



# ROKAnol IT SERIES

Ethoxylated fatty alcohols  
Nonionic surfactant series



# ROKANol IT SERIES

## Chemical description

ROKANol IT Series are nonionic surfactants of the polyethoxylated fatty alcohol type. The line of ROKAnols IT is based on fully branched, synthetic isotridecyl alcohol. Owing to the appropriate method of conducting the reaction with ethylene oxide, it is possible to obtain a range of products with various ethoxylation degrees. The chemical structure of the ROKAnol IT Series is represented by the following formula:



**R – branched alkyl radical, with an average carbon chain length of 13**

## Application

Nonionic surfactants - ROKAnol IT series find their use in many different applications. They are especially suitable for:



Industrial and institutional cleaning



Cosmetic and detergents



Metal working



Emulsion polymerization



Textile industry



Food industry



Agrochemicals



Others



## Basic physical and chemical properties

Depending on the ethoxylation degree, the appearance of the ROKAnol IT Series ranges from clear or turbid liquids to paste and solid. Basic information concerning their physical and chemical properties is summarised in Table 1.

### General characteristic

PRODUCT NAME	AVERAGE MOLECULAR WEIGHT [g/mol]	APPEARANCE <sup>1)</sup>	COLOR <sup>2)</sup>	SOLUTION pH <sup>3)</sup>	CLOUD POINT <sup>4)</sup> [°C]	SOLIDIFICATION POINT [°C]	APPROX. DENSITY <sup>5)</sup> [g/cm <sup>3</sup> ]	WATER CONTENT <sup>6)</sup> [%]	SURFACE TENSION <sup>7)</sup> [mN/m]	HLB <sup>8)</sup>
ROKAnol IT3	330	clear or cloudy liquid with a tendency to separation in time	max 100 (40°C) <sup>a</sup>	5-7 <sup>b</sup>	48-51 <sup>D</sup>	approx. -20	0.93 <sup>c</sup>	max 1	27	8.0
ROKAnol IT5	420	clear or cloudy liquid with a tendency to separation in time	max 100 (40°C) <sup>a</sup>	5-7 <sup>a</sup>	60-62 <sup>E</sup>	approx. -5	0.96 <sup>c</sup>	max 0.5	28	10.5
ROKAnol IT6	460	clear liquid <sup>a</sup>	max 100 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	67-72 <sup>D</sup>	approx. -3	0.97 <sup>c</sup>	max 0.5	27	11.4
ROKAnol IT6R	460	clear liquid <sup>a</sup>	max 100 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	71-73 <sup>D</sup>	approx. 3	0.97 <sup>c</sup>	max 0.5	27	11.5
ROKAnol IT7	510	clear or turbid liquid	max 100 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	65-70 <sup>E</sup>	approx. 2	0.97 <sup>c</sup>	max 1	28	12.1
ROKAnol IT7W	510	liquid	max 50 <sup>a</sup>	5-7 <sup>a</sup>	65-70 <sup>E</sup>	below -18	0.98 <sup>c</sup>	approx. 10	28	12.1
ROKAnol IT8	550	turbid liquid or paste	max 50 (40°C) <sup>a</sup>	5-7 <sup>a</sup>	76-78 <sup>D</sup>	approx. 8	1.00 <sup>c</sup>	max 0.5	28	12.8
ROKAnol IT8W	550	clear liquid	max 50 (40°C) <sup>a</sup>	5-7 <sup>a</sup>	75-79 <sup>D</sup>	below -20	1.00 <sup>c</sup>	approx. 10	28	12.8
ROKAnol IT9	600	liquid of oily consistence	max 70 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	56-60 <sup>A</sup>	approx. 10	1.01 <sup>c</sup>	max 1	28	13.3
ROKAnol IT9W	600	liquid	max 70 <sup>a</sup>	5-7 <sup>a</sup>	58-62 <sup>A</sup>	approx. -10	1.01 <sup>c</sup>	approx. 10	28	13.3
ROKAnol IT10	640	turbid liquid or paste	max 100 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	74-77 <sup>A</sup>	approx. 18	1.02 <sup>b</sup>	max 0.5	28	13.8
ROKAnol IT12	730	turbid liquid or paste	max 70 (40°C) <sup>a</sup>	5-7 <sup>a</sup>	79-85 <sup>A</sup>	approx. 20	1.02 <sup>c</sup>	max 0.5	29	14.5
ROKAnol IT13	770	clear liquid <sup>a</sup>	max 100 (50°C) <sup>a</sup>	5-7 <sup>a</sup>	74-76 <sup>B</sup>	approx. 24	1.02 <sup>d</sup>	max 0.5	31	14.8
ROKAnol IT15	860	soft white solid	max 2 (50°C) <sup>b</sup>	5-8 <sup>c</sup>	80-85 <sup>B</sup>	approx. 24	1.02 <sup>d</sup>	max 1.5	32	15.3
ROKAnol IT20	1080	white to yellowish solid	approx. 20 (40°C) <sup>a</sup>	5-7 <sup>a</sup>	84-88 <sup>B</sup>	approx. 30	1.02 <sup>e</sup>	max 1	34	16.3
ROKAnol IT20/80	1080	clear liquid	max 100 <sup>a</sup>	5-7 <sup>a</sup>	84-88 <sup>B</sup>	approx. -4	1.00 <sup>b</sup>	approx. 20	34	16.3
ROKAnol IT40	1960	solid	approx. 20 (50°C) <sup>a</sup>	5-7 <sup>d</sup>	72-77 <sup>C</sup>	approx. 40	1.05 <sup>a</sup>	max 1	42	18.0
ROKAnol IT40/70	1960	viscous liquid	max 150 (25°C) <sup>a</sup>	5-7 <sup>d</sup>	72-77 <sup>C</sup>	approx. 9	1.09 <sup>b</sup>	approx. 30	42	18.0
ROKAnol IT100/35	4600	liquid	max 150 <sup>a</sup>	6-8 <sup>a</sup>	approx. 73 <sup>C</sup>	approx. -7	1.06 <sup>a</sup>	approx. 70	48	19.1

#### 1) Appearance:

a - at 50

#### 2) Color

a - Hazen, b - Gardner

#### 3) pH:

a - pH of a 1% solution according to PN-EN 1262:2004, solution B, at 20°C  
 b - pH of a 2% solution according to PN-EN 1262:2004, solution B, at 20°C  
 c - pH of a 5% solution according to PN-EN 1262:2004, solution B, at 20°C  
 d - pH of a 10% solution according to PN-EN 1262:2004, solution B, at 20°C

#### 4) Cloud point according to PN-EN 1890:2000

Method A - aqueous solution  
 Method B - 50 g/l NaCl solution  
 Method C - 100 g/l NaCl solution  
 Method D - 45 g butyldiglycol/water solution  
 Method E - 25 g butyldiglycol/water solution

#### 5) Density measurements:

a - at 20°C  
 b - at 25°C  
 c - at 30°C  
 d - at 50°C  
 e - at 60°C

6) Water content according to PN-ISO 760:2001, direct method, solvent – methanol

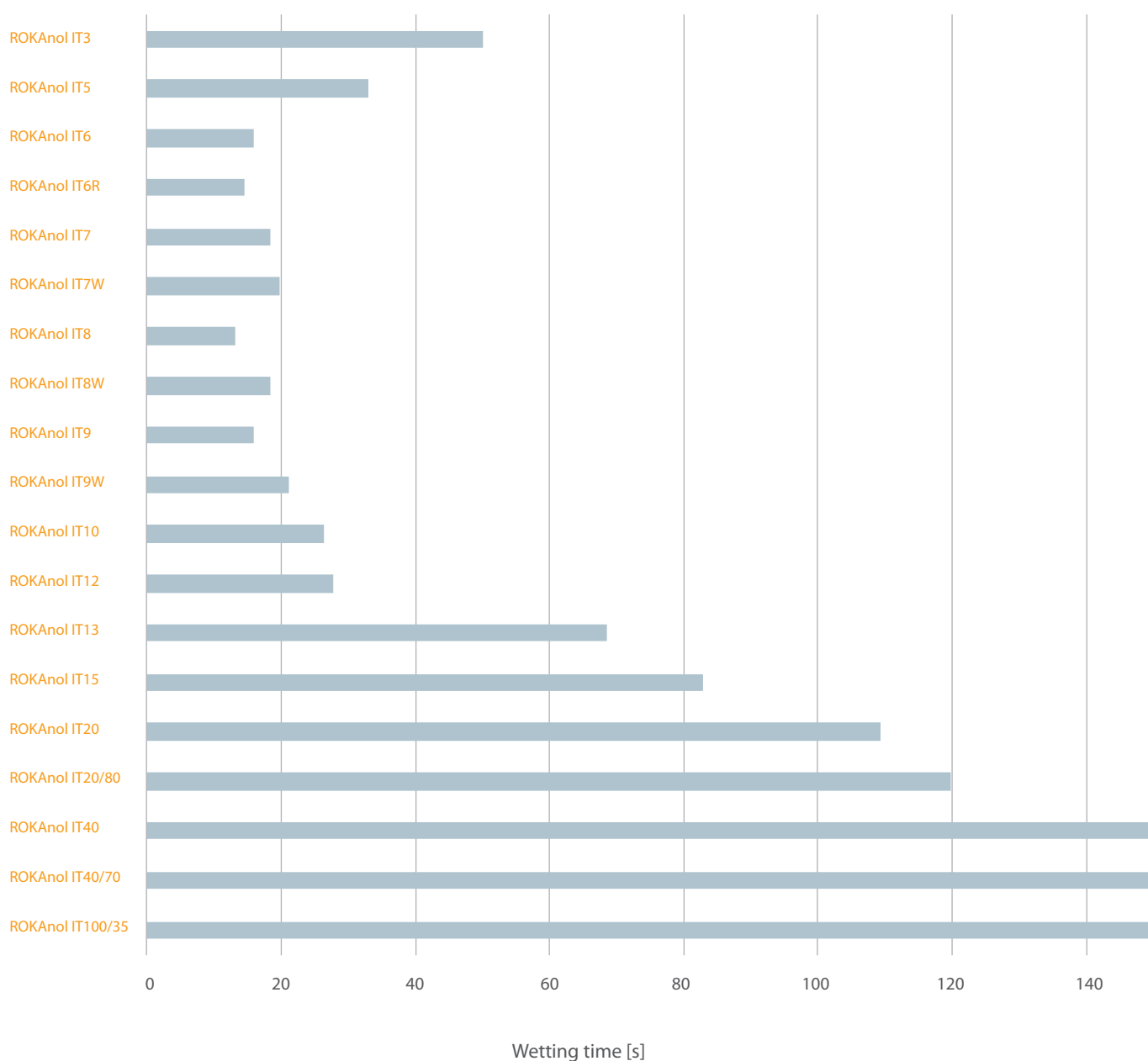
7) Surface tension according to PN-EN 14370:2004, determined using Wilhelmy plate method at a temperature of 25°C and concentration of 0.1%

8) HLB determined using calculation method

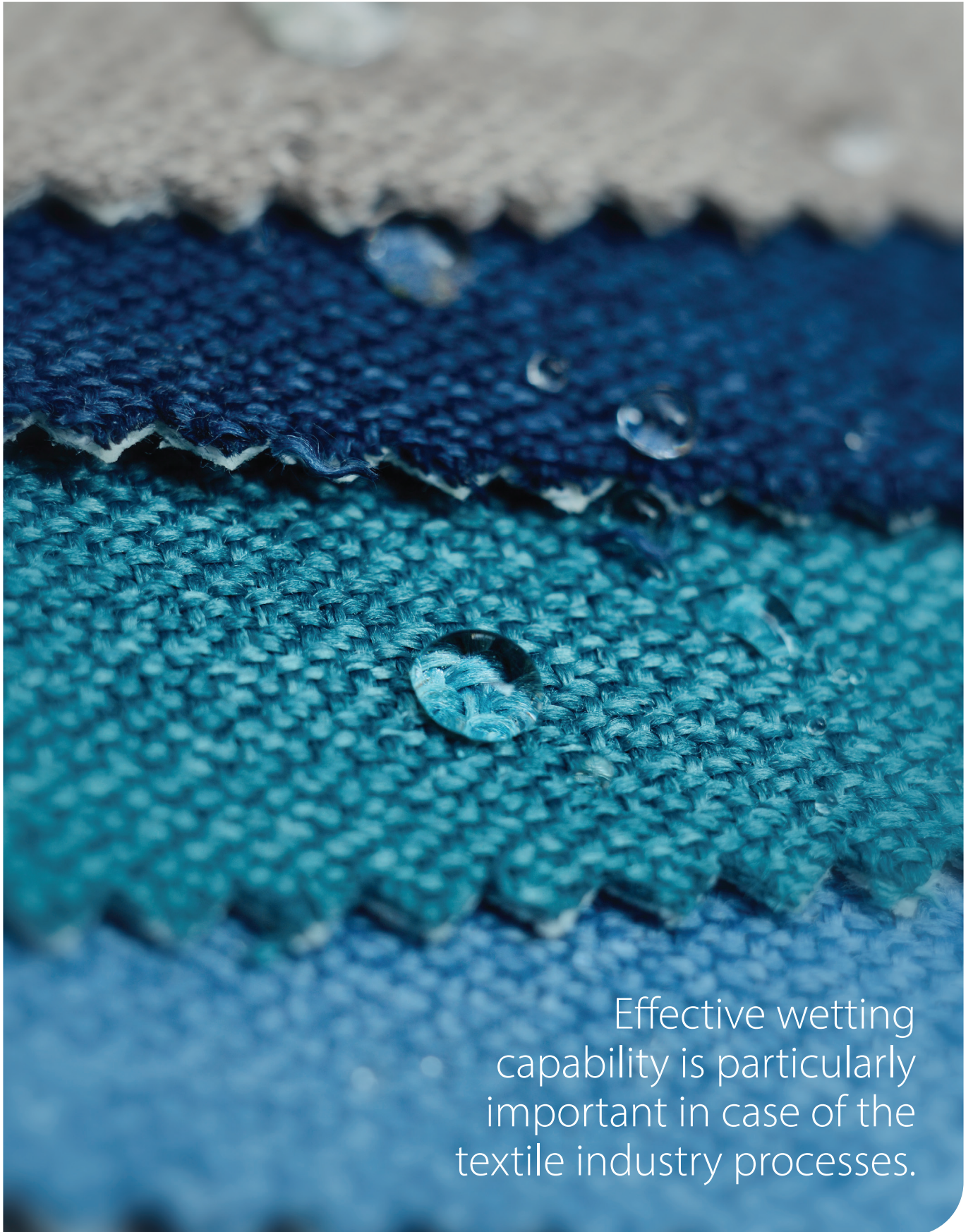
## Wetting capability

In a large number of applications the capability of effective wetting is desired property of surfactants. The wetting capability of cotton fabric was determined according to **EN 1772:2001** method. Wetting time (time in seconds necessary for wetting the textile material) was measured in ROKAnols solutions with a concentration of 1.0 g/L in demineralized water at a temperature of 20°C.

### Wettability solution concentration of 1.0 g/L in demineralised water at 20°C



Wetting time is highly depended on ethoxylation degree and HLB. The lowest wetting time is observed for HLB in range of 11-13. The best wetting agents are ROKAnol IT6R, ROKAnol IT8 and ROKAnol IT9.

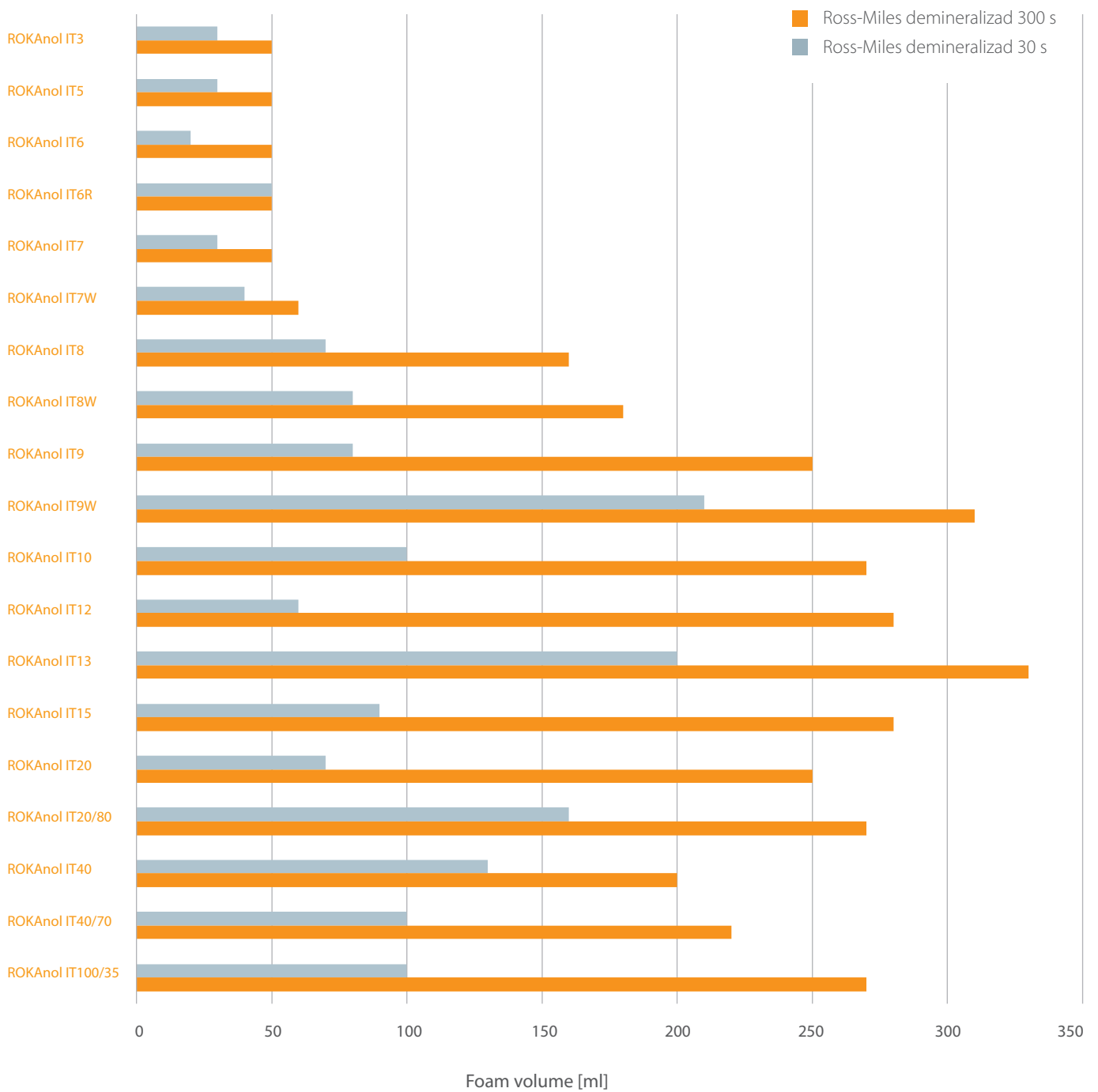


Effective wetting capability is particularly important in case of the textile industry processes.

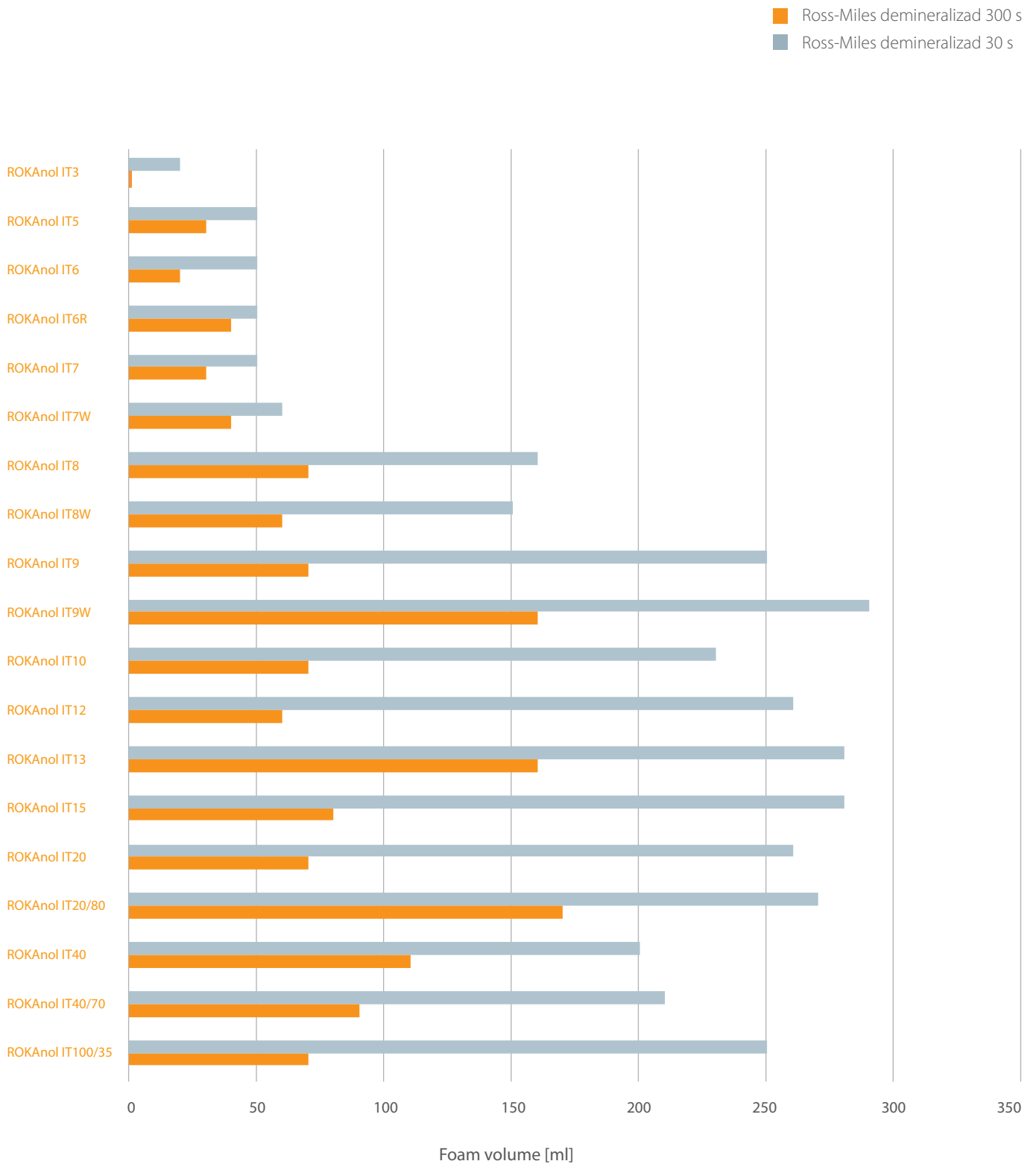
## Foaming capability

Determination of the foaming capability was performed according to PN-ISO 696:1994 (the modified Ross-Miles method) for the ROKAnol IT Series solutions with a concentration of 1.0 g/L in deionised water at a temperature of 25°C. The ROKAnol IT Series display lower foaming capability in comparison to anionic surfactants for which the average foam volume obtained after 5 minutes is approximately 430 ml (alkylethersulfates). The foaming properties change with increasing product ethoxylation degree.

Concentration of 1.0 g/L; demineralized water; temperature 25°C



Concentration of 1.0 g/L; hard water with calcium hardness of 3 Ca<sup>2+</sup> mmol/L (17°d); temperature 25°C



## Alkali and acid resistance

Determination of capability to form stable solutions in the acid and alkaline environment was performed according to **PN-EN 14712:2005** at a temperature of 20°C. Stability in the alkaline environment is defined as the maximum concentration of sodium hydroxide (with minimum purity of 98%) in g/L in a stable surfactant solution with a concentration of 1% (as active substance). Stability in the acid environment is defined as the maximum concentration of sulphuric acid (with purity in the range between 95% and 98%) in ml/L in a stable surfactant solution with a concentration of 1% (as active substance).

### Alkali resistance (Sodium Hydroxide); concentration of 1% active matter; temperature 20°C

Product	NaOH Concentration [g/L]								
	10	20	30	40	50	60	70	80	110
ROKAnol IT3	insoluble in water								
ROKAnol IT5	insoluble in water								
ROKAnol IT6	●	●	○						
ROKAnol IT6R	●	●	●	○					
ROKAnol IT7	●	●	●	○					
ROKAnol IT7W	●	●	○						
ROKAnol IT8	●	●	●	○					
ROKAnol IT8W	●	●	●	●	●	○			
ROKAnol IT9	●	●	●	●	●	○			
ROKAnol IT9W	●	●	●	●	○				
ROKAnol IT10	●	●	●	●	●	●	○		
ROKAnol IT12	●	●	●	●	○				
ROKAnol IT13	●	●	●	●	○				
ROKAnol IT15	●	●	●	●	●	●	●	○	
ROKAnol IT20	●	●	●	●	○				
ROKAnol IT20/80	●	●	●	●	●	○			
ROKAnol IT40	●	●	●	●	●	●	○		
ROKAnol IT40/70	●	●	●	●	●	●	●	●	○
ROKAnol IT100/35	●	●	●	○					

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



Acid resistance (Sulphuric Acid); concentration of 1% active matter; temperature 20°C

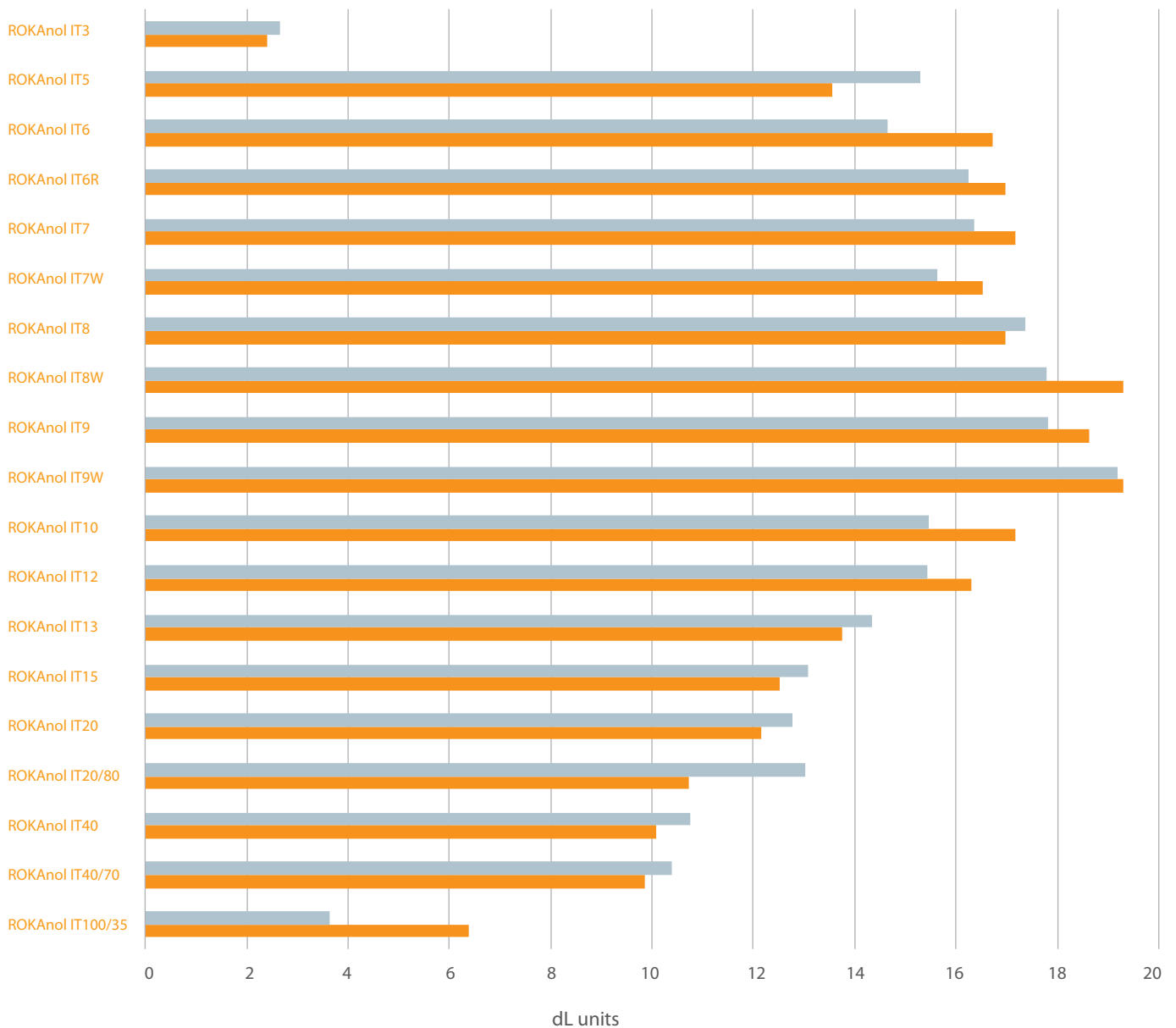
Product	H <sub>2</sub> SO <sub>4</sub> Concentration [g/L]					
	1	5	20	40	140	225
ROKAnol IT3	insoluble in water					
ROKAnol IT5	insoluble in water					
ROKAnol IT6	●	●	●	●	●	●
ROKAnol IT6R	●	●	●	●	●	●
ROKAnol IT7	●	●	●	●	●	●
ROKAnol IT7W	●	●	●	●	●	●
ROKAnol IT8	●	●	●	●	●	●
ROKAnol IT8W	●	●	●	●	●	●
ROKAnol IT9	●	●	●	●	●	●
ROKAnol IT9W	●	●	●	●	●	●
ROKAnol IT10	●	●	●	●	●	●
ROKAnol IT12	●	●	●	●	●	●
ROKAnol IT13	●	●	●	●	●	●
ROKAnol IT15	●	●	●	●	●	●
ROKAnol IT20	●	●	●	●	●	●
ROKAnol IT20/80	●	●	●	●	●	●
ROKAnol IT40	●	●	●	●	●	●
ROKAnol IT40/70	●	●	●	●	●	●
ROKAnol IT100/35	●	●	●	●	●	●

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

## Detergency

Detergency is the ability of the surfactant to remove soils from the fabric surface during the laundering process. Detergency tests were performed using to own method, with an EMPA 125 fabric. The material is soiled with a mixture of oils and carbon black. Cotton was washed at a temperature 40°C in ROKAnol IT series solutions. After drying the fabrics and pressing them, the total color difference of the fabric before and after washing, was measured. The higher the difference is, the better detergency properties are for surfactant.

### Detergency



The dL parameter is described by perceptually uniform, trichromatic colour models: CIE LAB and CIE LCH. The following is an interpretation of this parameter: L is defined as lightness (luminosity), while dL is determined by the equation:  $dL = LT - LS$ , where: T – tested sample (fabric after the detergency test), S – standard to which the tested sample is compared (fabric before the detergency test).

## 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	1	2	3	4
Appearance of the test sample	Homogeneous clear	Homogeneous opalescent	Homogeneous cloudy	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	3-6	7-9	10-12
Solubility	Soluble	Partially soluble	Insoluble

Product name	Water	Methanol	Eter	Aceton
ROKAnol IT3	Insoluble	Soluble	Insoluble	Soluble
ROKAnol IT5	Insoluble	Soluble	Insoluble	Soluble
ROKAnol IT6	Insoluble	Soluble	Insoluble	Soluble
ROKAnol IT6R	Insoluble	Soluble	Partially soluble	Soluble
ROKAnol IT7	Insoluble	Soluble	Partially soluble	Soluble
ROKAnol IT7W	Insoluble	Soluble	Insoluble	Soluble
ROKAnol IT8	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT8W	Soluble	Soluble	Soluble	Soluble
ROKAnol IT9	Soluble	Soluble	Partially soluble	Soluble
ROKAnol IT9W	Soluble	Soluble	Partially soluble	Soluble
ROKAnol IT10	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT12	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT13	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT15	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT20	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT20/80	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT40	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT40/70	Soluble	Soluble	Insoluble	Soluble
ROKAnol IT100/35	Soluble	Soluble	Insoluble	Soluble

# PCC EXOL SA

## Sustainable technologies for new generations



PCC EXOL SA is a company that combines cutting-edge technologies with rich experience in production of surfactants (surface active agents). The company is located in Brzeg Dolny (Poland), where anionic, nonionic and amphoteric surfactant production plants have been launched. Due to the flexible production processes, the company offers a wide spectrum of surfactants and industrial formulations, which are often suited for the individual customers operating in plenty of various industry sectors. As one of the leading surfactant manufacturers, PCC EXOL SA carries out new investment projects and implements innovative technologies based on the global sustainability trends.

PCC EXOL SA portfolio includes surfactants with a broad range of applications. Besides of the mass production for personal care and detergents industry, the substances produced by PCC EXOL SA also include specialized products used in various branches, such as textile, agrochemical, metal cleaning, oil drilling, building & construction, paints & coatings, paper industry, extraction & drilling, and many others. The company comprehensive portfolio is continuously enriched with new innovative products, which meet even the strictest market requirements and adapt to the individual needs of customers. This is possible due to the dynamic development of the research faci-



PCC EXOL SA combines innovative technologies with experience in designing, producing and selling surfactants and chemical formulations

ties, flexible production, knowledge as well as experienced personnel.

PCC EXOL SA has the key competence necessary for a worldwide production of surfactants. The ongoing projects will soon bring the new opportunities for the company's further development and expansion into new markets. The company offers not only a wide portfolio and professional servicing but most of all flexible production and comprehensive system solutions that meet individual customer demands. The strategic PCC EXOL SA investor is PCC SE, operating on international markets of the chemical raw materials, transport, energy, coal,

coke, petrol, plastics and metallurgy. PCC SE includes 80 companies operating in 39 different locations in 17 countries.



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