



# Application Data Sheet

DSM Food Specialties B.V.

P.O. Box 1  
2600 MA Delft  
The Netherlands

[www.dsm.com](http://www.dsm.com)

## Maxiren® 1800 BF

Applications: Cheese, Fermented Milk Products

### PRODUCT DESCRIPTION

Maxiren® 1800 BF is high quality 100% pure calf chymosine produced by the Dairy yeast *Kluyveromyces lactis* which has been isolated from the microflora of Kefir. Maxiren® was the first fermentation produced chymosine (FPC) commercially available.

### BENEFITS

- Clean cheese flavour development
- Suitable for all varieties of cheese
- 100% chymosin (no variation as with animal rennet)
- Cost effective
- Stable price (no fluctuating like animal rennet)
- Animal disease concern free (e.g. mad cow disease)
- Stable quality
- Kosher
- Halal
- Sodium benzoate free / preservative free
- Yield improvement compared to animal rennet

### ACTIVITY; FORMULATION AND RECOMMENDED DOSAGE

Activity: 1800 IMCU per gram

Formulation: granulated and standardized with Sodium chloride.

For Cheese application the recommended dosage is 15 to 25 gram per 1000 litre of milk.

Because of the impact of application conditions like: renneting temperature; desired gel-strength at cutting; available coagulation time; milk composition and seasonal effects, the optimum dosage level is determined through testing in the specific application.

For Fermented Milk Products application the recommended dosage is 0.5 to 1.5 gram per 1000 litres of milk.

## WORKING MECHANISM AND FUNCTIONALITY

The molecular weight of the chymosin protein is approximately 36 kDa. The I.U.B. number is 3.4.23.4. Maxiren® chymosin is chemically and functionally identical to calf chymosin. The molecular weight and the immunological properties are the same. When Maxiren® is added to milk, the influence of enzyme concentration, milk temperature, pH of the milk and the calcium concentration in the milk is identical to calf rennet of comparable strength. During maturation the breakdown profile of casein, and the taste and flavour development are the same. Like calf rennet, Maxiren® induces milk clotting through cleavage of the phenylalanine-methionine linkage of kappa-casein (Phe-Met 105-106)

### Effect of enzyme concentration

Animal rennet is known to follow the law of Storch and Segelke:

$$t = C1 * 1/[E] + C2$$

In which:

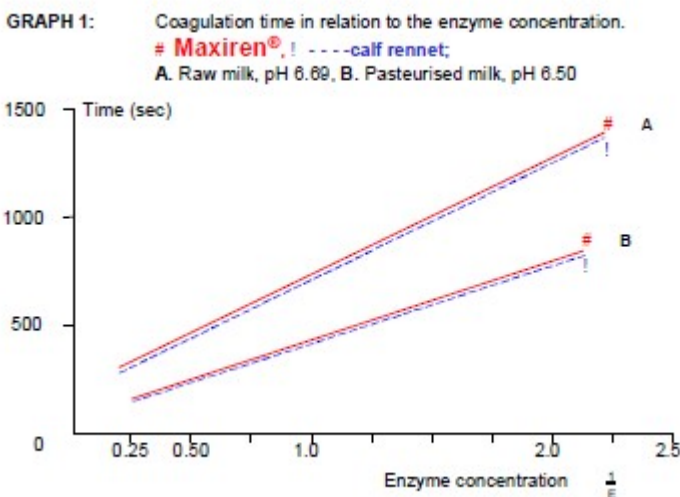
t = flocculation time

[E] = enzyme concentration

C1 = constant

C2 = constant depending on the type of milk used and the type of rennet.

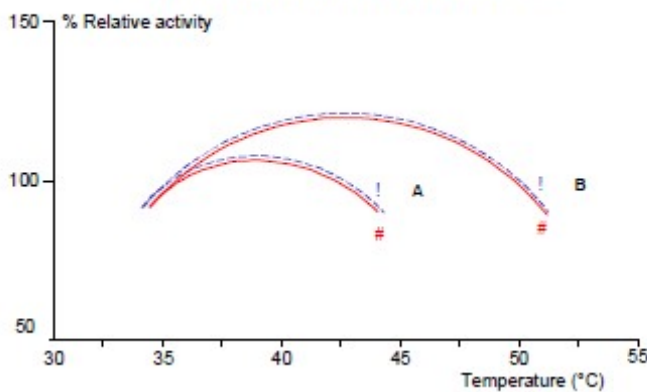
The coagulation time is inversely proportional to the enzyme concentration. Maxiren® and calf rennet show the same dosage response curve. The effect of the enzyme concentration on the coagulation time, in both raw and pasteurized milk, is shown in graph 1



### Effect of temperature

Maxiren® and calf rennet possess the same pattern of sensitivity to the temperature. The optimum activity is reached at 42,5°C when raw milk at pH 6.60 is used and at 45°C when pasteurized milk at pH 6.50 is used. Both enzymes are inactive at temperatures above 55°C and below 15°C. Graph 2 shows the relative activity of Maxiren® and calf rennet exposed to different temperatures, where 100% relative activity is attributed to the clotting time at 35°C. Like calf rennet, inactivation of Maxiren® in the whey can be achieved by pasteurisation at approx. 73°C for 15 seconds.

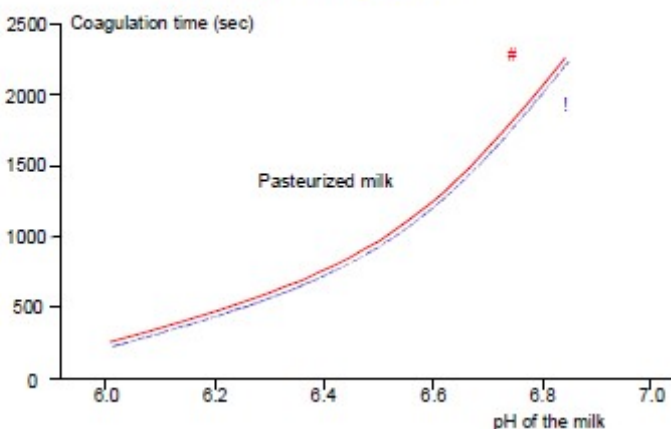
GRAPH 2: Effect of temperature.  
 # Maxiren®, ! calf rennet;  
 A. Raw milk, pH 6.60, B. Pasteurised milk, pH 6.50



### Effect of pH

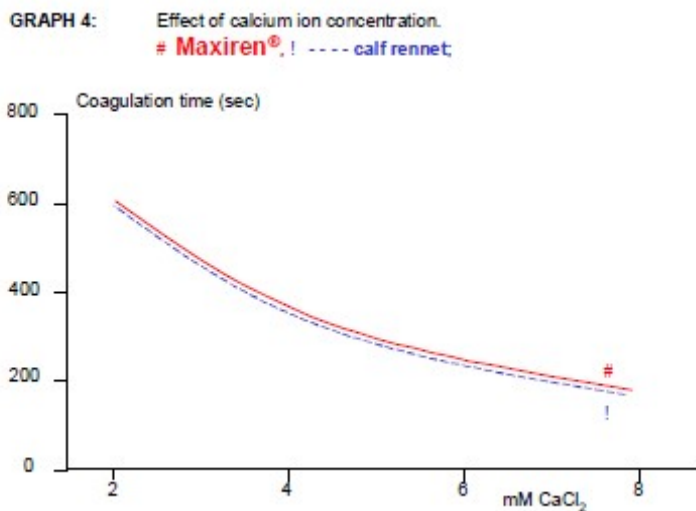
Maxiren® and calf rennet show similar responses to pH values between pH 6.00 and pH 6.80 (graph 3)

GRAPH 3: Effect of pH  
 # Maxiren®, ! calf rennet;



### Effect of calcium ion concentration

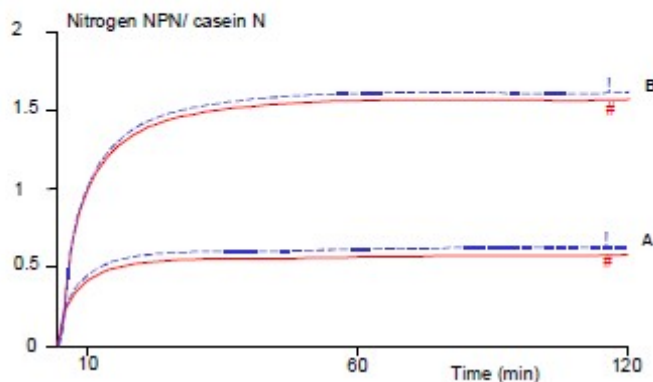
The stimulating effect of calcium ions on Maxiren® and calf rennet activity is very similar and this is shown in graph 4.



### Proteolytic activity

The amount of casein broken down primarily and totally was determined by measuring the amount of nitrogen present in the whey after renneting. The proteolytic activity is expressed by the NPN/Casein ratio in relation to time. This definition showed that Maxiren® and calf rennet give the same level of casein break-down (graph 5). The casein break-down profiles compared on a polyacrylamide gel are identical. Additional evidence for the identical action of Maxiren® and calf rennet is provided by the various casein break-down studies

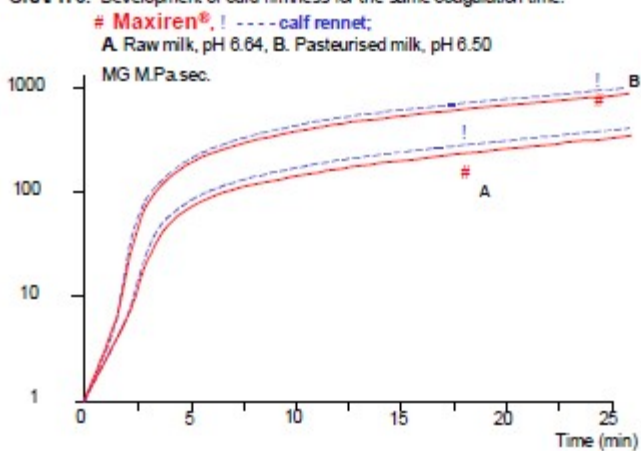
GRAPH 5: Proteolytic activity expressed by the NPN/Casein ratio in relation to time.  
 # Maxiren®, ! - - - - calf rennet;  
 A. Primary proteolytic activity, pH of milk pH 6.50, TCA 12%  
 B. Total proteolytic activity, pH of milk pH 5.50, TCA 2%



## Rheological properties

The rheological properties of the curd formed by Maxiren® are identical with those of the curd formed by calf rennet. The comparison was performed by the gelographic method, using both raw milk and pasteurized milk with 100 mg/l calcium-chloride (33%) added. The enzyme addition rates were selected to achieve the same coagulation time under conditions generally used for the production of Camembert. Graph 6 shows that Maxiren® and calf rennet produce a curd with the same degree of firmness.

GRAPH 6: Development of curd firmness for the same coagulation time.



## APPLICATION

Prior to addition of Maxiren® ensure that the milk is brought to the desired renneting temperature and, if calcium chloride and annatto cheese colour have been added, that they are homogeneously mixed throughout the vat.

Maxiren® 1800 BF must be dispersed in 20 parts of cool, chlorine free water. In situations with no chlorine free water available, alternatively 5% milk can be added to the water before dispersion of Maxiren® 1800 BF. After a soaking-time of 20-30 minutes in water. Ensure that the rennet is uniformly mixed throughout the milk. The stirring time will depend on the stirring speed and the design of the vat (between 3 and 4 minutes). The curd should be ready to cut in about 25 to 45 minutes depending on the coagulation temperature, CaCl<sub>2</sub> dosage rate, the rennet dosage and the required firmness of the coagulum.



### Method of analysis

The activity of Maxiren® is expressed in International Milk Clotting Units (IMCU) in accordance with the Relative Milk Clotting Activity Test (REMCAT) of the International Dairy Federation (IDF). In case of Maxiren® the IDF method 157A:2007 / ISO11815 applies. A copy of the method can be obtained from the IDF: 41, Square Vergrote, 1030 Brussels, Belgium or request from your local DSM Food Specialties office.

### ALTERNATIVES

Maxiren® is available in several strengths; formulations and packing sizes. Maxiren® can be combined with ripening enzymes like Accelerzyme® or Capalase® in order to achieve different cheese flavours.

### SAFE HANDLING

A Material Safety Data Sheet (MSDS) is supplied with all products. For details on safe handling of enzymes please see the MSDS.

### TECHNICAL SERVICE

DSM: a leading dairy player

DSM is the dairy industry's leading supplier, catering to the needs of multinational companies as well as small local producers. We are dedicated to supplying solutions, not just products. We work closely with our customers to help them overcome specific market challenges. To achieve this, we combine years of experience with a dedication to innovation and the best technical support possible. We apply this approach to all dairy markets, including cheese, milk, fermented milk products and whey processing.

### DSM services include:

- Technical in house know-how to support application development.
- Tailor made training possibilities.
- Technical Service.

For more information, please contact your local sales representative or send an e-mail to [info.food@dsm.com](mailto:info.food@dsm.com)

The recommendations made in the document are general. Local regulation has always to be consulted.

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