



# Metal cleaning



Product catalog

**Nouryon**



# Metal cleaning

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Metal cleaning is definitely as essential step in every metal fabricating, assembling and finishing operation. If you can start with a clean part the rest of your job can be a whole lot easier. Cleaning is generally defined as the removal of dirt or soil which is simply matter out of place. Painting, plating, or porcelain enameling are finishing operations that require the metal surfaces to be free of industrial soil.

Effective surface cleaning is often achieved through a combination of detergency, chemical reaction, solvent dissolution and mechanical action. Most cleaning processes include hot alkaline detergent cleaning, emulsion cleaning, acid cleaning/pickling, solvent cleaning, ultrasonic cleaning and mechanical cleaning.

## Alkaline cleaning (most widely used)

- Uses an alkali to remove all polar substances such as oils, grease, wax, and various types of particles (metal chips, silica, light scale) from a metallic surface.
- Alkaline solutions include sodium and potassium hydroxide (NaOH, KOH), sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) and borax (Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>)
- Cleaning methods: immersion or spraying, usually at temperatures of 50-95°C (120-200°F), followed by water rinse

## Emulsion cleaning

- Uses organic solvents (oils) dispersed in an aqueous solution. The use of suitable emulsifiers results in a two-phase cleaning fluid (oil-in-water), which functions by dissolving or emulsifying the soils on the surface.
- Must be followed by alkaline cleaning to eliminate all residues of the organic solvent

## Acid cleaning / pickling

Acid cleaning removes oils and light oxides from metal surfaces using acid solutions combined with water-miscible solvents, wetting and emulsifying agents. Acid pickling is a more severe acid treatment to remove thicker oxides, rusts, and scales. It generally results in some etching of the metallic surface as compared to acid cleaning.

- Cleaning acids include hydrochloric (HCl), nitric (HNO<sub>3</sub>), phosphoric (H<sub>3</sub>PO<sub>4</sub>), and sulfuric (H<sub>2</sub>SO<sub>4</sub>)
- Cleaning methods: soaking, spraying, manual brushing or wiping at ambient or elevated temperatures

## Solvent cleaning

- Removes organic soils (oil and grease) from a metallic surface by dissolving them with chemicals
- Cleaning methods: hand-wiping, immersion, spraying, and vapor degreasing

## Ultrasonic cleaning

- Mechanical agitation of cleaning fluid by high-frequency vibrations to cause cavitation bubbles that scrub the surface.
- Combines chemical cleaning and mechanical agitation of the cleaning fluid.
- Cleaning fluid is generally an aqueous solution containing alkaline detergents.
- Highly effective for removing surface contaminants.

## Mechanical cleaning

Physical removal of soils, scales, or films from the work surface by means of abrasives or similar mechanical action. It also serves other functions such as deburring, improving surface finishing, and surface hardening. Common application techniques include:

### Blast finishing

- High velocity impact of particulate media (Hard: Al<sub>2</sub>O<sub>3</sub> and SiC and Soft: nylon beads) propelled by pressurized air or centrifugal force to clean and finish a surface. Most well-known method, sand blasting, uses grits of sand as the blasting media.

### Shot peening

- High velocity stream of small cast steel pellets (called shot) is directed at a metallic surface to cold work and induce compressive stresses into surface layers to improve fatigue strength of metal parts

## What do we mean when we say industrial soils?

Industrial soils can be defined as:

1. Buffing compound residues
2. Cutting oils
3. Drawing compounds
4. Heat scale
5. Heat treating salts
6. Paint, stop-off lacquers, inks
7. Phosphate coatings, with and without oils
8. Quenching oils
9. Rust and corrosion inhibitors
10. Slushing oils
11. Smuts
12. Tarnish and finger prints
13. Inside and outside storage dirt

## A range of metal cleaning solutions for performance you can count on

At Nouryon, we have a wide range of aqueous based industrial metal cleaning chemical products including surfactants and polymers. We offer specialty surfactant blends, narrow range alcohol ethoxylates, hydrotrope/solubilizers, corrosion inhibitors, wetting agents and emulsifying agents which deliver good cleaning performance. Our aqueous cleaning chemicals span the entire application range from acidic industrial cleaners, to neutral pH, to mild alkaline, and to high alkaline.

**Our aqueous cleaning chemical products are designed for use in an array of cleaning processes to meet the cleanliness specifications of our customers.**

Nouryon offers aqueous cleaning chemical products for all metals such as steel, aluminum, brass, aerospace metals, and many others. We have engineered our chemical products for all of the various types of aqueous metal cleaning equipment, including spray, agitation immersion, and ultrasonic immersion cleaning.

Our aqueous cleaning chemical products are also designed to meet the demands of specific soils. These include oils/coolants, buffing/lapping compounds, carbon smut, metal oxides, and most other soils encountered across the broad spectrum of manufacturing industries.

# Metal cleaning product portfolio

## Surfactants

### Alcohol ethoxylates – narrow range

Product	Chemical	Appearance, 20°C	Active, %	Cloud point °C	HLB	Main properties
Berol® 260	Alcohol Ethoxylate	Liquid	100	55-59 <sup>1</sup>	10.5	Degreasing Emulsifier Wetting Low foaming, low odour
Berol® 266	Alcohol Ethoxylate	Liquid	100	24-29 & 54-59 <sup>2</sup>	12.1	Dispersing Emulsifier Less foam than standard surfactants Wetting
Berol® 840	Alcohol Ethoxylate	Liquid	100	49-54 <sup>1</sup>	11.5	Defoaming Very low foaming
Ethylan® 1005	Alcohol Ethoxylate	Liquid	100	47-53 <sup>1</sup>	11.6	Emulsifier Excellent wetting Very low foaming

### Alcohol ethoxylates

Berol® 087	C12-C16 alcohol with EO/PO block	Liquid	100	39-43	11.5	Emulsifier Low foaming Wetting
Berol® 185	C10-16 alcohol with EO/PO block	Liquid	90	64-70	13.5	Dispersing Emulsifier Wetting
Berol® GT 2624	C8 alcohol with EO/PO block	Liquid	100	55-59 <sup>1</sup>	8.4	Wetting
Ethylan® 1008	Alcohol Ethoxylate	Liquid	100	60-68 <sup>2</sup>	15	Dispersing Emulsifier Moderate foaming Wetting
Ethylan® CPG7545	C12-16 alcohol ethoxylate / propoxylate	Liquid	99			Low foaming Defoaming Dispersing
Ethylan® TD100	Tridecanol ethoxylate	Liquid	100	67-68	13.7	Emulsifier Dispersing Medium foam

<sup>1</sup> 5g product in 25 ml butyldiglycol, <sup>2</sup> 1% in water



# Anionics

Product	Chemical	Appearance, 20°C	Active, %	Main properties
Phospholan™ PE169	Ethoxylate phosphate ester	Liquid	100	Dispersing Emulsifier Corrosion inhibitor
Witconate® AOS	Sodium C14-16 olefin sulfonate	Liquid	38-40	Dispersion Detergency Wetting
Witconate® NAS-88	Sodium octane sulfonate	Liquid	37	Low foaming Hydrotropic Solubilizer Protein Removal Corrosion protection

# Hydrotropes / solubilizers

Product	Chemical	Active, %	Main properties
AG™ 6202	C8 Glucoside	65	Hydrotropic/solubilizing Dispersing Low foaming Wetting Soluble in 26% NaOH
AG™ 6206	C6 Hexylglucoside	75	Low foaming Dispersing Hydrotropic/solubilizing Soluble in 50% NaOH
AG™ 6210	C8-10 glucoside	61	High foaming Dispersing Wetting Soluble in 50% NaOH
Ampholak® YJH-40	Octyliminodipropionate	40	Soluble in 27% NaOH
Berol® 561	Quaternary coco alkylamine ethoxylate	100	Hydrotropic Dispersing Degreasing
Berol® R648 NG	Quaternary coco alkylamine ethoxylate	100	Hydrotropic Dispersing Degreasing



## Specialties surfactant blends for cleaning

Product	Chemical	Active, %	Main properties
Berol® 226	Nonionic/cationic	100	Degreasing Dispersing Emulsifier Medium foaming Wetting
Berol® 609	Nonionic/nonionic	90	Degreasing Dispersing Emulsifier Low pour point NP9/NP10 replacement
Berol® 610	Nonionic/nonionic	90	Degreasing Dispersing Emulsifier Low pour point NP9/NP10 replacement
Berol® DGR 81	Alcohol-eo / alkylglucoside	95	Emulsifier Medium foaming Wetting
Berol® ENV226 PLUS	Nonionic/cationic	55	Degreasing Dispersing Emulsifier Medium foaming Wetting
Berol® EZ-1	Nonionic / alkylglucoside	95	Dispersing Emulsifier Wetting Medium foaming
Berol® LFG 61	Alcohol-eo / alkylglucoside	95	Low foaming Soluble in 40% NaOH



# Polymers

Product	Chemical	Mw	Solids, %	Main properties
Alcosperse® 149	Polyacrylate	2500	39-41	Anti-redeposition Anti-encrustation Chlorine stable Particulate soil dispersion Scale and hardness control
Alcosperse® 175	Acrylic/maleic copolymer	20000	39-41	Anti-encrustation Ca-binding Crystal modifier
Alcosperse® 412	Acrylic/maleic copolymer	3000	40-42	Anti-redeposition Anti-encrustation Crystal modifier Electrolyte stability Scale and hardness control
Alcosperse® 602N	Polyacrylate	5000	44-46	Anti-redeposition Anti-encrustation Chlorine stable Particulate soil dispersion Scale and hardness control
Alcosperse® 747	Acrylic/styrene copolymer	3000	39-41	Aluminium corrosion protection Anti-redeposition Anti-spotting Hydrotropic effect Oily/particulate soil suspension Surface modification

# Other functional chemicals

Product	Chemical	Active, %	Main properties
Armohib® CI-28	Amine Blend	100	Acid corrosion inhibitors for HCl or HCl/HF mixtures
Armohib® CI-31	Amine Blend	100	Acid corrosion inhibitors for sulfuric, sulfamic, citric and phosphoric acids
Berol® 79	Oleylamine ethoxylate	100	O/W emulsifier
Ethomeen® O/17	Oleylamine ethoxylate	100	O/W emulsifier

# Performance properties

## Berol 226 (EU) Berol ENV226 PLUS (non-EU)

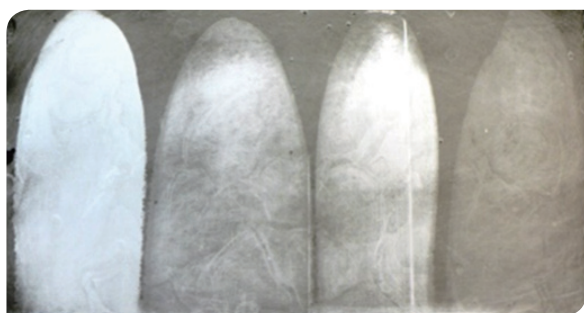
### At the heart of high-performance metal cleaning

A smart surfactant system. Ultra-high performance, cost-effective and versatile. Berol 226 and Berol ENV226 PLUS industry-leading powerful surfactant systems delivering highly efficient cleaning.

### Less chemicals, more chemistry

- Excellent cleaning even at very low concentrations
- Multi-functional product-Perfect combination of strong wetting, powerful emulsifying and excellent dispersing properties
- Unique synergy of powerful surfactants and cleaning boosters
- Exceptional cleaning of fat/oil and particulate soils on hard surfaces

Figure 1: Comparison of Berol 226 with competitor's product



1:10 Berol 226      1:10 Competitor      1:25 Berol 226      1:25 Competitor

#### Formulation

9.0% Berol 226, 14% chelating agent (GLDA, EDTA), 77% di-water

Berol 226: Cloud point >85°C adjust pH: 12.6

Competitor: Cloud point 68°C, pH 12.3

## Berol 561 (non-EU) and Berol R648 NG (EU)

### Delivering outstanding degreasing performance

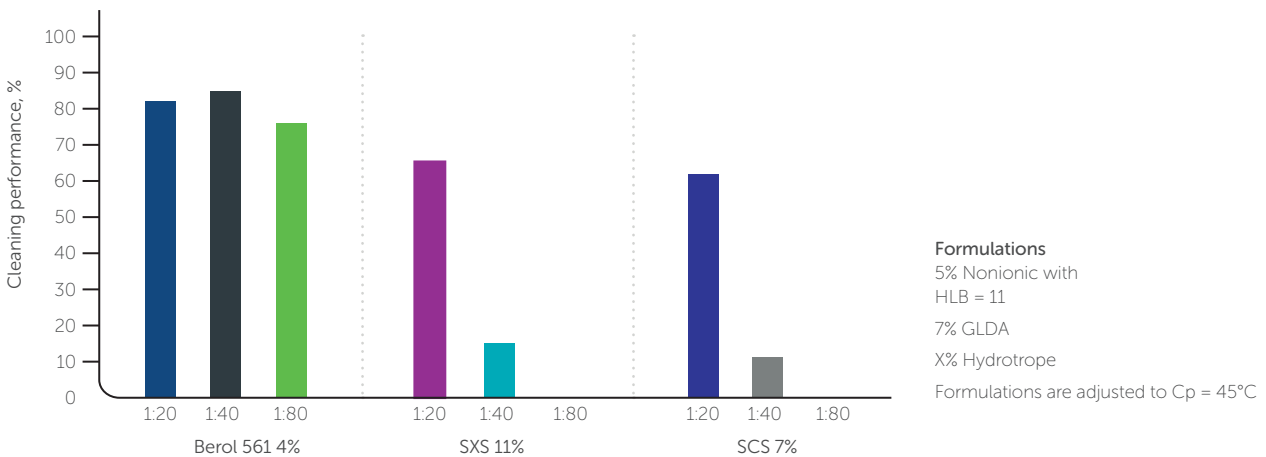
A multifunctional co-surfactant. Excellent hydrotrope, degreasing booster, and effective at very low concentrations. Berol R648 NG is an industry-leading readily biodegradable cosurfactant that upgrades the performance of your formulation.

### Elevates, enriches, and drives performance

- Elevates the degreasing power of nonionic surfactants
- Enriches your formulations by enabling additional key components
- Drives emulsifiers, chelating agents and other ingredients to deliver at peak performance
- Berol R648 NG is an environmentally friendly profile



Figure 2: Comparison of Berol 561 degreasing performance at low concentrations with common hydrotrope



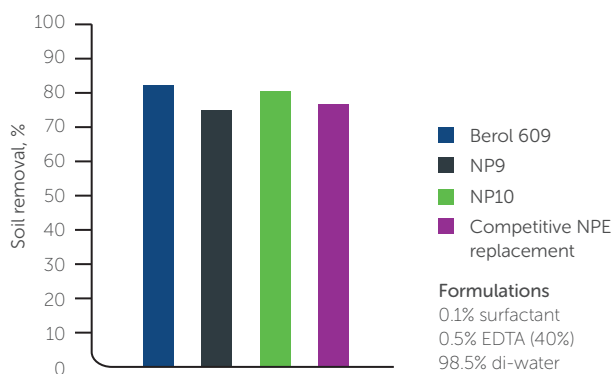
## Berol 609

### Highly targeted performance for more effective cleaning

Choose from our unique portfolio to provide the best cost performance solution for your customers. Efficient and sustainable cleaning formulations begin with this product.

- Next generation nonylphenol ethoxylate (NPE) replacement
- An alcohol ethoxylate blend designed to match the key properties and performance of NP9 or NP10
- Exceeds the degreasing power of leading NPE replacements
- Readily biodegradable
- U.S. EPA Safer Choice approved

Figure 3: Non-mechanical degreasing test results for NPE's and potential replacements



## Armohib series

### Corrosion inhibitors

Armohib aliphatic nitrogen inhibitors retard the corrosive effect of acids on metals during pickling, process equipment cleaning. Armohib comes in two versions for use with specific acids:

Product	Acid applications
Armohib CI-28	Hydrochloric Hydrochloric-Hydrofluoric acid mixtures
Armohib CI-31	Sulfuric, Sulfamic, Citric and Phosphoric



0.03% Armohib CI-28      0.03% JH-15      Blank  
 15% active hydrochloric acid, 6 hours soaking, RT 304 Stainless steel

# Formulation guidelines

## Aluminum wire spread oil removal

### Formulation F-001

Component	%w/w
Water (Aqua)	76.0
Berol 226	9.0
Potassium pyrophosphate	5.0
Sodium metasilicate pentahydrate	5.0
Liquid sodium silicate	5.0

### Properties

pH (as is)	13:3
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### Application guidelines

Dilution ratio	1:50-100
Temperature	50°C
Cleaning time	6 seconds
Ultrasonic cleaner parameter	Frequency is 53KHz and power is 250 W



After washing

Before washing



# Metal polish wax removal

## Formulation F-002

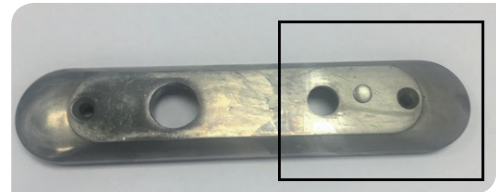
Component	%w/w
Deionized water	75.0
Berol 226	10.0
Berol 561	4.0
Berol 79	2.0
Potassium pyrophosphate	5.0
Sodium metasilicate pentahydrate	2.0

### Properties

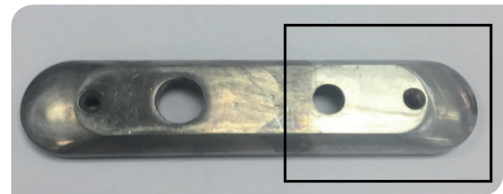
pH (as is)	12.7
pH (3% in water)	11.3

### Application guidelines

Dilution ratio	1:20-40; 1:50-100
Temperature	50°C
Cleaning time	3-5 minutes
Ultrasonic cleaner parameter	Frequency is 53KHz and power is 250 W



Before washing



After washing:  
No corrosion is observed

# Aluminium polish wax removal

## Formulation F-003

Component	%w/w
Water (Aqua)	65.5
Berol 609	10.0
Ethylan 1008	5.0
Ethylan 1005	1.0
Sodium alcohol ether sulphate (28%)	8.0
Potassium pyrophosphate	4.0
Sodium metasilicate pentahydrate	2.5
Xylene sulfonate (40%)	4.0

### Application guidelines

Dilution ratio	1:20-30
Temperature	70°C
Cleaning time	3-5 minutes
Ultrasonic cleaner parameter	Frequency is 53KHz and power is 200 W



Before washing



After washing: No corrosion is observed

# Metal derusting degreaser

## Formulation F-004

Component	%w/w
Deionized water	68.75
Berol 226	3.0
Armohib Cl-28	0.25
Sulfuric acid (95-97%)	10.0
Hydrochloric acid (37%)	18.0

### Properties

pH (1% in water)	1:1
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### Application guidelines

Dilution ratio	None; ready to use
Corrosion test	Metal / carbon steel
Temperature	RT
Soaking time	30 minutes



No corrosion is observed

# Phosphorous-free ferrous metal degreaser

## Formulation F-005

Component	%w/w
Deionized water	86.0
Berol 226	9.0
Sodium hydroxide	3.0
Dissolvine® E-39	2.0

### Properties

pH (1% in water)	11.57
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### Application guidelines

Dilution ratio	1:10-1:70
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Aluminum



Copper



# Acid metal cleaner (non-ferrous)

## Formulation F-006

Component	%w/w
Deionized water	68.0-73.0
Berol 226	5.0-10.0
Phosphoric acid	20.0
Citric acid	2.0

### Properties

pH (10% in water)	1:100
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### Application guidelines

Dilution ratio	1:100
Corrosion test	Copper and copper alloy
Temperature	RT
Soaking time	30 minutes



Before washing

After washing in  
100% solution

Copper Alloy



## Low foam met:

### Formulation F-007

#### Component

Deionized water
Berol DGR 81
Trisodium citrate
Sodium hydroxide

#### Properties

pH (1% in water)	12.99
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### Application guidelines

Dilution ratio for heavy cleaning	1:10 for heavy duty cleaning
Dilution ratio for medium-light cleaning	1:40-1:80

## Low foam and high pressure cleaner

### Formulation F-008

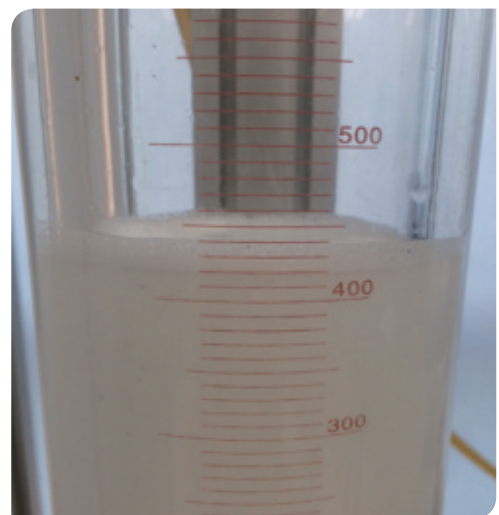
Component	%w/w
Deionized water	77.4
Ethylan 1005	5.0
Ampholak YJH-40	5.6
Sodium carbonate	10.0
Dissolvine E-39	2.0

#### Properties

Foam height	20 ml
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### Application guidelines

Dilution ratio	1:20
Test conditions	Spray for 10 min at room temperature and 0.5 MPa pressure



Foam Height

Contact us directly for detailed product information and sample request  
website | [nouryon.com/markets/cleaning](https://nouryon.com/markets/cleaning)  
email | [cleaning@nouryon.com](mailto:cleaning@nouryon.com)

# Nouryon

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of more than 7,900 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

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