BASF
The Chemical Company

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Plurafac® LF types

Plurafac LF 120
Plurafac LF 131
Plurafac LF 132
Plurafac LF 220
Plurafac LF 221
Plurafac LF 223
Plurafac LF 224
Plurafac LF 226
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 731
Plurafac LF 7319
Plurafac LF 900
Plurafac LF 901
Plurafac LF 1300
Plurafac LF 1430
Plurafac LF 1530

Low-foaming nonionic surfactants

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, LF 431 and LF 1530 terminate in an alkyl group.

Plurafac LF 731, 7319 and Plurafac LF 1430 are special alkoxylate.

Properties

The Plurafac LF types – with exemption of Plurafac LF 731 – are clear or slightly cloudy 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 226	LF 231
Physical form (23 °C)		liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid	liquid
Concentration	%	ca. 100	ca. 100	ca. 100	ca. 95	ca. 95	ca. 98	ca. 100	ca. 100	ca. 100
Water content (EN 13267)	%				ca. 5	ca. 5	ca. 2			
Cloud point (EN 1890)*										
Method A	°C	ca. 28	–	–	ca. 42	ca. 34	–	–	ca. 29	–
Method B	°C	–	–	–	ca. 32	ca. 24	–	–	–	–
Method C	°C	–	–	–	–	–	–	–	–	–
Method D	°C	ca. 48	ca. 42	ca. 38	ca. 52	ca. 48	ca. 41	ca. 35	ca. 46	ca. 35
Method E	°C	ca. 43	ca. 36	ca. 31	ca. 48	ca. 44	ca. 34	ca. 27	ca. 40	ca. 28
Water number (EN 12836)	ml	ca. 20	ca. 15	ca. 10	ca. 18	ca. 17	ca. 14	ca. 13	ca. 17	ca. 12
pH value (EN 1262, solution B)**		ca. 6	ca. 6	ca. 6	ca. 7	ca. 7	ca. 7	ca. 7	ca. 6	ca. 6
Density (DIN 51757, 23 °C)	g/cm^3	ca. 0.99	ca. 0.98	ca. 0.92	ca. 1.01	ca. 1.00	ca. 0.97	ca. 0.96	ca. 1.00	ca. 0.96
Setting point (DIN 51583)	°C	ca. 5	ca. −5	ca. −5	ca. 10	ca. 5	ca. −2	ca. −5	ca. −2	ca. −5
Viscosity (EN 12092, Brookfield LVT)										
at 23 °C	mPa · s	ca. 60	ca. 40	ca. 25	ca. 150	ca. 100	ca. 70	ca. 55	ca. 120	ca. 45
at 10 °C	mPa · s	ca. 4000	ca. 100	ca. 80	> 10^5	ca. 5000	ca. 110	ca. 110	ca. 3000	ca. 100
at 0 °C	mPa · s	> 10^5	ca. 500	ca. 200	solid	> 10^5	ca. 4000	ca. 3500	> 10^5	ca. 400
Wetting (EN 1772, dist. water, 2 g soda ash/l)										
23 °C 0.5 g surfactant/l	s	ca. 60	ca. 50	ca. 120	ca. 70	ca. 75	ca. 220	> 300	ca. 50	ca. 100
23 °C 1 g surfactant/l	s	ca. 25	ca. 25	ca. 70	ca. 30	ca. 30	ca. 130	ca. 240	ca. 30	ca. 40
23 °C 2 g surfactant/l	s	ca. 5	ca. 50	ca. 20	ca. 10	ca. 15	ca. 60	ca. 200	ca. 10	ca. 20
70 °C 0.5 g surfactant/l	s	ca. 100	> 300	> 300	ca. 250	> 300	> 300	> 300	> 300	> 300
70 °C 1 g surfactant/l	s	ca. 70	ca. 100	> 300	ca. 160	> 300	> 300	> 300	> 300	> 300
70 °C 2 g surfactant/l	s	ca. 40	ca. 60	ca. 70	ca. 90	ca. 100	> 300	ca. 180	ca. 120	> 300
Surface tension (EN 14370, 1 g/l dist. water, 23 °C)***	mN/m	ca. 28	ca. 29	ca. 29	ca. 31	ca. 30	ca. 29	ca. 30	ca. 29	ca. 29

* 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 300	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	liquid
Concentration	%	ca. 100	ca. 100	ca. 100	ca. 100	ca. 100	ca. 100	ca. 100	ca. 100	ca. 95	ca. 100
Water content (EN 13267)	%									ca. 5	
Cloud point (EN 1890)*											
Method A	°C	ca. 22	–	–	–	ca. 33	ca. 74	–	–	–	–
Method B	°C	–	–	–	–	–	ca. 60	–	–	–	–
Method C	°C	–	–	–	–	–	ca. 48	–	–	–	–
Method D	°C	ca. 53	ca. 41	ca. 35	ca. 44	ca. 54	ca. 70	ca. 51	ca. 52	ca. 60	ca. 46
Method E	°C	ca. 48	ca. 32	ca. 29	ca. 38	ca. 49	ca. 69	ca. 41	ca. 45	ca. 55	ca. 40
Water number (EN 12836)	ml	ca. 19	ca. 14	ca. 14	ca. 19	ca. 18	ca. 25	ca. 13	ca. 14	ca. 15	ca. 13
pH value (EN 1262, solution B)**		ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 6
Density (DIN 51757, 23 °C)	g/cm^3	ca. 0.97	ca. 0.97	ca. 1.02	ca. 1.01	ca. 0.97	ca. 1.03	ca. 0.95	ca. 0.96	ca. 0.97	ca. 0.96
Setting point (DIN 51583)	°C	ca. −30	ca. −20	ca. −20	ca. 5	ca. −2	ca. −5	ca. −25	ca. −20	ca. −25	ca. −5
Viscosity (EN 12092, Brookfield LVT)											
at 23 °C	mPa·s	ca. 75	ca. 150	ca. 350	ca. 110	ca. 70	ca. 170	ca. 60	ca. 70	ca. 85	ca. 45
at 10 °C	mPa·s	ca. 140	ca. 300	ca. 700	ca. 1400	ca. 170	ca. 1700	ca. 120	ca. 130	ca. 200	ca. 70
at 0 °C	mPa·s	ca. 250	ca. 550	ca. 1500	$>10^5$	$>10^5$	ca. 4500	ca. 250	ca. 250	ca. 350	ca. 120
Wetting (EN 1772, dist. water, 2 g soda ash/l)											
23 °C 0.5 g surfactant/l	s	ca. 40	ca. 55	>300	ca. 55	ca. 70	ca. 200	>300	ca. 150	ca. 190	ca. 85
23 °C 1 g surfactant/l	s	ca. 15	ca. 30	ca. 150	ca. 20	ca. 25	ca. 110	>300	ca. 70	ca. 90	ca. 30
23 °C 2 g surfactant/l	s	ca. 5	ca. 10	ca. 40	ca. 5	ca. 10	ca. 60	>300	ca. 30	ca. 50	ca. 15
70 °C 0.5 g surfactant/l	s	ca. 130	ca. 150	>300	ca. 100	>300	ca. 90	>300	>300	>300	>300
70 °C 1 g surfactant/l	s	ca. 100	ca. 60	>300	ca. 60	ca. 220	ca. 40	>300	>300	>300	>300
70 °C 2 g surfactant/l	s	ca. 80	ca. 20	>300	ca. 20	ca. 75	ca. 25	>300	>300	>300	>300
Surface tension (EN 14370, 1 g/l dist. water, 23 °C)***	mN/m	ca. 28	ca. 31	ca. 36	ca. 29	ca. 29	ca. 34	ca. 30	ca. 29	ca. 29	ca. 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 731	LF 7319	LF 900	LF 901	LF 1300	LF 1430	LF 1530
Physical form (23 °C)		liquid	liquid	liquid	solid	liquid	liquid	liquid	liquid	liquid	liquid
Concentration	%	ca. 100	ca. 100	ca. 100	ca. 100	ca. 90	ca. 100	ca. 100	ca. 100	ca. 100	ca. 100
Water content (EN 13267)	%					ca. 10					
Cloud point (EN 1890)*											
Method A	°C	–	ca. 55	ca. 36	–	–	–	ca. 38	–	ca. 35	ca. 31
Method B	°C	–	ca. 44	ca. 27	–	–	–	ca. 30	–	ca. 26	–
Method C	°C	–	ca. 34	–	–	–	–	–	–	–	–
Method D	°C	ca. 38	ca. 60	ca. 49	ca. 53	ca. 53	ca. 46	ca. 53	ca. 26	ca. 40	ca. 56
Method E	°C	ca. 32	ca. 58	ca. 45	ca. 51	ca. 51	ca. 39	ca. 48	ca. 21	ca. 36	ca. 51
Water number (EN 12836)	ml	ca. 14	ca. 20	ca. 19	n.b.	n.b.	ca. 18	ca. 20	ca. 10	ca. 18	ca. 17
pH value (EN 1262, solution B)**		ca. 7	ca. 7	ca. 7	ca. 6	ca. 6	ca. 7	ca. 7	ca. 7	ca. 8	ca. 6
Density (DIN 51757, 23 °C)	g/cm^3	ca. 0.96	ca. 1.00	ca. 0.99	ca. 1.02 (60°C)	ca. 1.05	ca. 0.99	ca. 1.01	ca. 0.97	ca. 1.03	ca. 1.03
Setting point (DIN 51583)	°C	ca. –20	ca. –25	ca. –40		ca. 10	ca. –20	ca. –15	ca. –5	ca. –25	ca. –2
Viscosity (EN 12092, Brookfield LVT)											
at 23 °C	mPa·s	ca. 65	ca. 120	ca. 80	fest	ca. 400	ca. 85	ca. 130	ca. 130	ca. 450	ca. 350
at 10 °C	mPa·s	ca. 120	ca. 250	ca. 150	fest	$>10^5$	ca. 250	ca. 300	ca. 280	ca. 1100	ca. 860
at 0 °C	mPa·s	ca. 220	ca. 500	ca. 270	fest	fest	ca. 700	ca. 600	ca. 500	ca. 2300	ca. 4000
Wetting (EN 1772, dist. water, 2 g soda ash/l)											
23 °C 0.5 g surfactant / l	s	ca. 140	ca. 130	ca. 70	ca. 170	ca. 170	ca. 50	ca. 80	>300	>300	>300
23 °C 1 g surfactant / l	s	ca. 50	ca. 60	ca. 25	ca. 100	ca. 100	ca. 20	ca. 30	>300	>300	>300
23 °C 2 g surfactant / l	s	ca. 20	ca. 30	ca. 10	ca. 55	ca. 55	ca. 5	ca. 10	ca. 190	>300	>300
70 °C 0.5 g surfactant / l	s	>300	>300	>300	>300	>300	ca. 250	>300	>300	>300	>300
70 °C 1 g surfactant / l	s	>300	ca. 90	ca. 90	ca. 200	ca. 200	ca. 170	ca. 150	>300	>300	>300
70 °C 2 g surfactant / l	s	ca. 220	ca. 45	ca. 40	ca. 120	ca. 120	ca. 70	ca. 80	>300	>300	>300
Surface tension (EN 14370, 1 g/l dist. water, 23 °C)***	mN/m	ca. 30	ca. 32	ca. 30	ca. 31	ca. 31	ca. 30	ca. 29	ca. 32	ca. 42	ca. 39

* 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 226	LF 231
Dist. water	+	–	–	+	+	–	–	+	–
Potable water	+	–	–	+	+	–	–	+	–
Caustic soda, 5 %	–	–	–	–	–	–	–	–	–
Hydrochloric acid, 5 %	+	–	–	+	+	–	–	+	–
Salt solution, 5 %	–	–	–	+	+	–	–	–	–
Mineral spirit	+	+	+	+	+	+	O	+	+
Spindle oil	+	+	+	–	±	+	O	+	+
Ethanol	+	+	+	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	–	–	O	–	+	+

Plurafac	LF 300	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 %	O	–	–	–	–	+	–	–	–	–
Mineral spirit	+	O	+	+	+	–	+	+	+	+
Spindle oil	+	O	O	O	+	–	+	O	+	+
Ethanol	+	+	+	+	+	+	+	+	+	+
Isopropanol	+	+	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	±	O	O	+	±	+	+	+	–	+

Plurafac	LF 500	LF 600	LF 711	LF 731	LF 7319	LF 900	LF 901	LF 1300	LF 1430	LF 1530
Dist. water	–	+	+	+	+	+	+	–	+	+
Potable water	–	+	+	+	+	+	+	–	+	+
Caustic soda, 5 %	–	–	–	+	+	–	–	–	–	–
Hydrochloric acid, 5 %	–	+	+	+	+	+	+	–	O	–
Salt solution, 5 %	–	+	+	–	–	–	+	–	–	+
Mineral spirit	+	+	+	–	–	O	O	+	±	±
Spindle oil	+	+	+	–	–	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 Addition of water (%)	LF 120	LF 131	LF 132	LF 220	LF 221	LF 223	LF 224	LF 226	LF 231
0	60	40	25	150	100	70	55	120	45
10	80	50	40	180	160	110	80	150	70
20	90	60	280	200	170	110	90	160	80
30	80	60	380	230	180	100	90	150	80
40	70	50	350	320	190	90	100	140	60
50	60	40	90	300	190	70	120	110	60
60	40	30	30	140	120	60	110	90	50
70	30	20	< 20	30	50	50	40	40	30
80	< 20	< 20	< 20	< 20	< 20	30	< 20	20	20
90	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20

Plurafac Addition of water (%)	LF 300	LF 301	LF 303	LF 305	LF 400	LF 401	LF 403	LF 404	LF 405	LF 431
0	75	150	350	110	70	170	60	70	85	45
10	90	240	490	120	100	250	120	110	150	70
20	110	340	480	110	130	340	230	150	220	80
30	230	370	410	100	170	570	310	150	630	90
40	$> 10^5$	410	320	90	230	$> 10^5$	360	1540	27500	100
50	4800	30	270	70	240	$> 10^5$	500	2400	45000	130
60	220	< 20	40	40	230	$> 10^5$	270	$> 10^5$	$> 10^5$	110
70	80	< 20	< 20	30	170	120	60	21000	47000	30
80	70	< 20	< 20	< 20	50	< 20	< 20	440	350	< 20
90	40	< 20	< 20	< 20	< 20	< 20	< 20	20	20	< 20

Plurafac Addition of water (%)	LF 500	LF 600	LF 711	LF 731	LF 7319	LF 900	LF 901	LF 1300	LF 1430	LF 1530
0	65	120	80	solid	400	85	130	130	450	350
10	90	180	110	440	70	105	155	180	540	530
20	95	230	110	740	80	100	145	210	400	650
30	90	340	100	$> 10^5$	85	90	130	260	260	510
40	80	$> 10^5$	90	$> 10^5$	80	75	105	300	150	320
50	60	$> 10^5$	80	12800	80	60	85	< 20	70	120
60	50	390	60	20400	65	45	60	< 20	30	40
70	30	60	20	4370	45	30	30	< 20	< 20	< 20
80	< 20	< 20	< 20	840	40	20	20	< 20	< 20	< 20
90	< 20	< 20	< 20	20	30	< 20	< 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.

Plurafac LF 1430 has a shelf life of one year.

Applications

The Plurafac LF types are compatible with other nonionic surfactants such as our Lutensol® A, AO, AT, F, GD, ON, XA, XL, XP and TO types and our Pluronic® PE and RPE types. They can also be used in combination with anionic (Lutensit® A types) and cationic surfactants (Lutensit TC-KLC types). They do not react with calcium, magnesium or any of the other cations in hard water, nor with soluble alkali salts, anionic polymers such as carboxymethyl cellulose, or polycarboxylates such as our Sokalan® CP, HP, PM and PA types.

The products in the range that terminate in a hydroxyl group are resistant to formaldehyde, chlorine compounds, phosphates, silicates, soda ash, hydrochloric acid, phosphoric acid, citric acid and most other acids and alkalis. This also applies to Plurafac LF 1430. Those that terminate in an alkyl group are resistant to strong alkalis such as the alkalis used in detergents for bottle-washing machines.

The hydroxyl-terminated Plurafac LF types can gradually turn yellow over prolonged periods at elevated temperatures in moderately alkaline formulations, but this has no effect on their detergency or foaming characteristics. Yellowing can often be avoided in powder dishwasher detergents, etc., by spraying the surfactants onto the phosphates or carbonates before adding the other ingredients such as sodium metasilicate, sodium hydroxide and a soluble dichloroisocyanurate.

All of the hydroxyl-terminated Plurafac LF types are resistant to acids, but Plurafac LF 220, LF 221 and LF 711 are the most suitable products for use in strongly acidic solutions.

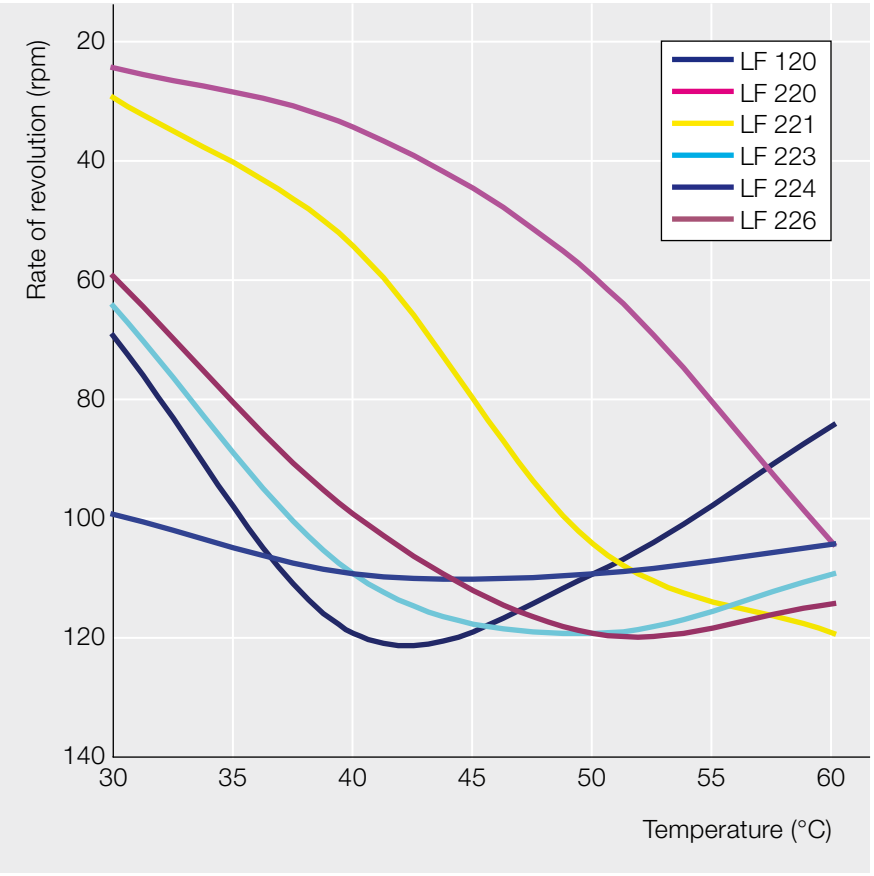
Foaming

Nonionic surfactants are renowned for their high detergency, wetting power and soil-dispersing capacity, but the distinguishing feature of the Plurafac LF types is that they form very little foam. Some of them can even be employed to inhibit foam formation.

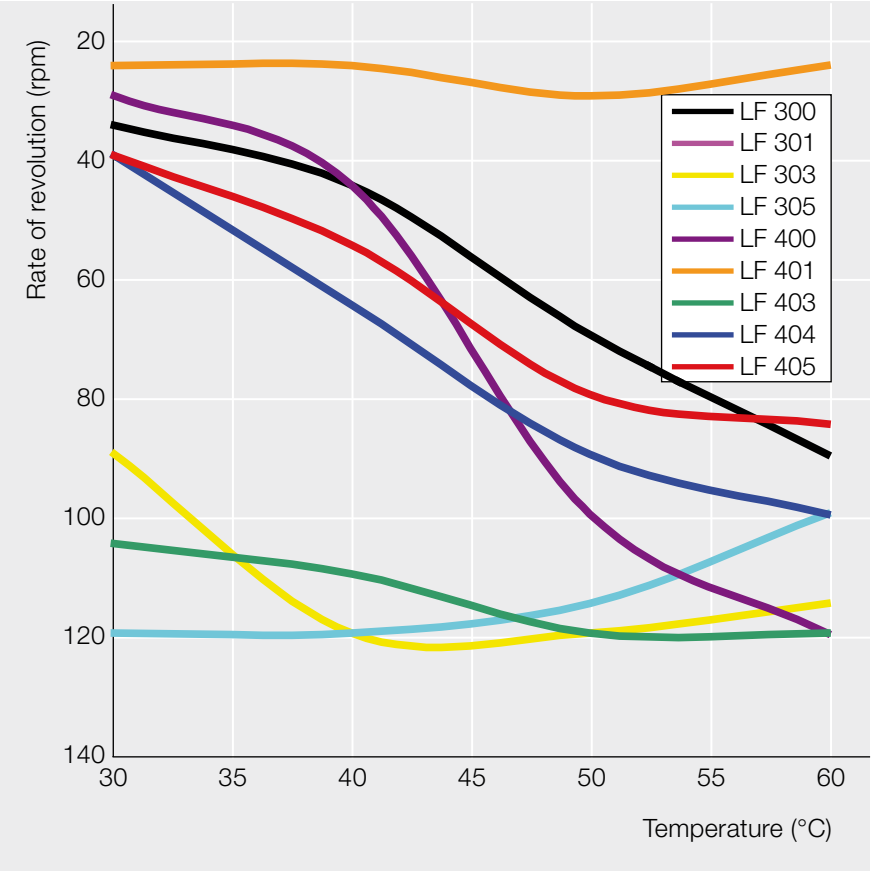
Foaming can often be a problem in cleaning processes that involve intensive mechanical action. It is difficult to predict the foaming behaviour of surfactants in advance with standard test methods because of the influence of the type of soil, the type of machinery, different temperature settings and the effects of the other ingredients in the formulation, etc. The results obtained by the beater method described in EN 12728, Part 1, or the Ross-Miles method described in DIN 53902, Part 2, and ASTM D 1175-53, have to be substantiated with methods that correspond more closely to real conditions.

One method of testing foam formation which closely corresponds to the conditions encountered in practice is to measure the level of foam produced in a dishwasher. The rotating spray arm is slowed down by foam, and the higher the rate of revolution, the less foam is present. Mixtures of 5 parts of Plurafac LF and 95 parts of builder consisting of 50 % sodium metasilicate, 45 % pentasodium triphosphate and 5 % soda ash were tested at a concentration of 20 g/l. Foaming was encouraged by adding 10 cm^3 of egg.

The results are shown in the diagrams overleaf. This method gives a reliable indication of the levels of foaming that can be expected in practice.



The foam formed by Plurafac LF types in alkaline solutions



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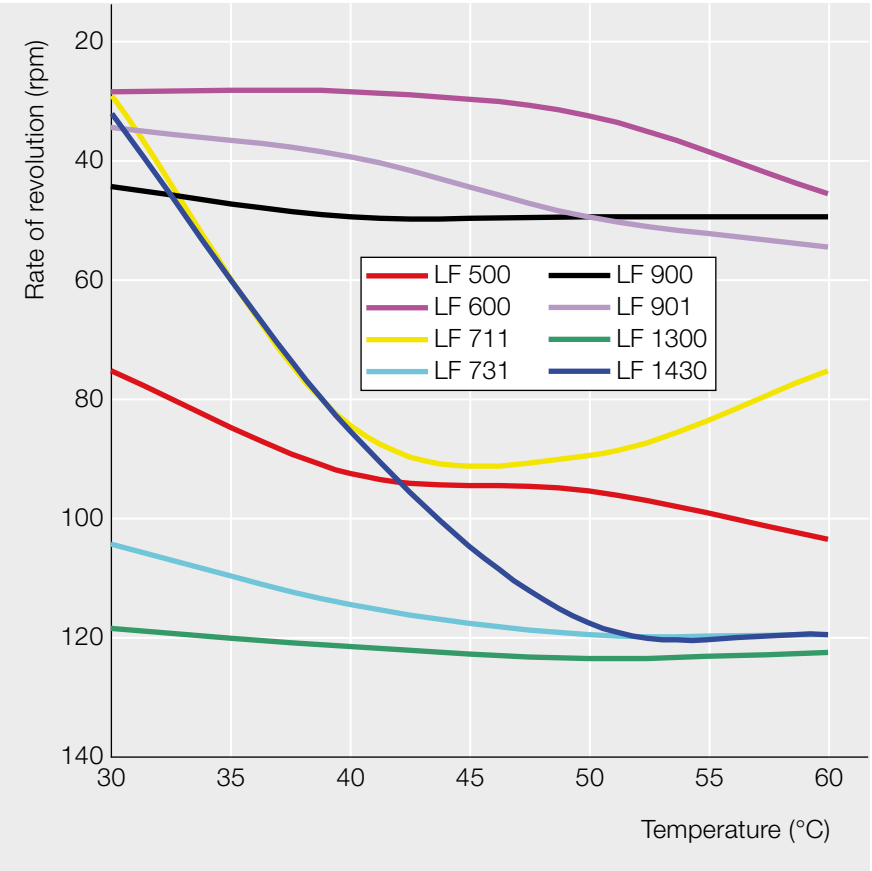
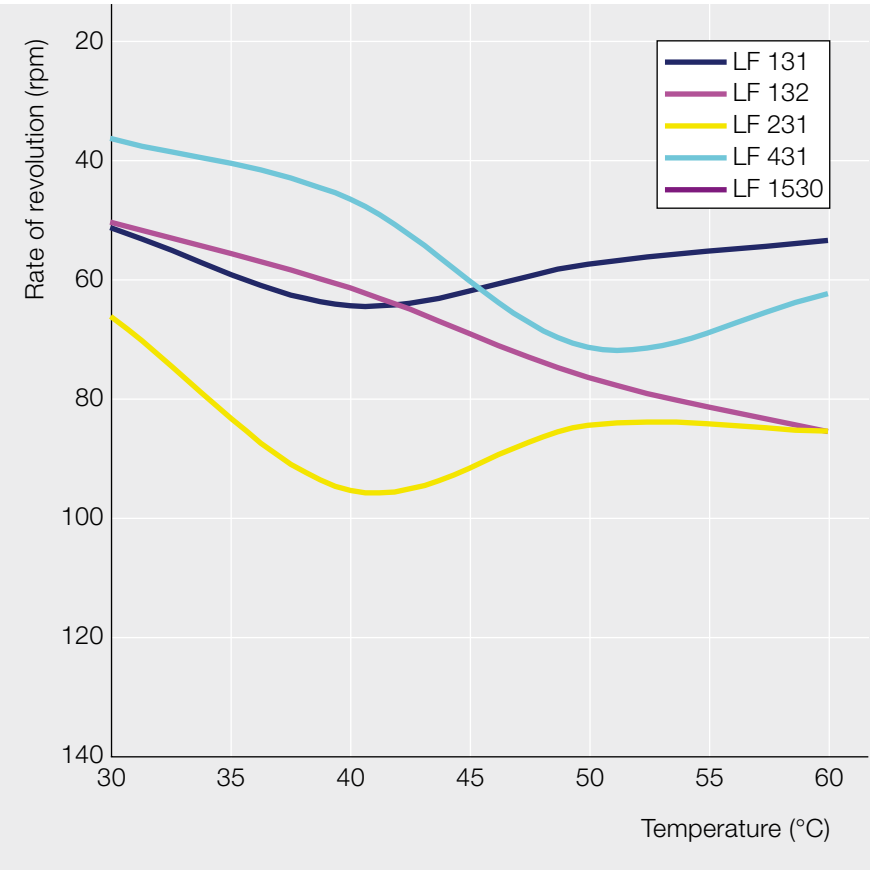
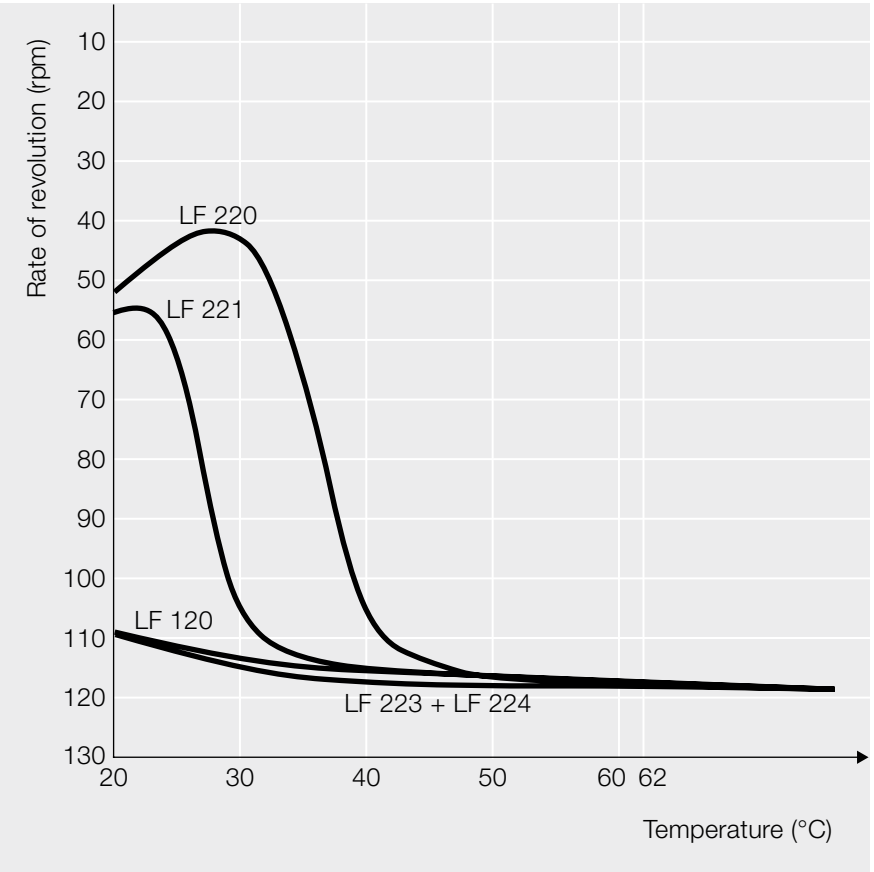


The foam formed by Plurafac LF types in alkaline solutions

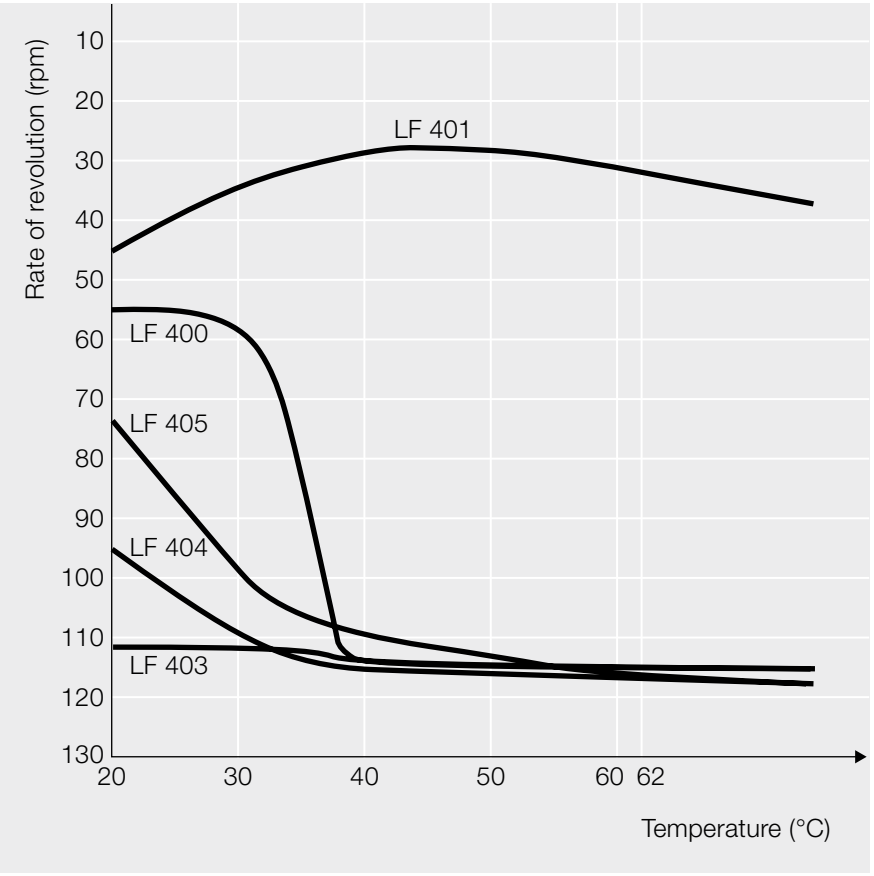


The foam formed by Plurafac LF types in alkaline solutions

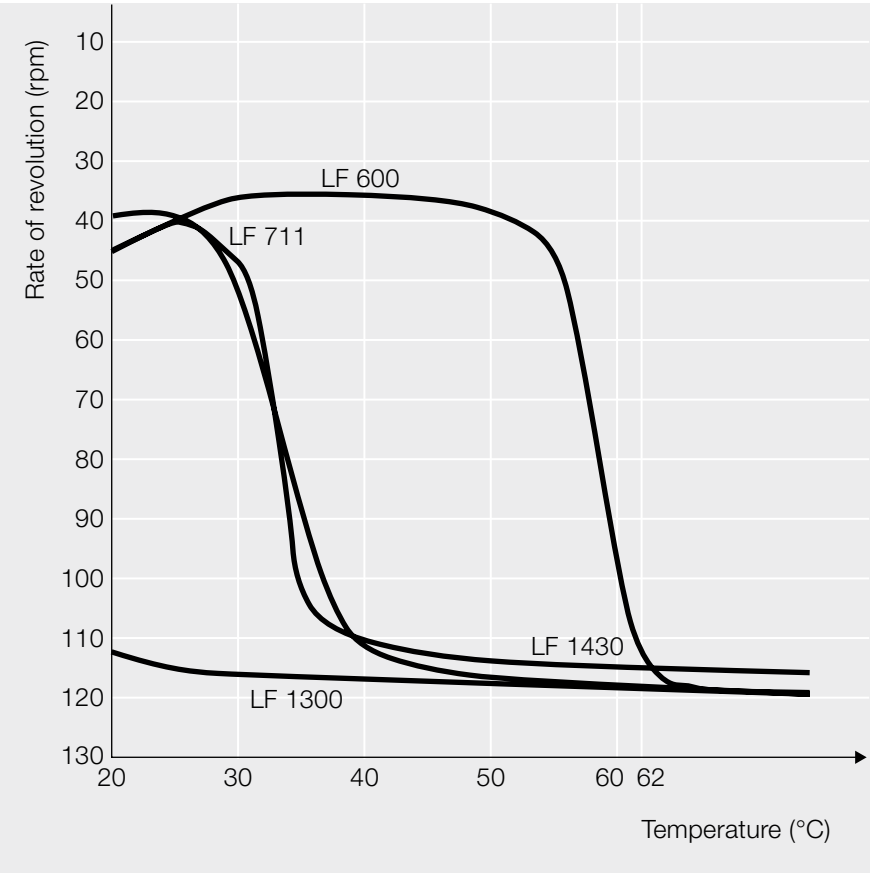
Much lower levels of foaming are observed if these tests are repeated in an acidic solution with no egg albumin. The curves below show the foam formed by surfactants at a concentration of 20 % in an acidic rinse aid formulation employed at a rate of 0.3 cm^3 per litre of water. This gives a reliable indication of the levels of foaming that can be expected in practice.



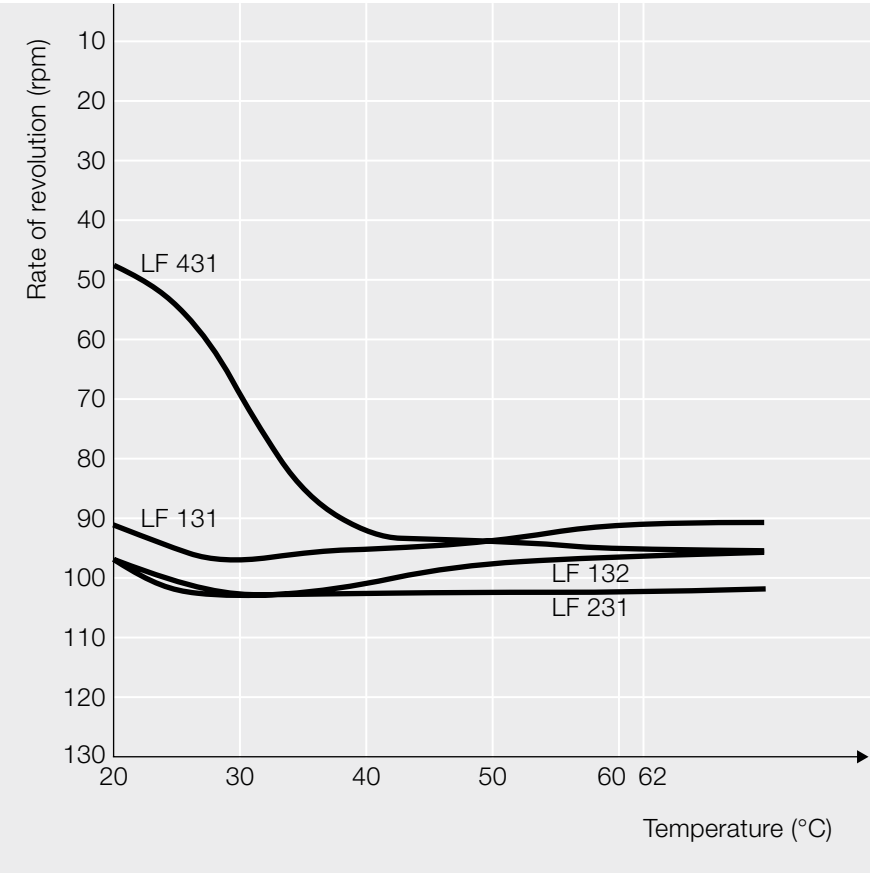
The foam formed by Plurafac LF types in acidic solutions



The foam formed by Plurafac LF types in acidic solutions



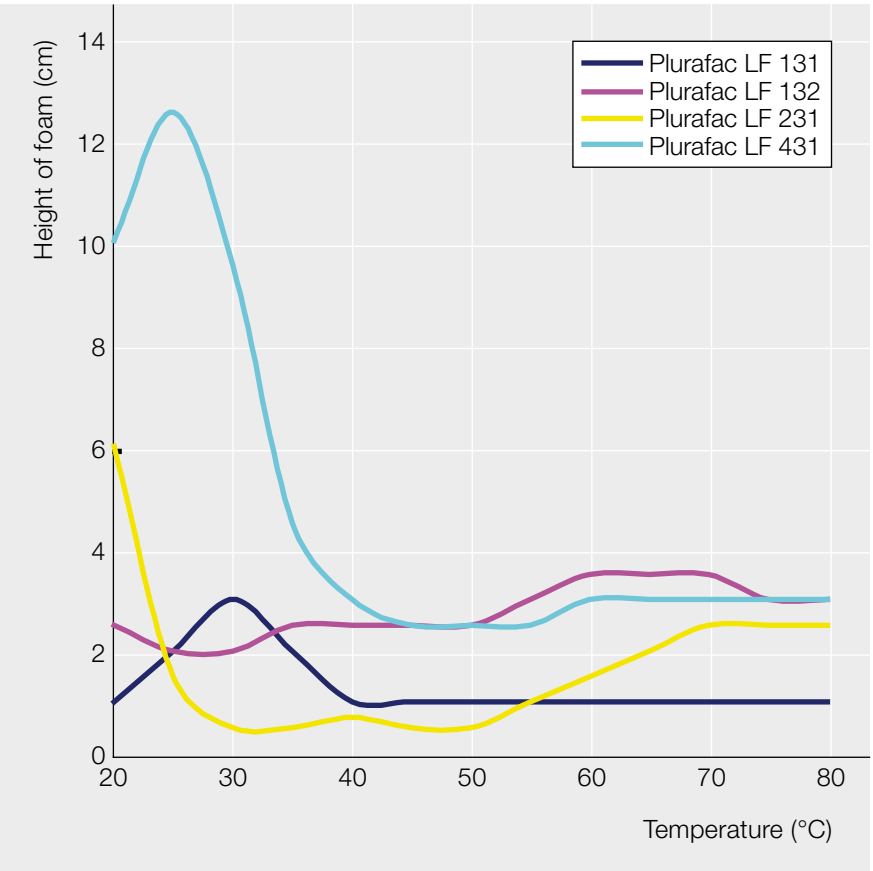
The foam formed by Plurafac LF types in acidic solutions



The foam formed by Plurafac LF types in acidic solutions

Alkali-resistant Plurafac LF types for washing bottles

The level of foam formed is of prime importance in bottle-washing machines. We use a vessel fitted with a pump and jet nozzles to simulate the conditions found in bottle-washing machines in the laboratory. In the example below, a solution containing 0.2 g of surfactant, 20 g of sodium hydroxide and 20 g of a mixture of beer and animal glue was taken, and the height of foam that formed was measured at different temperatures.



The foam formed by Plurafac LF X31 in the presence of beer and glue

Areas of application

The Plurafac LF types are very low-foaming nonionic surfactants. They are used in detergents and cleaners in which foaming has to be kept to a minimum. They can be used in powder, paste and liquid products.

The most important products in this category are detergents and rinse aids for domestic and commercial dishwashers, detergents for bottle-washing machines, and cleaners for breweries and dairies. Some of the Plurafac LF types can also be used as antifoams and surfactants in laundry detergents.

The Plurafac LF types also have applications in cleaners and degreasers for the metal industry, in cosmetics, and in the oil industry.

Safety

We know of no ill effects that could have resulted from using the Plurafac LF types for the purpose for which they are intended and from processing them in accordance with current practice. According to the experience that we have gained up to now and other information at our disposal, the Plurafac LF 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

The eyes must be protected from the products and prolonged contact with the skin should be avoided. Safety glasses must be worn when these products are being handled in their concentrated form.

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

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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BASF SE
Care Chemicals and Formulators
67056 Ludwigshafen, Germany
www.basf.com/detergents-formulators