

Lutensol® XP types

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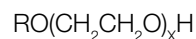
Lutensol® XP 30
Lutensol® XP 40
Lutensol® XP 50
Lutensol® XP 60
Lutensol® XP 69
Lutensol® XP 70
Lutensol® XP 79
Lutensol® XP 80
Lutensol® XP 89
Lutensol® XP 90
Lutensol® XP 99
Lutensol® XP 100
Lutensol® XP 140
Lutensol® XP 149

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

Chemical nature

The Lutensol® XP types are nonionic surfactants. They are alkyl polyethylene glycol ethers based on C₁₀-Guerbet alcohol and ethylene oxide.

They conform to the following formula:



$$R = \text{C}_{10}\text{H}_{21}$$

$$x = 3, 4, 5, 6, 7, 8, 9, 10, 14$$

The numeric code in the product name indicates in general the degree of ethoxilation.

The Lutensol® XP types are manufactured by causing the C₁₀-alcohol to react with ethylene oxide in stoichiometric proportions.

PRD-Nos.*

30149363	Lutensol® XP 30
30164451	Lutensol® XP 40
30149365	Lutensol® XP 50
30164454	Lutensol® XP 60
30168823	Lutensol® XP 69
30149367	Lutensol® XP 70
30163866	Lutensol® XP 79
30149369	Lutensol® XP 80
30168772	Lutensol® XP 89
30149371	Lutensol® XP 90
30164445	Lutensol® XP 99
30149372	Lutensol® XP 100
30149374	Lutensol® XP 140
30452310	Lutensol® XP 149

* BASF's commercial product numbers.

Properties

Lutensol® XP 30, XP 40, XP 50, XP 60, XP 70, XP 80 and XP 90 are cloudy liquids at room temperature, and they tend to form a sediment.

Lutensol® XP 100 and XP 140 are soft, colourless or slightly yellowish pastes at 23 °C.

They become clear at 50 °C.

Lutensol® XP 69, XP 79, XP 89, XP 99 and XP 149 are clear liquids at room temperature.

Lutensol®		XP 30	XP 40	XP 50	XP 60	XP 69	XP 70	XP 79
Physical form (23 °C)		Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
Degree of ethoxilation		approx. 3	approx. 4	approx. 5	approx. 6	approx. 6	approx. 7	approx. 7
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 85	approx. 100	approx. 85
Cloudpoint (EN 1890)*								
Method A	°C	–	–	–	–	–	–	–
Method B	°C	–	–	–	–	–	–	–
Method C	°C	–	–	–	–	–	–	–
Method D	°C	approx. 41	approx. 52	approx. 60	approx. 66	approx. 66	approx. 70	approx. 70
Method E	°C	approx. 31	approx. 44	approx. 56	approx. 62	approx. 62	approx. 68	approx. 68
Average molar mass (calc. from OH number)	g/mol	approx. 290	approx. 330	approx. 370	approx. 410	approx. 410	approx. 445	approx. 445
pH (EN 1262, solution B)**		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, 23 °C)	g/cm ³	approx. 0.95	approx. 0.96	approx. 0.97	approx. 0.98	approx. 1.00	approx. 0.99	approx. 1.01
Dropping point (DIN 51801)	°C	approx. 13	approx. 16	approx. 25	approx. 26	<5	approx. 27	<5
Congeaing point (ISO 2207)	°C	<5	<5	approx. 6	approx. 10	<5	approx. 9	<5
Melting point	°C	–	–	–	–	–	–	–
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa·s	approx. 25	approx. 90	approx. 90	approx. 140	approx. 70	approx. 290	approx. 90
Hydroxylnumber (DIN 53240)	mgKOH/g	approx. 195	approx. 170	approx. 150	approx. 135	approx. 135	approx. 125	approx. 125
HLB value		approx. 9	approx. 10.5	approx. 11.5	approx. 12.5	approx. 12.5	approx. 13	approx. 13
Flash point (DIN 51376)	°C	>110	>120	>130	>130	>130	>140	>140
Wetting (EN 1772, distilled water, 23 °C, 2 g Soda ash/l)								
0.5 g/l	s	approx. 80	approx. 60	approx. 60	approx. 60	approx. 60	approx. 60	approx. 60
1.0 g/l	s	approx. 20	approx. 20	approx. 10	approx. 10	approx. 10	approx. 10	approx. 10
2.0 g/l	s	approx. 20	approx. 10	approx. 10	approx. 5	approx. 5	approx. 5	approx. 5
Foam volume (EN 12728, 40 °C, 2 g/l water at a hardness of 1.8 mmol Ca-ions/l, after 30 s)	cm ³	approx. 20	approx. 20	approx. 20	approx. 250	approx. 250	approx. 300	approx. 300
Surface tension (EN 14370, 1 g/l in distilled water, 23 °C)***	mN/m	approx. 27	approx. 27	approx. 26	approx. 26	approx. 26	approx. 26	approx. 26

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.

* *Cloud point 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 pH of the Lutensol® XP types can decrease during storage, but this does not have any effect on their performance.*

*** *Applying Harkins-Jordan correction.*

Lutensol®		XP 80	XP 89	XP 90	XP 99	XP 100	XP 140	XP 149
Physical form (23 °C)		Liquid	Liquid	Liquid	Liquid	Liquid/ Paste	Paste	Liquid
Degree of ethoxilation		approx. 8	approx. 8	approx. 9	approx. 9	approx. 10	approx. 14	approx. 14
Concentration	%	approx. 100	approx. 85	approx. 100	approx. 85	approx. 100	approx. 100	approx. 80
Cloudpoint (EN 1890)*								
Method A	°C	approx. 56	approx. 56	approx. 69	approx. 69	approx. 80	approx. 96	approx. 96
Method B	°C	approx. 43	approx. 43	approx. 53	approx. 53	approx. 64	approx. 78	approx. 78
Method C	°C	approx. 34	approx. 34	approx. 42	approx. 42	approx. 52	approx. 64	approx. 64
Method D	°C	approx. 75	approx. 75	approx. 78	approx. 78	approx. 81	approx. 82	approx. 82
Method E	°C	approx. 74	approx. 74	approx. 76	approx. 76	approx. 81	approx. 85	approx. 85
Average molar mass (calc. from OH number)	g/mol	approx. 500	approx. 500	approx. 550	approx. 550	approx. 610	approx. 750	approx. 750
pH (EN 1262, solution B)**		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, 23 °C)	g/cm ³	approx. 0.98 (60 °C)	approx. 1.02	approx. 0.99 (60 °C)	approx. 1.03	approx. 1.00 (60 °C)	approx. 1.01 (60 °C)	approx. 1.04
Dropping point (DIN 51801)	°C	approx. 31	<5	approx. 32	<5	approx. 33	approx. 36	<5
Congeaing point (ISO 2207)	°C	approx. 14	<5	approx. 16	<5	approx. 17	approx. 20	<5
Melting point	°C	–	–	–	–	–	approx. 39	–
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa·s	approx. 300	approx. 90	approx. 1200	approx. 100	approx. 30 (60 °C)	approx. 40 (60 °C)	approx. 220
Hydroxylnumber (DIN 53240)	mgKOH/g	approx. 110	approx. 110	approx. 100	approx. 100	approx. 90	approx. 75	approx. 75
HLB value		approx. 14	approx. 14	approx. 14.5	approx. 14.5	approx. 15	approx. 16	approx. 16
Flash point (DIN 51376)	°C	>140	>140	>150	>150	>160	>190	>190
Wetting (EN 1772, distilled water, 23 °C, 2 g Soda ash/l)								
0.5 g/l	s	approx. 90	approx. 90	>300	>300	>300	>300	>300
1.0 g/l	s	approx. 10	approx. 10	approx. 20	approx. 20	approx. 50	approx. 150	approx. 150
2.0 g/l	s	approx. 5	approx. 5	approx. 5	approx. 5	approx. 10	approx. 20	approx. 20
Foam volume (EN 12728, 40 °C, 2 g/l water at a hardness of 1.8 mmol Ca-ions/l, after 30 s)	cm ³	approx. 350	approx. 350	approx. 400	approx. 400	approx. 400	approx. 400	approx. 400
Surface tension (EN 14370, 1 g/l distilled water, 23 °C)***	mN/m	approx. 27	approx. 27	approx. 28	approx. 28	approx. 30	approx. 35	approx. 35

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.

* Cloud point 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 pH of the Lutensol® XP types can decrease during storage, but this does not have any effect on their performance.

*** Applying Harkins-Jordan correction.

Solubility

Details on the solubility of the Lutensol® XP types in various solvents are given in the table below.

Solubility of the Lutensol® XP types (10% at 23 °C)

	Distilled water	Potable water (2.7 mmol Ca ²⁺ -Ionen/l)	Caustic soda (5%)	Hydrochloric (5%)	Salt solution (5%)	Solvent naphta	Ethanol Isopropanol ¹⁾	Aromatic hydrocarbons
Lutensol® XP 30	–	–	–	–	–	±	+	+
Lutensol® XP 40	–	–	–	o	–	±	+	+
Lutensol® XP 50	o	o	–	o	o	±	+	+
Lutensol® XP 60	–	–	o	–	o	±	+	+
Lutensol® XP 69	–	–	o	–	o	–	+	±
Lutensol® XP 70	+	+	o	+	–	±	+	+
Lutensol® XP 79	+	+	–	+	+	–	+	±
Lutensol® XP 80	+	+	–	+	+	±	+	+
Lutensol® XP 89	+	+	–	+	+	–	+	±
Lutensol® XP 90	+	+	o	+	+	±	+	+
Lutensol® XP 99	+	+	+	+	+	–	+	±
Lutensol® XP 100	+	+	+	+	+	±	+	+
Lutensol® XP 140	+	+	+	+	+	±	+	+
Lutensol® XP 149	+	+	+	+	+	±	+	+

+ = clear solution

± = sparingly soluble (insoluble sediment)

– = insoluble (phase separation)

o = forms an opaque soluble, homogeneous emulsion

¹⁾ All Lutensol® XP types except the water diluted types Lutensol® XP 69, XP 79, XP 89 and XP 99 are only partially soluble in isopropanol (formation of an insoluble sediment).

Viscosity

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

Viscosity at °C	0	10	20	23	30	40	50	60
Lutensol® XP 30	160	90	30	25	20	15	10	10
Lutensol® XP 40	>10 ⁵	900	150	90	30	25	15	10
Lutensol® XP 50	>10 ⁵	1600	160	90	40	30	20	10
Lutensol® XP 60	>10 ⁵	3100	280	140	60	40	20	10
Lutensol® XP 69	300	150	80	70	50	30	15	10
Lutensol® XP 70	>10 ⁵	>10 ⁵	1300	290	70	40	20	15
Lutensol® XP 79	370	200	120	90	60	40	30	20
Lutensol® XP 80	>10 ⁵	>10 ⁵	390	300	110	60	40	20
Lutensol® XP 89	400	200	100	90	60	40	30	20
Lutensol® XP 90	solid	solid	3300	1200	380	150	80	25
Lutensol® XP 99	460	230	120	100	70	40	30	20
Lutensol® XP 100	solid	solid	>10 ⁵	3100	720	350	60	30
Lutensol® XP 140	solid	solid	>10 ⁵	>10 ⁵	>10 ⁵	190	45	40
Lutensol® XP 149	800	380	260	220	100	50	30	20

We would recommend the preparation of 10 – 25% stock solutions of Lutensol® XP types if they are to be used in the form of very dilute solutions, or if they are to be added to other solutions. This makes it very much easier to dilute them later on.

The Lutensol® XP types can form fairly stiff gels at certain concentrations when water is added. The figures below were measured using a Brookfield-viscosimeter at 23 °C and 60 rpm.

The viscosity of Lutensol® XP types at 23 °C as a function of concentration in water (all values in mPa·s)

Water content %	Lutensol® XP 30	Lutensol® XP 40	Lutensol® XP 50	Lutensol® XP 60	Lutensol® XP 69	Lutensol® XP 70	Lutensol® XP 79
0	25	90	90	140	70	290	90
10	30	50	60	70	80	70	85
20	40	60	70	80	16000	80	43400
30	50	70	90	240	>10 ⁵	36900	15600
40	70 ¹⁾	90	8300	>10 ⁵	34900	78500	130 ¹⁾
50	110 ¹⁾	100 ¹⁾	45800	32500	760 ¹⁾	350 ¹⁾	80 ¹⁾
60	190 ¹⁾	150 ¹⁾	>10 ⁵	240 ¹⁾	110 ¹⁾	100 ¹⁾	50
70	180 ¹⁾	100 ¹⁾	43000	80 ¹⁾	60 ¹⁾	50	40
80	20 ¹⁾	60 ¹⁾	2000	70 ¹⁾	50 ¹⁾	20	20
90	10 ¹⁾	10 ¹⁾	270	10 ¹⁾	10 ¹⁾	10	10

¹⁾ two separate phases are formed

Water content %	Lutensol® XP 80	Lutensol® XP 89	Lutensol® XP 90	Lutensol® XP 99	Lutensol® XP 100	Lutensol® XP 140	Lutensol® XP 149
0	300	90	1200	100	3100	solid	220
10	150	100	160	100	180	200	240
20	150	3000	160	100	180	220	260
30	150	780	160	105	180	240	240
40	1200	110	160	110	230	260	150
50	150	90	200	105	240	240	90
60	130	70	150	70	190	150	60
70	100	30	90	30	90	90	50
80	60	20	60	20	60	60	30
90	50	10	50	10	50	50	20

The numbers reported have to be regarded as maximum values; the values measured immediately after mixing will be lower than the numbers reported.

Storage

- The Lutensol® XP types should be stored indoors in a dry place. Storerooms must not be overheated.
- The Lutensol® XP types are hygroscopic due to their good solubility in water, with the result that they may absorb moisture very quickly. Drums must be resealed each time they are opened.
- The storage temperature should not be allowed to fall substantially below 20 °C. The setting points of these products also need to be taken into account.
- Lutensol® XP 30, XP 40, XP 50, XP 60, XP 70, XP 80 and XP 90 are cloudy liquids at room temperature, and they tend to form a sediment. Lutensol® XP 100 and XP 140 are soft, colourless or slightly yellowish pastes at 23 °C. They become clear at 50 °C. Lutensol® XP 69, XP 79, XP 89, XP 99 and XP 149 are clear liquids at room temperature.
- Liquid that has solidified or that shows signs of sedimentation should be heated to 50 – 70 °C and homogenized before it is processed.
- 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 70 °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.
- The Lutensol® XP types must be blanketed with nitrogen if they are stored in heated tanks (at 50 – 70 °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:

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

Shelf life

Provided they are stored properly and drums are kept tightly sealed, the Lutensol® XP 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 Lutensol® XP types for the purpose for which it is intended and from processing it in accordance with current practices.

According to the experience that we have gained over many years and other information at our disposal, Lutensol® XP 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.

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

Note

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