

Trehalase Technical Sheet

High activity enzyme for digesting trehalose



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1. Product Overview

Trehalase is a high-performance enzyme designed to efficiently break down trehalose into two glucose molecules, enabling smoother, more controlled sugar conversion in food, beverage, and biotechnology applications. By eliminating trehalose-related processing challenges, trehalase improves product consistency, enhances fermentation efficiency, and helps optimize sweetness profiles without altering flavor. Reliable, fast-acting, and easy to integrate into existing processes, our trehalase enzyme delivers measurable performance gains while supporting cleaner labels and greater process control.

2. Product Characteristics

Parameter	Specification
Enzyme Class	EC 3.2.1.28
Source	<i>Aspergillus niger</i> (non-GM strain)
Appearance	Brown liquid
Activity	50,000 U / mL
Units	Where 1 U is the amount of enzyme required to release 1 µmol of glucose per minute
Total Protein	10-14 % w/v
Density	1.10-1.20 g per mL
Temperature Range	15–60 °C (operational)
Optimal Temperature	45–55 °C
pH Range	3.5–7.0
Optimal pH	4.5–5.5
Shelf Life	24 months (sealed and kept under recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

Trehalase (EC 3.2.1.28) is a glycoside hydrolase that catalyses the hydrolysis of trehalose, a nonreducing disaccharide composed of two glucose molecules linked by an α,α -1,1-glycosidic bond. The enzyme binds trehalose within its active site, where conserved catalytic amino acid residues facilitate cleavage of the glycosidic bond through an acid–base catalytic mechanism. A water molecule is activated and attacks the anomeric carbon, resulting in bond hydrolysis and the release of two molecules of D-glucose. Trehalase exhibits high substrate specificity for trehalose and operates optimally within defined pH and temperature ranges depending on its microbial or animal source. In industrial applications, trehalase is used to convert trehalose into readily fermentable

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glucose, improving substrate utilization and product yields in fermentation and bioprocessing operations.

3.2 Kinetics:

Trehalase-catalysed hydrolysis of trehalose generally follows Michaelis–Menten kinetics, where the reaction rate increases with substrate concentration until the enzyme becomes saturated and reaches a maximum velocity (V_{max}). The enzyme exhibits a high affinity for trehalose, with reported K_m values typically ranging from the low millimolar to sub-millimolar range depending on the enzyme source, assay conditions, and temperature. Catalysis proceeds through rapid formation of an enzyme–substrate complex followed by hydrolytic cleavage of the α,α -1,1-glycosidic bond to yield two molecules of glucose. Reaction rates are influenced by pH, temperature, substrate concentration, and the presence of reaction products, with glucose often acting as a competitive or mixed inhibitor at elevated concentrations. Under industrial operating conditions, trehalase activity is typically optimized near its temperature and pH optima to maximize catalytic efficiency (k_{cat}/K_m), ensuring rapid and complete conversion of trehalose while minimizing enzyme dosage and processing time.

3.3 Inhibitors:

- Heavy metals (Hg^{2+} , Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 60 deg. C
- High chelator concentrations (EDTA)

4. Applications

- **Bioethanol production** – Conversion of trehalose-containing feedstocks or hydrolysates into glucose for fermentation by *Saccharomyces cerevisiae* and other ethanol-producing microorganisms.
- **Cellulosic and lignocellulosic biofuels** – Supplementary enzyme in biomass conversion processes where trehalose accumulates during pretreatment, saccharification, or microbial metabolism.
- **Microbial lipid production** – Enhancement of glucose availability for oleaginous yeasts and fungi used in biodiesel and renewable diesel production.
- **Biogas and anaerobic digestion** – Pretreatment of trehalose-containing substrates to improve carbohydrate availability and methane yields.
- **Industrial fermentation feedstock preparation** – Generation of fermentable sugars for the production of ethanol, butanol, organic acids, and other bio-based chemicals.
- **Algal and microbial biomass processing** – Hydrolysis of intracellular trehalose reserves to increase sugar recovery prior to fermentation.
- **Integrated biorefinery operations** – Conversion of trehalose-rich side streams into glucose for subsequent fermentation or biochemical synthesis.

In biofuel processes, trehalase is typically employed alongside other carbohydrases such as amylases, cellulases, β -glucosidases, and glucoamylases to maximize overall sugar release and fermentation yield.

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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	<i>Salmonella</i> negative, <i>E. coli</i> negative

9. Shelf Life

- **Liquid:** 12 months when stored in original container, sealed, in cool conditions.

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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