



Application Data Sheet

MAXINVERT[®]

Invertase for Sucrose Hydrolysis

DSM Food Specialties B.V.

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S 03052014 R 06242014

PRODUCT DESCRIPTION

MAXINVERT[®] is an invertase (β -fructofuranosidase; EC 3.2.1.26) produced by the controlled fermentation of *Saccharomyces cerevisiae*. Invertase hydrolyzes (breaks) the β -D-1,2-glycosidic bonds (linkages) in sucrose; releasing an equal molar mixture of D-glucose and D-fructose. Invertase is commonly termed β -fructosidase, glucosucrase, saccharase or sucrose.

FUNCTIONALITY

MAXINVERT[®]:

- Selectively and efficiently converts sucrose containing solutions and syrups (e.g., molasses, cane and beet sugar syrups, fruit juice, confectionery fillings, marzipan) to an equal molar solution of glucose and fructose (invert syrup).
- Hydrolyzes raffinose; liberating melibiose and fructose.
- Hydrolyzes inulin; liberating fructose.
- Is standardized to ensure process reproducibility and efficiencies and cost/performance.
- Is available in both liquid and granular forms in a wide range of activities (strengths).

APPLICATION

MAXINVERT[®] is used for two primary purposes:

- As a processing aid for the production of invert sugar from sucrose solutions (cane and beet sugar syrups). The properties of invert sugar are of significant commercial value in numerous food applications:
 - Enhanced sweetness and lower viscosity.
 - Increased humectancy due to an increased affinity for water.
 - Invert syrup monosaccharides (i.e., glucose and fructose) are more soluble and less prone to crystallization at higher concentrations than sucrose.
 - The monosaccharides in invert syrup promote browning and flavour development via the Maillard Reaction.

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- Reduced water activity and a higher osmotic pressure retard microbial growth; enhancing food preservation and quality.
- A higher boiling point and lower freezing point compared to sucrose solutions.
- Reduced by-products such as hydroxymethylfurfural (HMF) compared to acid inversion.
- Enzymatically inverted syrup is less prone to browning during storage than acid inverted syrup.
- As an additive in food processing (*in situ* application in confectionery and fruit juice processing):
 - Converts sucrose to constituent monosaccharides that are more soluble and less prone to crystallization at higher concentrations; enhancing confection consistency, quality and shelf life.
 - Enhances sweetness.
 - Increases water affinity and subsequently humectancy; minimizing the drying of confection over time.
 - Enhances texture via increasing humectancy and constituent sugar solubility, and reducing viscosity and increasing flow (i.e., creaminess and softness).

MAXINVERT® PRODUCT RANGE

Selecting the appropriate MAXINVERT® product primarily depends on the application. In general, higher activity products are used for invert sugar production for economic efficiency and lower activity products are used in confectionery applications for ease of use/dosing.

Product Name	Product Form	Activity	Recommended Application
MAXINVERT® L 2400	Liquid	≥ 2400 SU/mL	Confectionery
MAXINVERT® L 5000		≥ 6200 SU/mL	
MAXINVERT® L 10000		≥ 10000 SU/mL	Confectionery/Invert Sugar
MAXINVERT® L 15000		≥ 15000 SU/mL	
MAXINVERT® L 15000 KPO		≥ 15000 SU/mL	
MAXINVERT® 200000 MG	Granule	≥ 200000 SU/g	Invert Sugar

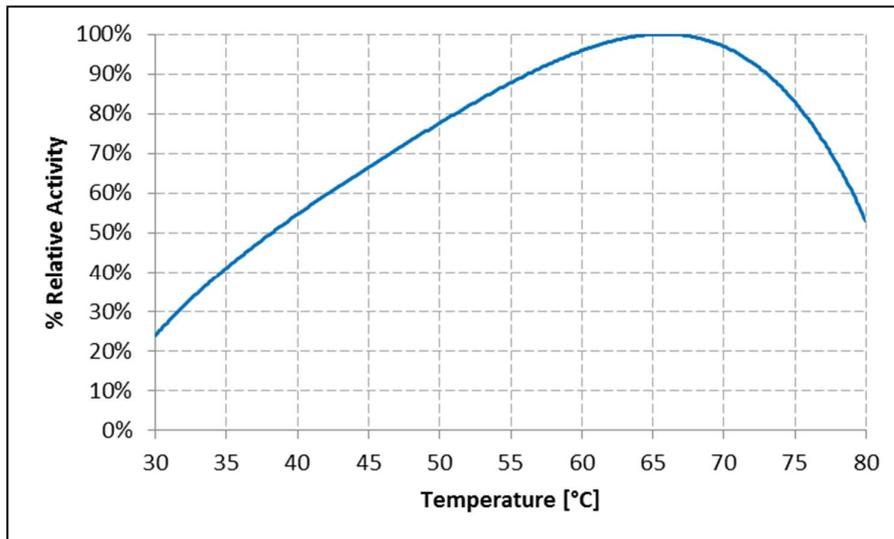
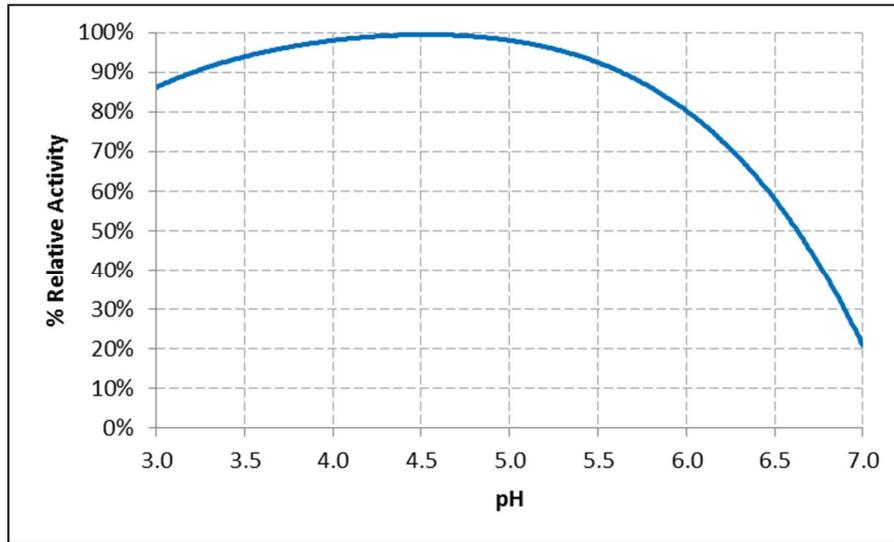
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EFFECT of pH and Temperature

MAXINVERT[®] products have optimum performance at pH 4.5 and 65°C (149°F). MAXINVERT[®] effectively hydrolyzes sucrose over the ranges of pH 3.5-5.5 and 10-75°C (50-167°F). The invertase is rapidly inactivated at temperatures above 85°C (185°F). For example, invertase may be inactivated by raising the temperature to 90°C (194°F) and holding for approximately 5-10 minutes.



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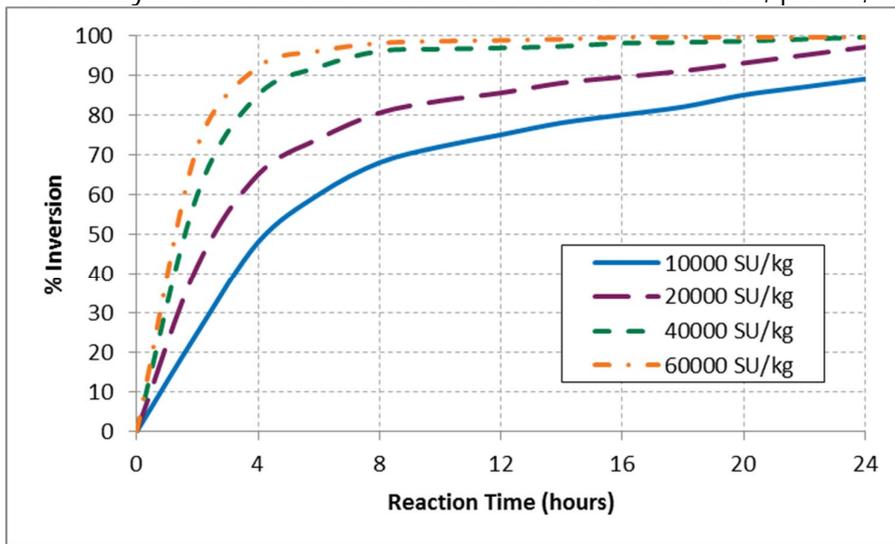
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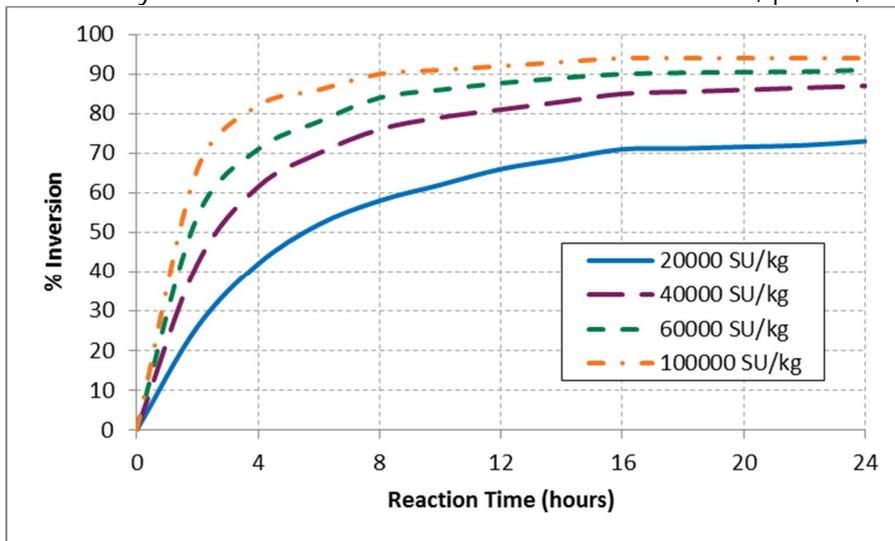
USAGE—Invert Sugar Production:

For the production of invert sugar, MAXINVERT® products are flexible with respect to pH, temperature, reaction time, starting sucrose substrate concentration, enzyme dose rate and desired degree of inversion. Given below are examples of sucrose inversion rates at different conditions.

Effect of Enzyme Dose and Inversion Rate: 65% sucrose solution, pH 4.5, 60°C



Effect of Enzyme Dose on Inversion Rate: 75% sucrose solution, pH 4.5, 70°C



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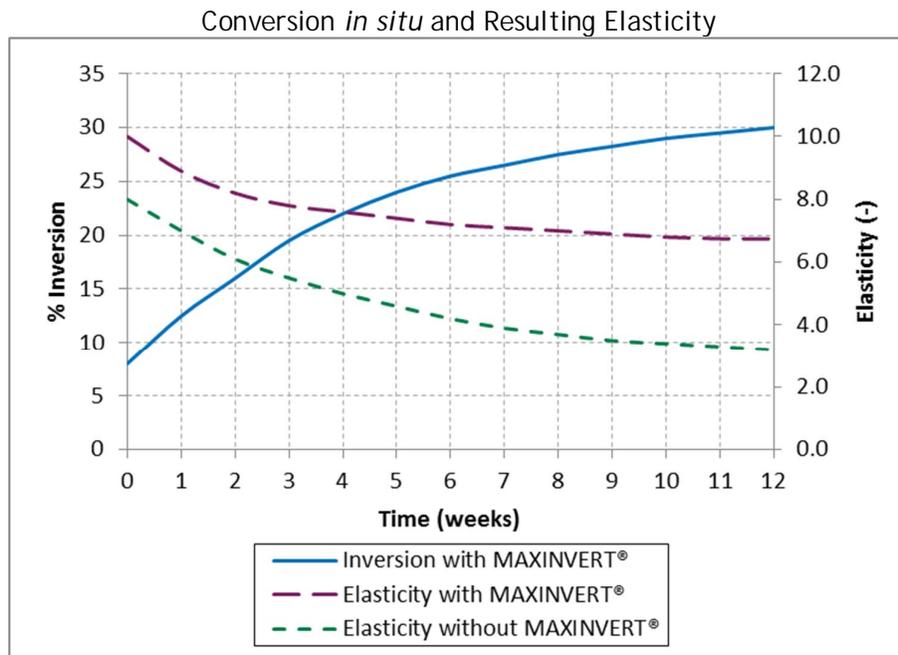
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USAGE—Confectionery:

The major use of MAXINVERT® in confections is to convert sucrose into a fondant cream after the confection has been shaped and enrobed in chocolate (cast and rolled cream centers, liquid centers, etc.). Fondants are a sucrose-based mixture comprised of sucrose crystals (solid phase) dispersed in a liquid phase containing corn syrup (glucose) and invert syrups, and other ingredients. The viscosity and flow properties of the fondant are largely determined by the relative ratio of the solid crystalline sucrose phase to the liquid phase (i.e., the greater the solid:liquid phase ratio, the greater the viscosity and the lower the flow).

The initial, solid phase of a fondant possesses a higher viscosity and enhanced firmness that permits and facilitates handling and processing (molding, enrobing, etc.). The inclusion of MAXINVERT® in fondants converts crystalline sucrose to invert sugar over time. The *in situ* enzymatic conversion of sucrose to constituent sugars of greater solubility prevents sucrose crystallization and softens the center to a consistent, fluid, creamy texture. A MAXINVERT® dose of 2000-5000 SU/kg sucrose is typical for this application. Given below are examples of *in situ* sucrose inversion and elasticity over time.



To reduce viscosity of sugar pastes to facilitate filling operations and portioning, the addition rate of 10000-20000 SU/kg is recommended. Add MAXINVERT® after heating the sugar mass and before portioning.

TECHNICAL SERVICE

Please contact your local DSM Food Specialties technical sales representative to receive additional information on meeting your needs.

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