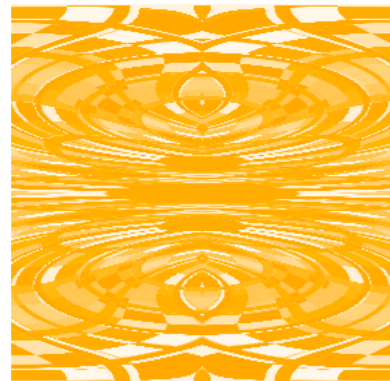
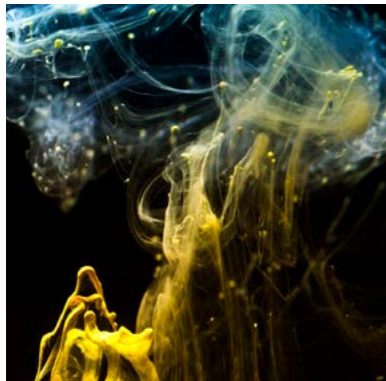


Innovate with bi-gels using Emulfree® Duo

For a better experience, download our brochure





Bi-gels: intimate
mixture of
aqueous and
oily gels





Advantages of bi-gels

Bi-gels consist of an intimate mixture of an aqueous gel and an oily gel.

Due to their dual nature, bi-gels are associated with the following advantages:

> Cooling and moisturizing effect

> Suitable for lipophilic and hydrophilic drugs

> Improved spreadability

> Better drug absorption through the skin

Interesting free access review articles on bi-gels

Meenu Sreekumar et al. Bigels: An Updated Review J. Pharm. Sci. & Res. Vol. 12(10), 2020, 1306-1308

Ahmad Shakeel et al. Bigels and multi-component organogels: An overview from rheological perspective, Food Hydrocolloids, Volume 111, 2021, 106190



Bi-gels: intimate mixture of aqueous and oily gels

How to make bi-gels

Bi-gels are usually produced by preparing separately the aqueous gel and the oily gel, and then mixing both phases at high speed.

Depending on the gelling agents used in both phases, different ratios water/oil phases can be achieved, and process temperature and mixing speed need to be adapted.

Composition of bi-gels



Easy bi-gel production with Emulfree[®] Duo

STEP 1:
PREPARATION OF
THE AQUEOUS GEL

STEP 2:
PREPARATION
OF THE OILY PHASE

STEP 3:
MIX BOTH
PHASES

The aqueous and the oily phases are prepared separately at room temperature, and then mixed at 3000 rpm for 15 minutes.

The whole process can be performed at room temperature.



Easy bi-gel production with Emulfree® Duo

Step 1: prepare the aqueous gel

Depending on the nature and grade of the aqueous gelling agent*, hydration and pre-neutralization might be required.

Process with a carbomer requiring hydration and pre-neutralization



- Water
- **Carbomer**
- Room temperature



- Allow to hydrate for 30 minutes
- Room temperature



- Pre-neutralize to slightly increase the viscosity
- 1500 rpm
- Room temperature

Process with xanthan gum



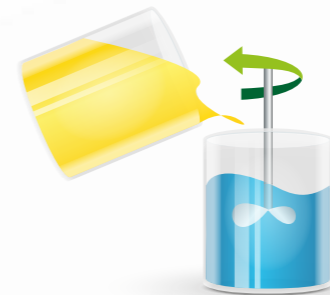
- Water
- **Xanthan gum**
- 1500 rpm
- Room temperature

Step 2: prepare the oily phase



- Oil
- Emulfree® Duo

Step 3: mix both phases



- Slowly pour the oily phase in the gelled aqueous phase
- 3000 rpm for 15 minutes
- Room temperature



- Obtain a homogenous dispersion

* Check with your supplier



Emulfree[®] Duo:
a ready-to-use
stabilizing agent

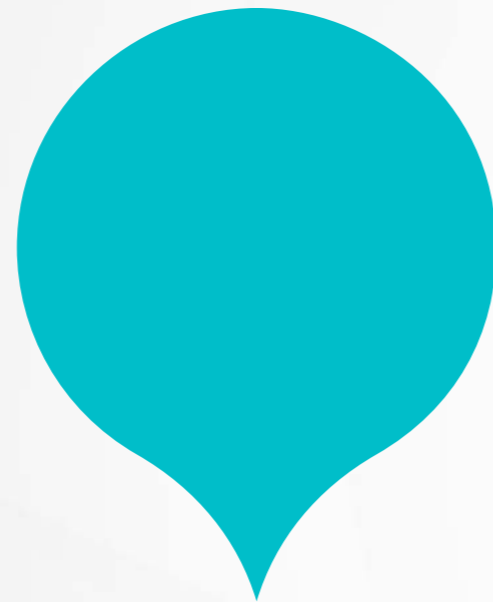




Product description

Emulfree® Duo

is a ready-to-use system. It is a combination of three excipients. It has been designed to stabilize the oil phase within the bi-gel, by ensuring a fine and homogeneous dispersion in the aqueous phase.

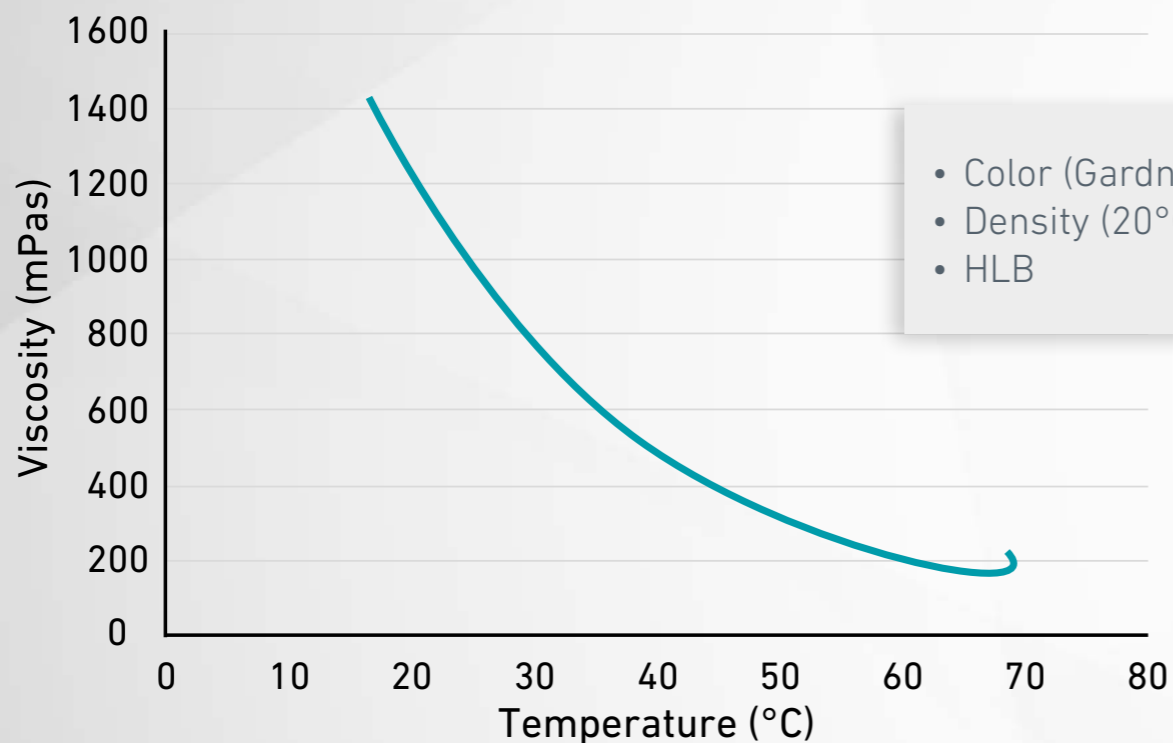


It is free of PEG.

**More information
on our website**



Physico-chemical properties



- Color (Gardner scale) <5
- Density (20°C) 0.920 – 0.950
- HLB 6

Coaxial cylinder rheometer, shear rate 720 s⁻¹

A liquid excipient, ideal for room temperature processes





Practical tips for bi-gel formulation with Emulfree® Duo

When formulating bi-gels with Emulfree® Duo, keep in mind the following points to get stable bi-gels:

- Maximum 20% of oily phase in the bi-gel
- Use **Emulfree® Duo** at 1 to 8% of the formulation depending on the desired texture
- Components of both gels should be compatible to ensure correct stability of the bi-gel

Gattefossé product portfolio offers a full range of solutions for topical dosage forms



Optimum composition to obtain stable bi-gels

We have tested a variety of excipients to formulate bi-gels and to obtain stable formulations:

Aqueous gelling agents	Solvents Penetration enhancers	Oils	Thickeners
0.3% Carbopol® Ultrez 10, 971 P, 980, ETD 2020, 974 P	10% ethanol	Mineral oil	2% Compritol® 888 Pellets
1.0% xanthan gum	10% Lauroglycol™ FCC	Light mineral oil	2% cetyl alcohol
0.3% Carbopol® Ultrez 10 + 0.2% xanthan gum	20% Transcutol® P	Sweet almond oil	2% stearyl alcohol
		Labrafac™ Lipophile WL 1349	2% Geleol™ Mono and Diglycerides NF
		Suppocire® A	Compritol® 888 Pellets: hydrogenated castor oil: Geleol™ Mono and Diglycerides NF (2:2:1)



A palette
of textures





From lotions to rich creams

The nature and the quantity of the oil phase components can be adapted depending on the desired final texture, from light sprayable lotions to rich creams.

OILY PHASE COMPONENTS	AQUEOUS PHASE COMPONENTS
<ul style="list-style-type: none">• Different oils:<ul style="list-style-type: none">- Labrafac™ Lipophile WL 1349- Sweet almond oil- Combination of oils- Suppocire® A, hard fat• Variable amounts of Emulfree® Duo as stabilizing agent	<ul style="list-style-type: none">• 0.3% Carbopol® Ultrez 10 as gelling agent or 0.3% Carbopol® Ultrez 10 and 0.2% xanthan gum as gelling agents or 1% xanthan gum as gelling agent• 0.7% NaOH (10% solution) for neutralization when Carbopol® is used• 1.0% benzyl alcohol as preservative• 5% glycerin as moisturizer• Demineralized water qs 100%

Sensorial analysis

Gattefossé has an in house panel for sensorial analysis of topical dosage forms and validated methods to quantify their sensorial criteria on immediate contact, upon application, after absorption and appearance.

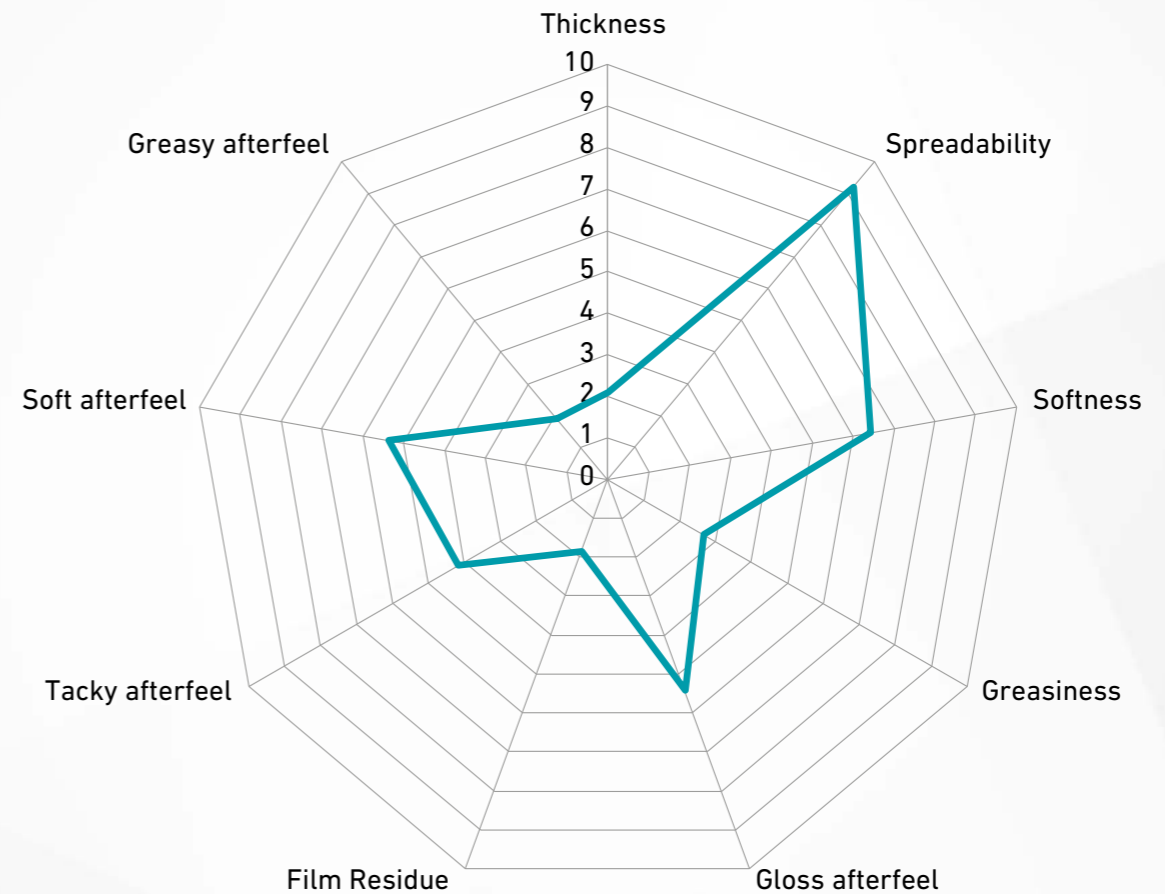




Sprayable lotion

With low viscosity and high spreadability, lotions are convenient for hairy areas or when large zones need to be treated.

Excipient	#18
Labrafac™ lipophile WL 1349	10.00
Emulfree® Duo	2.00
Demineralized water	81.00
Glycerin	5.00
Xanthan gum	1.00
Benzyl alcohol	1.00
TOTAL	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	5000



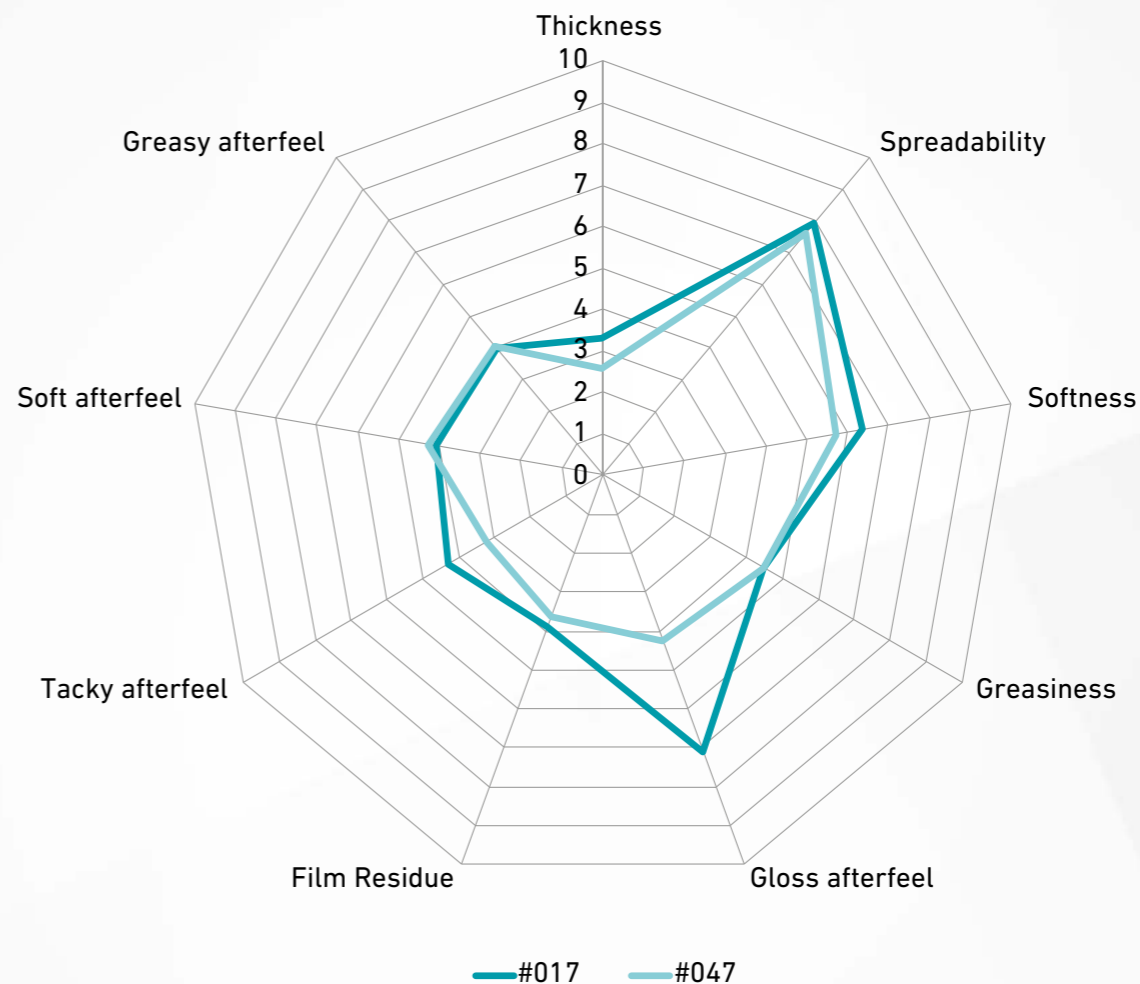


Light creams



Creams are the most popular topical dosage forms used to treat many diseases.

Excipient	#017	#047
Labrafac™ lipophile WL 1349	15.00	-
Sweet almond oil	-	15.00
Emulfree® Duo	5.00	5.00
Demineralized water	72.80	73.00
Glycerin	5.00	5.00
Carbopol® Ultrez 10	0.30	0.30
Xanthan gum	0.20	-
NaOH (10% solution)	0.70	0.70
Benzyl alcohol	1.00	1.00
TOTAL	100.00	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	20960	21240

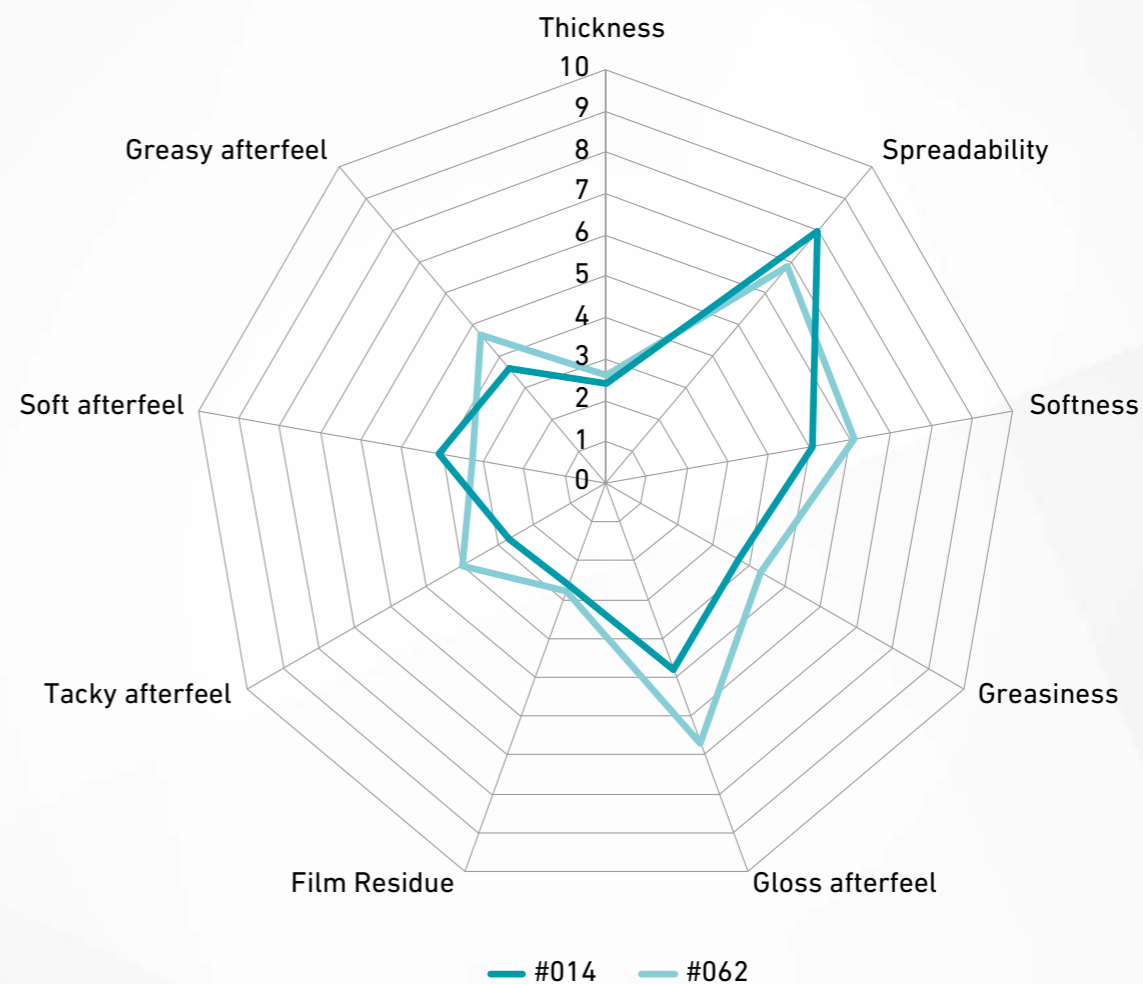


With a combination of carbomer and xanthan gum the cream looks much more brilliant ; other sensorial parameters are equivalent.



Light creams

Excipient	#014	#062
Labrafac™ lipophile WL 1349	7.50	15.00
Sweet almond oil	7.50	-
Emulfree® Duo	5.00	5.00
Compritol® 888 Pellets	-	1.00
Hydrogenated castor oil	-	1.00
Demineralized water	73.00	71.00
Glycerin	5.00	5.00
Carbopol® Ultrez 10	0.30	0.30
NaOH (10% solution)	0.70	0.70
Benzyl alcohol	1.00	1.00
TOTAL	100.00	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	23360	23400






Creams are the most popular topical dosage forms used to treat many diseases. The rich texture is obtained with Suppocire® A, a hard fat solid at room temperature.

Excipient	#015
Suppocire® A	15.00
Emulfree® Duo	5.00
Demineralized water	73.00
Glycerin	5.00
Carbopol® Ultrez 10	0.30
NaOH (10% solution)	0.70
Benzyl alcohol	1.00
TOTAL	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	30050





Case studies
with model drugs





Betamethasone dipropionate

Betamethasone dipropionate reduces the swelling, itching, and redness that can occur in eczema or dermatitis conditions. In that case, a rich cream is more appropriate for very dry skin.

Suppocire® A improves the texture and enables a smooth and easy application on the body.

Labrafac™ Lipophile WL 1349 improves skin feel and enhances spreadability with a melting sensation.

Transcutol® P is used to solubilize the drug.

Emulfree® Duo enables to produce bi-gels, providing cooling and moisturizing effects.

Excipient	#076
Suppocire® A	7.00
Lafrafac™ Lipophile WL 1349	7.00
Emulfree® Duo	5.00
Demineralized water	72.74
Glycerin	5.00
Carbopol® Ultrez 10	0.30
Xanthan gum	0.20
NaOH (10% solution)	0.70
Benzyl alcohol	1.00
Transcutol® P	1.00
Betamethasone dipropionate	0.06
TOTAL	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	25320



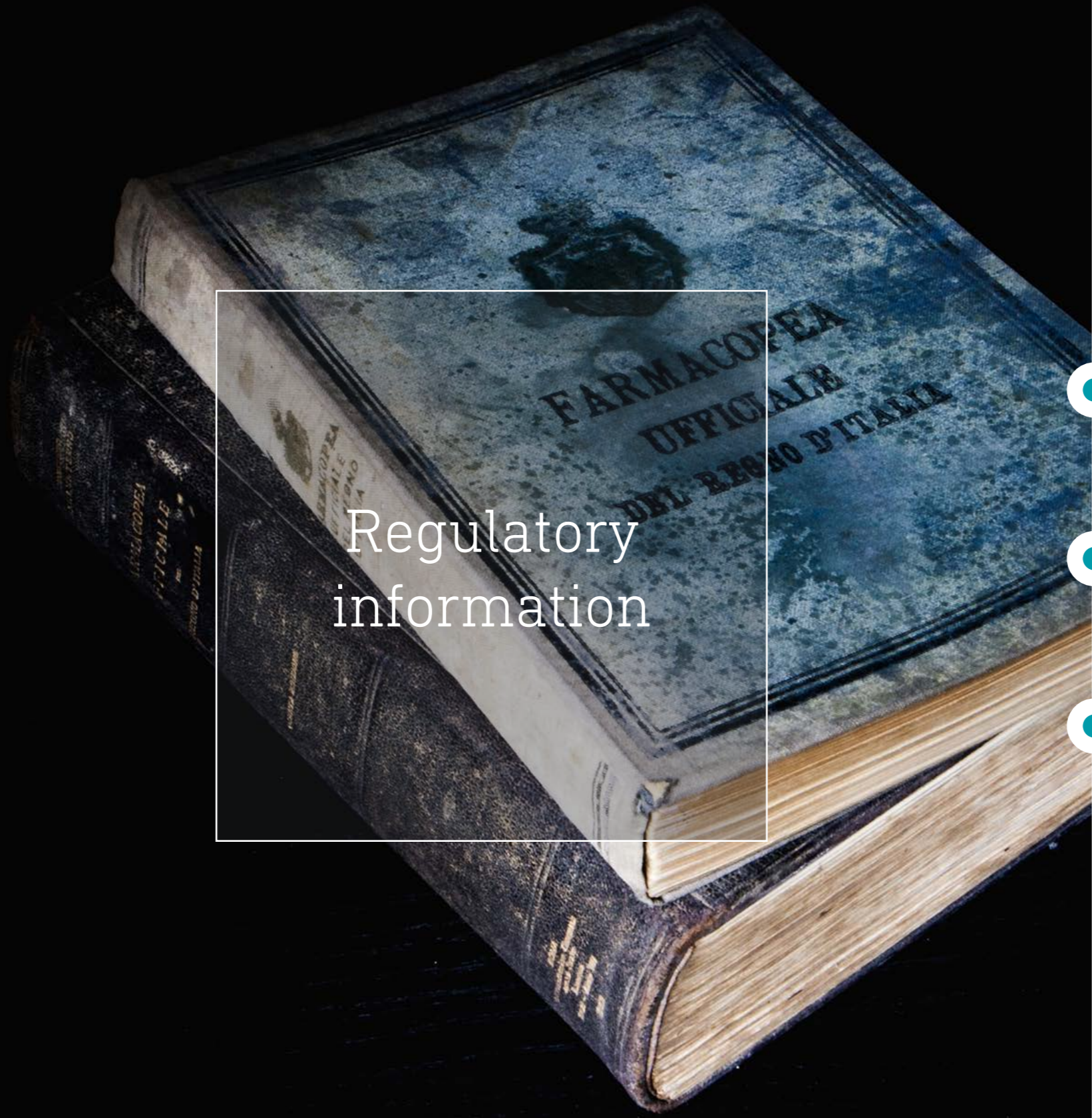
Lavander essential oil

Lavandula essential oil is reknown for its many therapeutic effects, including cicatrizant, skin regenerant, anti-bacterial, anti-fungal, pain killer and anti-inflammatory. In that case, a light cream is appropriate.

Glycerin is used in the formulation to retain or preserve moisture and sweet almond oil for its emollient properties.

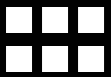
As a PEG-free excipient, **Emulfree® Duo** is adapted for highly sensitve skin

Excipient	#103
Sweet almond oil	15.00
Emulfree® Duo	5.00
Demineralized water	68.80
Glycerin	5.00
Carbopol® Ultrez 10	0.30
Xanthan gum	0.20
NaOH (10% solution)	0.70
Essential oil Lavandula angustifolia	5.00
TOTAL	100.00
Viscosity mPa.s (Brookfield, A91- 5 rpm - 23°C)	24240



Regulatory
information





Ethylcellulose

Propylene glycol monolaurate

Propylene glycol isostearate

Ethylcellulose

In pharmaceutical topical formulations, **ethylcellulose EP/NF** is known to be used as thickening agent.

It is listed in the [FDA Inactive ingredient database](#) (UNII: 7Z8S9VYZ4B)

Administration route	Dosage form	Use level
Oral	Tablet, Extended Release	300 mg
Topical	Cream Patch	NA 2.53 mg
Transdermal	Patch	18 mg
Vaginal	Tablet	50 mg



Propylene glycol monolaurate

Propylene glycol monolaurate

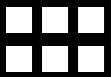
Propylene glycol isostearate

Ethylcellulose

In pharmaceutical topical formulations, **propylene glycol monolaurate EP/NF** is known to be used as solubilizer and penetration enhancer.

It is listed in the [FDA Inactive ingredient database](#) (UNII: 668Z5835Z3)

Administration route	Dosage form	Use level
Oral	Capsule	235 mg
	Tablet	10 mg
	Tablet, film coated	6.67 mg
Topical	Gel	3% W/W
Transdermal	Film, extended release	NA



Propylene glycol isostearate

Propylene glycol monolaurate

Propylene glycol isostearate

Ethylcellulose

In cosmetic formulations, **propylene glycol isostearate** is widely used as a skin conditioning agent and a surfactant. It is not listed in the FDA IID database. However, two similar chemical compounds are listed in the [FDA Inactive ingredient database](#).

Propylene glycol monostearate
(UNII: MZM1I680W0)

Administration route	Dosage form	Use level
Topical	Cream	6.5% W/W
	Ointment	2% W/W
	Lotion	3% W/W
Vaginal	Suppository	135 mg

Propylene glycol monopalmitostearate
(UNII: F76354LMGR)

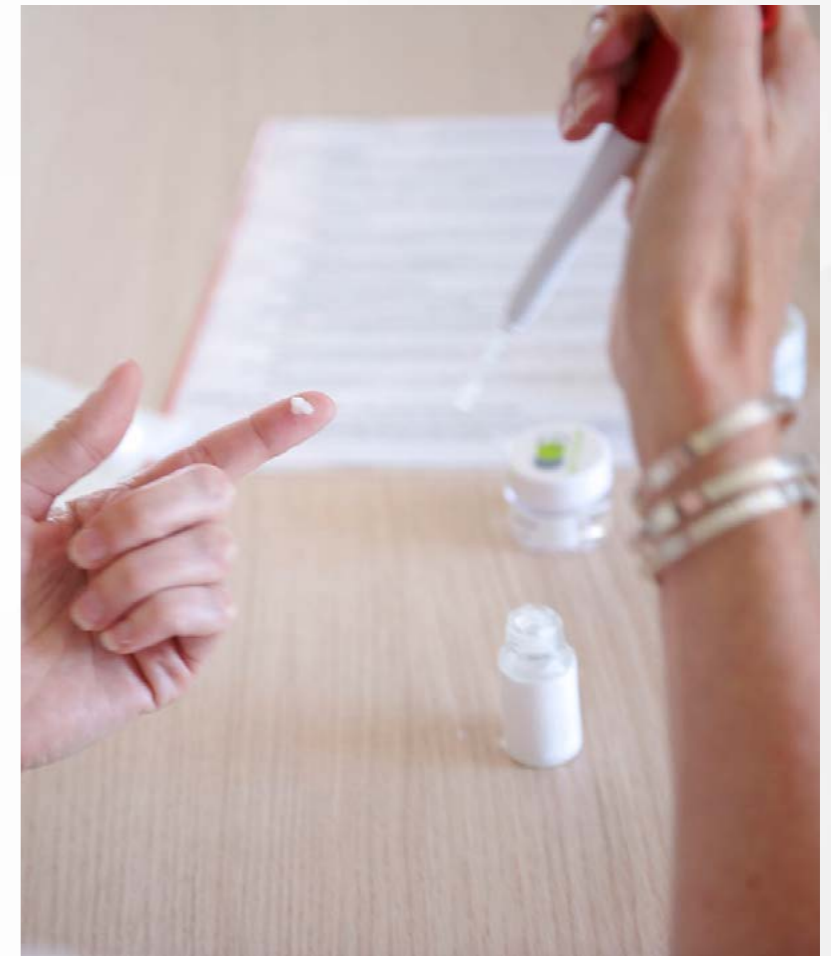
Administration route	Dosage form	Use level
Topical	Cream	9.3% W/W
	Lotion	4.69% W/W
	Ointment	8% W/W
	Ointment augmented	2% W/W
Vaginal	Cream	7% W/W




Technical support



Technical support



 [More information on sensorial analysis](#)



For technical support
and more information

www.gattefosse.com

Contact us



Emulfree® Duo in a nutshell

Ready-to-use stabilizing agent

- ▶ Processable at room temperature
- ▶ Suitable for hydrophilic, lipophilic and heat sensitive APIs
- ▶ Safe excipient for sensitive skins and mucosae
- ▶ Enabler of bi-gel, an emerging and innovative pharmaceutical topical dosage form
- ▶ Suitable for a wide range of classical topical dosage forms, from lotions, creams to rich creams



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Carbopol[®] is a trademark.

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