Protease (acidic) Technical Sheet

High activity protease for digesting protein

Scientific & Technical™

Protease (acidic) Technical Datasheet

1. Product Overview

Unlock superior flavour profiles and product quality with our premium food-grade protease enzyme, developed specifically for industrial applications. Designed for exceptional performance across a wide range of acidic pH's and temperature conditions, this enzyme delivers rapid and consistent protein hydrolysis, improving texture, flavour development, and nutritional value in your final products. Whether you work in dairy, brewing, baking, plant-protein processing, or flavour manufacturing, our protease enhances throughput, reduces processing time, and supports clean-label formulations. Backed by rigorous quality control and full regulatory compliance, it's the reliable, high-purity solution that elevates both productivity and product excellence.

2. Product Characteristics

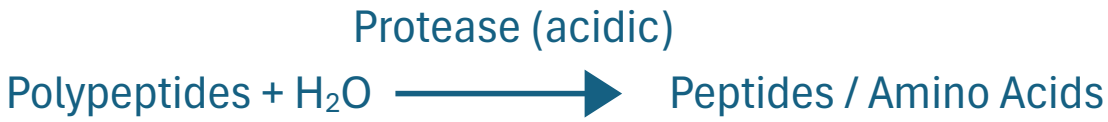
Parameter	Specification
Enzyme Class	Peptidase (EC 3.4.23.18)
Source	*Aspergillus niger* (non-GM strain)
Appearance	Brown liquid
Activity	530 U / g
Units	Where 1 U is the amount of enzyme required to release 1 µg of tyrosine (or equivalent peptides) per minute from casein
Total Protein	10-14 % w/v
Density	1.10-1.20 g per mL
Temperature Range	15–55 °C (operational)
Optimal Temperature	45–55 °C
pH Range	2.3–6.5
Optimal pH	2.5–3.5
Shelf Life	24 months (sealed and kept under recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

Acidic proteases, also known as aspartic proteases, catalyse protein hydrolysis through a mechanism that relies on two highly conserved aspartic acid residues in the active site. These residues work together to activate a water molecule, which performs a nucleophilic attack on the peptide bond of the substrate. Unlike serine or cysteine proteases, acidic proteases do not form a covalent enzyme–substrate intermediate; instead, they use a general acid–base catalytic mechanism in which one aspartate protonates the carbonyl oxygen of the peptide bond while the other deprotonates the

attacking water, enabling bond cleavage. This mechanism functions optimally at low pH, where the active-site environment flavours protonation states required for catalysis. As a result, acidic proteases efficiently break internal peptide bonds, generating smaller peptides and free amino acids, and are widely used for food processing, especially in dairy, brewing, and protein hydrolysis applications.



3.2 Kinetics:

Protease (Acidic) follow Michaelis–Menten reaction kinetics, with their catalytic rate increasing as substrate concentration rises until the enzyme becomes saturated and reaches V_{max}. Their activity is strongly influenced by pH, showing maximal performance in acidic conditions—typically between pH 2.5 and 4.5 - because the ionization states of the two catalytic aspartate residues must be precisely balanced for effective catalysis. Temperature also plays a major role, with most fungal acidic proteases exhibiting optimal activity around 40–55°C, after which thermal denaturation reduces the effective reaction rate. Apparent K_m values vary depending on the complexity and solubility of the protein substrates, generally reflecting moderate affinity due to the large, flexible binding clefts characteristic of aspartic proteases. Product inhibition may occur when accumulated peptides or amino acids occupy or partially block the active site, slowing turnover. Because the enzymes cleave internal peptide bonds rather than acting processively, the reaction often exhibits an initial rapid phase followed by a slower phase as easily accessible sites are depleted. Overall, acidic protease kinetics reflect both classical Michaelis–Menten behaviour and the structural constraints of heterogeneous protein substrates.

- K_m = 0.2-5 mg per mL
- V_{max} = 350 U / mg
- K_{cat} = 100 s^{-1}

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

4.1 Dairy Processing (Cheese & Protein Hydrolysates):
Food-grade acidic proteases are widely used to break down casein and other milk proteins under low-pH conditions. They support cheese ripening, enhance flavour development, and are used to produce milk protein hydrolysates for nutritional supplements, infant foods, and hypoallergenic formulations.

4.2 Brewing & Beverage Production:

In brewing, acidic proteases help degrade haze-forming proteins, improving beer clarity, foam stability, and filterability. They are particularly useful in mashing or wort treatment where controlled protein breakdown is required.

4.3 Meat Tenderisation & Flavour Development:

Acidic proteases can tenderize tough meat cuts by hydrolysing muscle proteins, enhancing texture, juiciness, and flavour release. Their optimal activity at low pH makes them effective in acidic marinades.

4.4 Plant & Animal Protein Hydrolysis:

These enzymes are commonly used to produce protein hydrolysates from soy, wheat, fish, gelatin, and other protein sources. The resulting peptides improve solubility, digestibility, umami flavour, and functional properties in soups, sauces, seasonings, and nutritional products.

4.5 Juice & Fruit Processing:

Acidic proteases help reduce cloudiness and improve clarity by breaking down protein–polyphenol complexes in fruit juices, especially apple, grape, and tropical fruit products.

4.6 Baking & Cereal Processing:

In bakery applications, acidic proteases help modify gluten and cereal proteins, improving dough extensibility, reducing mixing time, and creating more uniform crumb structure, particularly in biscuits and crackers.

4.7 Fermented Foods (Soy Sauce, Miso, Vinegar, Pickles):

Acidic proteases assist in controlled protein breakdown during fermentation, enhancing flavor maturation, aroma development, and nutrient bioavailability.

4.8 Nutraceuticals & Functional Ingredients:

Acidic proteases are used to make bioactive peptides, collagen hydrolysates, and digestive aids, supporting formulation of health products and functional beverages.

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	*Salmonella* negative, *E. coli* negative

9. Shelf Life

- **Liquid:** 12 months when stored 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