

Low foaming emulsifiers

ROKAnol® LP30, LP42, LP64, LP66

Products

ROKAnol® LP30 – Nonionic surfactant used mainly as an emulsifier for metalworking fluids and as lubricity enhancer. It is a high molecular weight polymer based on alcohol of plant origin with a chain length of C16-C18. Product has low foaming profile and it is highly compatible with anionic and other nonionic formulation components. It's not soluble in water, but may be used as an additive for mineral oils.

ROKAnol® LP42 – Nonionic surfactant that belongs to the category of alkoxyated fatty alcohols. It is a high molecular weight polymer derived from plant-based alcohol with a C16-C18 carbon chain length. The product is liquid and is composed of approximately 100% active ingredients. While it does not dissolve in water, it is highly soluble in lower aliphatic alcohols, as well as in rapeseed and mineral oils.

ROKAnol® LP64 – Nonionic surfactant that can be categorized as the alkoxyated fatty alcohol. It is a high molecular weight polymer derived from plant-based alcohol with a carbon chain length of C16-C18. The product is in liquid form, with an active substance content close to 100%. It is not soluble in water, but it has excellent solubility in lower aliphatic alcohols, rapeseed oil, methyl esters of rapeseed oil, and both paraffinic and naphthenic mineral oils.

ROKAnol® LP66 – Nonionic surfactant classified in the group of alkoxyated fatty alcohols. It is a high molecular weight polymer based on alcohol of plant origin with a chain length of C16-C18. The product has a liquid form and an active substance content of about 100%. Dissolves poorly in water, but very well in low aliphatic alcohols, rapeseed oil, methyl esters of rapeseed oil as well as paraffinic and naphthenic oils.

Physicochemical properties

Properties	ROKAnol® LP30	ROKAnol® LP42	ROKAnol® LP64	ROKAnol® LP66
CAS number	68002-96-0	68002-96-0	68002-96-0	68002-96-0
Appearance at 20-25°C	Liquid	Liquid	Liquid	Liquid
Hazen colour at 40°C	Max. 70	Max. 70	Max. 70	Max. 70
Cloud point, method E [°C]	45-48	44-46	~ 55	64-68
Average molar mass	800	610	770	1000
Solidification point [°C]	~ (-11)	~ 6	~ 2	~ 4
pH of 1% solution at 20°C	5-7	5-7	5-7	5-7
Density at 25°C [g/cm³]	~ 0.96	~ 0.94	~ 0.96	~ 0.98
Viscosity at 25°C [cP]	~ 110	~ 60	~ 115	~ 160
HLB	~ 9	~ 9	~ 11	~ 11

Solubility

Determination of the solubility of products is carried out by visual evaluation of 1%, 10% and 50% solutions of a given product in a specified solvent, 24 hours after their preparation. Visually, the appearance of the sample is evaluated according to the following scale:

Result	Appearance of the test sample
1	Homogeneous clear
2	Homogeneous opalescent
3	Homogeneous cloudy
4	Macroscopic phase separation

The results of the samples (1%, 10% and 50%) are added up and on this basis the solubility of the product is determined. The following table gives the solubility scales according to the sum of the appearance scale results:

Sum	Solubility
3 – 6	Soluble
7 – 9	Partially soluble
10 – 12	Insoluble

The results of solubility determination can be found below:

Product	ROKAnol® LP30	ROKAnol® LP42	ROKAnol® LP64	ROKAnol® LP66
Paraffinic base oil	+	+	+	+
Naphthenic base oil	+	+	+	+
Rapeseed oil	+	+	+	+
Rapeseed oil methyl esters (RME)	+	+	+	+
Acetone	+	+	+	+
Ethanol	●	+	+	+
Demineralized water	▲	▲	▲	▲

+ soluble

● partially soluble

▲ insoluble

It is clearly visible that all of mentioned products are designed to be soluble in different solvents that are used in lubricant industry. All of our products are perfectly soluble in base oils and acetone,

additionally beside ROKAnol® LP30, are also soluble in ethanol. This products aren't soluble in water, which can be crucial in some applications.

Acids and base stability

Determination of the stability of products in alkali and acidic environment is carried out based on PN-EN 14712:2005.

Visually, the appearance of the sample is evaluated according to the following scale:

- macroscopic phase separation
- ▲ homogenous, cloudy solution
- homogenous, clear solution
- + homogenous, opalescent solution

Product name	Stability in 30% NaOH in given concentration g/L																
	10	20	30	40	70	80	110	120	180	200	240	250	260	270	280	320	360
ROKAnol® LP30	▲	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP42	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP64	▲	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP66	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Product name	Stability in 25% HCl in given concentration mL/L												
	1	2	3	10	12	15	20	40	90	95	105	140	25% HCl solution
ROKAnol® LP30	●	●	●	●	●	●	●	●	●	●	●	●	■
ROKAnol® LP42	●	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP64	●	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP66	▲	▲	▲	▲	▲	▲	▲	+	+	▲	▲	▲	+

Product name	Stability in 25% H ₂ SO ₄ in given concentration mL/L											
	1	2	3	4	20	25	35	40	45	110	140	25% H ₂ SO ₄ solution
ROKAnol® LP30	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP42	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP64	●	●	●	●	●	●	●	●	●	●	●	●
ROKAnol® LP66	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	+

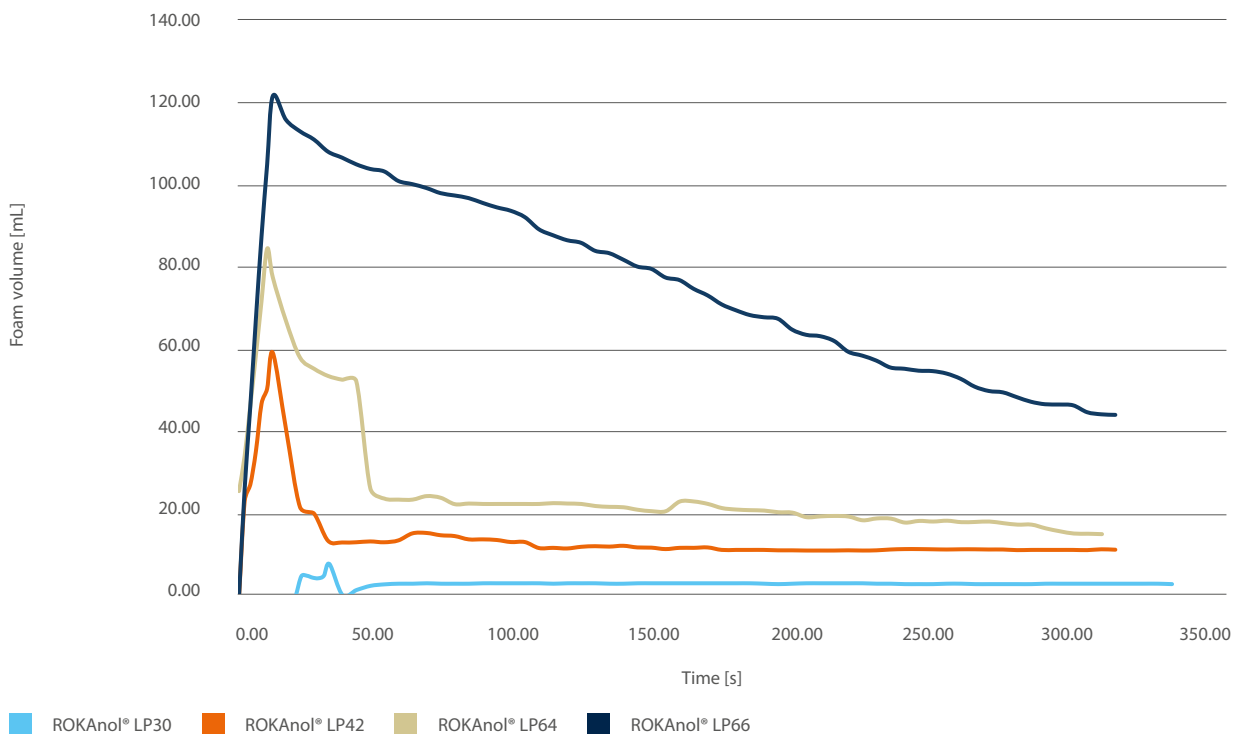
Despite not being stable in base solutions, some of our products like ROKAnol® LP30 and ROKAnol® LP66 are stable in acidic solutions,

especially in higher concentrations. This ability makes them more suitable for wide range of applications.

Foaming stability

Foaming stability were measured using Kruss DFA100 foam analyser. Previously prepared solution containing 0,1% of given product from the ROKAnol® LP series and demineralized water was foamed by

injecting 100 ml of gas with flow rate of 0,5 L/min. After that time the device started to measure the changes in foam volume in 5 minutes time. On the chart below you can see the results of the test.



From this chart it can be seen that in all cases the foam created due to gas injection, quickly fades away in short time. In that test it's clearly visible how ROKAnol® LP30 is non foaming at all, very small amount of foam almost immediately disappears.

Same goes for ROKAnol® LP42 and despite quite large volume in ROKAnol® LP64 and LP66 case, after 5 minutes time the foam is 4 times smaller (ROKAnol® LP64) and almost 3 times smaller (ROKAnol® LP66).



Foaming properties

ROKAnols® LP30, LP42, LP64 and LP66 have low foaming capability so these products can be used in many application where foam is problematic.

Determination of the foaming properties was preformed according to PN-ISO 696:1994 (the modified Ross-Miles method) for solution with a concentration of 1.0 g/l in demineralized and hard water at a temperature of 25°C.

Foam volume [ml]	Description
0-20	Non
20-70	Poor
70-100	Low
100<	Moderate

Product	Demineralized water	Hard water
ROKAnol® LP30	Non	Non
ROKAnol® LP42	Non	Non
ROKAnol® LP64	Non	Non
ROKAnol® LP66	Poor	Poor

Again, it can be seen that ROKAnol® LP series exhibit poor foaming properties and foaming stability. In many application it can be crucial

to use this type of products, thus choosing ROKAnol® LP 30, 42, 64 or 66 is an excellent choice in case of demanding applications.



Corrosion inhibition

Currently in PCC Group three main corrosion test are conducted. Trying to meet the expectations of our customers we developed methods for steel corrosion, copper corrosion and aluminum corrosion evaluation.

Steel corrosion test is conducted using Cast Iron Chip method and it's based on DIN 51360-2 standard. Cast iron chips are placed on filter paper and wetted with the test solution. After 2 hours, the corroded area is evaluated according to the scale in the DIN standard.

Product	Concentration	Result
ROKAnol® LP30	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3
ROKAnol® LP42	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3
ROKAnol® LP64	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3
ROKAnol® LP66	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3

Corrosion test on copper surface is conducted accordingly to ASTM D130-18 standard. The copper plate is immersed in the test sample for the duration of the test. The test lasts 3 hours and takes place at

50°C. After this time, the appearance of the plate is evaluated based on the standard contained in ASTM.

Product	Concentration	Result
ROKAnol® LP30	Concentrated product	1a
ROKAnol® LP42	Concentrated product	2c
ROKAnol® LP64	Concentrated product	1a
ROKAnol® LP66	Concentrated product	1a

Concentrated ROKAnols® LP series do not corrode copper surface and can be safely used in formulations dedicated to this type of metal. Evaluation of corrosion on aluminum surface is conducted using in-house method. Sample is immersed in solution of test

product for duration of the test. Prepared sample is kept in a drier with settled temperature of 40°C for 2 weeks. After that time surface of the plate is evaluated based on standardized scale below:

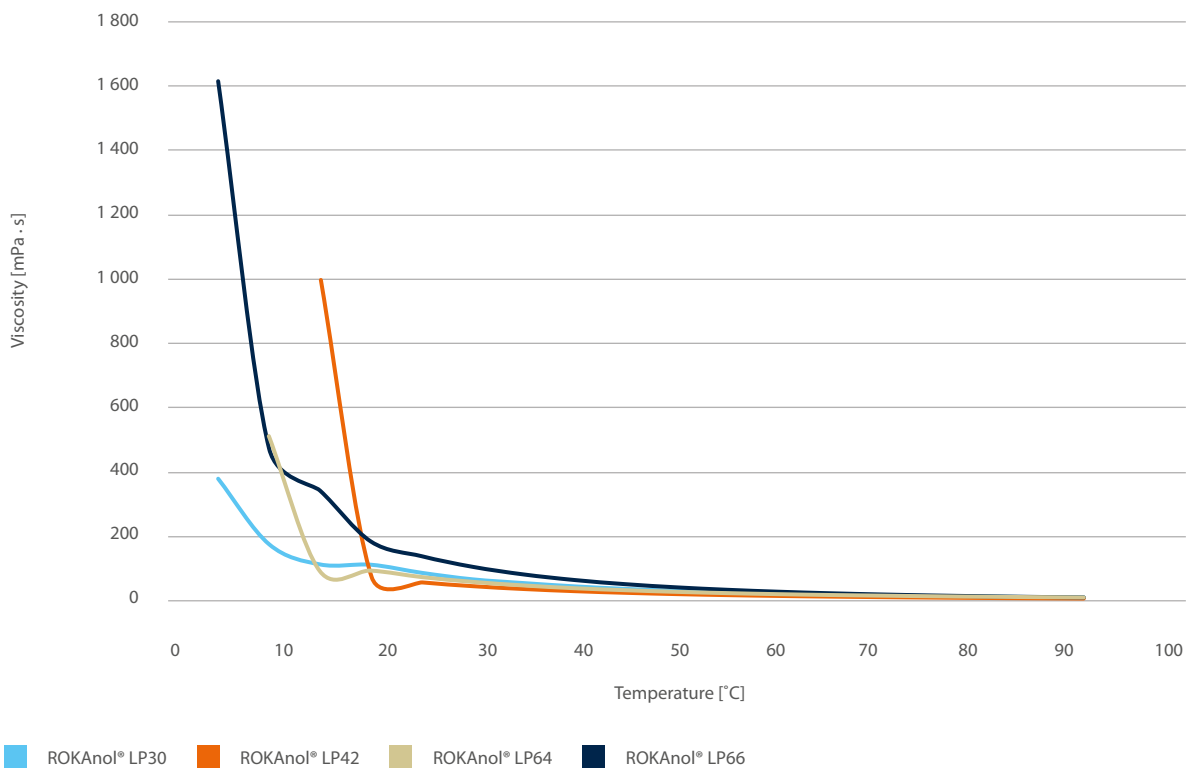
Corrosion rate	Description of corrosion effect
0	No visible corrosion
1a	Passivation between 1-50% of the plate surface (in gaseous phase)
1b	Passivation between 50-100% of the plate surface (in gaseous phase)
2a	Passivation between 1-50% of the plate surface (in aqueous phase)
2b	Passivation of the plate within a range of 50-100% of the plate surface (in aqueous phase)
3	Passivation of the plate surface in both the aqueous and gaseous phases
4	Plate passivation and exfoliation corrosion, characterized with solid particles in aqueous solution

Product	Concentration	Result
ROKAnol® LP30	Concentrated product	0
	1% Solution in demineralized water	2b
	1% Solution in hard water	2b
ROKAnol® LP42	Concentrated product	0
	1% Solution in demineralized water	2a
	1% Solution in hard water	2b
ROKAnol® LP64	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3
ROKAnol® LP66	Concentrated product	0
	1% Solution in demineralized water	3
	1% Solution in hard water	3

Viscosity of products

In many applications viscosity may be a crucial parameter in case of preparation of formulations, storage etc. Low viscosity in low temperature of our products prevents from additional heating and possible decomposition risk. Moreover ROKAnol® LP30 and LP66 stay homogenous and pumpable even in 5°C. ROKAnol® LP64 has a little

bit higher solidification point which makes it harder to use in lower temperatures, but even at 10°C this product can be easily applicable. ROKAnol® LP42 solidify in higher temperatures than other products from LP series, but at the temperature around 15°C is still easy to use during industrial processes.



Emulsion stability

To test the emulsion stability the emulsions were prepared in two-step way. First step was to prepare concentrate of one of the

products and mineral oil. Following concentrates consisting of 20% emulsifier and 80% base oil are presented in table below.

Product	ROKAnol® LP30	ROKAnol® LP42	ROKAnol® LP64	ROKAnol® LP66
Type of concentrate	20% ROKAnol® LP30	20% ROKAnol® LP42	20% ROKAnol® LP64	20% ROKAnol® LP66
	80% Base oil SN150	80% Base oil SN150	80% Base oil SN150	80% Base oil T-22

Next step was to prepare emulsions using 10% of concentrate (for ROKAnol® LP30 and LP42) or 5% of concentrate (for ROKAnol® LP64 and LP66). Accordingly 5 or 10 g of the product was added to the measuring cylinder and then water was added up to 100 g

of the entire emulsion. Two phases were then mixed manually in measuring cylinder and left until separation or any other major signs of instability.

Product	Concentrate type	Emulsion type	Stability [h]
ROKAnol® LP30	20% in base oil SN150	10% in demineralized water	< 96h
		10% in hard water	< 96h
ROKAnol® LP42	20% in base oil SN150	10% in demineralized water	< 96h
		10% in hard water	< 96h
ROKAnol® LP64	20% in base oil SN150	5% in demineralized water	< 96h
		5% in hard water	< 96h
ROKAnol® LP66	20% in base oil T-22	5% in demineralized water	> 3 weeks
		5% in hard water	> 3 weeks

ROKAnol® LP30 provides excellent emulsifying properties – up to 96h of emulsion stability both in demineralized and hard water. ROKAnol® LP42 stand out with very good emulsifying properties, it provides up to 96h stability in demineralized water, as well as in hard water. ROKAnol® LP66 is one of the best currently available

emulsifier, providing emulsion stability for more than 3 weeks. ROKAnol® LP64 has similar emulsification properties to ROKAnol® LP42. It can be used in smaller dosage (from 5%) and at the same time create stable emulsions in demineralized and hard water up to 96h.





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The information in the catalogue is believed to be accurate and compiled to the best of our knowledge; however, it should be considered as introductory only. Detailed information about our products is available in TDS and MSDS.

The suggestions for product applications are based on our best knowledge.

The responsibility for the use of products in conformity or otherwise with the suggested application, and for determining product suitability for the user's own purposes rests with the user.

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