

Technical Information

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Pluronic® PE types

Pluronic® PE 3100

Pluronic® PE 3500

Pluronic® PE 4300

Pluronic® PE 6100

Pluronic® PE 6120

Pluronic® PE 6200

Pluronic® PE 6400

Pluronic® PE 6800

Pluronic® PE 7400

Pluronic® PE 8100

Pluronic® PE 9200

Pluronic® PE 9400

Pluronic® PE 10100

Pluronic® PE 10300

Pluronic® PE 10400

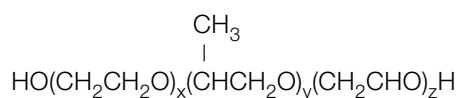
Pluronic® PE 10500

Pluronic® PE 10500 Solution

Low-foaming block copolymers for a wide variety of applications

Chemical nature

The Pluronic® PE types are low-foaming, nonionic surfactants. They are block copolymers in which the central polypropylene glycol group is flanked by two polyethylene glycol groups. They conform to the following structural formula.

**Nomenclature**

The Pluronic® PE types are designated by a four-figure or five-figure code. The first digit – or first two digits – is a guide to the molar mass of the hydrophobe, in this case polypropylene glycol, on a scale of 1–10. The second or third digit is the percentage of polyethylene glycol in the molecule, divided by ten.

Nomenclature of the Pluronic® PE types

Pluronic®	Code	Molar mass of polypropylene glycol block (g/mol)	Code	Percentage of polyethylene glycol in molecule (%)
PE 3100	3	950	1	10
PE 3500	3	950	5	50
PE 4300	4	1100	3	30
PE 6100	6	1750	1	10
PE 6120	6	1750	12	12
PE 6200	6	1750	2	20
PE 6400	6	1750	4	40
PE 6800	6	1750	8	80
PE 7400	7	2100	4	40
PE 8100	8	2300	1	10
PE 9200	9	2750	2	20
PE 9400	9	2750	4	40
PE 10100	10	3250	1	10
PE 10300	10	3250	3	30
PE 10400	10	3250	4	40
PE 10500	10	3250	5	50

Properties

The consistency of the individual products in the Pluronic® PE range is determined by their polyethylene glycol content and the molar mass of the central polypropylene glycol block. They tend to become more solid as these figures increase. Pluronic® PE 6800 is supplied in the form of fine, free-flowing, non-tacky beads for ease of processing.

The most important properties of the Pluronic® PE types are listed in the table overleaf.

The information below is correct at the time of going to press. It does not necessarily form part of the product specification.

A detailed product specification is available from your local BASF representative.

Pluronic® PE 3100	Clear, colourless liquid
Pluronic® PE 3500	Clear, colourless liquid
Pluronic® PE 4300	} Clear, colourless liquids; the cloudiness at low temperatures can be reversed by heating
Pluronic® PE 6100	
Pluronic® PE 6120	
Pluronic® PE 6200	
Pluronic® PE 6400	Colourless, slightly cloudy liquid
Pluronic® PE 6800	Fine, white powder
Pluronic® PE 7400	} Colourless, clear or slightly cloudy liquids
Pluronic® PE 8100	
Pluronic® PE 9200	
Pluronic® PE 9400	White, waxy solid
Pluronic® PE 10100	Colourless, clear or slightly cloudy liquid
Pluronic® PE 10300	Liquid or semi-solid
Pluronic® PE 10400	White, waxy solid
Pluronic® PE 10500	White, waxy solid
Pluronic® PE 10500 Solution	Clear, colourless liquid

Pluronic®		PE 3100	PE 3500	PE 4300	PE 6100	PE 6120
Physical form		Liquid	Liquid	Liquid	Liquid	Liquid
Molar mass, calculated from OH number	g/mol	approx. 1000	approx. 1900	approx. 1750	approx. 2000	approx. 2100
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100
Cloud point (EN 1890)*						
Method A	°C	approx. 40	approx. 68		approx. 23	approx. 25
Method B	°C	approx. 33	approx. 58	approx. 40		
Method C	°C	approx. 26	approx. 50	approx. 31		
Method D	°C	approx. 45	approx. 79	approx. 65	approx. 37	approx. 48
Method E	°C	approx. 40	approx. 78	approx. 61	approx. 31	approx. 40
pH (EN 1262, Solution B)**		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, Method A, 23 °C)	g/cm ³	approx. 1.02	approx. 1.05	approx. 1.03	approx. 1.02	approx. 1.02
Bulk density (ISO 697)	g/l					
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa · s	approx. 175	approx. 450	approx. 400	approx. 350	approx. 400
Setting point (DIN 51583)	°C	approx. -15	approx. 12	approx. -10	approx. -30	approx. -30
Melting point	°C					
Wetting (EN 1772, 23 °C, 2 g/l soda ash, 1 g/l surfactant)	s	> 300	> 300	> 300	> 300	> 300
Surface tension*** (DIN 53914, 1 g/l, 23 °C)	mN/m	approx. 44	approx. 45	approx. 42	approx. 40	approx. 39

* Cloud point according to 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)

** The pH of the Pluronic® PE types can fall slightly in storage, but this has no effect on their performance

*** Applying Harkins-Jordan correction

Pluronic®		PE 6200	PE 6400	PE 6800	PE 7400	PE 8100	PE 9200	PE 9400
Physical form		Liquid	Liquid	Powder	Liquid	Liquid	Liquid	Waxy solid
Molar mass, calculated from OH number	g/mol	approx. 2450	approx. 2900	approx. 8000	approx. 3500	approx. 2600	approx. 3650	approx. 4600
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100
Cloud point (EN 1890) *								
Method A	°C	approx. 33	approx. 60	> 100	approx. 60	approx. 19	approx. 22	approx. 79
Method B	°C		approx. 50	approx. 88	approx. 50			approx. 67
Method C	°C		approx. 40	approx. 72	approx. 40			approx. 55
Method D	°C	approx. 60	approx. 70	approx. 90	approx. 70	approx. 42	approx. 40	approx. 77
Method E	°C	approx. 54	approx. 69	approx. 95	approx. 69	approx. 36	approx. 49	approx. 80
pH** (EN 1262, Solution B)		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, Method A, 23 °C)	g/cm ³	approx. 1.04	approx. 1.05	approx. 1.06 (70 °C)	approx. 1.05	approx. 1.03	approx. 1.03	approx. 1.03
Bulk density (ISO 697)	g/l			approx. 600				
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa · s	approx. 500	approx. 1000		approx. 1500	approx. 700	approx. 900	
Setting point (DIN 51583)	°C	approx. -12	approx. 16		approx. 20	approx. -30	approx. -3	
Melting point	°C			approx. 48				approx. 32
Wetting (EN 1772, 23 °C, 2 g/l soda ash, 1 g/l surfactant)	s	> 300	> 300	> 300	> 300	approx. 70	> 100	> 300
Surface tension*** (DIN 53914, 1 g/l, 23 °C)	mN/m	approx. 41	approx. 41	approx. 51	approx. 42	approx. 35	approx. 35	approx. 42

* Cloud point according to 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)

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*** Applying Harkins-Jordan correction

Pluronic®		PE 10100	PE 10300	PE 10400	PE 10500	PE 10500 Solution
Physical form		Liquid	Liquid	Waxy solid	Waxy solid	Liquid
Molar mass, calculated from OH number	g/mol	approx. 3500	approx. 4950	approx. 5900	approx. 6500	approx. 6500
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 18
Cloud point (EN 1890)						
Method A	°C	approx. 17	approx. 42	approx. 81	> 100	> 100
Method B	°C		approx. 32	approx. 61	approx. 75	approx. 75
Method C	°C			approx. 50		
Method D	°C	approx. 40	approx. 67	approx. 78		
Method E	°C	approx. 35	approx. 71	approx. 81		
pH** (EN 1262, Solution B)		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757,) Method A, 23 °C	g/cm ³	approx. 1.02	approx. 1.02 (60 °C)	approx. 1.03 (60 °C)	approx. 1.03 (60 °C)	approx. 1.0
Bulk density (ISO 697)	g/l					
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa · s	approx. 800	approx. 1800			approx. 10
Setting point (DIN 51583)	°C	approx. -25	approx. 15			approx. -9
Melting point	°C			approx. 34	approx. 44	
Wetting (EN 1772, 23 °C, 2 g/l soda ash, 1 g/l surfactant)	s	approx. 60	approx. 70	approx. 85	approx. 300	> 300
Surface tension *** (DIN 53914, 1 g/l, 23 °C)	mN/m	approx. 36	approx. 37	approx. 38	approx. 39	approx. 39

* Cloud point according to 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)

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*** Applying Harkins-Jordan correction

Solubility

It is a general rule that the solubility of Pluronic® PE types in water increases in step with the proportion of polyethylene glycol that they contain. If two products contain the same mass fraction of polyethylene glycol, the molar mass of the polypropylene glycol block is the determining factor, and the one with the lower molar mass will be the more soluble.

For instance, Pluronic® PE 6800 is more soluble in water than Pluronic® PE 6100, which is less soluble than Pluronic® PE 3100.

All of the Pluronic® PE types are more soluble in cold water than in hot water. As in all alkoxyates, the oxygen atoms in the ether groups form hydrogen bonds with water. The molecules gradually dissociate as the solution warms up. It is for this reason that alkoxyates have a cloud point at which they form a separate phase. Each product in the Pluronic® PE range has its own characteristic cloud point.

The solubility of the various Pluronic® PE types in different solvents is shown below.

Solubility of Pluronic® PE types at 23 °C (10% solutions)

Pluronic®	PE 3100	PE 3500	PE 4300	PE 6100	PE 6120
Distilled water	-	+	+	-	-
Caustic soda, 10%	-	+	-	-	-
Hydrochloric acid, 10%	-	+	+	-	-
Ethanol	+	+	+	+	+
Isopropanol	+	+	+	+	+
Toluene	+	+	+	+	+
White mineral spirits	+	-	-		+ opalescent

Pluronic®	PE 6200	PE 6400	PE 6800	PE 7400	PE 8100	PE 9200
Water	+	+	+	+	-	+ opalescent
Caustic soda, 10%	-	-	-	-	-	-
Hydrochloric acid, 10%	+	+	+	+	-	+ opalescent
Ethanol	+	+	+	+	-	+
Isopropanol	+	+	-	+	+	+
Toluene	+ opalescent	+	+	+	+	+
White mineral spirits	-	-	-	-	-	-

Pluronic®	PE 9400	PE 10100	PE 10300	PE 10400	PE 10500	PE 10500 Solution
Water	+ opalescent	-	-	-	+	+
Caustic soda, 10%	-	-	-	-	-	+
Hydrochloric acid, 10%	+	+	-	-	+	+
Ethanol	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+
Toluene	+	+	+	+	+ opalescent	-
White mineral spirits	-	-/+	-	-	-	-

+ = Soluble
- = Insoluble

Wetting

The most effective wetting agents contain a low proportion of polyethylene glycol, and their central polypropylene glycol block has a high molar mass. The best wetting agents in the range are Pluronic® PE 8100, PE 9200 and PE 10100.

Compatibility

The Pluronic® PE types are nonionic and therefore miscible with anionic, cationic and other nonionic surfactants. They do not react with cations such as Ca^{2+} or Mg^{2+} , which means that they can be used in hard water. They are also compatible with soluble polyanionic substances such as our Sokalan® CP types, Sokalan® PA types and carboxymethyl cellulose.

The Pluronic® PE types are fully resistant to non-oxidizing acids at the concentrations at which they are normally employed in applications such as those described below but, although they are resistant to alkalis, they are not resistant to alkalis to quite the same extent.

Processing

It is advisable to stir the surfactant into water when preparing aqueous solutions, because solutions made up in the reverse order can have a very high viscosity. Products with a high molar mass also form gels in water at certain concentrations. The relationship between viscosity and concentration is shown in the table below.

**The viscosities of aqueous solutions of Pluronic® PE types in mPa · s (approx.)
(The values below were measured at 25 °C with a Brookfield viscometer)**

Pluronic®	PE 3100	PE 3500	PE 4300	PE 6100	PE 6120
Water content (%)					
0	175	440	400	350	410
10	170	450	600	380	530
20	130	360	750	350	510
30	110	215	9000	200	370
40	90	110	400	250	250
50	60	50	150	100	150
60	25	25	40	50	75
70	10	10	10	< 10	45
80	< 10	< 10	< 10	< 10	< 10
90	< 10	< 10	< 10	< 10	< 10

Pluronic®	PE 6200	PE 6400	PE 6800	PE 7400	PE 8100	PE 9200
Water content (%)						
0	500	1000	Powder	1500	700	900
10	600	1300	> 10 ⁵	3000	1000	70000
20	650	30000	> 10 ⁵	50000	1600	> 10 ⁵
30	450	40000	> 10 ⁵	> 10 ⁵	1800	> 10 ⁵
40	300	> 10 ⁵	> 10 ⁵	> 10 ⁵	2100	> 10 ⁵
50	200	> 10 ⁵	2000	> 10 ⁵	1200	> 10 ⁵
60	50	1000	280	> 10 ⁵	500	> 10 ⁵
70	20	20	60	500	400	13000
80	< 10	< 10	30	100	50	1200
90	< 10	< 10	20	10	10	20

Pluronic®	PE 9400	PE 10100	PE 10300	PE 10400	PE 10500	PE 10500 Solution
Water content (%)						
0	> 10 ⁵	800	1800	> 10 ⁵	> 10 ⁵	10
10	> 10 ⁵	3300	> 10 ⁵	> 10 ⁵	> 10 ⁵	10
20	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	10
30	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	10
40	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	10
50	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	< 10
60	> 10 ⁵	12000	> 10 ⁵	> 10 ⁵	> 10 ⁵	< 10
70	> 10 ⁵	2300	65	> 10 ⁵	> 10 ⁵	< 10
80	30	1100	15	35	3200	< 10
90	30	30	< 10	< 10	10	< 10

The relationship between the viscosities of the Pluronic® PE types in mPa · s (approx.) and temperature is shown in the following table.

Pluronic® PE	3100	3500	4300	6100	6120	6200	6400	6800	7400	8100	9200
Temperature (°C)											
0	1000	> 10 ⁵	10 000	1800	2000	2400	> 10 ⁵	–	> 10 ⁵	3000	13 500
10	300	> 10 ⁵	2000	900	900	1200	65 000	–	> 10 ⁵	1700	1500
20	200	1200	700	400	470	500	1000	–	10000	800	900
30	100	300	300	220	280	300	500	–	1000	400	500
40	60	190	200	130	170	200	300	–	700	240	300
50	40	130	120	80	120	130	200	–	200	160	200
60	20	90	80	40	80	80	100	5000	100	100	120

Pluronic® PE	9400	10100	10300	10400	10500	10500 Solution
Temperature (°C)						
0	> 10 ⁵	5200	> 10 ⁵	> 10 ⁵	> 10 ⁵	20
10	> 10 ⁵	2500	> 10 ⁵	> 10 ⁵	> 10 ⁵	15
20	> 10 ⁵	1200	> 10 ⁵	> 10 ⁵	> 10 ⁵	15
30	> 10 ⁵	500	700	> 10 ⁵	> 10 ⁵	10
40	600	350	430	> 10 ⁵	> 10 ⁵	< 10
50	400	200	280	800	800	< 10
60	300	150	200	500	500	< 10

Storage

- The Pluronic® PE types should be kept tightly sealed in a dry place in their tightly sealed original packaging. Storerooms must not be overheated.
- The Pluronic® PE types are hygroscopic and soluble in water, with the result that they absorb moisture very quickly. Drums should be tightly resealed each time material is taken from them.
- The Pluronic® PE types should not be stored at temperatures substantially below 20 °C.
- The Pluronic® PE types can become cloudy liquids at low temperatures and/or after long periods in storage, and this can cause them to form a sediment.

This cloudiness is reversible at 50 – 60 °C. Reconstitution has no effect on their practical performance.

- Liquid that has solidified or that shows signs of precipitation should be heated to 50 – 60°C and homogenized before use.

- f) Drums that have solidified or that have begun to precipitate should be reconstituted by gentle heating, preferably in a heating cabinet. The temperature must not be allowed to exceed 50 °C. This also applies if drums are heated by external electrical elements. Internal electrical elements should not be used because of the localized anomalies in temperature that they cause.
- g) The Pluronic® PE types must be blanketed with nitrogen if they are stored in heated tanks (at approx. 50 °C) to prevent them from coming into contact with air. Constant, gentle stirring helps to prevent them being discoloured as a result of prolonged contact with electrical elements or external heating coils.
- h) Pluronic® PE 6800 should be stored in a dry place at a temperature not exceeding 25 – 30 °C. It must be protected from sunlight to ensure that it does not form lumps.

Materials

The Pluronic® PE types should be stored in tanks made from the following materials.

- a) AISI 316 Ti stainless steel
- b) AISI 321 stainless steel

Shelf life

The Pluronic® PE types have a shelf life of at least two years, provided they are stored in their original packaging and kept tightly sealed.

Applications

The polyethylene glycol content and the molar mass of the central polypropylene glycol block of surfactants of this type can be varied within wide limits, and the result is that they are exceptionally versatile. The Pluronic® PE types can be tailored to boost their wetting, dispersing or emulsifying properties as the situation requires. They can be used to reduce foam or eliminate it altogether, and they can be used as solubilizers and thickeners.

Their ability to act as impregnating agents, humectants, plasticizers and lubricants can be exploited in a variety of situations. They can be used to adjust the viscosity of other liquids, to make tacky substances more coherent, and to disperse suspended solids. They can also be employed as heat transfer fluids and hydraulic fluids in some applications.

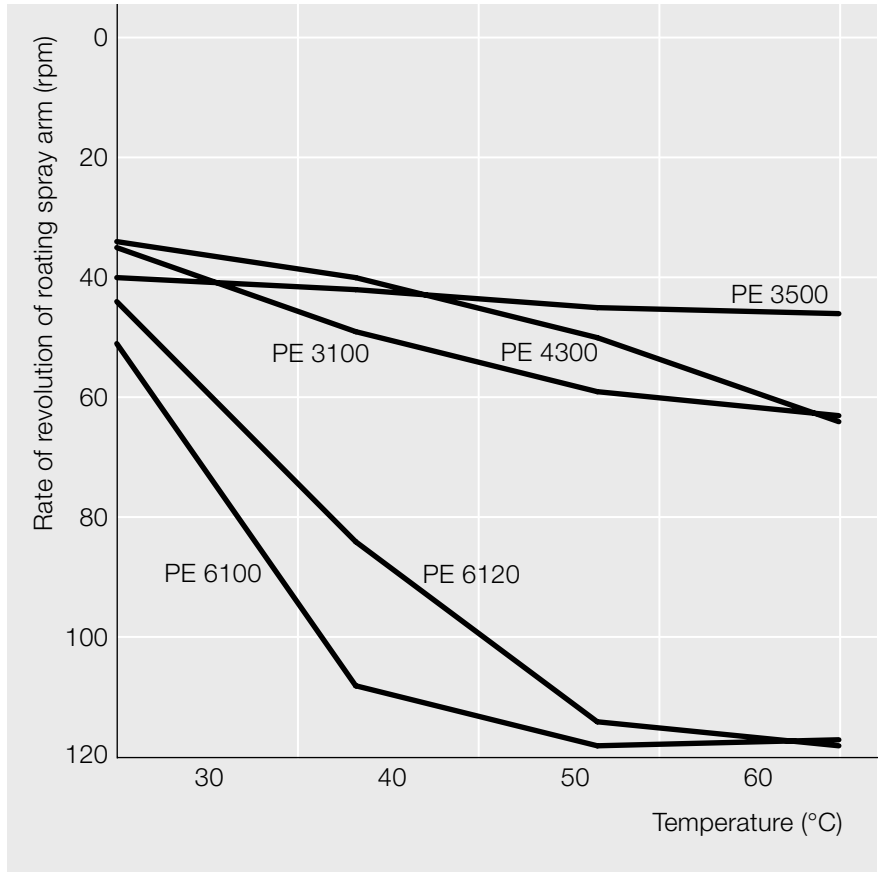
The Pluronic® PE types can be used in detergents and cleaners – in the dairy, brewery and soft drinks sectors, for instance –, in cleaners that are sprayed onto metal components to remove shavings and swarf, in the rubber and plastics industries, and in other branches of industry.

Foaming

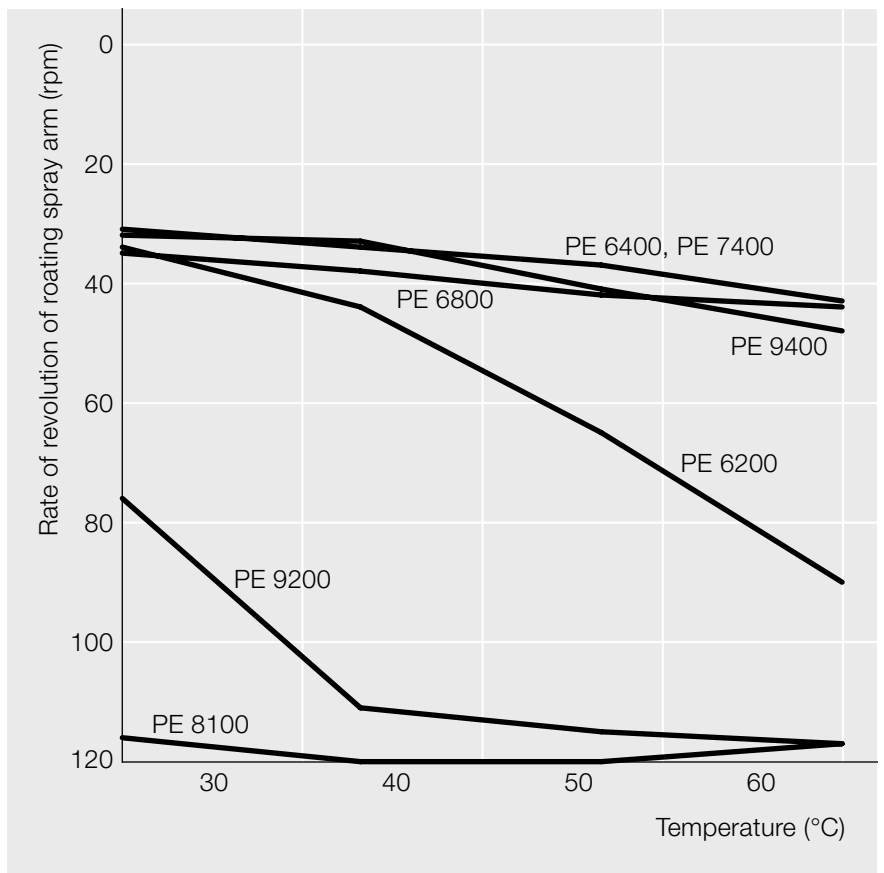
The Pluronic® PE types do not foam or, at most, they are very low-foaming. The amount of foam formed decreases in line with their polyethylene glycol content. Pluronic® PE types that contain less than 20% polyethylene glycol can be employed as antifoams.

It is difficult to predict the foaming behaviour of surfactants in advance with standard test methods because of the influence of the type of soil and machinery, different temperature settings and the effects of the other ingredients in the formulation. The results obtained by the beater method described in DIN 53902, Part 1, or the Ross-Miles method described in DIN 53902, Part 2 or ASTM D 1175-53 have to be substantiated by comparing them with results obtained by methods that correspond more closely to real conditions.

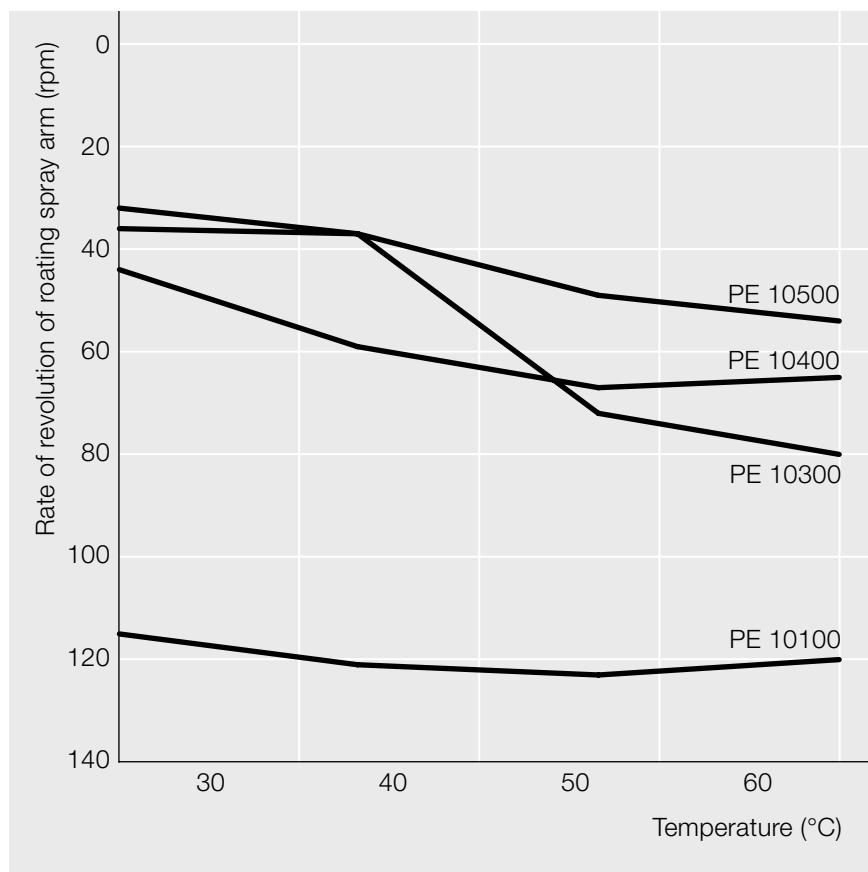
An effective method is to measure the level of foam produced in a dishwasher, because this closely corresponds to the conditions encountered in practice. The rotating spray arm is slowed down by foam: the higher the rate of revolution, the less foam is present. Foam formation can be encouraged by adding protein.



Foam curves for the Pluronic® PE types



Foam curves for the Pluronic® PE types



Foam curves for the Pluronic® PE types

The best antifoams at all temperatures are Pluronic® PE 6100, PE 6120, PE 8100 and PE 10100, all of which are insoluble in water at room temperature.

Pluronic® PE 3100

Pluronic® PE 3100 can be used to disperse dyes and pigments, and it can be employed as an antifoam in many situations.

**Pluronic® PE 3500
Pluronic® PE 4300**

The main area of application for Pluronic® PE 4300 is in dishwasher detergents and rinse aids, either alone or in combination with other Pluronic® PE types. It is low-foaming, and it often performs very well in combination with Pluronic® PE 3100. Pluronic® PE 3500 and are used in formulations for textile auxiliaries.

**Pluronic® PE 6100
Pluronic® PE 6120**

Pluronic® PE 6100 and Pluronic® PE 6120 can be employed in situations in which foam is a nuisance, such as in domestic dishwashers and industrial bottle-washing machines. They suppress foam very well, even in the presence of protein, starch or size. It is sometimes advisable to use them in combination with other Pluronic® PE types or with Plurafac® LF types.

Pluronic® PE 6100 and Pluronic® PE 6120 can also be used to defoam metal cleaning baths, acid dye baths and boiler feed water.

Pluronic® PE 6200

Pluronic® PE 6200 is an effective, low-foaming wetting agent. It is mainly used in mechanical cleaning processes. It can be employed in rinse aids to allow water to run off glass and crockery more easily, and to improve their gloss. Its high wetting power is particularly useful in phosphating baths.

Pluronic® PE 6200 can be used to emulsify monomers such as vinyl and acrylic monomers in polymerization processes, and it can also be used to break crude-oil emulsions.

Pluronic® PE 6400

Pluronic® PE 6400 has the highest detergency of all the products in the Pluronic® PE range, and it is low-foaming. It performs particularly well in applications that involve intensive mechanical action, i. e. in dishwashers and industrial bottle-washing machines. It can also be used in dairy cleaners.

Pluronic® PE 6400 has a very high dispersing capacity for sparingly soluble calcium and magnesium salts.

Other areas of application include cutting and grinding fluids for metal, where it acts as a lubricant and coolant. Like Pluronic® PE 6200, it is used as an emulsifier in polymerization processes.

Pluronic® PE 6800

Pluronic® PE 6800 is supplied in the form of very fine beads. It is a very appropriate choice for use in powder-type detergents and cleaners if surfactants cannot be sprayed on in liquid or paste form. It is easy to blend with other powders, and it has the added advantage that it binds dust.

It can be used to disperse suspended calcium and magnesium salts, and to remove and disperse soil in acid pickling baths. Because it is nonionic, it can be used for cleaning metal electrolytically.

Pluronic® PE 6800 can also be employed to solubilize essential oils and to emulsify monomers.

Pluronic® PE 8100

Pluronic® PE 8100 can be employed as a detergent and antifoam in cleaning applications in which lots of mechanical energy needs to be applied. Synergistic effects can often be obtained if it is combined with other low-foaming surfactants. Typical areas of application include dishwasher detergents, cleaners for the dairy and brewery sectors, and rinse aids.

Pluronic® PE 9200

Pluronic® PE 9200 can be used in all cleaning processes in which quick, thorough wetting is essential. It can be used in household and institutional dishwasher detergents, either alone or in combination with Plurafac® LF or other Pluronic® PE types. Pluronic® PE 9200 can be added to acidic rinse aids to prevent dull spots and streaks being formed by water droplets, and it imparts a high gloss to crockery and glass.

**Pluronic® PE 7400
Pluronic® PE 9400**

Pluronic® PE 9400 is used in industrial applications as an emulsifier for mineral oil and for dispersing solids in water.

It can also be used together with other Pluronic® PE types in dishwashers, bottle-washing machines, dairy equipment and in other applications of this type that involve intensive mechanical action. Like many other products in the Pluronic® PE range, it has a high dispersing capacity for calcium and magnesium salts.

Pluronic® PE 10100

Pluronic® PE 10100 is an effective wetting agent for use in dishwasher detergents and rinse aids. It is very low-foaming, and it suppresses the foam formed by other surfactants.

It can also be employed as a demulsifier.

**Pluronic® PE 10300
Pluronic® PE 10400
Pluronic® PE 10500
Pluronic® PE 10500 Solution**

Many different types of household and industrial cleaners can be formulated with mixtures of these products and other Pluronic® PE types, Pluronic® RPE 3110 or Plurafac® LF types.

These products product are also employed as emulsifiers for monomers and for pesticides.

Formulations

Suggested formulations containing Pluronic® PE types are given in the following Technical Information leaflets.

Dishwasher detergents (TI/ES 1187)

Specialty chemicals for metal pretreatment (TI/ES 1038)

Safety

We know of no ill effects that could have resulted from using the Pluronic® PE types for the purpose for which they are intended and from processing them in accordance with current practice.

According to the experience we have gained over many years and other information at our disposal, the Pluronic® PE types do not exert any harmful effects on health, provided that they are used properly, due attention is given to the precautions necessary for handling chemicals, and the information and advice given in our safety data sheets are observed.

Handling

All contact with the eyes and prolonged contact with the skin should be avoided. Safety glasses must be worn when handling these products in their undiluted form. Air extraction equipment should be available if there is a danger of aerosols being formed.

Labelling

Please refer to latest Safety Data Sheet for detailed information on product safety.

Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out their own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed.

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