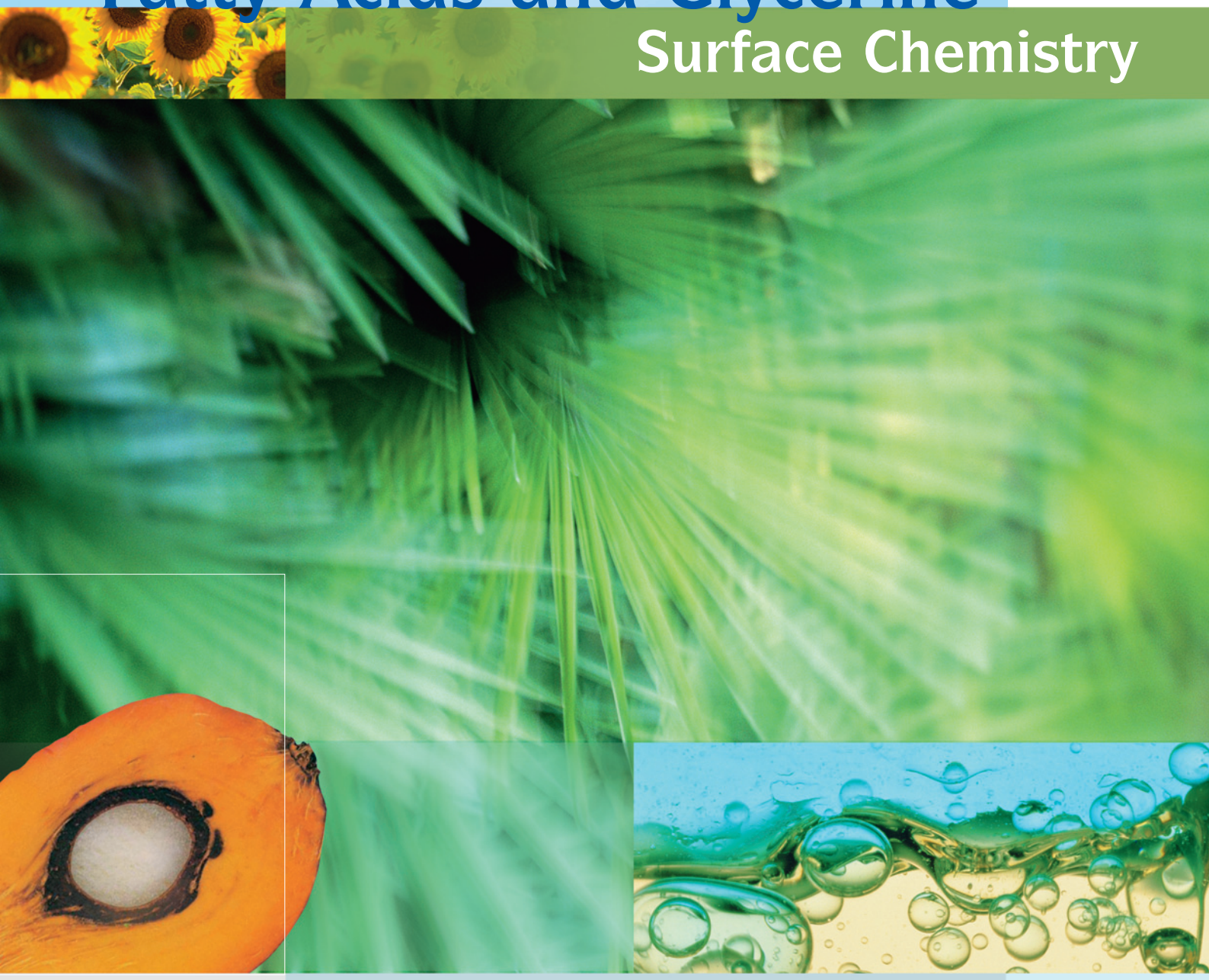
Fatty Acids and Glycerine

Surface Chemistry



AKZO NOBEL

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Creating The Right Chemistry

Akzo Nobel Oleochemicals is part of Akzo Nobel Surface Chemistry, a business unit of Akzo Nobel.

CERTIFICATE OF APPROVAL

This is to certify that the HACCP System of:

Akzo Nobel Oleochemicals Sdn. Bhd.
Akzo Nobel Industries Sdn. Bhd.
Pasir Gudang, Johor
Malaysia

has been evaluated and approved by Lloyd's Register Quality Assurance Limited to the following standard as defined by the Central Committee of Experts HACCP:

Criteria for the assessment of an operational HACCP system, September 1998

The HACCP system is applicable to:

Manufacture of Fatty Acids and Glycerine.

Approval Certificate No: 403810

Original Approval: 12th July 2002
Current Certificate: 12th July 2002
Certificate Expiry: 31st July 2005

RvA

Issued by: LRQA Kuala Lumpur

We are one of the leading producers of Oleochemicals and offer a wide range of fatty acids, glycerine and specialty products.

At Akzo Nobel Oleochemicals we believe in the use of natural renewable raw materials.

All of our products are derived from vegetable based oils. Our production facilities are located in Pasir Gudang (Malaysia) and Emmerich (Germany). The chemistry of fats and oils and their derivatives is our key technology and our history in Oleochemicals starts in the early part of the 20th century.

Today we manufacture our high quality products in modern facilities with state of the art technology.

Your guarantee of quality

All of our products are based on natural renewable vegetable raw materials such as the Tropical oils of coconut and palm kernel and European polyunsaturated vegetable oils.

Quality is also a central concept within our company and our Oleochemicals plants are certified according to ISO standards. Furthermore, we are able to supply all of our products certified to Kosher standards. Our Pasir Gudang site is also HACCP/GMP certified a system that concerns food safety.

Our commitment to the environment is of the highest priority and our Oleochemical plants are certified according to the ISO14001 standards. In addition to this we are committed to the Responsible Care Program of the chemical industry.

State-of-the-art technology

Rather than just selling standard products, we are committed to developing partnerships with our customers. With our dedicated organization and flexible manufacturing capabilities we are able to offer tailor-made products and services to our customers that meet specific needs. We want to be recognized as The Responsive Partner in Oleochemicals – wherever you are. You can contact us through our website at www.akzonobel-oleochemicals.com, or through or extensive network of sales offices.

Akzo Nobel, based in the Netherlands, serves customers throughout the world with healthcare products, coatings and chemicals. Consolidated sales for 2003 totaled EUR 13 billion. The Company currently employs approximately 64,300 people in more than 80 countries.

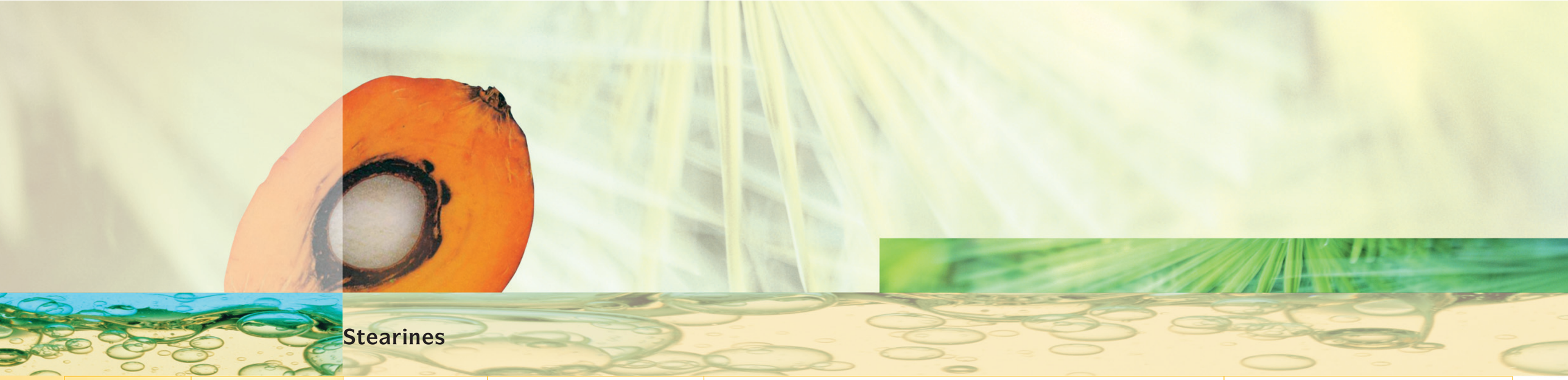
Surface Chemistry, a business unit of Akzo Nobel, operates in 50 countries, employing 2,400 people. The business unit is headquartered in Stenungsund, Sweden, with regional headquarters in Chicago, United States and Singapore. A leading supplier of fatty amine based surfactants, vegetable fatty acids and rheology modifiers. Surface Chemistry services a wide range of industries, including detergent, agro, petroleum, asphalt and the paint and building industry (see internet: www.akzonobel-oleochemicals.com).

Distilled Fatty Acids

Product	Fatty acid type	Color Lovibond 5¼" cell Red max	Color Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I_2/100 g min	Iodine Value g I_2/100 g max	Water % max	Titer °C min	Titer °C max	Fatty Acid Composition in % C 6 max	C 8 min	C 8 max	C 10 min	C 10 max	C 12 min	C 12 max	C 14 min	C 14 max	C 16 min	C 16 max	C 18 min	C 18 max	C 18:1 min	C 18:1 max	C 18:2 min	C 18:2 max	C 18:3 max	C 20 max	Others max	Remarks
Kortacid C 60	Coconut	2.5	25	264	274	7	15		21	26		4	10	3	8	45	56	15	23	7	14	1	7	3	11	3				1	> = C20 and others max. 2
Kortacid C 70	Coconut	1	5	265	275	7	12	0.2	23	26	1	4	8	4	9	47	55	16	20	7	11		3	5	10	2					
Kortacid CG	Stripped coconut	1	5	254	263	8	12	0.2	27	30				•		54	59	19	23	8	12		3	5	10	3					* < = C10 max 2
Kortacid PK 50	Palm kernel	0.4	4	255	265	15	20		22	25	T	2	6	2	6	47	55	13	17	7	10		3	12	17	4				1	
Kortacid PKG	Stripped palm kernel	1	10	240	260	14	23		23	28				•		40	60	14	20	6	12		5	12	22	5				1	* < = C10 max 1.6
Kortacid PKGH	Stripped hydrogenated palm kernel	0.5	2	254	260		1		29	32				•		54	58	20	22	10	12	11	13		1					1	* < = C10 max 1.5
Kortacid PZ 05	Palm	2	20	204	212	48	54		45	49.5				•			1		2	43	48	4	8	35	40	6	10	1	1		* < = C10 max 1.6

T = Traces

All product analysis is based on APAG, AOCS, or comparable, test methods.



Stearines

Product	Fatty acid type	Color Lovibond 5¼" cell Red max	Color Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I_2/100 g max	Titer °C min	Titer °C max	Fatty Acid Composition in % C 12 max	C 14 max	C 16 min	C 16 max	C 18 min	C 18 max	C 18:1 max	C 20 max	Others max	Remarks
Kortacid PH 05	Palm	0.3	3	206	211	0.5	55	56.5	0.5	1.5	43	48	50	55	0.5	1	0.5	
Kortacid PH 05 C	Palm	0.5	2.5	206	211	0.5	54	56	*	*	46	52	44	50	0.5	1	0.5	* C12 + C14 max 4
Kortacid PH 10	Palm	0.4	4	206	211	1	54.5	56	1	3	46	56	42	52	1	1	0.5	
Kortacid PH 10 S	Palm	0.3	3	206	211	1	55	56.5	1	3	46	52	48	54	1	1	0.5	
Kortacid PH 10 C	Palm	0.4	4	208	214	1	53.5	55.5	1	3	58	64	33	40	1	1	0.5	
Kortacid PT 10	Palm	0.5	5	203	208	1	57	61		2	29	33	65	69	1	1	0.5	
Kortacid 1655	Palm	0.3	3	205	212	0.5	53	56.5	T	1.5	52	58	42	48	1	2	0.5	
Kortacid PH 30	Palm	0.8	8	205	211	3	53.5	56	1	3	50	56	40	46	3	1	0.5	

T = Traces

All product analysis is based on APAG, AOCS, or comparable, test methods.

Fractionated Fatty Acids

Product	Fatty acid type	Color Lovibond 5¼" cell Red max	Color Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I_2/100 g min	Iodine Value g I_2/100 g max	Water % max	Titer % min	Titer % max	Fatty Acid Composition in % C 6 min	C 6 max	C 8 min	C 8 max	C 10 min	C 10 max	C 12 min	C 12 max	C 14 min	C 14 max	C 16 min	C 16 max	C 18 min	C 18 max	C 18:1 max	C 18:2 max	C 18:3 max	C 20 min	C 20 max	C 20:1 max	C 22 min	C 22 max	C 22:1 min	C 22:1 max	C 22:2 max	Others max	Remarks
Kortacid 0698	Caproic	0.5	2.0	472	482	2.5					97.5																									2.5	
Kortacid 0699	Caproic	0.3	1.5	476	482	1.0		0.3			99																									1.0	< C6 max 1.0; > C6 max 1.0
Kortacid 0899	Caprylic	0.5	2.0	386	390	0.35		0.2	15.5	16.5	*		99		**																					0.5	* < C8 max 0.5 ** > C8 max 1.0
Kortacid 0810	Caprylic/Capric	0.5	2.0	356	367	0.5		0.2			*		55	65	35	45	**																			0.5	* < C8 max 1.0 ** > C10 max 2.0
Kortacid 1099	Capric	0.5	2.0	323	328	0.5		0.2	30.5	31.5			*		99		**																			0.5	* < C10 max 1.0 ** > C10 max 1.0
Kortacid 1270	Lauric/Myristic	0.5	5.0	265	272	1.0			30	35					*		65	71	24	32		6	**													0.5	* < = C10 max 1.5 ** > = C18 max 0.5
Kortacid 1299	Lauric	0.2	2.0	279	281	0.2			43.3	44					1		99			1																0.5	
Kortacid 1499	Myristic	0.2	2.0	245	247	0.5			53	55								1	99			1														0.5	
Kortacid 1499.01	Myristic	0.2	2.0	245	247	0.5			53	55					*			0.3	99.4			0.3														0.5	< = C10 max 0.5
Kortacid 1695	Palmitic	0.2	2.0	218	221	1.0			60	63								1		2	95		**													0.5	** > = C18 max 4
Kortacid 1695.01	Palmitic	0.2	2.0	218	221	1.0			60	63								1		2	92.5	95	**													0.5	** > = C18 max 4
Kortacid 1698	Palmitic	0.2	2.0	218	221	1.0			60	63										1	98.5		**													0.5	** > = C18 max 1.5
Kortacid 1698.01	Palmitic	0.2	2.0	218	221	1.0			60	63										1	98.6		**													0.2	** > = C18 max 0.5
Kortacid 1890	Stearic	0.5	5.0	196	199	1.0			66	69												7	90	95	1					2					0.5	
Kortacid 1895	Stearic	0.5	5.0	195	199	2.0			68	70												5	95	98.5	1					2					1.0	
Kortacid 1898	Stearic	0.5	5.0	195	199	2.0			67	69												*	98		1					2					2.0	* < = C16 max 2
Kortacid 2285	Behenic	0.5	5.0	162	168	1.5			75	79														3				2	8		85	89				C24 max 2
Kortacid 2292	Behenic	1.0	4.0	160	166	2.0			75	79																				92	95					
Nouracid RE 07	Erucic	1.0	10.0	162	170	72	80		29	32.5											*	1		0.5	1.5	1.5	0.5		0.6	4		2	90	94	2	1.0	* < = C18 max 1.5 ** > = C24 max 3

All product analysis is based on APAG, AOCS, or comparable, test methods.

Poly Unsaturated Fatty Acids

Product	Fatty acid type	Colour Lovibond 5¼" cell Red max	Colour Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I_2/100 g min	Iodine Value g I_2/100 g max	Cloud point °C min	Cloud point °C max	Fatty Acid Composition (%) C 16 min	C 16 max	C 16:1 max	C 18 min	C 18 max	C 18:1 min	C 18:1 max	C 18:2 min	C 18:2 max	C18:3 min	C18:3 max	C 20 max	C 20:1 min	C 20:1 max	C 20:2 max	C 22 max	C 22:1 min	C 22:1 max	C 22:2 max	Others max	< = C 14 max	< = C 16 min	< = C 16 max	> = C 20 max	
Nouracid HE 30	Sunflower	1	5	198	202	130	146			5	8	1	3	6	18	27	60	70	1										1	1			2	
Nouracid ID 10	Mixed vegetable	2	15	195	205	120	140			7	13	1	2	7	33	45	30	46	4	10									2	1			4	
Nouracid IF 10	Mixed vegetable	8	80	190	205	90	115			8	18		2	10	40	60	12	25	4	9									3		8	20	10	
Nouracid LD 65	Linseed	2	15	194	205	165	180			5	10	1	2	6	18	30	20	30	32	42									3	1			4	
Nouracid LE 80	Linseed	1.5	10	198	202	180	200			4	8	1	3	5	17	25	13	19	45	56									2	1			3	
Nouracid RE 09	High erucic rapeseed	2	20	175	185	95	115				5			2	11	18	11	18	5	12	2	5	15	2	2	42	52	2						
Nouracid RZ 10	Rapeseed	1.5	10	198	202	111	113	5	13	4	7	1		4	57	65	18	24	6	11									1	1			5	
Nouracid SE 30	Soya	1	5	198	204	129	139			9	12	1	2	6	20	29	47	58	4	10									1	1			2	
Nouracid 1880	Oleic	0.6	6	197	204	90	100		8		5			2	77	84		15		1										3			2	
Nouracid HE 1885	Oleic	1	10	195	205	85	95		22		6			7	80	90		10		1										2			2	

All product analysis is based on APAG, AOCS, or comparable, test methods.

Poly Unsaturated Fatty Acids (Conjugated types)

Product	Fatty acid type	Color Lovibond 5¼" cell Red max	Color Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I2/100 g min	Iodine Value g I2/100 g max	Fatty Acid Composiiton in % C 16 min	C 16 max	C 18 min	C 18 max	C 18:1 min	C 18:1 max	C 18:2 min	C 18:2 max	C 18 Conjugated min	C 18 Conjugated max	C 18:3 min	C 18:3 max	Others max	< = C 18 min	< = C 18 max	> = C 20 min	> = C 20 max	
Nouracid DE 402	Dehydrated castor	1	10	195	201	140	154					13	18	40	50	22	27		3	2	6	12		2	
Nouracid DE 503	Dehydrated castor	1	10	196	200	145	157					11	16	40	47	30	35		4	2	6	10		2	
Nouracid DE 554	Dehydrated castor	1	10	194	200	150	162					9	14	32	40	40	45		1	2	5	8		2	
Nouracid DE 655	Dehydrated castor	1	10	193	198	155	166					6	12	26	38	50	54		1	2	2	8		2	
Nouracid DE 656	Dehydrated castor	1	10	193	198	163	173					5	8	22	29	60	65		1	2	2	5		1	
Nouracid DZ 453	Dehydrated castor	1.5	15	194	199	147	155					18	23	31	37	32	37		4	2	5	7		2	
Nouracid HE 301	Sunflower	1	10	198	202	132	142	5	9	3	7	19	26	46	56	12	15		1	2	8	16		2	
Nouracid HE 303	Sunflower	1.2	12	198	203	125	135					20	28	20	30	32	37		2	2	10	19		2	
Nouracid HE 304	Sunflower	1	10	198	202	125	135					20	28	18	27	40	42		2	2	10	19		2	
Nouracid HE 305	Sunflower	1	10	198	202	125	138					20	28	4	14	50	55		2	2	10	19		2	
Nouracid HE 306	Sunflower	1	10	198	202	130	140					22	28	2	10	58	63		1	2	10	17		2	
Nouracid HE 456	Sunflower	1	10	196	204	135	155					20	30	3	10	58	63		1	2		10		2	
Nouracid LE 805	Linseed	3	30	197	202	170						23	30	1	6	48	55	1	4	2	9	15	1	7	
Nouracid SE 305	Soya	1	10	198	203	125	140					20	28	2	11	48	56		1	1	12	18			

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Specialties

Product	Type	Colour Gardner max	Refractive Index N25/D min	Refractive Index N25/D max	Acid Value mg KOH/g max	Hydroxy Value mg KOH/g min	Hydroxy Value mg KOH/g max	Viscosity 20 °C d.Pas max	Water % max
Nourypol 200	Epoxidized soyabean oil based polyol	5	1.4630	1.4660	1.5	195	220	4	0.2

Ketones

Product	Type	Acid value mg KOH/g max	Ketone Content % min	Other % max
Kortacid EAK	Ethyl Amyl Ketone	2.0	97.5	2.4
Kortacid MHK	Methyl Heptyl Ketone	2.0	97.5	2.4
Kortacid MNK	Methyl Nonyl Ketone	2.0	97.5	2.4

Vitamin F

Products	Type	Colour Gardner max	Acid Value mg KOH/g min	Acid Value mg KOH/g max	Iodine Value g I2/100 g min	Iodine Value g I2/100 g max	Peroxide Value meq/1000g max	Refractive Index N25/D min	Refractive Index N25/D max	Fatty Acid Composition (%) C 18:1 min	C 18:1 max	C 18:2 min	C 18:2 max	C 18 Conjugated min	C 18 Conjugated max	C 18:3 min	C 18:3 max	C 24 max	Others max	< = C 18 min	< = C 18 max	> = C 20 max
Vitamin F/AO	Activated vegetable oil blend	3		0.2	123	133	3	1.4720	1.4730	20	30	47	56			4	10	3	2	10	18	3
Vitamin F/EE	Vegetable oil blend ethyl ester	1		1	145	155	3	1.4555	1.4570	18	24	31	37			28	34	2	2	11	15	2
Vitamin F/SP40	Fatty acids	2	195	204	155	165	3	1.4695	1.4720	4	11	44	54	34	42		1		2.5		8	2
Vitamin F/SP60	Fatty acids	1	193	198	165	170	3	1.4746	1.4754	5.5	6.5	22	29	60	65		2	1	2	2	4	1

All product analysis is based on APAG, AOCS, or comparable, test methods.

Castor Oil Derivatives

Product	Fatty acid type	Color Gardner max	Color Lovibond 1" cell Red max	Color Lovibond 1" cell Yellow max	Color Lovibond 5¼" cell Red max	Color Lovibond 5¼" cell Yellow max	Acid Value mg KOH/g min	Iodine Value g I_2/100 g min	Iodine Value g I_2/100 g max	Hydroxy Value mg KOH/g min	Water % max	Refractive Index N20/D min	Refractive Index N20/D max	Density kg/l min	Density kg/l max	Fatty Acid Composition (%) C 16 max	C 18:1 max	C 18:2 max	C 18 Conjugated max	C 18:3 max	Riz C 18:1 OH min	
Nouracid CZ 80.01	Ricinoleic	2	0.5	3	1.5	6	175	85	92	155	0.5	1.4695	1.4720	0.935	0.945	3	5	6.5	4.5	1	84.5	

Refined Glycerine

Product	Assay % min	Water % max	Appearance clear and colourless	Color alpha max	Density 20 °C kg/l min	Density 20 °C kg/l max	Refractive index n(20/D) min	Refractive index n(20/D) max	Identification A,C,D	Characteristics	Impurity A and related substances	Acidity 0.2 ml of 0.1 M NaOH	Esters 8 ml of 0.1 M HCl	Sulphated ash % max	Chlorides ppm max	Halogenated compounds ppm max	Heavy metals (as Pb) ppm max	Aldehydes	Sugars	
Glycerine 1.262	99.5	0.5	pass	10	1.260	1.263	1.4700	1.4750	pass	pass	pass	pass	pass	0.01	10	35	5	pass	negative	

Akzo Nobel's glycerine complies with the leading worldwide pharmacopaeia, USP, EUP, and BP grades are available upon request.

All product analysis is based on APAG, AOCS, or comparable, test methods.

Applications

Product ranges	Main applications
Distilled Fatty Acids	soaps, detergents, nitrogen derivatives, alkyd resins
Stearines	rubber, stabilizers, cosmetics, candles, paper chemicals
Poly Unsaturated Fatty Acids	alkyd resins, epoxy resin esters, air drying alkyd resins, emulsifiers, soft soaps
Fractionated Fatty Acids	esters, lubricants, peroxides, stabilizers, cosmetics, flavors and fragrances, detergents, alkyd resins
Castor Oil Fatty Acids	epoxy resin esters, emulsifiers, metal soaps, coating resins, epoxy resins
Glycerine	coating resins, pharmaceuticals, tobacco, esters, cosmetics
Ketones	animal repellents, flavors and fragrances

Packaging

All products are available in bulk and various types of packaging.
For further details please contact your local representative.

Characteristics of Important Oils and Fats

Saturated Acids

Chain length		Caproic		Caprylic		Capric		Lauric		Myristic		Palmitic		Stearic		Arachidic		Behenic		Lignoceric	
		C 6		C 8		C 10		C 12		C 14		C 16		C 18		C 20		C 22		C 24	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Coconut oil		0	1	5	9	5	10	44	53	13	19	8	11	1	3	T					
Palmkernel oil		0	0.5	2	5	2	4	45	56	13	18	6	12	1	3	0	1				
Palm oil									1	0.5	2	43	48	4	6		1				
Tallow (BFT)										1	6	20	37	14	21	T					
Olive oil										0	1	7	16	1	3						
Castor oil												1	2	1	2						
Groundnut oil										0	1	6	12	3	6	2	4	1	3	1	2
Rapeseed oil	- low erucic									T		3	6	1	3	0	2	T		T	
	- high erucic									T		0	5	1	3	0	2	0	2	T	
Cottonseed oil										0.5	2	20	23	1	3	0	1				
Corn oil										0.5	1.5	8	12	2	5						
Soya bean oil												7	11	2	7	0	2				
Sunflower oil												3	6	2	5	0.5	1	0.5	1		
Safflower oil												6	8	3	4						
Herring oil										6	8	11	16	1	2						
Linseed oil												4	7	2	5	0	1				
Sardine oil										4	6	15	17	1	3						

Unsaturated Acids

Chain length		Myristoleic		Palmitoleic		Oleic		Gadoleic		Erucic		Ricinoleic	
		C 14:1		C 16:1		C 18:1		C 20:1		C 22:1		C 18:1.OH	
		min	max	min	max	min	max	min	max	min	max	min	max
Coconut oil				0	1	5	8						
Palmkernel oil				0	1	10	19						
Palm oil				0.5	2	35	40						
Tallow (BFT)				3	9	35	46	T					
Olive oil						65	85						
Castor oil						4	5					85	90
Groundnut oil				1	2	40	56						
Rapeseed oil	- low erucic					50	65	1	5	0	5		
	- high erucic					9	25	5	15	30	60		
Cottonseed oil				0	2	23	35						
Corn oil						19	49						
Soya bean oil						20	30						
Sunflower oil						25	32						
Safflower oil						13	20						
Herring oil		0	1	12	20	14	24						
Linseed oil						18	22						
Sardine oil				12	14	10	16						

Poly Unsaturated Acids

Chain length		Linoleic		Linolenic		Licanic		Arachidonic		Clupanadonic		Iodine value		Saponification value		Solidification point	
		C 18:2		C 18:3		C 18:3.0		C 20:4		C 22:5		gI_2/100 g		mg KOH/g		°C	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Coconut oil		1	3									8	11	250	264	20	26
Palmkernel oil		1	4									14	23	245	255	22	28
Palm oil		8	11									50	55	195	205	33	39
Tallow (BFT)		4	10	0	3							50	60	200	206		41
Olive oil		4	15									82	90	190	195	17	26
Castor oil		4	5									82	90	177	187	3	6
Groundnut oil		20	35									85	100	185	192	26	32
Rapeseed oil	- low erucic	18	28	8	14							100	120	185	198	5	15
	- high erucic	11	25	5	12			T		0	2	91	108	170	185	15	23
Cottonseed oil		42	54									100	115	192	200	30	36
Corn oil		34	62									115	125	188	195	15	20
Soya bean oil		43	56	8	14							125	140	190	195	20	24
Sunflower oil		54	70	0	2							120	135	187	194	17	20
Safflower oil		70	75	0.5	3							140	150	188	194	16	17
Herring oil		2	4	0	1			22	30	20	30	115	140	179	193	23	27
Linseed oil		13	17	45	60							170	200	189	195	18	21
Sardine oil		3	6	1	3			15	30	15	30	160	190	189	193	28	34

T = Traces

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