

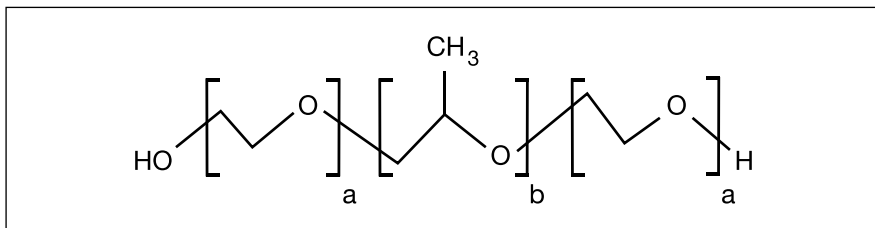
Pluracare L/F Grades Poloxamer

® = Registered trademark
of BASF SE

Care Chemicals & Formulators

Chemical nature

Poloxamer block copolymers are non ionic surfactants available under the Pluracare registered trade name. The Pluracare block copolymers (CAS 9003-11-6) are synthetic copolymers of propylene oxide and ethylene oxide represented by the following chemical structure:



Wherein a and b have the following values:

Pluracare	PRD	INCI	a	b
L 44	30423781	Poloxamer 124	11	21
L 64 G*	30366560	Poloxamer 184	13	30
L 64**	30095899	Poloxamer 184	13	30
F 68 G*	30366561	Poloxamer 188	75	30
F 68**	30095850	Poloxamer 188	75	30
F 127	30089491	Poloxamer 407	98-101	56

*not available in the US

**only available in the US

Specification

See separate documents "Standard Specification (not for regulatory purposes)" available via BASF's WorldAccount: <https://worldaccount.basf.com> (registered access).

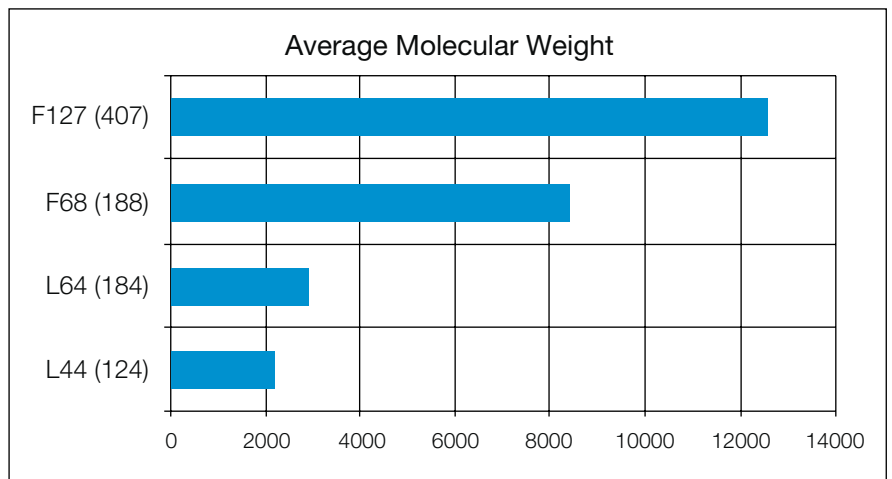
Properties

The alphabetical designation explains the physical form of the product: "L" for liquid, "F" for solid forms.

The first digit (two digits in a three-digit number) in the numerical designation, multiplied by 300, indicates the approximate molecular weight of the hydrophobic part of the molecule (propylene oxide). The last digit, when multiplied by 10, indicates the approximate ethylene oxide content in the molecule.

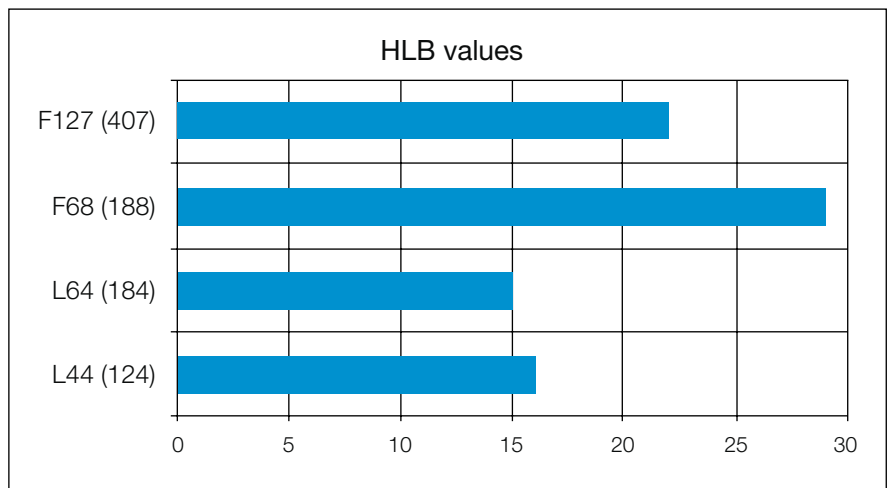
The approximate molecular weight of the hydrophobic part of the molecule (propylene oxide) is also indicated by the first 2 digits in the numerical designation of the INCI name, multiplied by 100. The last digit, when multiplied by 10, indicates the approximate ethylene oxide content in the molecule.

Name	INCI	Mw of PO part	% of the EO part
Pluracare L 44	Poloxamer 124	4 x 300 = 1200	4 x 10 = 40
Pluracare L 64	Poloxamer 184	6 x 300 = 1800	4 x 10 = 40
Pluracare F 68	Poloxamer 188	6 x 300 = 1800	8 x 10 = 80
Pluracare F 127	Poloxamer 407	12 x 300 = 3600	7 x 10 = 70
Pluracare L 44	Poloxamer 124	12 x 100 = 1200	4 x 10 = 40
Pluracare L 64	Poloxamer 184	18 x 100 = 1800	4 x 10 = 40
Pluracare F 68	Poloxamer 188	18 x 100 = 1800	8 x 10 = 80
Pluracare F 127	Poloxamer 407	40 x 100 = 4000	7 x 10 = 70



The block copolymers are anhydrous and non-corrosive. Therefore mild steel can be used for storage tanks, piping and conventional process equipment.

Due to the non-ionic character of the block copolymers they are miscible and compatible with almost all anionic as well as cationic surfactants. They do not react with cations such as Ca and Mg which are present in hard water.



Pluracare	L 44	L 64	L 64 G	F 68	F 68 G	F 127
Physical form	liquid*	liquid	liquid	powder	powder	solid, Prill**
Cloud point*** (EN 1890)	71 - 75°C method E	58 - 62°C method A	59 - 61°C method A	100°C method A	86 - 90°C method B	< 100°C method A
Color APHA (EN 1557, 70°C)	max. 50	max. 50	max. 50	max. 100	max. 2 (Iodine color)	max. 120
% H ₂ O	0.4	0.4	0.4	0.4	0.75	0.75
Average molecular weight	appr. 2,200	appr. 2,900	appr. 2,900	appr. 8,400	appr. 8,400	appr. 12,600
Density (DIN 51757, method A, 23°C)	appr. 1.05 g/cm ³	appr. 1.05 g/cm ³	appr. 1.05 g/cm ³	appr. 1.06 (70°C)g/cm ³	appr. 1.06 (70°C) g/cm ³	appr. 1.05 (70°C) g/cm ³
Viscosity (EN 12092, 23°C, Brookfield, 60 rpm)	appr. 440 mPa s	appr. 850 mPa s	appr. 850 mPa s	appr. 1,000 (77°C) mPa s	appr. 1,000 (77°C) mPa s	appr. 3,100 (77°C) mPa s
HLB	12 - 18	12 - 18	12 - 18	29	29	18 - 23
Surface tension (DIN 53914, 1 g/l, 23°C)	appr. 42 mN/m	appr. 41 mN/m	appr. 41 mN/m	appr. 52 mN/m	appr. 52 mN/m	appr. 41 mN/m
Pour/Melt Point	16°C	16°C	16°C	52°C	48°C	56°C

* the product is stabilized with 100 ppm Tocopherol

** the product is stabilized with 100 ppm BHT as antioxidant

*** Cloud point according EN 1890

Method A: 1 g surfactant + 100 g distilled water

Method B: 1 g surfactant + 100 g NaCl solution (c = 50 g/l)

Method C: 1 g surfactant + 100 g NaCl solution (c = 100 g/l)

Method D: 5 g surfactant + 45 g ethylene glycol monobutyl ether solution (c = 250 g/l)

Method E: 5 g surfactant + 25 g ethylene glycol monobutyl ether solution (c = 250 g/l)

Solubility of Pluracare surfactants in different vehicles

Pluracare (Poloxamer)	Water	Ethanol	Isopropanol	Mineral Oil	Ethylene Glycol	Propylene Glycol
L44 (124)	Yes	Yes	Yes	No	No	Yes
L64 (184)	Yes	Yes	Yes	No	No	Yes
F68 (188)	Yes	Yes	No	No	No	No
F108 (338)	Yes	Yes	No	No	No	<10%
F127 (407)	Yes	Yes	Yes	No	No	No

Applications

It is suggested that these Pluracare copolymers be considered for their general functionality as surfactants, emulsifiers, solubilizers and stabilizers in almost all cosmetic preparations.

The Poloxamers boost the formation of well dispersed emulsions of usually not miscible liquids by changing the interfacial tension. They decrease the interfacial tension of cosmetic preparations and contribute to equal distribution during the application.

Overview of Suggested Applications

Pluracare (Poloxamer)	Highest water solubility	Best foaming	Best de-tergency	Most effi- cient gel formation	Best oil- in-water emulsifier	Best solubilizer
F127 (407)	■	■		■		■
F68 G (188)	■	■	■			■
L64 G (184)			■		■	
L44 (124)			■		■	

■ General use

■ Major use

Cosmetic Applications

Product	Function	Use
Pluracare L44 (Poloxamer 124)	Emulsifier (o/w)	Liquid soap, cleansing water, make-up remover, cleansing wipes ...
Pluracare L64/ L64 G (Poloxamer 184)	Emulsifier (o/w), Co-emulsifier, Cleansing agent	Liquid soap, cleansing water, skin care conditioner, lotions and cream preparations, make-up remover, direct hair dyeing ...
Pluracare F68/ F68 G (Poloxamer 188)	Solubilizer, Dispersant, Cleansing agent, Foam booster/stabilizer	Liquid soap, cleansing water, skin care conditioner, make-up remover, deodorant sticks, cake eyeliner, mouthwash ...
Pluracare F127/ F127 NF (Poloxamer 407)	Solubilizer, Gelling agent	Toothpaste, whitening gels, mouthwash, Sun and Skin care applications, ...

Pluracare L 44

Due to the low skin and eye irritation Pluracare L 44 find particular application in skin care such as liquid soaps, cleansing wipes or make-up removers. However it is also used as an emulsifier (o/w or w/o) in a wide variety of areas from cosmetics to oral care products.

Pluracare L 64 G Pluracare L 64

Pluracare L 64/L 64 G has the highest cleansing activity of the available Poloxamers. Therefore and due to the low skin and eye irritation Pluracare L 64/L 64 G is mainly used as cleanser in mild facial products such as make-up cleansing wipes but also in color cosmetics. It also finds application as o/w emulsifier.

Pluracare F 68 G Pluracare F 68

Pluracare F 68/F 68 G has the best foaming properties of the available Poloxamers. Therefore it is mainly used in shower gels, washing foams, shaving gels but also in oral care applications such as toothpastes or mouthwash products. It easily solubilizers perfume oils.

Pluracare F 127

Pluracare F 127 is used as thickener, gelling agent, coemulsifier, and bodying agent in toothpastes, mouthwashes, creams and liquid emulsions. Another application is as a solubilizer for certain active substances and essential oils in cosmetic preparations.

Rheological properties

Dilute aqueous solutions display Newtonian flow, which is transformed into plastic flow with a pronounced change in flowability at concentrations above about 10% (Fig. 1).

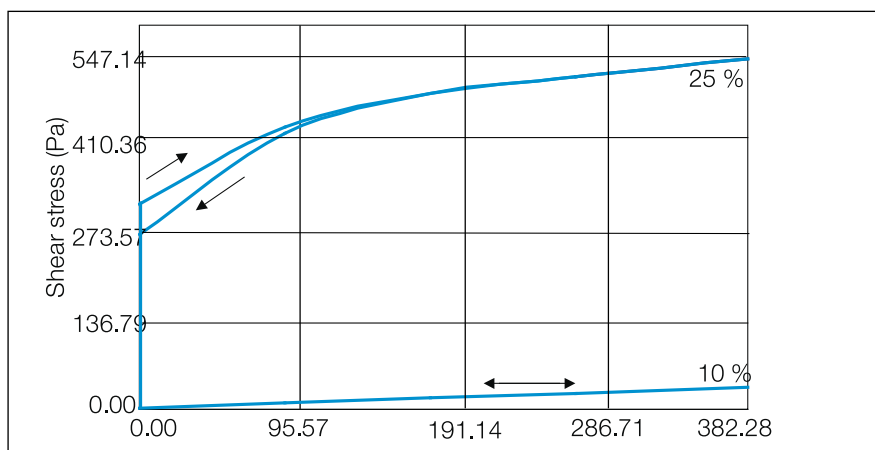


Fig. 1: Flow of 10% and 25% aqueous Pluracare F 127 gels

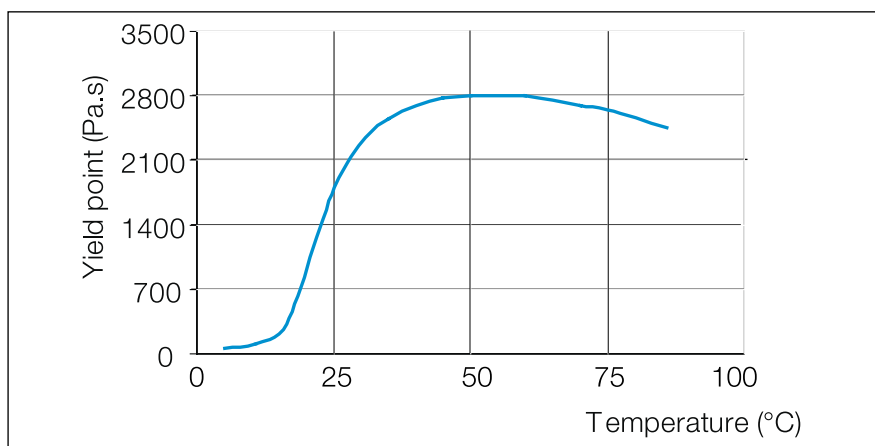


Fig. 2: Viscosity of a 25% aqueous Pluracare F 127 gel as a function of temperature

Electrolytes, humectants, alcohols, surfactants, and other additives affect the viscosity of Pluracare F 127 gels. For instance, sodium chloride lowers the gel formation temperature, and increases the viscosity. Sensitivity to electrolytes does not occur until the addition rate of sodium chloride reaches 20% (Fig. 3). Ethanol, on the other hand, raises the gel formation temperature. Incompatibility arises with anionic surfactants and at low pH values.

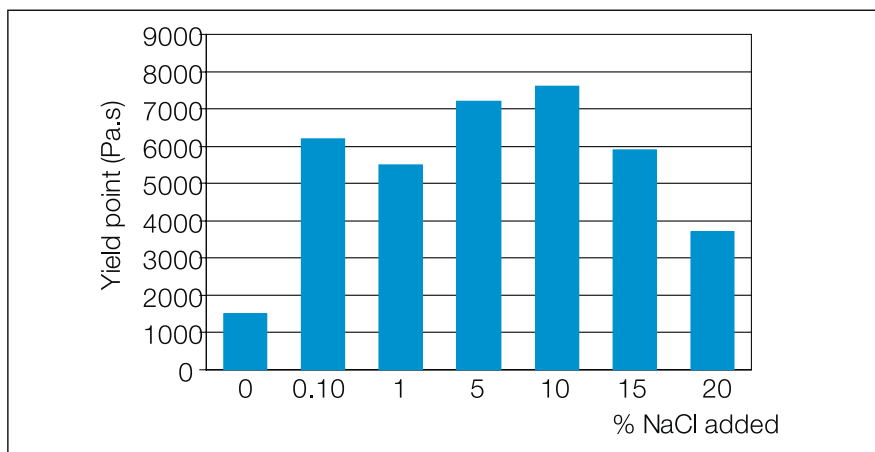


Fig. 3: Viscosity of 25% aqueous Pluracare F 127 gel for various addition rates of sodium chloride

Preparation of gels

Gels can be prepared by two methods.

1. Cold-water process

Pluracare F 127 is stirred into water at about 5°C. Gelling sets in on heating to room temperature.

2. Hot-water process

The Pluracare F 127 is dissolved in hot water. The gel is formed when the solution cools to room temperature.

In principle, both methods yield gels with the same properties. However, lumps are formed when the Pluracare F 127 is mixed into the hot aqueous phase, and the solutions may have to stand for several hours before the lumps disappear. For this reason, we recommend the cold-water process for the production of gels. In order to avoid the formation of air bubbles, a vacuum should be applied before heating, i.e. before the gel is formed.

Handling

When formulating these surfactants into aqueous systems, always introduce the surfactant into the water slowly and with mild agitation. This procedure will minimize the potential for gellation to occur.

Stability/Storage

The Pluracare block copolymers should be stored in a cool, dark place. Low storage temperature (< 15°C) can lead to congealing, turbidity or sedimentation which is reversible at 50 – 60 °C. In case of any inhomogeneity the product should be heated with or without stirring to 50 – 60°C before use. Pluracare F 68 G/F 68 and F 127 should not be stored over 30°C. The products are hygroscopic so that we recommend resealing opened drums under total air exclusion.

The recommended shelf life of these materials is two years from the date of manufacture when stored in the original sealed containers. Material over two years old should be checked for quality before use.

Typical formulations**Mascara*****No. 67/00013**

	%	Ingredients	Supplier	INCI name
A	14.00	Water, dem.		Aqua
	q.s.	Preservative		
	2.50	Pluracare® F 127	(1)	Poloxamer 407
	3.50	Luviskol® K 30	(1)	PVP
	11.00	Ethanol		Alcohol
	0.70	Triethanolamine Care	(1)	Triethanolamine
B	0.52	Carbopol 934	(6)	Carbomer
	57.78	Water, dem.		Aqua
C	10.00	Sicovit® Black 80 E 172	(1)	C. I. 77 499, Iron Oxides

Production:

Solubilize the components of phase A.
Dissolve phase B and stir it into phase A.
Stir phase C into the solution of the combined phases A and B and homogenize thoroughly.

Properties:

Viscosity: 30.000 mPa·s
pH value: appr. 7

*Please note: formulation not approved in Japan

Handwash with instant foam**No. 52/00101**

	%	Ingredients	Supplier	INCI name
A	74.60	Water dem.		Aqua
B	5.00	Pluracare® F 68 G	(1)	Poloxamer 188
C	3.80	Luviquat® UltraCare	(1)	Polyquaternium 44
	q.s	Preservative		
	1.00	Glycerine 87%	(20)	Glycerine
D	15.00	Tego Betain L 7	(44)	Cocamidopropyl Betaine
	q.s	Perfume		

Production:

Heat ingredients of phase A to 80° C.
 Add ingredients of phase B and stir till everything is completely dissolved.
 Cool to 40° C while stirring, add ingredients of phase C and stir to get a clear dissolution.
 Mix ingredients of phase D.
 Add slowly the mixture from phase D to the mixture of the phases A+B+C and stir to homogenize.

Properties:

pH value: 5.20

Eye Make up remover**No. 52/00102**

	%	Ingredients	Supplier	INCI name
A	20.00	Luvitol® Lite	(1)	Hydrogenated Polyisobutene
	0.30	Pemulen TR-1	(6)	Acrylates/C10-30 Alkyl Acrylate Cross
	0.20	Vitamin E-Acetate	(1)	Tocopheryl Acetate
	0.20	Bisabolol nat.	(1)	Bisabolol
	q. s.	Perfume		
B	70.75	Water dem.		Aqua
	5.00	Pluracare® E 400	(1)	PEG 8
	2.00	Pluracare® L 44	(1)	Poloxamer 124
	1.00	Cremophor® A 25	(1)	Cetareth 25
	0.50	D-Panthenol USP	(1)	Panthenol
	0.05	Edeta® BD	(1)	Disodium EDTA
C	q. s.	Preservative		
D	q. s.	Sodium hydroxide 10% water		Sodium hydroxide

Production:

Weigh and mix ingredients of phase B and dissolve them to become clear.
 Mix ingredients of phase A. Stir ingredients of phase B in the mixture of phase A and homogenize.
 Add ingredients of phase C while stirring.
 Add ingredients of phase D and adjust the pH value to 6.0. Stir the whole mixture for about one hour.
 Homogenize shortly.

Properties:

Viscosity: 6140 mPa s Brookfield
 pH value: 5.20

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