

Detergent Enzymes Technical Sheet

High activity enzymes for cleaning applications



HIGH ACTIVITY ECONOMICAL



CLEANING



WASHING



BULK OPTION

 Scientific & Technical™

Detergent Enzymes Technical Datasheet

1. Product Overview

Cleaning enzymes - amylase, cellulase, protease, mannanase and lipase offer a versatile, green and highly effective solution for a wide range of cleaning applications. Amylase targets and breaks down starch-based soils, protease hydrolyses protein-based stains such as blood, egg, and dairy residues, while lipase efficiently degrades fats and oils. Together, this synergistic blend accelerates the removal of complex, mixed-type stains, improving cleaning efficiency while reducing the need for harsh chemicals. These granulates are particularly valuable in industrial and household detergents, laundry formulations, and surface cleaners, where they enhance stain removal at lower temperatures, support eco-friendly formulations, and contribute to energy savings. Additionally, their stable granular form ensures long shelf life and consistent enzymatic activity, making them a reliable choice for both professional cleaning operations and consumer products.

2. Product Characteristics

Parameter	Specification
Enzyme Class	Various: 3.2.1.1, 3.1.3, 3.4.21.62, 3.2.1.4, 3.2.1.78
Source	<i>Various: Bacillus, Bacillus alcalophilus, Aspergillus spp.</i>
Activity	Amylase 48,000 U per g, Protease 2,18 U per g, Lipase 25,000 U per g, Cellulase 3,000 U per g, Mannanase 10,000 U per g
Appearance	Light brown/brown liquid
Temperature Range	15–70 °C (operational)
Optimal Temperature	35–45 °C
pH Range	7.0–12.0
Optimal pH	10.0–11.0
Shelf Life	12 months (sealed and kept under recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

A concentrated enzyme cleaning blend comprising amylase, cellulase, protease, mannanase and lipase operates through distinct but complementary catalytic mechanisms that target major classes of organic macromolecules. Amylases (typically α -amylases) catalyse the endo-hydrolysis of α -1,4-glycosidic linkages in polysaccharides via a double-displacement mechanism involving a covalent glycosyl-enzyme intermediate, yielding oligosaccharides and maltose. Proteases, depending on class (e.g., serine or metalloproteases), facilitate peptide bond hydrolysis through nucleophilic attack on the carbonyl carbon of the amide linkage, forming a tetrahedral intermediate stabilized by

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an oxyanion hole before bond cleavage. Lipases catalyse the hydrolysis of ester bonds in triglycerides at lipid–water interfaces, often exhibiting interfacial activation; their mechanism involves a catalytic triad (Ser–His–Asp/Glu) and formation of an acyl–enzyme intermediate, followed by deacylation to release fatty acids and glycerol. The combined action results in the systematic depolymerization of heterogeneous soils into low-molecular-weight, water-soluble products.

From a kinetic perspective, each enzyme in the blend generally follows Michaelis–Menten behaviour under dilute substrate conditions, with catalytic efficiency defined by k_{cat}/K_m values that vary depending on substrate accessibility and environmental parameters. In practical cleaning systems, reaction rates are influenced by substrate heterogeneity, diffusion limitations, and surface adsorption phenomena, particularly for lipases acting at hydrophobic interfaces. Synergistic effects arise as initial hydrolysis by one enzyme increases substrate accessibility for others—for example, proteolytic disruption of protein matrices enhances amylase and lipase penetration. The formulation is typically engineered to maintain optimal activity within overlapping pH and temperature windows, while stabilizers mitigate denaturation and autolysis, preserving turnover rates over time. Additionally, competitive inhibition, product inhibition, and enzyme–enzyme interactions are minimized through careful ratio optimization, ensuring sustained catalytic performance in concentrated applications.

3.2 Inhibitors:

- Heavy metals (Hg^{2+} , Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 90 deg. C
- High chelator concentrations (EDTA)

4. Applications

4.1 Laundry Detergents (Liquid, Powder, Pods):

- Removal of fatty, oily, and sebum-based stains
- Enhanced cleaning performance in cold-water and short-cycle washes
- Improved stain removal in eco-friendly, low-surfactant formulations

4.2 Pre-Soak and Pre-Treat Stain Removers:

- Targeted breakdown of tough grease spots
- Effective on collar/cuff grime, food oils, cosmetics, and body-fat residues

4.3 High-Efficiency (HE) Washing Machine Detergents:

- Optimized for low-water washing environments
- Faster emulsification and removal of lipid soils

4.4 Automatic Dishwashing Detergents:

- Breakdown of food oils, baked-on fats, and greasy residues
- Supports low-temperature and rapid-wash programs

4.5 Industrial & Institutional Cleaning:

- Laundry services (hotels, hospitals, restaurants) needing efficient fat removal

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- Enhanced cleaning of heavily soiled textiles and uniforms

4.6 Multi-Enzyme Detergent Formulations:

- Synergistic action with proteases, lipases, cellulases, and mannanases
- Creation of premium, high-performance enzyme blends

4.7 Eco-Friendly & Low-Chemical Detergent Lines:

- Enables reduction of surfactant loading
- Supports sustainability claims such as biodegradability and energy savings

4.8 Fabric Care & Longevity Products:

- Gentle cleaning with less harsh chemicals
- Helps maintain fabric softness, brightness, and integrity over time

4.9 Household Degreasers and Hard-Surface Cleaners:

- Removal of kitchen grease from counters, stovetops, filters, and tiles
- Effective in enzymatic spray cleaners and foam formulations

5. Handling & Storage

5.1 Storage Conditions:

- Store at 4–25 °C in sealed containers
- Avoid direct sunlight and freezing
- Keep away from acids, oxidizing agents, and heavy metals

5.2 Stability on Storage:

- Activity loss ~1–5% per month at room temperature
- Refrigeration improves stability

5.3 Safety Information:

- Non-toxic and biodegradable
- May cause allergic reactions via inhalation or skin contact
- Use protective clothing, gloves, goggles
- Avoid aerosol formation

Refer to product SDS for complete safety details.

6. Packaging Options

- 0.1 kg, 1 kg, 10 kg, 25 kg

7. Quality Control Specifications

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Test	Specification
Activity assay	≥ labelled activity
Microbial load	Total plate count ≤ 50,000 CFU / g
Pathogens	<i>Salmonella</i> negative, <i>E. coli</i> negative

9. Shelf Life

Liquid: 12 months. When stored in original container, sealed, in cool conditions.

10. Disclaimer

This technical data sheet provides general information. Application testing is recommended to determine optimal use conditions.

NOTE: THIS DOCUMENT CANCELS AND SUPERSEEDS ALL OTHER EDITIONS