phase will be incorporated into the water phase.

During cooling, a constant horizontal and vertical movement of the emulsion has to be ensured. The viscosity of the liquid emulsion increases to a creamy consistency, as the consistency enhancers solidify.

It is recommended that thickeners, such as Carbomers or alkyl modified Carbomers, are dispersed in oil and then added to the emulsion. The dispersion of TEGO® Carbomer 141, TEGO® Carbomer 134 or TEGO® Carbomer 341 ER in oil (e. g. in mineral oil, ethylhexyl stearate; not in triglycerides) is added at 60 °C. Then, the emulsion is homogenized again.

Perfume, temperature-sensitive substances or electrolyte-containing ingredients, such as LACTIL®. are added at 35 – 40 °C.

Phenoxyethanol-containing preservatives should be incorporated at this temperature, as well. Since phenoxyethanol is an amphiphilic molecule it can interfere with the emulsification process when added directly to the oil or water phase.

It is also suggested to add natural preservatives, such as Benzoic Acid or Sorbic Acid, at temperatures below 40 °C.

Neutralization of the emulsion is done at approx. 35 °C.

The particle size of the dispersed oil droplets for emulsions with long-term stability is approx. 1 to 8 µm. More coarsely dispersed emulsions tend to separate.

Recommended usage concentration

1.5 – 3.0% TEGO® Care PSC 3

Packaging

600 kg pallet (24 x 25 kg)

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in case of accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guideline formulations

Natural Wellness Body Lotion F 11/10-16	
Phase A	
TEGO® Care PSC 3	3.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	4.00%
TEGOSOFT® OER (Oleyl Erucate)	3.00%
Prunus Amygdalus Dulcis (Sweet Almond) Oil	5.00%
Phase B	
Water	80.50%
Glycerin	3.00%
Phase C	
Xanthan Gum (Keltrol CG-SFT, CP Kelco)	0.50%
Phase D	
Sodium Hydroxide (10% in water)	0.20%
Phase E	
Benzyl Alcohol; Glycerin; Benzoic Acid; Sorbic Acid (Rokonsal BSB-N, ISP)	0.80%
Phase Z	
Perfume	q. s.
Preparation:	
1. Heat phase A and B separately to 70 – 75 °C.	
2. Add phase A to phase B with stirring ¹⁾ .	
3. Homogenize.	
4. Cool with gentle stirring.	
5. Add phase C at 40 °C.	
6. Homogenize for a short time.	
7. Add phase D.	
8. Add phase E and adjust pH to 5.0 – 5.5.	
¹⁾ Important: If phase A has to be charged into the vessel first, phase B must be added without stirring .	

All-natural Face & Body Cream F 11/10-17	
Phase A	
TEGO® Care PSC 3	3.00%
TEGIN® M Pellets (Glyceryl Stearate)	1.20%
TEGO® Alkanol 18 (Stearyl Alcohol)	1.30%
TEGOSOFT® OER (Oleyl Erucate)	5.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	8.50%
Persea Gratissima (Avocado) Oil	6.00%
Phase B	
Water	67.00%
Glycerin	3.00%
Phase C	
Water	3.80%
Xanthan Gum (Keltrol CG-SFT, CP Kelco)	0.20%
Phase D	
Sodium Hydroxide (10% in water)	0.20%
Phase E	
Benzyl Alcohol; Glycerin; Benzoic Acid; Sorbic Acid (Rokonsal BSB-N, ISP)	0.80%
Phase Z	
Perfume	q. s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to 70 – 75 °C. 2. Add phase A to phase B with stirring¹⁾. 3. Homogenize. 4. Cool with gentle stirring and add phase C below 40 °C. 5. Add phase D. 6. Add phase E and adjust pH to 5.0 – 5.5. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	

High Caring O/W Natural Cream (35% oil phase) F 21/10-10	
Phase A	
TEGO® Care PSC 3	3.00%
TEGIN® M Pellets (Glyceryl Stearate)	2.00%
TEGO® Alkanol 18 (Stearyl Alcohol)	1.00%
TEGOSOFT® P (Isopropyl Palmitate)	8.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	11.00%
Prunus Amygdalus Dulcis Oil	10.00%
Phase B	
Water	61.00%
Glycerin	3.00%
Phase C	
Sodium Hydroxide (10% in water)	0.20%
Phase D	
Benzyl Alcohol; Glycerin; Benzoic Acid; Sorbic Acid (Rokonsal BSB-N, ISP)	0.80%
Phase Z	
Perfume	q. s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and phase B separately to 70 – 75 °C. 2. Add phase A to phase B with stirring¹⁾. 3. Homogenize. 4. Cool with gentle stirring and add phase C below 40 °C. 5. Add phase D and adjust the pH to 5.0 – 5.5. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	

Daily Skin Renewal Body Lotion FU 16/09-5	
Phase A	
TEGO® Care PSC 3	3.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.00%
TEGOSOFT® OP (Ethylhexyl Palmitate)	5.00%
TEGOSOFT® E (PPG-15 Stearyl Ether)	2.00%
Phytosphingosine SLC (Salicyloyl Phytosphingosine)	0.20%
Phase B	
Water	80.00%
Glycerin	3.00%
Phase C	
TEGO® Carbomer 141 (Carbomer)	0.20%
TEGOSOFT® OP (Ethylhexyl Palmitate)	0.80%
Phase D	
Sodium Hydroxide (10% in water)	q.s.
Phase E	
Dipropylene Glycol; Methylparaben; Ethylparaben; Aqua; Methylisothiazol- inone (Microcare MEM, Thor GmbH)	0.80%
Phase Z	
Perfume	q. s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 80 °C. 2. Add phase A to phase B with stirring¹⁾. 3. Homogenize. 4. Cool with gentle stirring to approx. 60 °C and add phase C. 5. Homogenize for a short time. 6. Cool with gentle stirring and add phase D and phase E below 40 °C. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	

Rejuvenating Facial Cream F 11/10-9	
Phase A	
TEGO® Care PSC 3	3.00%
TEGIN® M Pellets (Glyceryl Stearate)	1.50%
TEGO® Alkanol 18 (Stearyl Alcohol)	1.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	10.00%
TEGOSOFT® OP (Ethylhexyl Palmitate)	7.50%
TEGOSOFT® TIS (Triisostearin)	2.00%
Phase B	
Water	70.10%
HyaCare® 50 (Hydrolyzed Hyaluronic Acid)	0.10%
Glycerin	3.00%
Phase C	
TEGO® Carbomer 134 (Carbomer)	0.20%
TEGOSOFT® OP (Ethylhexyl Palmitate)	0.80%
Phase D	
Sodium Hydroxide (10% in water)	q. s.
Phase E	
Phenoxyethanol; Methylparaben; Propylparaben; Ethylparaben (Phenonip XB, Clariant AG)	0.80%
Phase Z	
Perfume	q. s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 80 °C. 2. Add phase A to phase B with stirring¹⁾. 3. Homogenize. 4. Cool with gentle stirring to approx. 60 °C and add phase C. 5. Homogenize for a short time. 6. Cool with gentle stirring and add phase D and phase E below 40 °C. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	

Natural Light O/W Lotion (10% oil phase)	
MK 9/10-1	
Phase A	
TEGO® Care PSC 3	1.50%
TEGIN® M Pellets (Glyceryl Stearate)	0.50%
TEGO® Alkanol 18 (Stearyl Alcohol)	0.50%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	4.50%
TEGOSOFT® P (Isopropyl Palmitate)	3.00%
Phase B	
Water	85.90%
Glycerin	3.00%
Phase C	
Xanthan Gum (Keltrol CG-SFT, CP Kelco)	0.20%
Phase D	
Sodium Benzoate; Potassium Sorbate; Aqua (Euxyl K 712, Schülke GmbH)	0.90%
Phase Z	
Perfume	q. s.
Preparation:	
<ol style="list-style-type: none"> Heat phase A and phase B separately to 70 – 75 °C. Add phase A to phase B with stirring¹⁾. Homogenize. Cool with gentle stirring. Add phase C at 40 °C. Homogenize for a short time. Add phase D and adjust the pH to 5.0 – 5.5. 	
¹⁾ Important: If phase A has to be charged into the vessel first, phase B must be added without stirring .	

E 08/14

This information and all further technical advice is based on our present knowledge and experience. However, it implies no liability or other legal responsibility on our part, including with regard to existing third party intellectual property rights, especially patent rights. In particular, no warranty, whether express or implied, or guarantee of product properties in the legal sense is intended or implied. We reserve the right to make any changes according to technological progress or further developments.

The customer is not released from the obligation to conduct careful inspection and testing of incoming goods. Performance of the product described herein should be verified by testing, which should be carried out only by qualified experts in the sole responsibility of a customer. Reference to trade names used by other companies is neither a recommendation, nor does it imply that similar products could not be used. (Status: April, 2008)

Evonik Industries AG

Goldschmidtstraße 100 45127 Essen, Germany

P.O.BOX 45116 Essen PHONE + 49 201 173-2854 FAX +49 173-1828

personal-care@evonik.com www.evonik.com/personal-care