

Alpha-Amylases

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Deerland FA Concentrate	Powder	A series of fungal enzymes (primarily alpha-amylases) characterized by both dextrinizing and saccharifying action on starch. Deerland FA hydrolyzes starch more extensively than most alpha-amylases, resulting in the formation of substantial quantities of maltose and low levels of glucose.	<p>STARCHES: Modifies starch and dextrans into syrups with significant maltose content.</p> <p>SYRUPS: Hydrolyzes acid or enzyme liquefied syrups into intermediate or high maltose syrups. In combination with Glucozyme enzyme produces high conversion and high fermentable noncrystallizing syrups.</p> <p>BREWING: Removes unconverted starch thus reducing beer haze.</p> <p>FRUIT JUICES: Facilitates filtration by converting starch to soluble Dextrans of lower viscosity, and eliminates starch hazing problems.</p>	<p>Effective pH Range: 4.0 to 6.6.</p> <p>Effective Temperature Range: up to 60°C.</p>
Thermozyme L-340	Liquid	All liquid thermostable bacterial alpha-amylase for economical starch liquefaction at high temperature. Thermozyme displays excellent thermal stability and is compatible with batch or continuous starch liquefaction processes. In most systems no additional calcium addition is necessary. The dextrinizing enzymes rapidly reduce the viscosity of gelatinized starch slurries yielding soluble dextrans, along with smaller quantities of glucose and maltose.	<p>SYRUPS: Liquefies starch in processes to produce High Fructose Corn Syrup (HFCS) and glucose syrup.</p> <p>ETHANOL: Used in liquefaction of starch fermentation media.</p>	<p>Effective pH Range: 5.5 to 7.0</p> <p>Effective Temperature Range: up to 110°C.</p>

Alpha-Amylases (continued)

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Licuamil 1200	Powder	A bacterial alpha-amylase for Economical starch liquefaction at low temperatures. Licuamil displays good thermal stability and is compatible with batch and continuous starch liquefaction processes. The dextrinizing enzymes rapidly reduce the viscosity of gelatinized starch slurries yielding soluble dextrans, along with smaller quantities of glucose and maltose.	<p>SYRUPS: Liquefies starches in dual-enzyme processes to produce dextrose, high fermentable syrups and high maltose syrups.</p> <p>TEXTILE: Rapidly liquefies and modifies gelatinized starch for textile desizing.</p>	Effective pH Range: 5.0 to 7.5
Licuamil L-1200				Effective Temperature Range up to 90°
Liquamil L-340				
Liquamil 7000 Concentrate				

Beta-Glucanase

Zymafilt L-300	Liquid	<p>A bacterial Enzyme for the hydrolysis of beta –glucans. The hydrolysis products of the beta-glucan are primarily oligosaccharides of three and four glucose units. In the preparation of wort for the brewing process Zymafilt L-300 rapidly reduces the viscosity of barley, barley malt, rice, rye and other cereal grain beta-glucans as they are solubilized. Consequently Zymafilt L-300 reduces wort viscosity, increases rate of wort filtration and therefore alleviates final beer filtration problems and improves beer clarity and stability.</p>	<p>BREWING: Used in the mash tub, fermentor, or beer storage tank to improve filtration.</p>	<p>Effective pH Range: 5.5 to 7.5</p> <p>Effective Temperature Range: up to 70°C.</p>
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Catalase

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Deerland Catalase	Liquid	A bacterial catalase derived from <i>Micrococcus lysodeikticus</i> . Catalyzes the decomposition of hydrogen peroxide to water and oxygen.	MILK: Removes residual hydrogen peroxide after anti microbial treatments	Effective pH Range: 6.5 to 7.5 Effective Temperature Range: 5 to 45° C.

Cellulases

Cellulase 4000	Powder	A fungal cellulase system primarily active on soluble forms of cellulose (Cx component). Hemicellulase component of the system rapidly reduces the viscosity of several plant gums.	<p>PHARMACEUTICALS: Aids in digestion of cellulosic materials.</p> <p>ANIMAL FEEDS: Added to the diet of swine and poultry, Cellulase may result in increased weight gains and feed efficiencies.</p> <p>BREWING: Increases the body of the malt beverages by solubilizing more of the malt and cereal adjuncts.</p> <p>FRUIT JUICES: Aids in extraction and clarification of juice from citrus fruits.</p> <p>ESSENTIAL OILS AND SPICES: Increases yields of essential oils and other plant extracts.</p> <p>WASTES: Digests paper and other waste as a component of septic tank and drain compounds.</p>	<p>Effective pH Range: 3.0 to 6.0</p> <p>Effective Temperature Range: up to 60° C.</p>
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Cellulase TR Concentrate	Powder	Multi-enzyme <i>Trichoderma reese</i> Derived cellulase capable of converting cellulose to glucose.	Major uses are essentially the same as those of cellulase 4000	Effective pH Range: 3.0 to 7.0
Cellulate TRL	Liquid	The cellulase complex consists of both exoglucanases and endo-glucanases which directly attack soluble cellulose derivatives and native cellulose.		Effective Temperature Range: up to 50° C.

Hemicellulase

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Hemicellulase	Powder	A fungal hemicellulase with a high degree of specificity for the class of polysaccharides designated as galactomannans. Locust bean gum, and guar gum are common galactomannans.	PETROLEUM: Used as a breaker with guar gum. COFFEE: Hydrolyze coffee gums which cause liquid coffee concentrates to gel. FLAVORS: Extraction of essential oils flavors and plant extracts. TEXTILES: Desizing of fabrics made from synthetic fibers (in the case of galatomannan like guar gum or locust bean gum are used in size.)	Effective pH Range: 3.5 to 6.0 Effective Temperature Range: up to 60°C.

Glucoamylase

Glucozyme L-400	Liquid	A glucoamylase which removes successive glucose units from the non-reducing ends of starch polymers. Glucozyme, unlike alpha-amylase, can hydrolyze both the linear and branched glucosidic linkages of starch, amylose and amylopectin. Essentially transglucosidase free Glucozyme Hydrolyze starch polymers to glucose.	DEXTROSE: Hydrolyzes corn, wheat, potato and other starches to dextrose, producing a final syrup with excellent color, taste and low ash which can be further processed to a powdered or crystalline form. BREWING: Provided a continuous supply of fermentable sugar by converting non-fermentable dextrans to fermentables, thereby increasing alcohol yields and reducing the carbohydrate content of beer. FERMENTATION: Converts starch to dextrose, which serves as a growth medium or nutrient in industrial fermentation.	Effective pH Range: 3.5 to 5.0 Effective Temperature Range: up to 60°C.
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Lipase

Pancreatic Lipase 250	Powder	Standardized lipolytic enzyme system isolated from pig pancreas for hydrolysis and fatty acids. Most active on fats with fatty acids higher C12.	FLAVORS: For development through fat hydrolysis of triglycerides to glycerol.	Effective pH Range: 6.0 to 9.5 Effective Temperature Range: up to 50°C.
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Lactase

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Fungal Lactase 100,000	Powder	A fungal lactase for hydrolyzing lactose over a wide range of temperatures and pH. The lactase catalyzes the hydrolysis of lactose liberating one mole of D-glucose and one mole of D-galactose.	DAIRY: Lactose hydrolysis in whole milk, skim milk, acid whey, sweet whey, processed cheese, cottage cheese, cheddar cheese, yogurt and other dairy products. LACTOSE HYDROLYSIS: Where it is desirable to convert moderately soluble non-sweet lactose into soluble sugar with an increased degree of sweetness. PHARMACEUTICALS: Digestive aids and lactose intolerance.	
Yeast Lactase L-50,000	Liquid	A yeast lactase for hydrolyzing lactose in a neutral pH range.	Major uses are the same as those of fungal Lactase.	Effective pH Range: 6.0 to 8.0 Effective Temperature Range: up to 40°C.

Pancreatin

Pancreatin 4X	Powder	A combination of enzymes, (principally protease, amylase and lipase). Isolated from pig pancreas for hydrolysis of fats into glycerol and fatty acid, change protein into proteases and derived substances and converts starch into dextrins and sugars.	PHARMACEUTICALS: Aids in the digestive breakdown of protein, carbohydrates and fats. STARCHES: Liquefies starch into dextrins and sugars.	Effective pH Range: 6.0 to 9.5
Pancreatin 8X				Effective Temperature Range: up to 50°C.
Pancreatin 10X				

Pectinase

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Deepect L-20	Liquid	A concentrated liquid pectic enzyme system designed for efficient depolymerization of naturally occurring pectins. Extremely flexible <i>Deepect</i> is effective for a wide variety of plant processing conditions, including a broad range of pH and temperature.	FRUIT JUICES: Improves total juice yield and produces clear juice of exceptionally high quality from apples, cranberries, grapes and other fruits. WINES: Increases free-run and total juice yield. Resulting wines are of crystalline clarity with excellent color and body. FRUITS AND VEGETABLES: Hydrolyzes undesirable gel formations in fruit and vegetable purees.	Effective pH Range: 2.5 to 5.5
Deepect L-50	Liquid			Effective Temperature Range: 5 to 65°C.
Deepect L-100	Liquid			
Deepect PML-MX	Liquid			
Deepect PMLX	Liquid	An extensively researched combination of several enzyme activities resulting in an efficient maceration or liquefaction system.	FRUIT PROCESSING: Maceration or liquefaction of fruit in order to maximize fruit juice and solids extraction.	Effective pH Range: 2.5 to 5.5
Deepect APLX	Liquid	Also a fungal pectic enzyme system. Contains a high arabinase activity.	FRUIT JUICES: Used to prevent arabin haze formation mainly in pear and apple processing.	Effective Temperature Range: 5 to 65°C. Effective pH Range: 2.5 to 5.5
Deepect L-200	Liquid	A highly concentrated fungal pectic enzyme system uniquely formulated to operate effectively at low pH.	CRANBERRY JUICE: Provide fast depectinization times at low dosage rates and temperature.	Effective pH Range: 2.5 to 5.5 Effective Temperature Range: 5 to 65°C.

Proteases

Deerland AFP 2000	Powder	An acid fungal protease characterized by its ability to hydrolyze proteins under acid conditions.	PROTEINS: Where the solubilization and modification of proteins under acid conditions are desirable. The enzyme can be used to hydrolyze protein gels to lower viscosity which may be readily filtered or concentrated. FRUIT JUICE: Effective in prevention of protein haze.	Effective pH Range: 2.5 to 6.0 Effective Temperature Range: up to 55°C.
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Proteases (continued)

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Deterzyme APL-660 APL-440	Liquid Liquid	A bacterial alkaline protease capable of hydrolyzing the interior peptide bonds of protein molecules	DETERGENT: Primarily used in moderately alkaline laundry detergents.	Effective pH Range: 7.0 to 10.0.
PAG 520/220 PAG 380/220 (Protease Amylase Granular) APUG-380	Granular Granular	(endopeptidase). PAG products also contain alpha-amylase for starch hydrolysis. Granular	SILVER RECOVERY: Hydrolysis of gelatin for silver recovery from x-ray and photographic film.	Effective Temperature Range: up to 65°C
Deterzyme APYL-1000 APY-560	Liquid Granular	A bacterial protease capable of protein hydrolysis under highly alkaline conditions. Deterzyme shows excellent stability in the presence of oxygen bleaches.	DETERGENT: For use in highly alkaline laundry detergents.	Effective pH Range: 8.0 to 11.0 Effective Temperature Range: up to 65°C.
Bromelain Concentrate	Powder	A mixture of proteases, isolated from the pineapple plant, capable of hydrolyzing both plant and animal proteins to peptides and amino acids. Depending upon hydrolysis conditions <i>Bromelain</i> can hydrolyze protein substrates to large or small peptides.	MEATS: A useful ingredient in tenderizer formulation. BAKING: Produces excellently textured sugar wafers, waffles and pancakes. Improves handling of pizza dough's. PHARMACEUTICALS: Permits rapid healing as a wound debriding agent, and is used in certain blood typing studies. FISH: Used to process inedible and scrap fish for fish meal, oil and solubles. PROTEINS: Reduces the viscosity of protein solutions used in the manufacture of protein hydrolystates. Eliminates protein hazes in food products.	Effective pH Range: 4.0 to 9.0 Effective Temperature Range: up to 60°C.

Proteases (continued)

<u>Product</u>	<u>Form</u>	<u>Description</u>	<u>Major Uses</u>	<u>Suitable Operating Conditions</u>
Fungal Protease Concentrate	Powder	A fungal system of endo-and-exo-peptidases capable of catalyzing the hydrolysis of a wide range of peptide bonds.	BAKING: Improves grain, texture and compressibility of bread crumb, reduces mixing requirements of sponge doughs and increases loaf volume and color.	Effective pH Range: 4.0 to 9.5
Fungal Protease 500,000	Powder	Primarily an acid protease, <i>Fungal Protease</i> is active over a broad pH range, and demonstrates significant saccharifying alphan amylase activity.	PROTEINS: Hydrolyzes and modifies plant and animal protein under acid conditions.	Effective Temperature Range: up to 60°C.
HT-Proteolytic Concentrate	Powder	A bacterial protease system extremely effective for protein hydrolysis over the neutral and alkaline pH range. Primarily a neutral protease, <i>HT Proteolytic</i> also demonstrates significant liquefying alpha-amylase activity.	MEATS: major component BAKING: Produces excellent flavored, better quality crackers and cookies in a fraction of the normal processing time. Improves handling of pizza doughs.	Effective pH Range: 5.0 to 9.5
HT Proteolytic 200	Powder		PROTEINS: Hydrolyzes both plant and animal proteins where a significant level of hydrolysis and lower molecular weight peptides are desired.	Effective Temperature Range: up to 60°C.
Papain Concentrate	Powder	A potent protease preparation derived from papaya latex by a purification procedure designed to activate all latent proteolytic activity. <i>Papain</i> has a broad substrate specificity which allows it to more extensively hydrolyze proteins. It is further characterized by elevated temperatures.	BREWING: Stabilizes and chillproofs beer. MEATS: Tenderizes meat, even extremely tough cuts. PHARMACEUTICALS: Used digest ional aid formulations. PROTEINS: Ideal for protein modifications when varying degrees of hydrolysis are desired, either for of dispersed protein, or for increasing despersibility.	Effective pH Range: 3.0 to 9.0 Effective Temperature Range: up to 90°C.