

TEGO® Care APD 18

Superior PEG-free O/W emulsifier for diverse AP/ Deo roll-on systems

Intended use

O/W emulsifier

Benefits at a glance

- High performance PEG-free O/W emulsifier for AP/Deo roll-on systems
- High compatibility with various AP and Deo actives
- No additional polymeric thickener necessary
- Provides moisturization properties
- Can contribute to enhanced mildness of AP/Deo products
- Contributes to the production of sustainable palm oil

INCI (PCPC name)

Polyglyceryl-6 Stearate; Polyglyceryl-6 Behenate;
C18-22 Hydroxyalkyl Hydroxypropyl Guar

Chemical and physical properties (not part of specifications)

Form	pellets
HLB value	approx. 12

Properties

TEGO® Care APD 18 is a non-ionic, O/W PEG-free emulsifier that is based predominantly on renewable raw materials.

TEGO® Care APD 18 is based on glycerol, stearic acid and behenic acid and hydrophobized guar. In a first step, a polycondensation reaction of glycerol is carried out. The obtained polyglycerol is subsequently esterified with stearic acid and behenic acid. In the final step, the polyglycerol fatty acid esters are blended with C18-22 Hydroxyalkyl Hydroxypropyl Guar.

- TEGO® Care APD 18 is especially designed to meet all requirements for stabilizing low-viscous, fluid PEG-free roll-on emulsions.
- Due to the ability of generating a yield point on its own, there is no need to combine TEGO® Care APD 18 with additional polymeric stabilizers like Hydroxyethyl Cellulose or Carbomer.
- TEGO® Care APD 18 is able to stabilize various types of deo actives such as ethylhexylglycerin, triethylcitrate p-anisic acid, Polyglyceryl-3 Caprylate or Zinc Ricinoleate.
- High tolerance towards Aluminum Chlorohydrate. Emulsions based on TEGO® Care APD 18 including up to 20% ACH have been successfully tested.
- TEGO® Care APD 18 is suitable for the formulation of O/W emulsions with all types of cosmetic oils at a pH of 3.5 to 8.5. Typically, polar oils should be preferred to formulate most AP/ Deo actives.

- The recommended preservative systems for TEGO® Care APD 18 are based on organic acids (e.g. benzoic acid and sorbic acid) at a pH of 5.0 – 5.5. Other preservatives such as phenoxyethanol, benzyl alcohol or parabens are also possible to use. However, they may require increased emulsifier concentrations
- The recommended usage concentration of TEGO® Care APD 18 is approx. 2.5 to 5.0 % in roll-on systems. The actual suitable usage concentration is depending on the amount of oil phase as well as the type and amount of AP/Deo active.
- To increase the freeze stability of emulsions based on TEGO® Care APD 18, the addition of 3 to 5% Glycerin is recommended.
- Although TEGO® Care APD 18 is recommended for the formulation of AP/Deo resp. Deo roll-on systems, it can also be used for stabilizing classical O/W systems like lotions and creams.
- In lotions, 2.5 – 5.0% emulsifier can be combined with up to 1.5% consistency enhancers such as Cetearyl Alcohol or Glyceryl Stearate and up to 0.5% carbomer or xanthan gum to achieve the desired viscosity.
- In classical O/W creams 4.0 to 6.0 % of TEGO® Care APD 18 are recommended to obtain the desired high viscosity. Alternatively, the combination with up to 0.5 % of typical consistency enhancers or up to 0.5 % of polymeric thickeners such as carbomer or xanthan gum can be used.
- The pelletized product TEGO® Care APD 18 may tend to agglomerate under elevated temperatures during storage. This effect is not affecting the application properties of the emulsifier. If agglomeration has occurred, manually reduce the lumps to smaller pieces and add them to the oil phase for melting and subsequent standard processing procedure.
- *In vivo* tests with TEGO® Care APD 18 have shown that it provides enhanced moisturization properties compared to classical ethoxylated emulsifier systems such as Steareth-2 and Stearath-20.
- Test results of *in vitro* cell culture assays indicate that TEGO® Care APD 18 can contribute to enhanced mildness of AP/Deo products.

Preparation

For the preparation of emulsions based on TEGO® Care APD 18, the oil and water phases should be heated separately to 70 – 80 °C. When melting, TEGO® Care APD 18 is converting into a turbid solution containing the dispersed polymer. Thus, it is necessary to stir the hot oil phase in order to prevent sedimentation of components. If it is not possible to stir the hot oil phase in the support vessel, TEGO® Care APD 18 can also be added via the water phase directly into the main vessel.

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.

In general, the homogenization should be done using high shear rates in order to support the emulsifier in generating small oil droplet sizes of 1 – 4 µm. Thus, the use of an Ultra Turrax (or similar devices providing high shear forces) is recommended. The homogenization should be carried out at temperatures above 60 °C. Additional homogenization at lower temperatures can lead to long-term emulsion instabilities and should be avoided. It is recommended to control the particle size via microscope after processing.

If heat sensitive ingredients have to be added at lower temperatures, the incorporation should be done subsequently with intensive stirring or if necessary with short-term homogenization with low shear forces. Most deo actives e.g. ethylhexylglycerin or caprylyl glycol have surface-active properties. In order to avoid negative interactions between such actives and the emulsifier during emulsification, the actives should be incorporated later on after the homogenization process. Also in this case, intensive stirring is in most cases sufficient to uniformly distribute the active in the emulsion.

It is recommended that thickeners such as carbomers are dispersed in oil and then added to the emulsion.

The dispersion of TEGO® Carbomer products in oil (20% active) is added at 60 °C. Then, the emulsion is homogenized again. Alternatively, polyacrylate based thickeners can also be incorporated via dissolving them in the hot water phase.

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.

Perfume, temperature-sensitive substances or electrolyte-containing ingredients are preferably 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, to the emulsion at temperatures below 40 °C. In order to prevent partial crystallization of the organic acids, it is recommended that the necessary amount of sodium hydroxide to neutralize those acids is 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. Neutralization of the emulsion is done at approx. 35 °C.

The droplet size of the dispersed oil droplets for emulsions with long-term stability is approx. 1 to 4 µm. More coarsely dispersed emulsions tend to separate.

After processing and cooling down, the viscosity of the system can be still low and can increase particularly during the next 2 days. This is due to a reorganisation process of the stabilizing lamellar structures. Thus, it is recommended to determine the final viscosity of a formula not directly after preparation.

Recommended usage concentration

Typical usage concentration for roll-on systems: 2.5 – 5.0 % depending on the respective formulation and AP/Deo active.

For systems with higher viscosity up to 6.0% TEGO® Care APD 18 are needed.

Packaging

360 kg EURO pallet (24 x 15 kg carton box)

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 accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guideline formulations

PEG-free AP/Deo roll-on FU 01/15-178	
Phase A	
TEGO® Care APD 18	3.30%
Helianthus Annus (Sunflower) Seed Oil	5.40%
Phase B	
Water	71.30%
Phase C	
Aluminum Chlorohydrate (50% aq.)	20.00%
Phase Z	
Perfume	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 75 °C. 2. Add phase A to phase B with stirring.¹⁾ 3. Homogenize. 4. Cool with gentle stirring and add phase C below 35 °C. 5. Homogenize again for a short time. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	
Remarks:	
Emulsion viscosity: 4 Pas (Brookfield RVT, spindle 5, 5 rpm)	

PEG- and ACH-free AP/Deo roll-on FU 01/15-60	
Phase A	
TEGO® Care APD 18	5.00%
TEGOSOFT® P (Isopropyl Palmitate)	5.00%
Phase B	
Water	82.00%
Glycerin	3.00%
Potassium Alum	5.00%
Phase Z	
Preservative*, Perfume	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 75 °C. 2. Add phase A to phase B with stirring.¹⁾ 3. Homogenize. 	
¹⁾ Important:	
If phase A/B has to be charged into the vessel first, phase C must be added without stirring .	
Remarks:	
Emulsion viscosity: 5 Pas (Brookfield RVT, spindle 4, 5 rpm)	
*Formulation was tested with 0.8% Dipropylene Glycol; Methylparaben; Ethylparaben; Aqua; Methyliso-thiazolinone (Microcare MEM, Thor GmbH) and 1.0% Benzyl Alcohol, Glycerin, Benzoic Acid, Sorbic Acid (Rokonsal BSB-N, Ashland S.C.)	

PEG- and Aluminum-free Deo roll-on FU 01/15-202	
Phase A	
TEGO® Care APD 18	3.30%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.70%
TEGO® Cosmo P 813 (Polyglyceryl-3 Caprylate)	0.50%
TEGODEO® PY 88 G (Zinc Ricinoleate)	1.00%
Phase B	
Water	89.50%
Phase C	
Citric Acid (50% aq.)	q.s.
Phase Z	
Preservative*, Perfume	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 75 °C. 2. Add phase A to phase B with stirring.¹⁾ 3. Homogenize. 4. Cool down with gentle stirring. 5. Adjust pH to 5.0. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	
Remarks:	
Emulsion viscosity: 5 Pas (Brookfield RVT, spindle 4, 5 rpm)	
*Formulation was tested with 0.8% Dipropylene Glycol; Methylparaben; Ethylparaben; Aqua; Methylisothiazolinone (Microcare MEM, Thor GmbH); 1.0% Benzyl Alcohol, Glycerin, Benzoic Acid, Sorbic Acid (Rokonsal BSB-N, Ashland S.C.); 1.0% Phenoxyethanol; Ethylhexylglycerin (Euxyl PE 9010, Schülke & Mayr GmbH)	

PEG- and Aluminum-free Deo roll-on FU 01/15-198	
Phase A	
TEGO® Care APD 18	3.50%
TEGOSOFT® P (Isopropyl Palmitate)	5.00%
Triethylcitrate	5.00%
Sodium Caproyl/Lauroylate; Triethylcitrate (Dermosoft decalact liquid, Dr. Straetmans GmbH)	0.80%
Phase B	
Water	79.70%
Glycerin	5.00%
Parfum; p-Anisic Acid (Dermosoft 688, Dr. Straetmans GmbH) (10% aq.)	1.00%
Phase Z	
Preservative*, Perfume	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 75 °C. 2. Add phase A to phase B with stirring.1) 3. Homogenize. 	
Remarks:	
Emulsion viscosity: 4.5 Pas (Brookfield RV DV-I, spindle 4, 5 rpm)	
*Formulation was tested with 1.0% Benzyl Alcohol, Glycerin, Benzoic Acid, Sorbic Acid (Rokonsal BSB-N, Ashland S.C.)	

Protecting Sun Care Lotion SPF 30 FU 15/14-11	
Phase A	
TEGO® Care APD 18	4.00%
TEGOSOFT® XC (Phenoxyethyl Caprylate)	3.20%
TEGOSOFT® P (Isopropyl Palmitate)	2.00%
Bis-Ethylhexyloxyphenol Methoxy- phenyl Triazine (Tinosorb S, BASF SE)	3.00%
Butyl Methoxydibenzoylmethane	2.00%
Ethylhexyl Methoxycinnamate	2.00%
Ethylhexyl Salicylate	4.00%
Octocrylene	4.00%
Phase B	
Glycerin	3.00%
Water	61.20%
Phase C	
TEGO® Carbomer 341 ER (Acrylate/C ₁₀₋₃₀ Alkyl Acrylate Copolymer)	0.20%
TEGOSOFT® XC (Phenoxyethyl Caprylate)	0.80%
Phase D	
Tromethamine (30 % in water)	0.60%
Phase E	
Phenylbenzimidazol Sulfonic Acid (Eusolex 232, Merck KGaA)	2.00%
Water	7.10%
Tris(hydroxymethyl)aminomethane	0.90%
Phase Z	
Preservative*, Perfume	q.s.

Preparation:

1. Heat phase A and B separately to approx. 70 – 75 °C.
2. Add phase A to phase B with stirring.¹⁾
3. Homogenize.
4. Cool with gentle stirring and add phase C below 60 °C and homogenize for a short time.
5. Add phase D at approx. 40 °C and stir well.
6. Adjust pH of formulation to 6.5.
7. Add phase E, stir until uniform and check pH.
8. Homogenize for a short time.

¹⁾ Important:

If phase A has to be charged into the vessel first, phase C must be added **without stirring**.

Remarks:

Formulation viscosity: 20 Pas (Brookfield RVT, spindle 4, 5 rpm)

SPF: 33.7, UVA-Balance: 35%, CW 373 nm
(Calculated values, BASF Sunscreen Simulator)

*Formulation was tested with 0.9% Dipropylene Glycol; Methylparaben; Ethylparaben; Aqua; Methyliso-thiazolinone (Microcare MEM, Thor GmbH)

Natural O/W foundation FU 15/14-1	
Phase A	
TEGO® Care APD 18	6.00%
TEGOSOFT® MM (Myristyl Myristate)	2.00%
TEGOSOFT® M (Isopropyl Myristate)	6.00%
TEGOSOFT® DC (Decyl Cocoate)	6.00%
TEGOSOFT® CR (Cetyl Ricinoleate)	1.00%
Phase B	
Water	65.20%
Glycerin	1.00%
Phase C	
CI 77891 (Titanium Dioxide) (Kronos 1171, Kronos Int.)	8.00%
Iron Oxide (Sicovit Yellow 10 E 172, BASF SE)	0.90%
Iron Oxide (Sicovit Red 30 E 172, BASF SE)	0.20%
Iron Oxide (Sicovit Brown 70 E 172, BASF SE)	0.40%
Iron Oxide (Sicovit Black 80 E 172, BASF SE)	0.10%
TEGO® Feel Green (Cellulose)	2.00%
Phase D	
Sodium Hydroxide (10% aq.)	0.20%
Phase E	
Benzyl Alcohol, Glycerin, Benzoic Acid, Sorbic Acid (Rokonsal BSB-N, ISP)	1.00%
<p>Preparation:</p> <ol style="list-style-type: none"> Mix phase C in a blender until homogeneous. Heat phase A and B separately to approx. 75 °C. Add phase C to phase B and homogenize for a short time. Add phase A to phase B/C while stirring.¹⁾ Homogenize. Cool with gentle stirring & add phase D below 40 °C. Homogenize for a short time. Cool with gentle stirring below 30 °C and add phase E. <p>¹⁾ Important: If phase A has to be charged into the vessel first, phase B must be added without stirring.</p> <p>Remarks: Emulsion viscosity: 45 Pas (Brookfield RVT, spindle C, 10 rpm)</p>	

Caring natural O/W Cream FU 15/14-3	
Phase A	
TEGO® Care APD 18	6.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	8.00%
TEGOSOFT® P (Isopropyl Palmitate)	11.00%
<i>Prunus Amygdalus Dulcis</i> (Sweet Almond) Oil	10.00%
Phase B	
Water	61.00%
Glycerin	3.00%
Phase C	
Sodium Hydroxide (10% aq.)	0.20%
Phase D	
Benzyl Alcohol, Glycerin, Benzoic Acid, Sorbic Acid (Rokonsal BSB-N, ISP)	0.80%
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A and B separately to approx. 75 °C. 2. Add phase A to phase B with stirring.¹⁾ 3. Homogenize. 4. Cool with gentle stirring and add phase C below 40 °C. 5. Cool with gentle stirring and add phase D below 30 °C. 6. Stir until uniform. 	
¹⁾ Important:	
If phase A has to be charged into the vessel first, phase B must be added without stirring .	
Remarks:	
Emulsion viscosity: 50 Pas (Brookfield RVT, spindle C, 10 rpm)	

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