Technical Information

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Last change WF-No. 3809

Plurafac® LF types

® = Registered trademark of BASF

Plurafac® LF 120
Plurafac® LF 131
Plurafac® LF 132
Plurafac® LF 220
Plurafac® LF 221
Plurafac® LF 223
Plurafac® LF 224
Plurafac® LF 231
Plurafac® LF 300
Plurafac® LF 301
Plurafac® LF 303
Plurafac® LF 305
Plurafac® LF 400
Plurafac® LF 401
Plurafac® LF 403
Plurafac® LF 404
Plurafac® LF 405
Plurafac® LF 431
Plurafac® LF 500
Plurafac® LF 600
Plurafac® LF 711
Plurafac® LF 7319
Plurafac® LF 900
Plurafac® LF 901
Plurafac® LF 1300
Plurafac® LF 1430

Low-foaming nonionic surfactants

BASF
The Chemical Company

Chemical nature

The Plurafac® LF types are low-foaming nonionic surfactants.

They consist of alkoxylated, predominantly unbranched fatty alcohols, and they contain higher alkene oxides alongside ethylene oxide.

The fatty alcohol chains of Plurafac® LF 131, LF 132, LF 231 and LF 431 terminate in an alkyl group.

Plurafac® LF 7319 and Plurafac® LF 1430 are special alkoxylate.

PRD-Nos.*

30044042	Plurafac® LF 120
30044039	Plurafac® LF 131
30044048	Plurafac® LF 132
30044050	Plurafac® LF 220
30044056	Plurafac® LF 221
30044063	Plurafac® LF 223
30044064	Plurafac® LF 224
30044031	Plurafac® LF 231
30044951	Plurafac® LF 300
30063172	Plurafac® LF 301
30079911	Plurafac® LF 303
30082057	Plurafac® LF 305
30044021	Plurafac® LF 400
30044053	Plurafac® LF 401
30044016	Plurafac® LF 403
30044054	Plurafac® LF 404
30044055	Plurafac® LF 405
30044045	Plurafac® LF 431
30044065	Plurafac® LF 500
30044066	Plurafac® LF 600
30044129	Plurafac® LF 711
30273266	Plurafac® LF 7319
30273370	Plurafac® LF 900
30273371	Plurafac® LF 901
30044040	Plurafac® LF 1300
30044049	Plurafac® LF 1430

* BASF's commercial product numbers.

Properties

The Plurafac® LF types are clear or slightly cloudy, colorless to yellow liquids. Their most important properties are shown in the table overleaf.

The figures quoted in the table are averages from a representative sample of batches.

The properties of the Plurafac® LF types

Plurafac®		**LF 120**	**LF 131**	**LF 132**	**LF 220**	**LF 221**	**LF 223**	**LF 224**	**LF 231**	**LF 300**
Physical form (23 °C)		liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 95	approx. 95	approx. 98	approx. 100	approx. 100	approx. 100
Water content (EN 13267)	%	–	–	–	approx. 5	approx. 5	approx. 2	–	–	–
Cloud point (EN 1890)*										
Method A	°C	approx. 28	–	–	approx. 42	approx. 34	–	–	–	approx. 22
Method B	°C	–	–	–	approx. 32	approx. 24	–	–	–	–
Method C	°C	–	–	–	–	–	–	–	–	–
Method D	°C	approx. 48	approx. 42	approx. 38	approx. 52	approx. 48	approx. 41	approx. 35	approx. 35	approx. 53
Method E	°C	approx. 43	approx. 36	approx. 31	approx. 48	approx. 44	approx. 34	approx. 27	approx. 28	approx. 48
Water number (EN 12836)	ml	approx. 20	approx. 15	approx. 10	approx. 18	approx. 17	approx. 14	approx. 13	approx. 12	approx. 19
pH value (EN 1262, solution B)**		approx. 6	approx. 6	approx. 6	approx. 7	approx. 7	approx. 7	approx. 7	approx. 6	approx. 7
Density (DIN 51757, 23 °C)	g/cm^3	approx. 0.99	approx. 0.98	approx. 0.92	approx. 1.01	approx. 1.00	approx. 0.97	approx. 0.96	approx. 0.96	approx. 0.97
Setting point (DIN 51583)	°C	approx. 5	approx. -5	approx. -5	approx. 10	approx. 5	approx. -2	approx. -5	approx. -5	approx. -30
Viscosity (EN 12092, Brookfield LVT)										
at 23 °C	mPa·s	approx. 60	approx. 40	approx. 5	approx. 150	approx. 100	approx. 70	approx. 55	approx. 45	approx. 75
at 10 °C	mPa·s	approx. 4000	approx. 100	approx. 80	>10^5	approx. 5000	approx. 110	approx. 110	approx. 100	approx. 140
at 0 °C	mPa·s	>10^5	approx. 500	approx. 200	solid	>10^5	approx. 4000	approx. 3500	approx. 400	approx. 250
Wetting (EN 1772, dist. water, 2 g soda ash/l)										
23 °C 0.5 g surfactant/l	s	approx. 60	approx. 50	approx. 120	approx. 70	approx. 75	approx. 220	>300	approx. 100	approx. 40
23 °C 1 g surfactant/l	s	approx. 25	approx. 25	approx. 70	approx. 30	approx. 30	approx. 130	approx. 240	approx. 40	approx. 15
23 °C 2 g surfactant/l	s	approx. 5	approx. 50	approx. 20	approx. 10	approx. 15	approx. 60	approx. 200	approx. 20	approx. 5
70 °C 0.5 g surfactant/l	s	approx. 100	>300	>300	approx. 250	>300	>300	>300	>300	approx. 130
70 °C 1 g surfactant/l	s	approx. 70	approx. 100	>300	approx. 160	>300	>300	>300	>300	approx. 100
70 °C 2 g surfactant/l	s	approx. 40	approx. 60	approx. 70	approx. 90	approx. 100	>300	approx. 180	>300	approx. 80
Surface tension (EN 14370,1 g/l dist. water, 23 °C)***	mN/m	approx. 28	approx. 29	approx. 29	approx. 31	approx. 30	approx. 29	approx. 30	approx. 29	approx. 28

* *Cloud point according to EN 1890:*
Method A: 1 g of surfactant + 100 g of dist. Water
Method B: 1 g of surfactant + 100 g of NaCl solution (c = 50 g/l)
Method C: 1 g of surfactant + 100 g of NaCl solution (c = 100 g/l)
Method D: 5 g of surfactant + 45 g of butyldiglycol solution (c = 250 g/l)
Method E: 5 g of surfactant + 25 g of butyldiglycol solution (c = 250 g/l)

** *The Plurafac® LF types can undergo a decrease in pH during storage, but this does not affect their performance.*

*** *Applying Harkins-Jordan correction.*

The properties of the Plurafac® LF types

Plurafac®		**LF 301**	**LF 303**	**LF 305**	**LF 400**	**LF 401**	**LF 403**	**LF 404**	**LF 405**	**LF 431**
Physical form (23 °C)		liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100	approx. 100	approx. 95	approx. 100
Water content (EN 13267)	%	–	–	–	–	–	–	–	approx. 5	–
Cloud point (EN 1890)*										
Method A	°C	–	–	–	approx. 33	approx. 74	–	–	–	–
Method B	°C	–	–	–	–	approx. 60	–	–	–	–
Method C	°C	–	–	–	–	approx. 48	–	–	–	–
Method D	°C	approx. 41	approx. 35	approx. 44	approx. 54	approx. 70	approx. 51	approx. 52	approx. 60	approx. 46
Method E	°C	approx. 32	approx. 29	approx. 38	approx. 49	approx. 69	approx. 41	approx. 45	approx. 55	approx. 40
Water number (EN 12836)	ml	approx. 14	approx. 14	approx. 19	approx. 18	approx. 25	approx. 13	approx. 14	approx. 15	approx. 13
pH value (EN 1262, solution B)**		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 6
Density (DIN 51757, 23 °C)	g/cm^3	approx. 0.97	approx. 1.02	approx. 1.01	approx. 0.97	approx. 1.03	approx. 0.95	approx. 0.96	approx. 0.97	approx. 0.96
Setting point (DIN 51583)	°C	approx. -20	approx. -20	approx. 5	approx. -2	approx. -5	approx. -25	approx. -20	approx. -25	approx. -5
Viscosity (EN 12092, Brookfield LVT)										
at 23 °C	mPa·s	approx. 150	approx. 350	approx. 110	approx. 70	approx. 170	approx. 60	approx. 70	approx. 85	approx. 45
at 10 °C	mPa·s	approx. 300	approx. 700	approx. 1400	approx. 170	approx. 1700	approx. 120	approx. 130	approx. 200	approx. 70
at 0 °C	mPa·s	approx. 550	approx. 1500	>10^5	>10^5	approx. 4500	approx. 250	approx. 250	approx. 350	approx. 120
Wetting (EN 1772, dist. water, 2 g soda ash/l)										
23 °C 0.5 g surfactant/l	s	approx. 55	>300	approx. 55	approx. 70	approx. 200	>300	approx. 150	approx. 190	approx. 85
23 °C 1 g surfactant/l	s	approx. 30	approx. 150	approx. 20	approx. 25	approx. 110	>300	approx. 70	approx. 90	approx. 30
23 °C 2 g surfactant/l	s	approx. 10	approx. 40	approx. 5	approx. 10	approx. 60	>300	approx. 30	approx. 50	approx. 15
70 °C 0.5 g surfactant/l	s	approx. 150	>300	approx. 100	>300	approx. 90	>300	>300	>300	>300
70 °C 1 g surfactant/l	s	approx. 60	>300	approx. 60	approx. 220	approx. 40	>300	>300	>300	>300
70 °C 2 g surfactant/l	s	approx. 20	>300	approx. 20	approx. 75	approx. 25	>300	>300	>300	>300
Surface tension (EN 14370, 1 g/l dist. water, 23 °C)***	mN/m	approx. 31	approx. 36	approx. 29	approx. 29	approx. 34	approx. 30	approx. 29	approx. 29	approx. 30

* *Cloud point according to EN 1890:*
Method A: 1 g of surfactant + 100 g of dist. Water
Method B: 1 g of surfactant + 100 g of NaCl solution (c = 50 g/l)
Method C: 1 g of surfactant + 100 g of NaCl solution (c = 100 g/l)
Method D: 5 g of surfactant + 45 g of butyldiglycol solution (c = 250 g/l)
Method E: 5 g of surfactant + 25 g of butyldiglycol solution (c = 250 g/l)

** *The Plurafac® LF types can undergo a decrease in pH during storage, but this does not affect their performance.*

*** *Applying Harkins-Jordan correction.*

The properties of the Plurafac® LF types

Plurafac®		**LF 500**	**LF 600**	**LF 711**	**LF 7319**	**LF 900**	**LF 901**	**LF 1300**	**LF 1430**
Physical form (23 °C)		liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 90	approx. 100	approx. 100	approx. 100	approx. 100
Water content (EN 13267)	%	–	–	–	approx. 10	–	–	–	–
Cloud point (EN 1890)*									
Method A	°C	–	approx. 55	approx. 36	–	–	approx. 38	–	approx. 35
Method B	°C	–	approx. 44	approx. 27	–	–	approx. 30	–	approx. 26
Method C	°C	–	approx. 34	–	–	–	–	–	–
Method D	°C	approx. 38	approx. 60	approx. 49	approx. 53	approx. 46	approx. 53	approx. 26	approx. 40
Method E	°C	approx. 32	approx. 58	approx. 45	approx. 51	approx. 39	approx. 48	approx. 21	approx. 36
Water number (EN 12836)	ml	approx. 14	approx. 20	approx. 19	n.b.	approx. 18	approx. 20	approx. 10	approx. 18
pH value (EN 1262, solution B)**		approx. 7	approx. 7	approx. 7	approx. 6	approx. 7	approx. 7	approx. 7	approx. 8
Density (DIN 51757, 23 °C)	g/cm^3	approx. 0.96	approx. 1.00	approx. 0.99	approx. 1.05	approx. 0.99	approx. 1.01	approx. 0.97	approx. 1.03
Setting point (DIN 51583)	°C	approx. -20	approx. -25	approx. -40	approx. 10	approx. -20	approx. -15	approx. -5	approx. -25
Viscosity (EN 12092, Brookfield LVT)									
at 23 °C	mPa·s	approx. 65	approx. 120	approx. 80	approx. 400	approx. 85	approx. 130	approx. 130	approx. 450
at 10 °C	mPa·s	approx. 120	approx. 250	approx. 150	>10^5	approx. 250	approx. 300	approx. 280	approx. 1100
at 0 °C	mPa·s	approx. 220	approx. 500	approx. 270	solid	approx. 700	approx. 600	approx. 500	approx. 2300
Wetting (EN 1772, dist. water, 2 g soda ash/l)									
23 °C 0.5 g surfactant/l	s	approx. 140	approx. 130	approx. 70	approx. 170	approx. 50	approx. 80	>300	>300
23 °C 1 g surfactant/l	s	approx. 50	approx. 60	approx. 25	approx. 100	approx. 20	approx. 30	>300	>300
23 °C 2 g surfactant/l	s	approx. 20	approx. 30	approx. 10	approx. 55	approx. 5	approx. 10	approx. 190	>300
70 °C 0.5 g surfactant/l	s	>300	>300	>300	>300	approx. 250	>300	>300	>300
70 °C 1 g surfactant/l	s	>300	approx. 90	approx. 90	approx. 200	approx. 170	approx. 150	>300	>300
70 °C 2 g surfactant/l	s	approx. 220	approx. 45	approx. 40	approx. 120	approx. 70	approx. 80	>300	>300
Surface tension (EN 14370,1 g/l dist. water, 23 °C)***	mN/m	approx. 30	approx. 32	approx. 30	approx. 31	approx. 30	approx. 29	approx. 32	approx. 42

* *Cloud point according to EN 1890:*
Method A: 1 g of surfactant + 100 g of dist. Water
Method B: 1 g of surfactant + 100 g of NaCl solution (c = 50 g/l)
Method C: 1 g of surfactant + 100 g of NaCl solution (c = 100 g/l)
Method D: 5 g of surfactant + 45 g of butyldiglycol solution (c = 250 g/l)
Method E: 5 g of surfactant + 25 g of butyldiglycol solution (c = 250 g/l)

** *The Plurafac® LF types can undergo a decrease in pH during storage, but this does not affect their performance.*

*** *Applying Harkins-Jordan correction.*

The above information 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.

Solubility

The solubility of the Plurafac® LF types increases in line with their cloud point. Products with a cloud point below room temperature can be made to form clear solutions by adding solubilizers such as alcohols, glycols or sodium cumene sulfonate.
The solubility of the Plurafac® LF types in various solvents is shown below.

The solubility of the Plurafac® LF types (10% at 23 °C)

Plurafac®	LF 120	LF 131	LF 132	LF 220	LF 221	LF 223	LF 224	LF 231	LF 300
Dist. water	+	–	–	+	+	–	–	–	–
Potable water	+	–	–	+	+	–	–	–	–
Caustic soda, 5%	–	–	–	–	–	–	–	–	–
Hydrochloric acid, 5%	+	–	–	+	+	–	–	–	+
Salt solution, 5%	–	–	–	+	+	–	–	–	O
Mineral spirit	+	+	+	+	+	+	O	+	+
Spindle oil	+	+	+	–	±	+	O	+	+
Ethanol	+	+	+	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	–	–	O	–	+	±

Plurafac®	LF 301	LF 303	LF 305	LF 400	LF 401	LF 403	LF 404	LF 405	LF 431
Dist. water	–	–	O	+	+	–	–	–	–
Potable water	–	–	O	+	+	–	–	–	–
Caustic soda, 5%	–	–	–	–	–	–	–	–	–
Hydrochloric acid, 5%	–	–	+	+	+	–	–	–	–
Salt solution, 5%	–	–	–	–	+	–	–	–	–
Mineral spirit	O	+	+	+	–	+	+	+	+
Spindle oil	O	O	O	+	–	+	O	+	+
Ethanol	+	+	+	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	O	O	+	±	+	+	+	–	+

Plurafac®	LF 500	LF 600	LF 711	LF 7319	LF 900	LF 901	LF 1300	LF 1430
Dist. water	–	+	+	–	+	+	–	+
Potable water	–	+	+	–	+	+	–	+
Caustic soda, 5%	–	–	–	–	–	–	–	–
Hydrochloric acid, 5%	–	+	+	+	+	+	–	O
Salt solution, 5%	–	+	+	–	–	+	–	–
Mineral spirit	+	+	+	–	O	O	+	±
Spindle oil	+	+	+	O	O	O	+	±
Ethanol	+	+	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	+	O	+	±	O	O	+	+

+ = *clear soluble*
– = *insoluble*
± = *sparingly soluble*
O = *opalescent solution*

Viscosity

It is advisable to stir the surfactant into water when preparing aqueous solutions of Plurafac® LF types. The viscosity of solutions made up in the reverse order can be too high at certain concentrations. The relationship between the viscosity and water addition of solutions of Plurafac® LF types is shown in the tables below.

The viscosity of mixtures of Plurafac® LF types and water (Brookfield LVT, 23 °C, in mPa·s)

Plurafac®	LF 120	LF 131	LF 132	LF 220	LF 221	LF 223	LF 224	LF 231	LF 300
Addition of water (%)									
0	60	40	25	150	100	70	55	45	75
10	80	50	40	180	160	110	80	70	90
20	90	60	280	200	170	110	90	80	110
30	80	60	380	230	180	100	90	80	230
40	70	50	350	320	190	90	100	60	$>10^5$
50	60	40	90	300	190	70	120	60	4800
60	40	30	30	140	120	60	110	50	220
70	30	20	<20	30	50	50	40	30	80
80	<20	<20	<20	<20	<20	30	<20	20	70
90	<20	<20	<20	<20	<20	<20	<20	<20	40

Plurafac®	LF 301	LF 303	LF 305	LF 400	LF 401	LF 403	LF 404	LF 405	LF 431
Addition of water (%)									
0	150	350	110	70	170	60	70	85	45
10	240	490	120	100	250	120	110	150	70
20	340	480	110	130	340	230	150	220	80
30	370	410	100	170	570	310	150	630	90
40	410	320	90	230	$>10^5$	360	1540	27500	100
50	30	270	70	240	$>10^5$	500	2400	45000	130
60	<20	40	40	230	$>10^5$	270	$>10^5$	$>10^5$	110
70	<20	<20	30	170	120	60	21000	47000	30
80	<20	<20	<20	50	<20	<20	440	350	<20
90	<20	<20	<20	<20	<20	<20	20	20	<20

Plurafac®	LF 500	LF 600	LF 711	LF 7319	LF 900	LF 901	LF 1300	LF 1430
Addition of water (%)								
0	65	120	80	400	85	130	130	450
10	90	180	110	70	105	155	180	540
20	95	230	110	80	100	145	210	400
30	90	340	100	85	90	130	260	260
40	80	$>10^5$	90	80	75	105	300	150
50	60	$>10^5$	80	80	60	85	<20	70
60	50	390	60	65	45	60	<20	30
70	30	60	20	45	30	30	<20	<20
80	<20	<20	<20	40	20	20	<20	<20
90	<20	<20	<20	30	<20	<20	<20	<20

Storage

a) The Plurafac® LF types should be stored indoors in their original packaging, which should be kept tightly sealed.

b) The Plurafac® LF 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.

c) The storage temperature should not be allowed to fall substantially below 20 °C, and storerooms must not be overheated.

d) The Plurafac® LF types can become cloudy if they are stored at low temperatures, but this has no effect on their performance.
The cloudiness can be dissipated by heating them to 40 – 50 °C

e) Liquid that has solidified or that shows signs of precipitation should be heated to approx. 40 – 50 °C before it is processed.

f) Drums that have solidified or that have begun to form a sediment should be reconstituted by gentle heating, preferably in a heating cabinet. The temperature must not be allowed to exceed 50 – 60 °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 Plurafac® LF 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. Gentle, constant stirring helps to prevent them being discoloured as a result of prolonged contact with electrical elements or external heating coils.

Materials

The following materials can be used for tanks and drums:

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

Shelf life

Provided they are stored properly and drums are kept tightly sealed, the Plurafac® LF types have a shelf life of at least two years in their original packaging.

Safety

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

According to the experience that we have gained over many years and other information at our disposal, Plurafac® LF types do not exert harmful effects on health, provided 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.

Labelling

Please consult the current Safety Data Sheets for information on the classification and labelling of our products and other information relevant to safety.

Note

March 2014