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Lutensol® F types

Lutensol® FSA 10

Lutensol® FA 12

Lutensol® FA 12 K

Nonionic surfactants for detergents and cleaners, and for the chemical and allied industries

Chemical nature

Lutensol® FSA 10 Oleic amide ethoxylate
Lutensol® FA 12 Oleylamine ethoxylate
Lutensol® FA 12 K Coco amine ethoxylate

The surfactants are manufactured by causing the fatty amides and fatty amines to react with ethylene oxide. They have the following chemical structure.

Lutensol® FSA 10 $C_{17}H_{33}CONH(CH_2CH_2O)_{10}H$

Lutensol® FA types $R-CH_2N[(CH_2CH_2O)_{n/2}H]_2$

Lutensol® FA 12 $n = 12$

Lutensol® FA 12 K $n = 12$

The Lutensol® FA types contain two ethylene oxide chains, which implies that they contain two terminal hydroxyl groups. They are basic in nature because of the nitrogen bridge. They form salts with acids and aqueous solutions of these products are alkaline. Their behaviour is similar to that of cationic surfactants in terms of their adsorption on hard surfaces, but they behave as nonionic surfactants in all other respects.

PRD-Nos.*

30043975 Lutensol® FSA 10

30043982 Lutensol® FA 12

30150914 Lutensol® FA 12 K

* BASF's commercial product numbers.

Properties

Lutensol® FSA 10 is supplied in the form of a reddish liquid. The contents of drums should be stirred vigorously before use, because it has a tendency to form a sediment.

The Lutensol® FA types are supplied in the form of yellowish or reddish liquids. Most important properties of the Lutensol® F types are shown below.

Lutensol®	Unit	FSA 10	FA 12	FA 12 K
Physical form (23 °C)		Liquid	Liquid	Liquid
Concentration	%	approx. 100	approx. 96	approx. 100
Cloud point (EN 1890)*				
Method A	°C	approx. 62	>100	>100
Method B	°C	approx. 52	approx. 86	approx. 92
Method C	°C	approx. 39	approx. 75	approx. 82
Method D	°C	approx. 85	>100	>100
Method E	°C	approx. 85	>100	>100
Molar mass (calc. from OH value)	g/mol	approx. 720	approx. 800	approx. 730
pH (EN 1262, solution B)**		approx. 8	approx. 8	approx. 10
Density (DIN 51757, method A)				
23 °C	g/cm ³	–	approx. 1.02	approx. 1.02
60 °C		approx. 1.02		
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa·s	approx. 300	approx. 150	approx. 190
Pour point (ISO 3016)	°C	approx. 10	approx. -30	approx. -20
Wetting (EN 1772, distilled water, 2 g Soda/ash/l)				
0.5 g/l, 23 °C	s	approx. 260	approx. 300	approx. 300
1.0 g/l, 23 °C	s	approx. 130	approx. 200	approx. 300
2.0 g/l, 23 °C	s	approx. 70	approx. 150	approx. 220
0.5 g/l, 70 °C	s	approx. 90	approx. 100	approx. 150
1.0 g/l, 70 °C	s	approx. 50	approx. 70	approx. 80
2.0 g/l, 70 °C	s	approx. 30	approx. 50	approx. 60
Foam formation (EN 12728, 40 °C, 2 g/l in water, 1.8 mmol Ca ²⁺ -ions/l, after 30 s)				
pH = as supplied	cm ³	approx. 300	approx. 400	approx. 480
pH = 3	cm ³	approx. 300	approx. 500	approx. 650
pH = 11	cm ³	approx. 300	approx. 400	approx. 520
Surface tension*** (EN 14370, 1 g/l, distilled water, 23 °C)	mN/m	approx. 33	approx. 37	approx. 38

* Cloud point EN 1890:

Method A: 1 g surfactant + 100 g dist. 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 Butyldiglycol solution (c = 250 g/l)

Method E: 5 g surfactant + 25 g Butyldiglycol solution (c = 250 g/l)

** The pH of the Lutensol® F types can decrease during storage, but this does not have any effect on 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 Lutensol® F types in various different solvents is shown in the table below.

Solubility of Lutensol® F types (10% m/m solutions at 23 °C)

	Lutensol® FSA 10	Lutensol® FA 12	Lutensol® FA 12 K
Distilled water	+	+	+
Hard water (2.7 mmol Ca ²⁺ -ions/l)	+	+	+
Caustic soda, 5% m/m	+	+	+
Hydrochlorid acid, 5% m/m	+	+	+
Sodium chloride solution, 5% m/m	+	+	+
White mineral spirit	–	–	○
Spindle oil	–	–	+
Ethanol	+	+	+
Isopropanol	+	+	+
Toluene	+	○	+

+ = *Clear solution*

○ = *Partially soluble*

– = *Insoluble*

Viscosity

The relationship between viscosity and temperature is always an important point to consider when Lutensol® F types are stored or shipped. This is shown in the following table (mPa·s, Brookfield LVT).

Viscosity at	Lutensol® FSA 10	Lutensol® FA 12	Lutensol® FA 12 K
0 °C	solid	approx. 740	approx. 880
5 °C	solid	approx. 500	approx. 600
10 °C	solid	approx. 350	approx. 420
15 °C	approx. 500	approx. 275	approx. 300
20 °C	approx. 360	approx. 180	approx. 225
23 °C	approx. 300	approx. 150	approx. 190
30 °C	approx. 210	approx. 105	approx. 130
40 °C	approx. 120	approx. 75	approx. 80
50 °C	approx. 80	approx. 45	approx. 55
60 °C	approx. 55	approx. 30	approx. 40

Viscosity of dilute solutions of Lutensol® F types (mPa·s, 23 °C)

Water content in %	Lutensol® FSA 10	Lutensol® FA 12	Lutensol® FA 12 K
0	approx. 300	approx. 150	approx. 190
10	approx. 400	approx. 300	approx. 335
20	approx. 550	>10 ⁵	approx. 440
30	approx. 1 000	>10 ⁵	approx. 1 280
40	approx. 2 300	>10 ⁵	>10 ⁵
50	approx. 24 000	>10 ⁵	>10 ⁵
60	approx. 5 000	approx. 50	approx. 170
70	approx. 1 000	approx. 15	approx. 30
80	approx. 70	approx. 10	approx. 15
90	approx. 10	approx. 5	approx. 10

Compatibility

The Lutensol® F types are nonionic and largely unreactive. They are compatible with anionic, cationic and nonionic surfactants such as our Lutensit® A, Lutensit TC-KLC 50, the low-foaming Plurafac® and Pluronic® types, and the other products in our Lutensol® range.

High concentrations of salts, acids and bases can impair the solubility of the Lutensol® F types. They are chemically stable in hard water and in solutions that contain electrolytes.

Storage

- a) The Lutensol® F types should be stored indoors in a dry place in their sealed original packaging. Storerooms must not be overheated.
- b) The Lutensol® F types are hygroscopic and soluble in water, and so care needs to be taken to exclude moisture. Drums must be tightly resealed each time they are opened.
- c) The storage temperature should not be allowed to fall to substantially below 20 °C if at all possible.
- d) The Lutensol® F 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 sedimentation should be heated to 40 – 50 °C and homogenized before it is processed.
- 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 – 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 Lutensol® F 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.

Materials

The following materials can be used for tanks and drums.

- a) AISI 321 stainless steel (X6CrNiTi1810)
- b) AISI 316 Ti stainless steel (X6CrNiMoTi17122)

Shelf life

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

Safety

We know of no ill effects that could have resulted from using the Lutensol® F 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 Lutensol® F 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.

Labelling

Refer to the latest Safety Data Sheet for detailed information on product safety.

Note

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