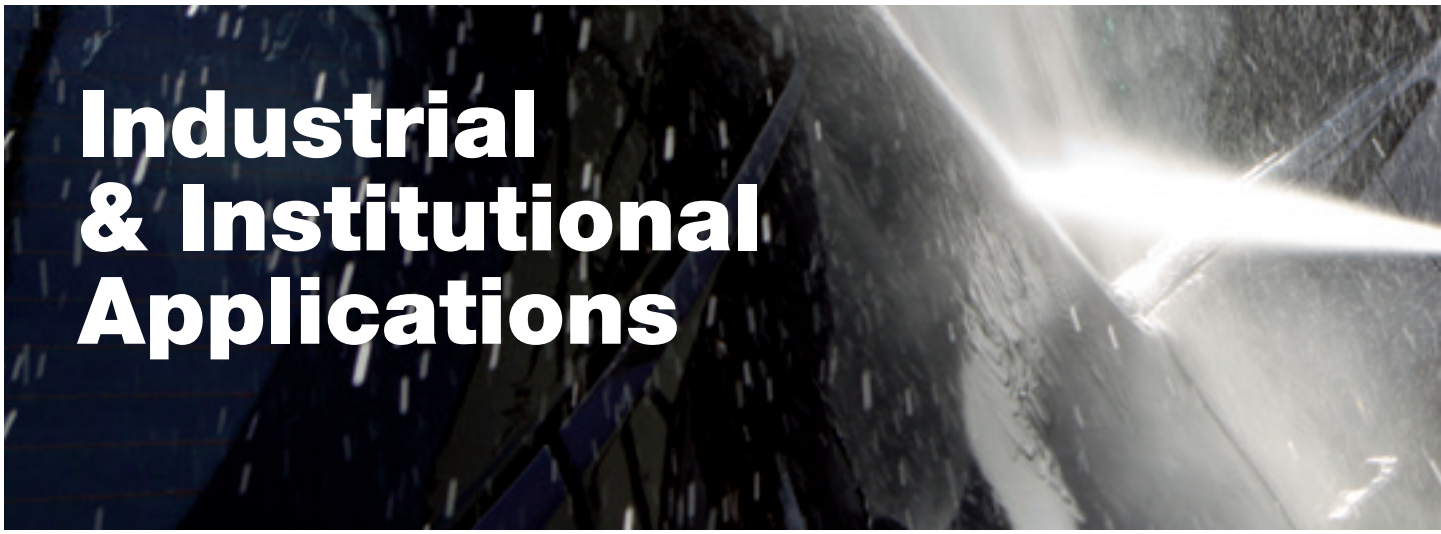
DEGREASERS PROGRAM

AKYPO® LF Range
AKYPO® LM-40
BETADET® S-20
DANOX® 511-B
DANOX® DB-1
FINDET® 10/18
OXIDET® DMCLD
TETRANYL® DM-24

WHEN CLEANING BECOMES CHALLENGING

KAO SURFACTANTS TECHNOLOGY AT YOUR SERVICE

kao



Industrial & Institutional Applications

Industrial & Institutional (I&I) cleaning is one of the most challenging areas for surfactants. The different types of soiling, cleaning processes and formulation environments require a good understanding of the cleaning mechanism for each application.

I&I covers a wide range of applications where formulations are applied by cleaning professionals in accordance with very demanding and specific requirements. Surfactants are required to work in the toughest conditions, chemical stability and formula compatibility being highly valued properties.

Industrial and Institutional includes:

- **Vehicle cleaning:** Surfactants and formulations for cleaning vehicles in car wash tunnels or at high pressure stations.
- **Industrial Cleaning:** General degreasing formulations designed to remove organic and inorganic soiling.
- **Food & Beverage (CIP, OPC):** Surfactants used for cleaning purposes in the food and beverage industries. This includes the cleaning of process reactors and work facilities.
- **Food Services (HORECA):** Cleaning products for the Hotel, Restaurant and Catering industries.
- **Others:** Including Healthcare, Building Care and Commercial Laundry.

In this brochure Kao Chemicals Europe gives an overview of the range of chemicals we can offer to the detergent industry for I&I cleaning.

TOWARDS SUSTAINABLE DEVELOPMENT

At Kao we believe that safe and sustainable products are the only option to guarantee the future. This is why all the products and formulations shown in this brochure were developed with our full commitment to this principle and in an endeavor to achieve optimal performance. All the products shown are readily biodegradable in accordance with Regulation EC 648/2004.

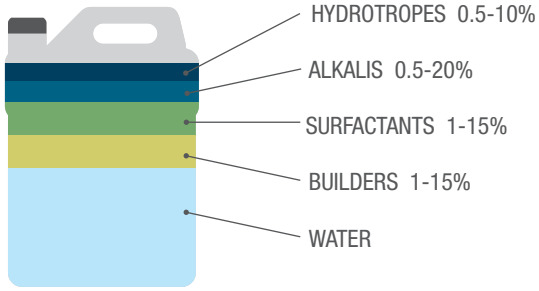
INDUSTRIAL & **INSTITUTIONAL**

INDUSTRIAL	INSTITUTIONAL
VEHICLE CLEANING	FOOD SERVICE
INDUSTRIAL CLEANING	HEALTH CARE
FOOD & BEVERAGE: · CIP · OPC · MEMBRANE CLEANING · BOTTLE CLEANING · CONVEYOR BELT	BUILDING CARE
	COMMERCIAL LAUNDRY

FORMULA DESIGN

SELECTION OF INGREDIENTS

The process of formulating hard surface cleaners is based on a careful selection of ingredients that meet the requirements of the final application. Properties such as wetting, emulsifying, dispersing, foaming and hydrotropy must be balanced in order to achieve the best cleaning effect.



Hard surface cleaning formulations can achieve optimal cleaning performance through the right combination of surfactants, hydrotropes, alkalis, builders and water. In this combination, surfactants are responsible for a significant part of the action required for the final performance.

	CHEMICAL DESCRIPTION		Hydrotropy	Wetting	Hydrophobicity	Emulsifying	Dispersing	Foaming
Anionic	**AKYPO® LF range**	C_4 – C_8 Ether Carboxylic Acids	■			■	■	*
	AKYPO® LM-40	C_{12-14} Ether Carboxylic Acid		■		■	■	■
Amphoteric	**OXIDET® DMCLD**	Lauramine Oxide		■		■		■
	BETADET® S-20	Lauryl Hydroxysultaine		■		■		■
Cationic	**TETRANYL® DM-24**	Cocotrimethyl Ammonium Methosulfate	■		■	■	■	■
Non-ionic	**FINDET® 10/18**	Deceth-6		■		■		■
Blend	**DANOX® 511-B**	Proprietary mixture		■	■	■	■	■
	DANOX® DB-1	Proprietary mixture		■	■	■	■	■

■ High
■ Medium
■ Low
* Specially designed for low foaming applications
Not relevant

Summary of the surfactants offered by Kao Chemicals Europe for these applications, highlighting their most relevant properties.

EMULSIFYING & WETTING

A good degreaser should be able to quickly and easily remove water-insoluble substances like grease, paint, oil, lubricants, etc. To do so, the final formulation has to be highly emulsifying. In this line, Kao has developed DANOX® 511-B, an excellent degreaser, and DANOX® DB-1, with enhanced wetting ability.

DANOX® 511-B / DANOX® DB-1

Optimised surfactant blends with strong emulsifying effect for use in water based I&I cleaning products.

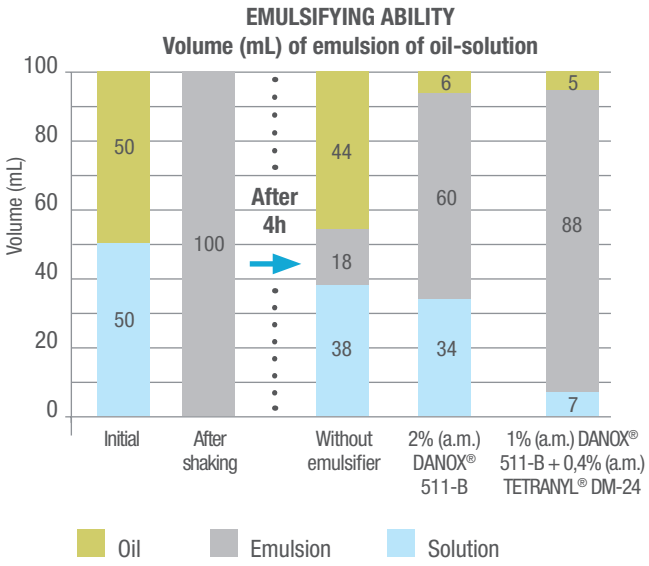
Both DANOX® are blends with non-ionic character. They are soluble in water, isopropyl alcohol, ethyl alcohol and propylene glycol. Both are clear liquids compatible with soaps and all families of surfactants and they can be mixed with strong alkalis and acids.

DANOX® 511-B is a blend with strong emulsifying properties, with an active content of 60%.

DANOX® DB-1 is a combination of DANOX® 511-B and a non-ionic surfactant, with an active content of 78%. It is a strong emulsifier with enhanced wetting ability, specially recommended for detergent processes which require a more effective contact of the product with the surface to achieve good cleaning.

As seen in the graph, DANOX® 511-B is a good emulsifier of motor oil. However, the synergistic combination of DANOX® 511-B and TETRANYL® DM-24 gives even better results.

MODEL FORMULA A	%
Emulsifier	x
MGDA.3Na	6.0
FINDET® 10/18 Deceth-6	3.0
KOH	(pH = 13.0)
Deionized Water	Up to 100 %



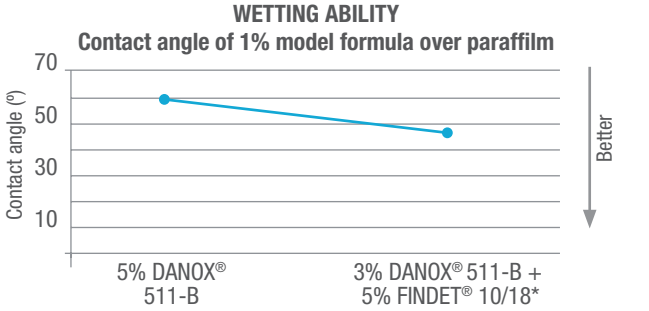
FINDET® 10/18

Excellent wetting agent for I&I applications.

FINDET® 10/18 can improve the detergency of the final formulation due to its high wetting effect which improves the contact with the surface.

- This ethoxylated fatty alcohol shows a wide range of application properties such as wetting, emulsifying and foaming, besides some solubilizing effect.
- FINDET® 10/18 reduces the surface tension of water increasing the spread ability of a detergent solution.

In the graph, a lower contact angle indicates a better wetting and spreading ability.



*Formulations also contain 6% TKPP, 4% $Na_2SiO_3 \cdot 5H_2O$ and deionized water.

HYDROTROPY & DISPERSING

TETRANYL® DM-24

Cationic hydrotrope recommended for water-based degreasing products in all kinds of electrolyte and alkaline systems.

In I&I cleaners it is common to use large quantities of builders and other electrolytes to improve cleaning. In this medium, conventional non-ionic surfactants give hazy and poorly stable formulations. To formulate a clear and stable cleaning product, a hydrotrope is required.

- TETRANYL® DM-24 raises the cloud point of the formulation, improving stability and cleaning performance.

- It is a 50 % active content transparent liquid of vegetable origin.

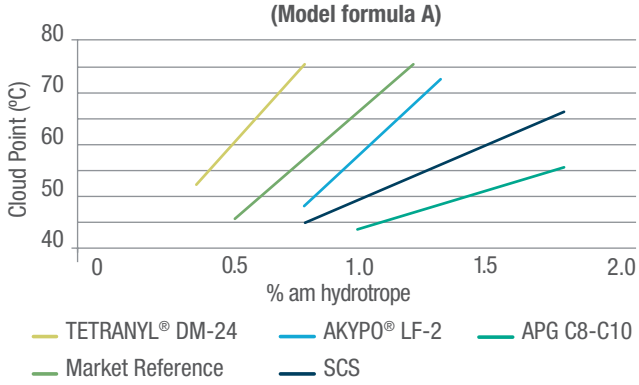
With the synergistic combination of DANOX® 511-B and TETRANYL® DM-24 outstanding effects in terms of soil removal and stability are obtained.

AKYPO® LF range

Low foaming surfactants with high dispersing and hydrotropic properties.

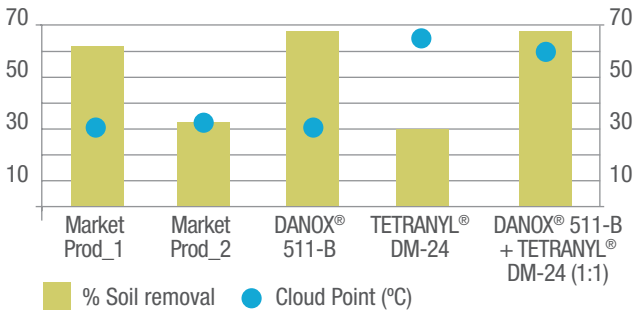
- Ether Carboxylic Acids of short alkyl chain.
- Capable of dispersing large quantities of particulate soiling.
- Specially recommended for vehicle cleaning.
- High concentrated (≈ 90%).

HYDROTROPIC ABILITY
% of hydrotrope required to obtain clear formulations.
(Model formula A)

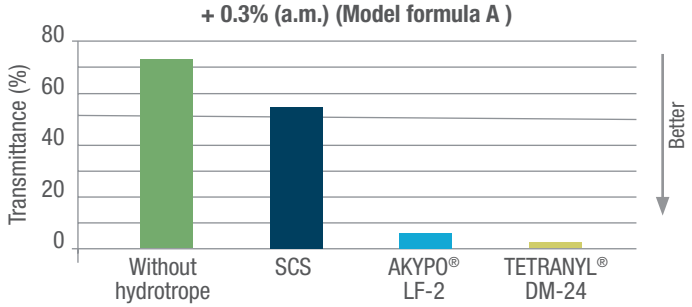


CLEANING & CLOUD POINT EVALUATION
% of Soil Removal & Cloud Point (ºC) for each product.
Formula applied at 10% dilution

MODEL FORMULA B	%
Hydrotrope	2.5
FINDET® 10/18 Deceth-6	2.5
NaTTP	3.0
MGDA.3Na	3.0
Deionized Water	Up to 100 %



DISPERSING ABILITY TEST
Preparation of a model dispersion: 6% kaolin
+ 0.3% (a.m.) (Model formula A)



FOAMING

The foam behavior of a cleaner is very much dependent on characteristics such as pH value, electrolyte content, surfactant type and concentration, among others. Based on experience, Kao proposes the following surfactants to cover the different requirements of the I&I market when considering foam.

BETADET® S-20

High foaming amphoteric surfactant recommended for strong alkaline formulations.

- Lauryl Hydroxysultaine.
- Stable over a wide pH range.
- Additionally, it improves the stability of final preparations at cold temperatures.

OXIDET® DMCLD

Recommended for OPC and bleach formulations.

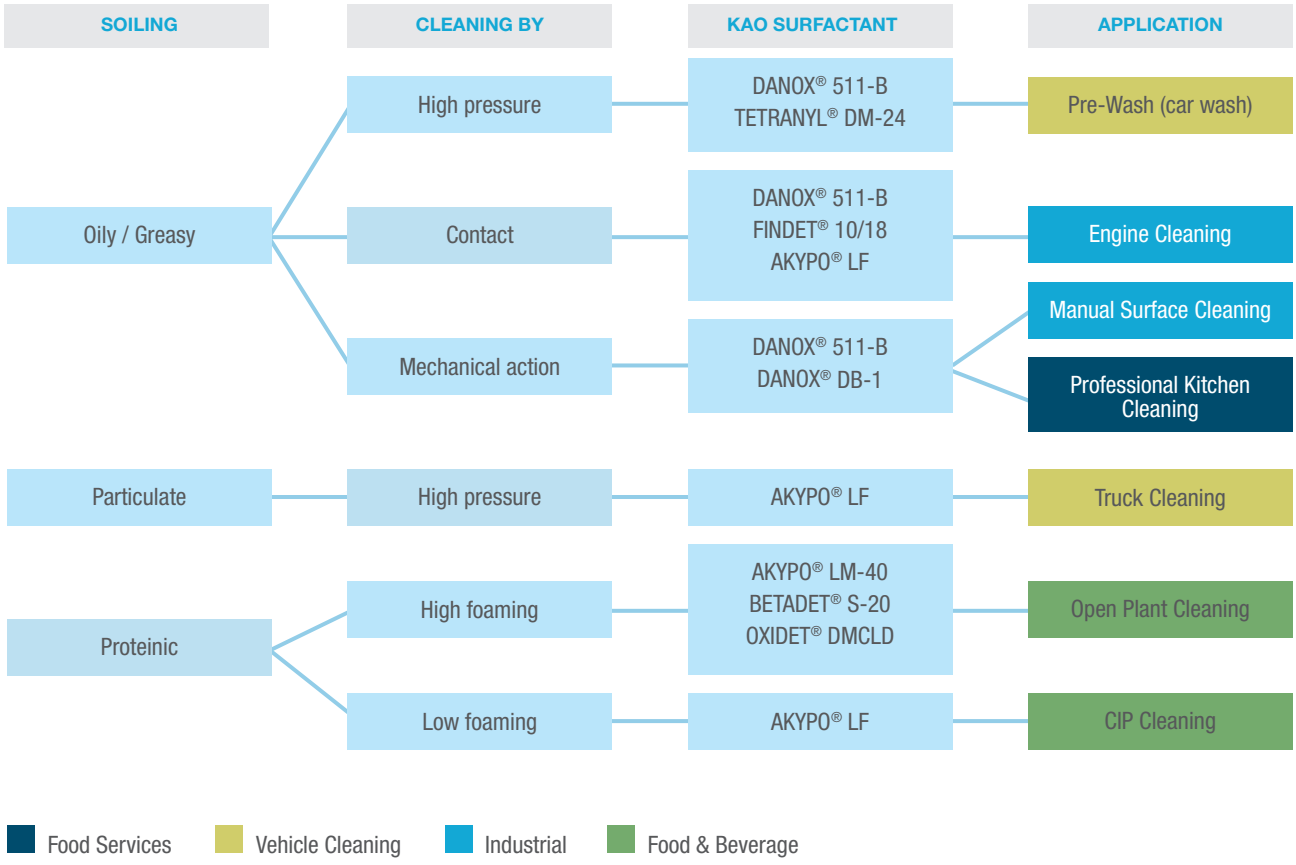
- Cocamine Oxide.
- Non-ionic / Cationic character (pH dependent).
- Good foam booster.
- Fragrance solubilizer and thickener for chlorine-based bleaches.

AKYPO® LM-40

Outstanding foam retention in vertical cleaning.

- Ether carboxylate surfactant.
- Surfactant specially designed for use in Open Plant Cleaning processes (Food & Beverage).
- Stable in extreme conditions.

CHOICE GUIDE BY APPLICATION



FORMULATION

Kao Chemicals Europe, in line with the latest market trends and based on years of experience, recommends below formulations for I&I applications in order to help professionals get the best results from the end products.

DEGREASER For Professional applications	D-185 (for greasy soiling) %	D-186 (for particulate soiling) %
DANOX® 511-B Proprietary mixture	6.7	-
AKYPO® LF-2 Capryleth-9 Carboxylic Acid	-	1.1
FINDET® 10/18 Deceth-6	-	2.5
Trisodium Citrate	1.0	1.0
Monoethanolamine	3.0	1.0
Propyleneglycol n-butylether	5.0	5.0
Sodium Hydroxide (50%)	q.s. (adjust pH = 11.5)	q.s. (adjust pH = 11.5)
Deionized Water	Up to 100%	Up to 100%

VEHICLE CLEANER Pre-wash for Automatic Washing Station (High Pressure for Manual Cleaning)	D-211 %
TETRANYL® DM-24 Cocotrimethyl Ammonium Methosulfate	3.6
DANOX® 511-B Proprietary mixture	3.0
FINDET® 10/18 Deceth-6	4.0
Butyldiglycol	5.0
MGDA-3Na (78%)	5.1
Sodium Metasilicate · 5 H_2O	2.1
Monoethanolamine	5.0
Sodium Hydroxide (50%)	q.s. (adjust pH = 12.5)
Deionized Water	Up to 100%

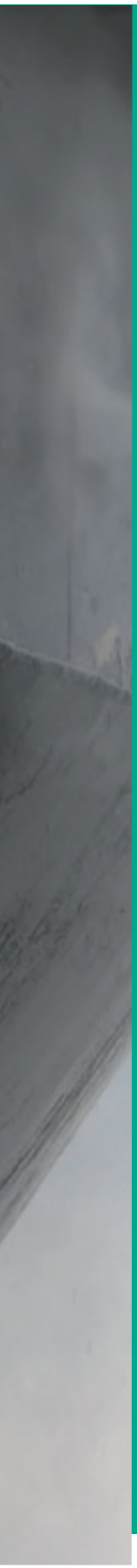
HIGH PRESSURE CLEANER For touchless truck wash	D-187 %
AKYPO® LF-4 Capryleth-9 Carboxylic Acid + Hexeth-4 Carboxylic Acid	2.7
FINDET® 10/18 Deceth-6	3.0
Tetrapotassium Pyrophosphate	5.0
MGDA.3Na (40%)	4.0
Potassium Hydroxide	q.s. (adjust pH = 11.5)
Deionized Water	Up to 100%

DEGREASER METAL (IRON)	D-035 %
BETADET® S-20 Lauryl Hydroxysultaine	2.4
Sodium Hydroxide (50%)	38.7
Gluconic Acid (50%)	18.0
Deionized Water	Up to 100%

OPEN PLANT CLEANING	D-218 %	D-221 %	D-220 %
AKYPO® LM-40 Lauryl / Myristyl Ether Carboxylic Acid	4.3	4.1	3.5
OXIDET® DMCLD Lauramine Oxide	3.3	4.2	-
BETADET® S-20 Lauryl Hydroxysultaine	-	-	4.6
Sodium Hydroxide	5.0	10.0	15.0
Additional / Others	q.s.	q.s.	q.s.
Deionized water	Up to 100%	Up to 100%	Up to 100%

Additional / Others: chelating agents, hydrotropes, preservatives, fragrances and/or dyes.

More guideline formulations for I&I applications are available upon request or by visiting www.kaochemicals-eu.com.



KAO CHEMICALS EUROPE

www.kaochemicals-eu.com

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in harmony with nature.

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