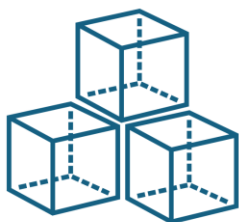


Glucose Isomerase Technical Sheet

High activity enzyme for fructose production



HIGH ACTIVITY



FRUCTOSE



VALORISATION



BULK OPTION

Glucose Isomerase Technical Datasheet

1. Product Overview

Glucose isomerase is a widely used industrial enzyme that catalyses the conversion of glucose into fructose, a key step in the production of high-fructose corn syrup (HFCS). Its primary application is in the food and beverage industry, where it enables the creation of sweeter syrups from starch-derived glucose, providing a cost-effective alternative to sucrose. Beyond sweetness enhancement, glucose isomerase improves product consistency and stability and contributes to a more efficient production process by reducing the need for chemical treatments. In addition to HFCS production, it finds use in biofuel industries, where it helps optimize the conversion of sugars into fermentable intermediates for ethanol production. The benefits of glucose isomerase include high specificity, scalability for industrial processes, energy efficiency due to its mild operational conditions, and the ability to increase yield while lowering overall production costs.

2. Product Characteristics

Parameter	Specification
Enzyme Class	Isomerase (EC 5.3.1.5)
Source	<i>Aspergillus Streptomyces spp.</i>
Appearance	Off white powder
Activity	20,000 U / g
Units	Where 1 U is the amount of enzyme required to produce 1 mg of fructose per minute under defined conditions
Total Protein	7-9 % w/w
Temperature Range	55–85 °C
Optimal Temperature	70–80 °C
pH Range	7.0–9.0
Optimal pH	7.5–8.5
Shelf Life	12 months (sealed and kept under recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

Glucose isomerase catalyses the reversible conversion of D-glucose (an aldose) to D-fructose (a ketose) through an intramolecular rearrangement. The reaction occurs in the enzyme’s active site, where divalent metal ions (usually Mg^{2+} or Co^{2+}) help stabilise the substrate and catalytic intermediates. First, glucose binds and the enzyme opens the cyclic glucose ring to form the linear aldehyde form. A base in the active site then abstracts a proton, forming a cis-enediol

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intermediate. During this step, a hydride shift rearranges the carbonyl group from the C-1 position (aldehyde) to the C-2 position, converting the aldose into a ketose. The intermediate is then re-protonated, forming linear fructose, which subsequently cyclises into its ring form before being released from the enzyme. This mechanism allows glucose isomerase to efficiently interconvert glucose and fructose without adding or removing atoms, only rearranging them within the molecule.

3.2 Kinetics:

The reaction kinetics of glucose isomerase generally follow Michaelis–Menten kinetics, typical of many enzyme-catalysed reactions. The rate of conversion of D-glucose to D-fructose increases with substrate concentration as more enzyme active sites become occupied. At low glucose concentrations, the reaction rate is approximately first-order, meaning it is directly proportional to the substrate concentration. As the glucose concentration increases, the enzyme approaches saturation, and the reaction rate reaches a maximum velocity (V_{max}) where nearly all active sites are occupied. At this stage the reaction becomes zero-order with respect to substrate concentration. The enzyme has a characteristic K_m (Michaelis constant) representing the substrate concentration at which the reaction rate is half of V_{max} , reflecting the enzyme's affinity for glucose. Because the reaction is reversible ($\text{glucose} \rightleftharpoons \text{fructose}$), the system eventually reaches an equilibrium mixture of the two sugars, typically around 42–50% fructose under industrial conditions, and the net reaction rate decreases as equilibrium is approached. Temperature, pH, and the presence of required metal cofactors such as Mg^{2+} or Co^{2+} strongly influence both K_m and V_{max} by affecting enzyme structure and catalytic efficiency.

3.3 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

Glucose isomerase (EC 5.3.1.5) has several important industrial and biotechnological applications, mainly related to sugar conversion and biomass utilisation.

1. Production of High-Fructose Corn Syrup (HFCS)

The most important industrial use of glucose isomerase is the conversion of glucose to fructose during the manufacture of high-fructose corn syrup. Fructose is sweeter than glucose, so this process increases the sweetness of corn-derived syrups used in soft drinks, processed foods, baked goods, and confectionery.

2. Sweetener industry

The enzyme is used to produce fructose-rich syrups and crystalline fructose, which are used as sweeteners in:

- beverages
- dairy products
- jams and jellies

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- diet and low-calorie foods.

3. Biomass and biofuel production

Glucose isomerase also converts D-xylose to D-xylulose, an important step in the utilisation of hemicellulose from plant biomass. This helps microorganisms ferment xylose more efficiently during bioethanol production from lignocellulosic biomass.

4. Food processing

In the food industry, glucose isomerase helps improve flavour, sweetness balance, and texture in certain food products by adjusting sugar composition.

5. Analytical and research applications

The enzyme is used in biochemical assays and metabolic studies to investigate sugar metabolism and enzyme mechanisms involving aldose–ketose isomerisation.

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 kg, 1 kg, 10 kg, 25 kg

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7. Quality Control Specifications

Test	Specification
Activity assay	≥ labelled activity
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

Powder: 12 months, store 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