Technical Information

Lutensol[®] TO types

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 Registered trademark of BASF Aktiengesellschaft

Lutensol TO 3 Lutensol TO 5 Lutensol TO 6 Lutensol TO 65 Lutensol TO 7 Lutensol TO 8 Lutensol TO 89 Lutensol TO 10 Lutensol TO 109 Lutensol TO 12 Lutensol TO 129 Lutensol TO 15 Lutensol TO 20 Lutensol TO 389 Lutensol TO 565

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



Lutensol TO types

The Lutensol TO range consists of the following products.

Lutensol TO 3 (10)*

Lutensol TO 5 (10)*

Lutensol TO 6 (8)*

Lutensol TO 65 (8)*

Lutensol TO 7 (8)*

Lutensol TO 8 (8)*

Lutensol TO 89 (8)*

Lutensol TO 10 (8)*

Lutensol TO 109 (8)*

Lutensol TO 12 (8)*

Lutensol TO 129 (8)*

Lutensol TO 15 (8)*

Lutensol TO 20 (8)*

Lutensol TO 389 (8)*

Lutensol TO 565 (10)*

None of the Lutensol TO types need to be labelled as being "Dangerous for the environment".

Chemical nature

The Lutensol TO types are nonionic surfactants. They are made from a saturated iso- $\rm C_{13}$ alcohol.

They conform to the following structural formula.

RO(CH₂CH₂O)_xH

 $R = iso-C_{13} H_{27}$

x = 3, 5, 6, 6.5, 7, 8, 10, 12, 15 or 20

The numeric code in the product name indicates the degree of ethoxylation.

Lutensol TO 89 consists of ca. 90% Lutensol TO 8 and ca. 10% water. Lutensol TO 109 consists of ca. 85% Lutensol TO 10 and ca. 15% water. Lutensol TO 129 consists of ca. 85% Lutensol TO 12 and ca. 15% water. Lutensol TO 389 is a special mixture of Lutensol TO 3 and Lutensol TO 8 with an active content of ca. 90% and a water content of ca. 10%. Lutensol TO 565 is a mixture of Lutensol TO 5 and Lutensol TO 65.

(8) = Harmful

(10) = Irritant

Further details are given on Page 12.

^{*} Classification according to German chemicals legislation based on EU Directive 67/548/EEC

The Lutensol TO types are manufactured by causing the iso- C_{13} oxo alcohol to react with ethylene oxide in stoichiometric proportions. The ethoxylation temperature is kept as low as possible. This, combined with the high purity of the feedstocks, ensures that high-performance products with low toxicity are obtained.

Properties

Lutensol TO 3, TO 5, TO 6, TO 7, TO 8, TO 65 and TO 565 are cloudy liquids at 23 $^\circ\text{C},$ which tend to form a sediment. They become clear at 50 $^\circ\text{C}.$

Lutensol TO 89, TO 109, TO 129 and TO 389 are clear liquids at 23 °C. Lutensol TO 10, TO 12, TO 15 and TO 20 are soft, slightly yellowish pastes.

Lutensol		TO 3	TO 5	T0 6	TO 65	T0 7	TO 8	TO 89
Physical form		Liquid						
Degree of ethoxylation		ca. 3	ca. 5	ca. 6	ca. 6,5	ca. 7	ca. 8	ca. 8
Concentration	%	ca. 100	ca. 90					
Cloud point (DIN 53917)								
in BDG	°C	ca. 40	ca. 62	ca. 67	ca. 68	ca. 70	ca. 80	ca. 80
in water	°C	-	_	_	_	_	ca. 60	ca. 60
in saline solution	°C	-	_	_	_	_	_	_
Molar mass	g/mol	ca. 340	ca. 430	ca. 470	ca. 485	ca. 500	ca. 600	ca. 600
pH (5% in water)		ca. 7						
Density (23 °C)	g/cm ³	ca. 0.93	ca. 0.96	ca. 0.97	ca. 0.98	ca. 0.98	ca. 1.01	ca. 1.02
Dropping point	°C	< 5	ca. 14	ca. 18	ca. 18	ca. 18	ca. 22	< 5
Solidification point	°C	< 5	< 5	< 5	< 5	ca. 5	ca. 10	< 5
Melting point	°C							
Viscosity (23 °C, Brookfield, 60 rpm)	mPa∙s	ca. 50	ca. 80	ca. 80	ca. 100	ca. 100	ca. 150	ca. 120
Hydroxyl number	mgKOH/g	ca. 165	ca. 130	ca. 120	ca. 115	ca. 110	ca. 95	ca. 95
Hydrophilic-lipophilic balance		ca. 9	ca. 10.5	ca. 11	ca. 11.5	ca. 12	ca. 13	ca. 13
Flash point (DIN 51376)	°C	> 100	> 100	> 100	> 100	> 100	> 100	> 100
Wetting (DIN 53901, in distilled water with 2 g/l soda ash at room temperature)								
0.5 g/l	S	> 300	ca. 80	ca. 60	ca. 60	ca. 60	ca. 70	ca. 90
1 g/l	S	> 300	ca. 50	ca. 25	ca. 20	ca. 20	ca. 25	ca. 30
2 g/l	S	ca. 230	ca. 20	ca. 10				
Foam formation (DIN 53902, Sheet 1, 40 °C, 2 g/l in water with a hardness of 1.8 mmol Ca ions/l, after 30 sec)	cm ³	ca. 10	ca. 50	ca. 70	ca. 90	ca. 120	ca. 550	ca. 550
Surface tension** (DIN 53914, 1 g/l at 23 °C) in distilled water	mN/m	ca. 27	ca. 28	ca. 28				

 ^{*} The pH of the Lutensol TO types can decrease during storage, but this does not have any effect on their performance.
 ** Applying Harkins-Jordan correction

TO 10	TO 109	T0 12	TO 129	TO 15	TO 20	TO 389	TO 565
Liquid/paste	Liquid	Paste	Liquid	Paste	Paste	Liquid	Liquid
ca. 10	ca. 10	ca. 12	ca. 12	ca. 15	ca. 20	ca. 7	ca. 6
ca. 100	ca. 85	ca. 100	ca. 85	ca. 100	ca. 100	ca. 90	ca. 100
ca. 82	ca. 82	ca. 88	ca. 88	ca. 89	ca. 92	ca. 70	ca. 66
ca. 70	ca. 70	ca. 93	ca. 93	> 100	> 100	-	_
ca. 54	ca. 54	ca. 75	ca. 75	ca. 80	ca. 86	-	-
ca. 630	ca. 630	ca. 750	ca. 750	ca. 850	ca. 1000	ca. 500	ca. 470
ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7	ca. 7
ca. 0.97 (60 °C) ca. 1.02	ca. 0.99 (60 °C)) ca. 1.04	ca. 1.00 (60 °C) ca. 1.02 (60 °C)	ca. 0.99	ca. 0.97
ca. 25	ca. 5	ca. 30	ca. 8	ca. 33	ca. 38	ca. 5	ca. 18
ca. 14	< 5	ca. 20	< 5	ca. 22	ca. 26	< 5	< 5
		ca. 29		ca. 31	ca. 36		
ca. 30 (60 °C)	ca. 150	ca. 40 (60 °C)	ca. 200	ca. 50 (60 °C)	ca. 60 (60 °C)	ca. 100	ca. 80
ca. 90	ca. 90	ca. 75	ca. 75	ca. 65	ca. 55	ca. 110	ca. 120
ca. 13.5	ca. 13.5	ca. 14.5	ca. 14.5	ca. 15.5	ca. 16.5	ca. 12	ca. 11
> 100	> 100	> 100	> 100	> 100	> 100	> 100	> 100
ca. 80	ca. 80	ca. 120	ca. 120	ca. 160	> 300	ca. 70	ca. 60
ca. 30	ca. 35	ca. 50	ca. 55	ca. 90	> 300	ca. 30	ca. 25
ca. 10	ca. 10	ca. 20	ca. 20	ca. 40	ca. 200	ca. 10	ca. 10
ca. 600	ca. 600	ca. 600	ca. 600	ca. 600	ca. 600	ca. 90	ca. 70
ca. 28	ca. 29	ca. 31	ca. 31	ca. 32	ca. 36	ca. 27	ca. 27

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

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

Solubility of the Lutensol TO types (10% solutions at 23 °C)

	Distilled water	Potable water (2.7 mmol Ca ²⁺ -ions/l)	Caustic soda (5%)	Hydro- chloric acid (5%)	Salt solution (5%)	Mineral oils	Alcohols	Aromatic hydro- carbons
Lutensol TO 3	_	_	_	_	_	(+)	+	+
Lutensol TO 5	_	_	_	_	_	+	+	+
Lutensol TO 6	_	_	_	_	_	+	+	+
Lutensol TO 65	_	_	_	_	_	+	+	+
Lutensol TO 7	_	_	_	_	_	+	+	+
Lutensol TO 8	+	+	+	+	+	(+)	+	_
Lutensol TO 89	+	+	+	+	+	+	+	-
Lutensol TO 10	+	+	+	+	+	-	+	_
Lutensol TO 109	+	+	+	+	+	(+)	+	-
Lutensol TO 12	+	+	+	+	+	-	+	-
Lutensol TO 129	+	+	+	+	+	(+)	+	_
Lutensol TO 15	+	+	+	+	+	-	+	-
Lutensol TO 20	+	+	+	+	+	-	+	_
Lutensol TO 389	_	-	_	-	_	(+)	+	+
Lutensol TO 565	_	_	_	_	_	+	+	+

+ = Clear solution
(+) = Sparingly soluble
- = Insoluble

Viscosity

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

Viscosity at n °C	0	10	20	23	30	40	50	60
Lutensol TO 3	350	150	70	50	35	25	15	10
Lutensol TO 5	1800	500	160	80	50	25	15	10
Lutensol TO 6	30000	2200	200	80	50	30	20	15
Lutensol TO 65	16500	1700	600	100	70	30	25	20
Lutensol TO 7	> 10 ⁵	75000	500	100	60	40	30	20
Lutensol TO 8	> 10 ⁵	> 10 ⁵	700	150	80	50	40	25
Lutensol TO 89	1200	250	160	120	70	40	25	20
Lutensol TO 10	> 10 ⁵	> 10 ⁵	2000	1000	450	150	50	30
Lutensol TO 109	1200	600	220	150	100	70	35	25
Lutensol TO 12	> 10 ⁵	> 10 ⁵	4500	2000	800	200	80	40
Lutensol TO 129	1200	650	280	200	150	80	50	35
Lutensol TO 15	> 10 ⁵	> 10 ⁵	> 10 ⁵	10000	1500	250	100	50
Lutensol TO 20	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	2000	300	120	60
Lutensol TO 389	700	350	130	100	70	35	30	20
Lutensol TO 565	70000	900	160	80	30	20	10	10

We would recommend preparing 10-25% stock solutions of Lutensol TO 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 rates at which the Lutensol TO types dissolve can be increased by adding alcohols, glycols and other solubilizers.

The Lutensol TO types can form fairly stiff gels at certain concentrations when water is added. The figures below were measured with a Brookfield viscometer at 23 $^{\circ}$ C and 60 rpm.

Water content (%)	Lutensol TO 3	Lutensol TO 5	Lutensol TO 6	Lutensol TO 65	Lutensol TO 7	Lutensol TO 8	Lutensol TO 89	
0	50	80	80	100	100	150	120	
10	55	80	90	120	150	130	130	
20	80	140	150	150	250	10000	45000	
30	110	10000	2000	35000	20000	40000	35000	
40	180	20000	20000	40000	35000	20000	26000	
50	200	> 10 ⁵	35000	28000	10000	5000	10000	
60	230	40000	2000	8000	5000	1000	3200	
70	200	30000	800	2500	1500	500	1000	
80	50	1000	200	700	400	100	400	
90	20	50	70	150	250	30	100	

The viscosity of Lutensol TO types (mPa·s) as a function of concentration

Storage

- a) The Lutensol TO types should be stored indoors in a dry place. Storerooms must not be overheated.
- b) The Lutensol TO types are hygroscopic and readily soluble in water, with the result that they absorb moisture very quickly. Drums must be resealed each time they are opened.
- c) 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.
- d) Lutensol TO 3, TO 5, TO 6, TO 7, TO 8, TO 65 and TO 565 are cloudy liquids at room temperature, and they tend to form a sediment. This cloudiness can be dissipated by heating them to ca. 50 °C.
- e) Liquid that has solidified or that shows signs of sedimentation should be heated to 50 60 °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 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 TO types must be blanketed with nitrogen if they are stored in heated tanks (at 50 – 60 °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.

The following materials can be used for tanks and drums.

- a) AISI 321 stainless steel (X6 CrNiTi 1810)
- b) AISI 316 Ti stainless steel (X10 CrNiMoTi 1810)

Shelf life

Materials

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

Lutensol TO 10	Lutensol TO 109	Lutensol TO 12	Lutensol TO 129	Lutensol TO 15	Lutensol TO 20	Lutensol TO 389	Lutensol TO 565	
1000	150	2000	200	10000	> 10 ⁵	100	80	
135	175	150	200	160	200	120	90	
150	> 10 ⁵	220	300	200	250	10000	150	
4800	2000	800	> 10 ⁵	600	1200	12000	15000	
1500	3500	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	10000	45000	
> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	> 10 ⁵	1000	> 10 ⁵	
> 10 ⁵	> 10 ⁵	1700	300	600	> 10 ⁵	500	2000	
450	135	300	70	100	400	200	750	
120	65	150	50	40	50	150	250	
20	15	20	30	20	20	20	100	

Applications

The Lutensol TO types belong to a group of nonionic surfactants that have established themselves in detergents and cleaners, and in other branches of the chemical industry, by virtue of the high levels of surface activity they display. Their main area of application is in detergents and cleaners for household, industrial and institutional use.

Because they are nonionic, the Lutensol TO types can be combined with anionic, cationic and nonionic surfactants and auxiliaries. They are fully compatible with alkylaryl sulphonates (Lutensit[®] A-LB types), ether sulphates and other sulphated and sulphonated products. This enables synergistic effects and very high levels of performance to be obtained. They are also compatible with the Protectol[®] KLC types (cationic biocides based on dimethyl fatty alkylbenzeneammonium chloride) and with other nonionic surfactants such as our Lutensol A N, TO, AP, AT, EC, F, GD and ON types, and the low-foaming surfactants in our Plurafac[®] LF and Pluronic[®] PE and RPE ranges. Their compatibility with dyes, pigments, protective colloids, thickeners and other substances with a molar mass in the upper range is also very good.

The versatility of the Lutensol TO types is such that they can be used to formulate acid, alkaline and neutral cleaners that satisfy the most varied requirements. They are very effective emulsifiers in combination with Emulan[®] and other products from the Lutensol range.

Laundry detergents

The Lutensol TO types and other similar nonionic surfactants have been gaining in importance in recent years, for the following reasons.

1. Detergent manufacturers have been working steadily for years to reduce the amount of pentasodium triphosphate (STP) in their products, or to eliminate it completely, for ecological reasons. The proportions of nonionic surfactants in detergent formulations, in terms of the total surfactant content, have had to be increased to compensate for the drop in performance caused by replacing STP with other builders. Fatty alcohol ethoxylates, especially those with a medium-length alkyl chain, have been shown to provide substantial increases in detergency in extensive trials.

2. Laundry detergents with a high anionic surfactant content are only really effective on cotton fabrics at high temperatures and at high concentrations. All-temperature detergents, especially, have to contain a large proportion of nonionic surfactants if they are to provide acceptable results on cotton, synthetic fibres and blended fabrics. The detergency of medium-chain fatty alcohol ethoxylates is substantially better than that of anionic surfactants, especially in the low-to-medium temperature range and at reduced concentrations.

	3. Medium-chain fatty alcohol ethoxylates can be used to control foaming in household detergents. Their degree of ethoxylation can be in the lower or upper range, depending on the temperatures for which detergents are designed. Detergents are often expected to produce different amounts of foam at different temperatures. This can normally be achieved simply by adjusting the proportions of linear alkylbenzenesulphonate, soap and nonionic surfactants, but special antifoams can be added if required.
	4. Nonionic surfactants containing around 7 mol of ethylene oxide are the best choice for liquid laundry detergents, because they are the most effective in the 60 °C temperature range. The popularity of Lutensol TO 7 has been increasing in line with the increasing demand for household liquid detergents.
High-temperature powders	We would recommend Lutensol TO 8, Lutensol TO 10 and Lutensol TO 12 for use at temperatures of up to 95 °C, either alone or in combination with Lutensol AO types.
Powders for use at 60 °C	The Lutensol TO types with a medium degree of ethoxylation perform best at 60 °C, and they perform well in low-phosphate and phosphate-free formulations. We would therefore recommend Lutensol TO 7, Lutensol TO 8 or Lutensol TO 89, either alone or in combination with Lutensol AO types.
	Lutensol TO 389 has been shown to perform very well in low-foaming, low-phosphate and phosphate-free detergents and in institutional laundry detergents, either alone or in combination with Lutensol AO 3109.
	Lutensol TO 389, TO 5, TO 6 and TO 65 have been shown to remove fatty stains very effectively in combination with Lutensol TO 8.
	Combinations of Lutensol TO 5 or TO 6 and Plurafac LF 403 can be employed in low-foaming institutional laundry detergents for use at 60 – 70 °C.
Light-duty liquids and powders, detergents for wool, hand-washing detergents	Lutensol TO 7, TO 8 and TO 109 perform very well in detergents of this type detergents in combination with Lutensol AO 3109 and Plurafac LF 400 or Plurafac LF 401.
Cleaners	The Lutensol TO types have high detergency and high soil-dispersing capacity, and they are very effective emulsifiers and wetting agents. It is for this reason that they are frequently employed in detergents and cleaners and in other industrial processes that require this type of performance. The Lutensol TO types with a low degree of ethoxylation perform very well as emulsifiers for mineral oils, which is particularly useful in cleaners that are applied cold.
	The Lutensol TO types with a degree of ethoxylation in the middle of the range perform particularly well in all-purpose cleaners and in cleaners for industrial, household and institutional use that are applied at higher temperatures.
	Very large amounts of acids, alkalis, salts and organic solvents may have to be added to some formulations in order to fulfil special requirements. High concentrations of inorganic salts, bases and acids can impair the solubility of the Lutensol TO types.
	Nevertheless, this does not necessarily affect their performance. Although electrolytes of this type do not cause the Lutensol TO types to decom- pose, they can still cause solutions to become cloudy or to separate but, provided they are still homogeneous, their performance is not affected.
Neutral cleaners	The water-soluble products in the range – Lutensol TO 8, TO 10, TO 12, TO 89, TO 109 and TO 129 – perform particularly well in neutral cleaners in combination with anionic surfactants from our Lutensit range (especially Lutensit A-LB types), dispersing agents (Sokalan [®]) and chelating agents (Trilon [®]). It can be advisable to add a solubilizer such as cumene sulphonate to highly concentrated formulations.

Neutral metal cleaners	Neutral cleaners and degreasers with a corrosion-inhibiting action for metal pretreatment can be formulated from products such as our Korantin [®] MAT and Korantin PAT. The water-soluble surfactants in the range, especially Lutensol TO 8 or TO 89 and Lutensol TO 10 or TO 109, are very effective wetting agents for use in this type of formulation.
Alkaline cleaners	Cleaners of this type are based on caustic alkalis and carbonates, silicates and phosphates. They are mainly used to clean metal before it is plated, coated, phosphatized or anodized. Lutensol TO 8, TO 10 and TO 12 perform best, in combination with our anionic Lutensit A-PS and Lutensit A-LB types, chelating agents (Trilon) and dispersing agents (Tamol [®] N types).
Acid cleaners	Lutensol TO 8, TO 10, TO 12, TO 89, TO 109 and TO 129 can be used in pickling solutions, degreasers, descalers and derusters based on hydro- chloric, sulphuric, phosphoric or amidosulphonic acid. Formulations can also contain Lutensol FA 12, Protectol KLC types and corrosion inhibitors such as our Korantin BH types.
Household cleaners	Household cleaners are mostly neutral, but they can be slightly alkaline or slightly acidic. They can be formulated with Lutensol TO 5, TO 6, TO 65, TO 7, TO 8, TO 10, TO 89, TO 109 and TO 129, together with other anionic and nonionic surfactants, chelating agents and dispersing agents (Sokalan).
	Lutensol TO 12, TO 15 and TO 20 can be used alongside our Pluriol [®] E types as binders for solid cleaners.
Solvent-based cleaners	Lutensol TO 3 and Lutensol TO 5 can be used alongside Emulan P to emulsify hydrocarbons such as kerosene and white mineral spirits.
Emulsification	The Lutensol TO types generally perform well as emulsifiers, although some perform better than others. Their practical performance as emulsi- fiers can be gauged according to their hydrophilic-lipophilic balance, which correlates with their degree of ethoxylation.
	The Lutensol TO types can be combined with other emulsifiers from our anionic Emulan and nonionic Emulphor [®] ranges, and with alkali soaps, amine soaps and sulphonated oils. Graduated tests are the most effective means of determining the best combination of emulsifiers and the amounts required. Tests are indispensable if emulsions are subjected to severe demands due to the presence of electrolytes, finely divided suspended solids or water-soluble, organic solvents. Special emulsifier combinations often have to be employed to cope with exceptional thermal or mechanical stress.
	Lutensol TO 5, TO 6, TO 65, TO 7, TO 8, TO 10, TO 12, TO 15, TO 20 and TO 389 can be used to emulsify aromatic solvents such as benzene, toluene, xylene and solvent naphtha.
	Lutensol TO 7, TO 8, TO 10, TO 12, TO 15 and TO 20 can be used in emulsion polymerization process to emulsify monomers such as acrylic, vinyl and styrene compounds, either alone or in combination with anionic emulsifiers such as Emulphor OPS 25.
Dispersing	The dispersing capacity of surfactants, which plays an important part in cleaning and emulsification processes, is the single most important attribute that has to be considered if sparingly soluble solids are to be dispersed in water, polar solvents or mixtures of water and solvents. The Lutensol TO types are effective dispersing agents in grinding and milling processes, and they can be used to disperse the solids generated by precipitation, coagulation and other chemical reactions. They can be used alone or in combination with protective colloids.
Wetting	The Lutensol TO types are very effective wetting agents. They can be employed in a variety of refining, mixing, impregnating and surface-treatment processes.
	Again, graduated tests under practical conditions are the most effective means of determining the best products for specific applications.

Other applications	There are many applications for the Lutensol TO types in the leather, paper, paints and building products industries.
	Lutensol TO 3 can be employed as a feedstock in the production of ether sulphates.
Substitutes for alkylphenol ethoxylates (APEO)	Legislation and voluntary agreements have been adopted in many countries to prohibit the use of alkylphenol ethoxylates in detergents and cleaners. This was prompted by the ecological objections that have been raised owing to the toxicity of degradation products of APEO to fish.
	The Lutensol TO types can be employed as substitutes for alkylphenol ethoxylates in most detergent and cleaner formulations. Our Lutensol AO or Lutensol ON types may be more appropriate depending on the formulation in question.
Formulations	Suggested formulations are contained in the following publications.
	Cleaners and shampoos (TI/ES 1142) Liquid detergents (TI/ES 1148) Powder detergents (TI/ES 1154) Technical cleaners (TI/ES 1167) Specialty chemicals for metal pretreatment (TI/ES 1038)
Safety	
	We know of no ill effects that could have resulted from using the Lutensol TO 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 TO types do not exert any harm- ful 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 should be worn when handling these products in their undiluted form.
	Further details are given in our Safety Data Sheets.
Ecology	
	Biodegradability
	The Lutensol TO types are, on average, at least 90 % biodegradable and satisfy the requirements of German surfactants legislation of 4 June 1986.
	Labelling
	According to European and German legislation, the Lutensol TO types have to be labelled as follows.
	Hazard labelling
	Xn = Harmful Xi = Irritant R 22 = Harmful if swallowed R 36 = Irritating to eyes R 38 = Irritating to skin R 41 = Risk of serious damage to eyes

Labelling "Dangerous for the environment"

- N = Dangerous for the environment (Symbol: dead tree/fish)
- R 50 = Very toxic to aquatic organisms
- R 51 = Toxic to aquatic organisms
- R 52 = Harmful to aquatic organisms
- R 53 = May cause long-term adverse effects in the aquatic environment

NLN = No labelling necessary

The labelling that applies to the individual products in the Lutensol TO range is shown in the table below.

	Hazaı Iabelli	rd ing	Labelling "Dangerous for the environment"
Lutensol TO 3 Lutensol TO 5 Lutensol TO 6 Lutensol TO 65 Lutensol TO 7 Lutensol TO 8 Lutensol TO 89 Lutensol TO 10 Lutensol TO 109 Lutensol TO 12 Lutensol TO 129 Lutensol TO 15 Lutensol TO 20 Lutensol TO 389 Lutensol TO 565	Xi Xn Xn Xn Xn Xn Xn Xn Xn Xn Xn Xn Xn Xn	R 36/38 R 36/38 R 22/36/38 R 22/36 R 22/36 R 22/36 R 22/36/38 R 36/38	NLN NLN NLN NLN NLN * NLN * NLN * NLN * NLN * NLN

* Lutensol TO 89, Lutensol TO 109, Lutensol TO 129 and Lutensol TO 389 are classified as preparations. They are therefore exempt from being labelled as "Dangerous for the environment".

The information submitted in this publication is based on our current knowledge and experience. In view of the many factors that may affect processing and application, these data do not relieve processors of the responsibility of carrying out their own tests and experiments; neither do they imply any legally binding assurance of certain properties or of suit-ability for a specific purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed.



