Product Information

DESCRIPTION
AMYLEX™ 3T enzyme is a very stable alpha-amylase derived from a genetically modified strain of Bacillus licheniformis. Potential application areas for AMYLEX™ 3T include cereal cooker starch liquefaction, all-barley brewing and correction of poor malt quality.

TYPICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>940 GSAU/g (minimum)</td>
</tr>
<tr>
<td>Appearance</td>
<td>Brown liquid</td>
</tr>
<tr>
<td>Grade</td>
<td>Food Grade, Kosher</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>Typically 1.1 - 1.2 g/ml.</td>
</tr>
<tr>
<td>pH</td>
<td>Minimum 5.0</td>
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</tbody>
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Unit Definition
The activity of AMYLEX™ 3T is expressed in GSAU/g. One GSAU is the measure of the digestion time required to produce a color change with iodine solution indicating a definite stage of dextrinization of starch substrate under specified conditions. The assay method is available upon request.

pH Dependency
The pH-range for the enzyme activity of Genencor AMYLEX™ 3T is approximately from 5.5 to 7.0, with an optimum performance at pH 5.8. The exact pH-optimum will depend on process variables, including temperature, time, substrate concentration and source.

Temperature Dependency
The enzymatic activity of AMYLEX™ 3T is effective in the temperature range from 60°C (140°F) to 110°C (230°F), with an optimum performance at 108°C (226°F). The exact temperature optimum will depend on many process variables, such as pH, time, substrate concentration and source.

Inactivation
The enzyme can be inactivated by holding for 10 minutes at a temperature of 135°C (275°F) or at pH below 4.3.

BIOCHEMICAL PARAMETERS

<table>
<thead>
<tr>
<th>Enzyme type</th>
<th>alpha-1,4-glucan-4-glucanohydrolase</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUB #</td>
<td>3.2.1.1</td>
</tr>
<tr>
<td>CAS #</td>
<td>9000-90-2</td>
</tr>
<tr>
<td>Activators/cofactors</td>
<td>Low concentrations calcium</td>
</tr>
<tr>
<td></td>
<td>(50ppm) improve operational stability of enzyme</td>
</tr>
<tr>
<td>Inhibitors</td>
<td>High concentrations of strong calcium-chelating agents (phosphate, EDTA, phytate)</td>
</tr>
</tbody>
</table>

APPLICATION RECOMMENDATIONS
AMYLEX™ 3T very stable alpha-amylase hydrolyses the alpha-1,4 glucosidic linkages within polysaccharides containing more than three glucose units.

Insoluble starch is converted into dextrins (soluble) and fermentable maltotriose, maltose and glucose.

Extract Liquefaction and Solubilisation in Cereal Cookers
AMYLEX™ 3T solubilises the starch content rapidly and completely before it is combined with the malt mash. Adjuncts such as rice, maize, sorghum benefit from enzyme treatment.

Set Mash Rectification
All residual starch material is converted after incomplete mash liquefaction or with traces of non-saccharized starch remaining. The AMYLEX™ 3T will be inactivate in the brewing kettle once all the starch substrate has been converted.

Brewing Entirely with Unmalted Cerals
Sorghum brewing makes use of several enzymes to overcome the inherent lack of enzyme in malted sorghum compared with barley malt.

Poor Malt Correction
Adding AMYLEX™ 3T to the mash will correct for poor malt quality and/or decrease mashing time achieving complete liquefaction.

DOSAGE
For optimizing the dosage of AMYLEX™ 3T you may use the following rates as starting point:

- 0.09-0.2 kg per ton malt or 0.45-0.6 kg/ton barley (mashing)
- 0.2-0.3 kg per ton of mash added before filtration (in case of corrective action after incomplete saccharification during mash)
- 0.01-0.02 kg per ton of mash (correcting traces of starch after mashing)
- 0.58 kg per ton DS starch for (adjunct liquefaction—even at pH as low as 5.2)

REGULATORY STATUS
This product meets or exceeds the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and the Food Chemicals Codex (FCC) specifications for enzyme preparations used in food and is GRAS (Generally Recognized As Safe) in the United States.
STORAGE
AMYLEX™ 3T will meet the declared activity of 940 GSAU/g upon arrival at the customer’s plant.

Genencor enzymes can be safely stored in unopened and sealed original containers. Enzyme containers should be stored below 20°C (70°F), preferably refrigerated and sheltered against direct sunlight.

During storage AMYLEX™ 3T will have an activity loss less than 16% per year at a temperature of 4°C (40°F). For more information on storage of this product, please contact your Genencor International® representative.

PACKAGING
AMYLEX™ 3T is available in 28, 225, and 1125 kg containers. Please note that some Genencor® products are sold in full pallet loads only.

SAFETY & ENZYME HANDLING
Inhalation of enzyme dust and mists should be avoided. In case of contact with the skin or eyes, promptly rinse with water for at least 15 minutes.

For detailed handling information, please refer to the appropriate Material Safety Data Sheet, the Enzyme Technical Association (ETA) handbook Working Safely with Enzymes, and the Association of Manufacturers of Fermentation Enzyme Products (AMFEP) handbook Guide to the Safe Handling of Microbial Enzyme Preparations. All are available from Genencor International®.

TECHNICAL SERVICE
Information covering specific applications of this product is available. Genencor International® will work with customers to enhance processes and solve problems.

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