beta-Amylase

High activity β-amylase for digesting starch

1. Product Overview

beta-Amylase offers significant benefits and versatile applications across the food and beverage industry due to its ability to efficiently hydrolyse starch into high-purity maltose. Its key advantages include improved sweetness, enhanced flavour development, and clean-label formulation since maltose provides a natural alternative to added sugars. In baking, beta-amylase supports better dough handling, improved crumb softness, and desirable browning through increased fermentable sugars. In brewing and distilling, it boosts fermentability, enhances attenuation, and contributes to a consistent, malt-forward flavour profile. The enzyme also plays a central role in producing maltose syrups and carbohydrate ingredients for confectionery and processed foods, where controlled starch conversion is essential. Additionally, beta-amylase improves extraction efficiency in cereal processing and supports smoother texture and flavour release in plant-based beverages. Overall, its stability, natural action, and high maltose yield make beta-amylase a valuable tool for creating high-quality, efficient, and consumer-friendly food products.

2. Product Characteristics

Parameter	Specification
Enzyme Class	Hydrolase – 1,4-α-D-glucosidic bonds (EC 3.2.1.2)
Source	*Bacillus spp.*
Appearance	Brown liquid
Activity	700,000 U / mL
Units	Beta-Amylase Units (BAU)
Temperature Range	40–65 °C (operational)
Optimal Temperature	55–65 °C
pH Range	3.5 – 6.0
Optimal pH	4.5 – 5.5
Shelf Life	12–24 months (sealed, recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action

beta-Amylase catalyses the stepwise hydrolysis of starch by removing maltose units from the non-reducing ends of polysaccharide chains. The enzyme follows a retaining, double-displacement mechanism, typical of many glycosidases. In the first step, a key proton-donating acidic residue in the active site protonates the glycosidic oxygen, allowing cleavage of the α-1,4 bond, while another acidic residue acts as a nucleophile, forming a short-lived covalent intermediate with the terminal glucosyl unit. In the second step, this intermediate is hydrolysed

when a water molecule—activated by the same catalytic residue—attacks the bond, releasing maltose and regenerating the enzyme's active site. Beta-amylase does not act on internal bonds or α-1,6 branch points, so it progresses outward from chain ends until it reaches a branch, producing a consistent, high-purity maltose profile.

3.2 Kinetics

This enzymes follows Michaelis–Menten reaction kinetics, with its catalytic rate increasing as substrate concentration rises until the enzyme becomes saturated and reaches Vmax. Its Km varies depending on substrate type—typically lower for soluble starches and higher for more complex or branched substrates—reflecting differences in binding affinity. Because beta-amylase acts exolytically, releasing maltose units from the non-reducing ends of starch, its reaction rate is influenced by the number of available chain ends and can slow as those ends become depleted. The enzyme's activity is highly sensitive to temperature and pH, typically exhibiting optimal performance near pH 4.5–6.0 and moderate temperatures that preserve stability without denaturation. Product inhibition also plays a role, as accumulating maltose can bind to the active site and reduce overall catalytic efficiency. Together, these factors create a kinetic profile shaped by both classical Michaelis–Menten behaviour and the structural limitations of real starch substrates.

K_m = 1-10 mg / mL

K_{cat} = 400 s^{-1}

V_{max} = 350 U / mg

3.3 Inhibitors

- Heavy metals (Hg^{2+}, Cu^{2+})
- Oxidants
- High chelator concentrations (EDTA)

4. Applications

4.1 Baking and Dough Improvement

Food-grade xylanase is widely used in bakery formulations to break down arabinoxylans in wheat flour. This improves dough handling, gas retention, and loaf volume, while enhancing crumb softness and extending freshness by slowing staling. It's particularly valuable in whole-grain breads, where high fiber content can otherwise reduce quality.

4.2 Brewing and Malting

In brewing, xylanase reduces wort viscosity by degrading hemicellulose in malt and grain adjuncts. This leads to faster lautering, better wort flow, higher extract yield, and improved fermentation efficiency. It also enhances clarity and stabilizes the final beverage.

4.3 Fruit and Vegetable Juice Processing

Xylanase helps break down plant cell wall hemicellulose, increasing juice yield, press efficiency, and clarity. It reduces haze and turbidity, especially in apple, grape, berry, and tropical fruit processing, and is often used in enzyme blends with pectinase and cellulase.

4.4 Plant-Based Milk & Extract Production

In oat, barley, and cereal-based beverages, xylanase helps release soluble solids, improve texture, and reduce viscosity. It increases extraction of natural flavors and nutrients, making it ideal for modern plant-based dairy applications.

4.5 Cereal & Grain Processing

Xylanase breaks down hemicellulose in grains, improving filtration, hydration, and extractability. It supports production of cereals, grain concentrates, and functional ingredients by reducing fiber-related processing challenges.

4.6 Dietary Fiber Modification

By partially hydrolysing hemicellulose, food-grade xylanase converts insoluble fibers into more soluble, digestible, or fermentable forms. This improves mouthfeel, nutritional value, and functionality in high-fiber foods and supplements.

4.7 Flavour, Colour, and Nutrient Extraction

In food ingredient production—such as botanical extracts, teas, and herbal beverages—xylanase opens the plant matrix to enhance extraction of polyphenols, aromas, pigments, and bioactives, often improving yield and reducing processing time.

4.8 Synergistic Action in Multi-Enzyme Systems

Xylanase is frequently blended with pectinase, cellulase, β-glucanase, and amylase to optimize breakdown of plant cell walls. This synergy enhances performance in juice processing, brewing, plant-milk production, and general food extraction processes.

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 MSDS for complete safety details.

6. Packaging Options

- 0.1 L, 1 L, 10 L, 25 L (1000 kg totes available upon request)

7. Quality Control Specifications

Test	Specification
Activity assay	≥ labelled activity
Density (liquid)	1.1–1.2 g / mL
Moisture (powder)	≤ 8%
Microbial load	Total plate count ≤ 50,000 CFU / g
Pathogens	*Salmonella* negative, *E. coli* negative

9. Shelf Life

- **Liquid:** 12 months
- **Powder:** 24 months
  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.