The Specialists for Pectin
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The Specialists for Pectin – A Product of Nature.

The Corporate Group Herbstreith & Fox is worldwide a byword for makers of high-quality pectins used in the food and non-food industry for more than 75 years.

Decades of experience with perspectives in research and development, in production and sales are certainly the foundation for the present success in the world market.

Tradition and experience alone will not be enough to be successful in today’s markets. Only with a modern management, promoting innovative thinking and not wishing to be merely copy-cats but pioneers, listening to the market demands, will it be possible to transform ideas into promising action.

Herbstreith & Fox has always consistently followed this corporate philosophy.

In this way, convincing innovative products at the highest quality level were created in the most advanced production processes.

Generally speaking, the Corporate Group Herbstreith & Fox provides users of pectins with a sophisticated high-quality product range of all types of pectins, which meet the most demanded requirements in the most varied areas of application.

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1. The pectin works at Neuenbürg are cradle and headquarters of the whole corporate group.
2. Rotenbach, raw materials and finished goods warehouse with an area of 15,000 m².
3. The production location at Werder was acquired in 1990. It is at the same time headquarters of Herbafood Ingredients GmbH and agro Food Solution GmbH.
Pectin is a natural substance which is present in great amount in many vegetable foodstuff, e.g. fruits and vegetables. As structural element in the growth generating tissue and main component of the middle lamella in plants it provides cohesion and stability in tissues and cells.

Pectin as a name is derived from the Greek word “pectos”, which means gelatinated, or solidified.

Pectin is a rather young product. The scientist Vauquelin discovered its existence in fruit juices some 200 years ago.

At that time, however, in 1790, the year of birth for pectin, it was not yet called by that name. The name was first used in 1824, when Braconnot continued the research started by Vauquelin. He called the gel-forming substance pectic acid.

Smolenski in 1924 was the first to assume a substance from polymeric galacturonic acid in pectin. In 1930, Meyer and Mark discovered the chain formation of the pectin molecule. And Schneider and Bock in 1937 established the formula.

The practical potential was recognized only at the beginning of the 20th century. The excellent jellifying properties of pectin were employed in the production of foodstuff, which marked the beginning of the large-scale production of pectin.
The founder of our company, Hermann Herbstreith, discovered decades ago the usefulness and multivariated application potential of pomace, a by-product from the fruit juice manufacture and discarded until then. From then on, the undervalued pomace served as valuable raw material in the production of apple pectin.

Chemically speaking, pectin is a macromolecular compound belonging to the heteropolysaccharides. The main component is polygalacturonic acid, which is partially esterified with methanol.

Pectin is produced from vegetable raw material with a high natural pectin content, such as apple pomace, citrus peels and beet chips, in a technologically complicated process.

The different raw materials will yield various amounts of pectin. These pectin extracts are now specifically processed in various processes to achieve a number of different types of pectin with specific properties.

Which type of pectin will finally be employed by the user depends largely on the specific criteria to be met by the finished product.

Pectin is today an indispensable component in many products, mainly in the food sector, but also in the non-food sector, since it is a universally applicable, naturally gelling, thickening and stabilizing substance.

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**Raw Materials which are a Source of Pectin:**

<table>
<thead>
<tr>
<th>Pectin content</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>pomace</td>
<td>10-15 %</td>
</tr>
<tr>
<td>sugar beet chips</td>
<td>10-20 %</td>
</tr>
<tr>
<td>citrus peels</td>
<td>20-35 %</td>
</tr>
</tbody>
</table>

*Natural Food Additives are absolutely in line with consumer wishes.*
Our Product Variety is the Answer to Market Requirements.

For decades, our corporate group has enjoyed an enormous worldwide reputation for the production of high quality apple and citrus pectins. These pectins, working reliably in all areas of application, will also in future be the focus of our product range.

Raw materials for the manufacturing of our high, medium and low methylester Classic Apple and Citrus Pectins are mainly apple pomace and citrus peels.

High gel strength and excellent thickening properties of Classic Pectins provide products with an extra-ordinary texture achieved with a small amount of pectin. Classic Pectins have a neutral taste and enhance the existing natural flavour of the processed fruit.

Based on our know-how in the production of Classic Apple and Citrus Pectins, we also produce high-quality Classic Grapefruit Pectins and Betapec Beet Pectins.

Thus the Herbstreit & Fox product range supplies today the full scope of commercially available pectins for all areas of application, such as:

- Classic Apple Pectins
- Classic Citrus Pectins
- Classic Grapefruit Pectins
- Betapec Beet Pectins
Aside from Classic Pectins, we also supply for special applications and for achieving specific properties tailored Combi Pectins, made by blending various classic raw materials.

The group of Amid Pectins presents a technologically reasonable supplement and alternative to our Classic Pectins. The specific properties of Amid Pectins lead to different gel structures and will provide technological benefits in certain areas of application.

For direct blending into the product batch and thus easier and quicker handling, we offer users Instant Pectins and Instant-Plus Pectins, which permit a lump-free dispersion.

And last but not least, we offer Pectin à la carte, specially designed to meet your requirements and specifications.

This extraordinary variety in pectins (being both kosher and halal certified) is our answer to market demands.

The importance of pectin for the quality of the finished product is very high and the Corporate Group Herbstreit & Fox, the pectin specialists, will meet all requirements existing in practical work with a comprehensive product range.
Pectins are divided into three groups on the basis of their different gelling properties.

**High Ester Pectins (HM Pectins)**
These pectins have usually a more than 50% share of esterified polygalacturonic acid units (DE°), thus practically no reaction with calcium ions occurs. The gel strength depends, among others, on acid content, type of pectin, concentration and soluble solids content, which generally has to be more than 55%.

The degree of esterification correlates with the gel setting rate and gel texture under otherwise similar conditions. Very high esterified pectins jellify quicker resp. at higher temperatures and form more elastic and brittle gel textures than less esterified pectins.

This accurate correlation requires a very homogeneous inter- and intramolecular carboxyl group distribution, as is especially given in Classic Apple Pectins from Herbstreith & Fox. Due to a blockwise distribution of carboxyl groups Classic Citrus Pectins with the same degree of esterification will form gels with a slightly higher setting temperature and a more elastic-brittle texture than Classic Apple Pectins. The blockwise carboxyl groups distribution of high methylester pectins additionally provides advantages regarding protein stabilization in acidified milk drinks.

**Low Ester Pectins (LM Pectins)**
Pectins with less than 50% share of esterified polygalacturonic acid units (DE°) can jellify with calcium ions. LM pectins thus do not only form gels with sugar and acids, but at less soluble solids mainly with calcium ions. The resulting gel strength is determined by pectin concentration, type of pectin, soluble solids content, pH range and the concentration of buffer salts and calcium ions. A well matched balance between pectin and calcium concentration will lead to an optimal texture.

Exceeding the calcium optimum will produce a brittle gel with tendency towards syneresis (loss of water from the gel) or, in the end, to the formation of calciumpectinate, the insoluble calcium salt of pectin.

Since gel setting with LM pectins is also possible with a low soluble solids content and at a high pH-value, this opens up numerous application possibilities in dietetic and dairy products.

**Amidated Pectins (HM- and LM Amidated Pectins)**
In case of amidated pectins ammonia instead of acids is used for deesterification and with that part of the ester groups is replaced by amide groups. This process modifies the gelling properties in comparison to acid deesterified pectins.

LM amidated pectins, just like non-amidated pectins, require calcium ions for gelling. They will already set sufficiently with only minor calcium amounts present. Furthermore, the gel setting temperature of amidated pectins is less influenced by the calcium dosage.
Since pectin is extracted from natural vegetable raw materials, its properties may differ depending on the quality of the raw material.

We, as pectin specialists, must supply users with products for large-scale industrial production that guarantee reliable and reproducible results on the basis of a standardized pectin grade.

Depending on the use of pectin, different methods of standardization are being employed. Three essential methods:

**USA-Sag Method**

The standardization of high methylester pectins to constant grades is internationally done by way of a *Ridgelimeter* according to the “USA-Sag Method”.

In this method, a sugar-water gel is produced at 65% TSS and a pH of approximately 2.2. After a defined cooling period and cooling temperature, the percentage of sagging under its specific weight is measured and converted to USA-Sag. A frequent standard is 150°USA-Sag. The disadvantage of the method is that the low pH range of the test gel does not recommend itself for practical work and it does not provide any information on the gel texture. The simple handling and good reproducibility are the advantages of this method.

**Measuring breaking strength with the Pektinometer Mark IV**

The “inner strength” of a gel is called “breaking strength”. It correlates more with the sensory perception of stability than the USA-Sag value. Thus pectins often are assessed also for their breaking strength. To determine the breaking strength, the internal gel stability of a standard gel (65% TSS, pH 3.0) is measured by way of the *Herbstreith Pektinometer* by pulling a central share insert out of the gel at constant velocity. The force necessary for this purpose is measured by a strain gauge.

The force variation is additionally recorded as a force-displacement diagram on the display providing information on the gel texture.

**Setting temperature and setting time**

Standardization of setting temperature and setting time is done by using high-quality *Rheometers*. These measurements are supplemented by texture analysis. Thus the dynamic Weissenberg index provides values which correlate well with sensory impressions.

The thickening properties of pectins such as formation of a yield point or the viscosity are also determined rheometrically.

In penetration measurements with the *Texture Analyser*, the force of resistance is measured which acts on a test plunger penetrating a gel over a defined path or disrupting into it, respectively.
Once the pectin has passed through all stages of the production process and quality control, it is suitably packaged to start its journey to various industries.

Usually it is filled into 25 kg cardboard boxes with an inside polyethylene bag or a corresponding paper bag. Specific customer requirements regarding filling and composition of packages may be considered. In this way, pectin may be stored cool and dry for up to 18 months.

A worldwide distribution network assures reliable delivery of the products to our international customers.

Standard Packaging Sizes:

<table>
<thead>
<tr>
<th>Boxes:</th>
<th>25kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Bag:</td>
<td>500kg</td>
</tr>
<tr>
<td></td>
<td>800kg</td>
</tr>
</tbody>
</table>

* special sizes upon request
The reliably high quality of our valuable pectins has decisively contributed to our success in the world market. Only with a continuous system of in-process tests through all stages of production, from suppliers of raw materials to the finished product, we are able to guarantee a uniformly high quality level of our products.

The certificate awarded to us is proof of the fact that our quality management system complies with the strict German and international standards DIN EN ISO 9001. It is testimony of the quality awareness in all areas of our company.

Uniformly high level of quality is guaranteed.
## Regulations for Purity Requirements of Pectins.

<table>
<thead>
<tr>
<th>International Specification</th>
<th>EU E 440 (i) Pectin</th>
<th>EU E 440 (ii) amidated Pectin</th>
<th>FAO/WHO JECFA Pectins</th>
<th>FDA/FCC Pectins</th>
<th>USP Pectin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Loss on drying max. 12%</td>
<td>max. 12%</td>
<td>max. 12%</td>
<td>max. 12%</td>
<td>max. 12.0%</td>
<td>max. 10.0%</td>
</tr>
<tr>
<td>2. Acid-insoluble ash (in approx. 3 N HCl) max. 1%</td>
<td>max. 1%</td>
<td>max. 1%</td>
<td>max. 1%</td>
<td>max. 1.0%</td>
<td>–</td>
</tr>
<tr>
<td>3. Total insolubles max. 3 %</td>
<td>max 3 %</td>
<td>max. 3 %</td>
<td>max. 3%</td>
<td>max. 3.0%</td>
<td>–</td>
</tr>
<tr>
<td>4. Sodium methyl sulfate –</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>max. 0.1%</td>
<td>–</td>
</tr>
<tr>
<td>5. Free methyl-, ethyl- or isopropyl alcohol on the anhydrous basis max. 1%</td>
<td>max. 1%</td>
<td>max. 1%</td>
<td>max. 1%</td>
<td>max. 1.0%</td>
<td>max. 1%</td>
</tr>
<tr>
<td>6. Sulphur dioxide max. 50 ppm on the anhydrous basis</td>
<td>max. 50 ppm</td>
<td>max. 50 ppm</td>
<td>max. 50 ppm</td>
<td>max. 50 ppm</td>
<td>max. 50 ppm</td>
</tr>
<tr>
<td>7. Nitrogen content (pectins) max. 1.0% (after washing with acid and ethanol)</td>
<td>–</td>
<td>–</td>
<td>max. 2.5%</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>8. Nitrogen content (amidated pectins) max. 2.5% (after washing with acid and ethanol)</td>
<td>–</td>
<td>max. 2.5%</td>
<td>max. 2.5%</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>9. Galacturonic acid min. 65% (on the ash-free and anhydrous basis)</td>
<td>min. 65 %</td>
<td>min. 65%</td>
<td>min. 65%</td>
<td>min. 65.0%</td>
<td>min. 74.0%</td>
</tr>
<tr>
<td>10. Degree of amidation (amidated pectin) max. 25% (after washing with acid and ethanol)</td>
<td>–</td>
<td>max. 25%</td>
<td>max. 25%</td>
<td>max. 25%</td>
<td>–</td>
</tr>
<tr>
<td>11. Sugar and organic acids –</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>max. 18%</td>
<td>–</td>
</tr>
<tr>
<td>12. Arsenic max. 3 ppm</td>
<td>max. 3 ppm</td>
<td>max. 3 ppm</td>
<td>–</td>
<td>max. 3 ppm</td>
<td>–</td>
</tr>
<tr>
<td>13. Lead max. 5 ppm</td>
<td>max. 5 ppm</td>
<td>max. 5 ppm</td>
<td>max. 5 ppm</td>
<td>max. 5 ppm</td>
<td>max. 5 ppm</td>
</tr>
<tr>
<td>14. Cadmium max. 1 ppm</td>
<td>max. 1 ppm</td>
<td>max. 1 ppm</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>15. Mercury max. 1 ppm</td>
<td>max. 1 ppm</td>
<td>max. 1 ppm</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>16. Total aerobic microbial count Yeasts and molds max. 1,000 CFU/g</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>max. 1,000 CFU/g</td>
</tr>
<tr>
<td>17. Pathogenous germs according to general food regulations</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>max. 100 CFU/g</td>
</tr>
<tr>
<td>18. Pesticides according to general food regulations</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

– = no specifications

EU = European Union
FAO/WHO = Food & Agriculture Organisation/World Health Org.
JECFA = Joint Expert Committee on Food Additives
USP = United States Pharmacopeia
FDA = Food and Drug Administration
FCC = Food Chemical Codex

as of 03/2012
Wherever you are – we are close to you.

- Austria
- Australia
- Baltic States
- Belgium
- Bulgaria
- Canada
- China
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Great Britain
- Greece
- Hungary
- Ireland
- Italy
- Japan
- Jordan
- Korea
- Liechtenstein
- Malaysia
- Netherlands
- New Zealand
- Norway
- Poland
- Portugal
- Romania
- Russian Federation
- Saudi Arabia
- Slovak Republic
- Spain
- Sweden
- Switzerland
- South Africa
- Taiwan
- Thailand
- Turkey
- Ukrainia
- USA
- UAE
- Vietnam
The different Properties of Pectins.

**Gelling mechanisms**

The association of pectin chains leads to the formation of three-dimensional networks, that is to gel formation.

These are long segments of regular sequence, ruptured by the incorporation of rhamnose and branching of the chain.

Two or more chain segments bond together and start to interact.

**High ester pectins**

Jellify predominantly in the so-called "sugar-acid gelling mechanism", that means a certain amount of acid is required to suppress the dissociation of the free carboxyl groups. In this way, the negative charging of the molecules is prevented and their mutual repulsion reduced.

A high sugar concentration lowers the water activity of the system, the pectin molecules are subsequently dehydrated and cluster more easily in bonding zones.

**Low ester pectins**

Too, jellify in a sugar-acid gelling mechanism. Pectin molecules with a low ester content, however, may form bonding zones with bivalent cations, but they may form gels in relative independence from soluble solids content and pH range in the presence of multivalent cations (e.g. calcium ions).

The calcium concentration required for gelling depends here on such parameters as pH of the product, soluble solids content and buffer system.

With smaller additions of calcium, pectin chains will start to cluster over calcium bonds, the viscosity increases. With increased calcium concentration, a gel will form. Overdosage of calcium ions will lead to calcium pectinate precipitation under the given gel formation conditions, this is also called "pre-gelling".

The gel structure will be less elastic, rather pasty with lower breaking strength. Precipitation of calcium pectinate is only reversible to a limited extent, even when the gel is once more heated above its setting temperature and cooled down without destruction.

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*Pectin chain with galactan side chains*  
**GUS = galacturonic acid**  
**RHA = rhamnose**
Gelling Mechanism of High and Low Ester Pectins.

Gelling mechanism of HM pectins (hydrophobic interaction and hydrogen bonds)

Gelling mechanism of LM pectins (complexing of calcium ions)
The application potential of pectin is manifold and textural requirements of users vary greatly; therefore it is one of the most important requirements to develop pectins, which in a targeted and reproducible way reliably control the rheological-sensory characteristics.

### Rheological and sensory definitions

In the sensory evaluation of jellified and viscous products we distinguish between the consistency of the gel and the construction of the gel formation, that is the gel structure. To reach an overall impression of the gel, always both criteria have to be jointly considered during sampling.

The term **consistency** describes compactness, firmness and viscosity of the sample. These properties are perceived sensorily by pressing and spreading and are generally described as firmness. The behaviour during deformation (pressing) can be rheologically determined, for example, in penetration and compression measuring. Together with the composition of ingredients, such as type of fruit, fruit volume and type of sugar, the parameter consistency, all important for sensory acceptance, is also influenced by the choice of pectin.

The term **structure** or “formation” describes bonding, the gel structure and homogenousness of a sample. The gel structure can be noticed on the surface of a destroyed gel. A rough and brittle structure points to an inhomogeneous gel structure, while a smooth and elastic surface indicates a homogeneous structure.

The ratio of rigid to shifting bonds within a gel formation determines the gel structure. The greater the elastic phases within a gel, the more brittle and fragile the gel structure will be. With an increasing viscous phase, the gel structure will also become increasingly smoother.

Consistency and structure, jointly experienced, will provide the so-called **texture**. The texture is the overall impression obtained by sensory perception and describes what is experienced in the mouth, the mouth feel, such as softness of bite, the way in which broken pieces disintegrate, tenderness and coating of the tongue while chewing.

An important aspect for the sensory evaluation of gels is the release of flavours and aromas during eating. Texture has a decisive influence on the release of these substances. Smooth gels, due to their higher viscous shares, are more aromatic than elastic-brittle gels.

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**Texture is the decisive influence on the taste experience.**
The best way to add standardized pectin during the cooking process is the production of a pectin solution with suitable devices. However, pectin may also be blended directly into the product batch.

Production of a pectin solution
(The addition of pectin or a pectin-sugar-mixture is done by using a mixer)

** Production of a pectin solution **

- **mixer**
  - approx. 500 rpm
  - pectin + approx. 5 times the amount of pectin-sugar-mixture
  - water min. 80°C
  - 3-5% pectin solution

- **Dispersing mixer**
  - approx. 1500 rpm
  - pectin
  - water min. 80°C
  - 3-7% pectin solution

- **Modem injection mixer**
  - (quick dissolver system)
  - pectin
  - water min. 80°C
  - 7-10% pectin solution

* Benefit: the amount of water evaporated during cooking is noticeably smaller

Incorporation of pectin directly into the product batch

** Incorporation of pectin directly into the product batch **

- **mixer**
  - min. 500 rpm
  - pectin + 5-10 times the amount of sugar, liquid sugar or 10-20 times the amount of sugar syrup or liquid sugar
  - pectin-sugar-mix / dispersion

*Note: solids content in batch not more than 30%

** rotation speed depending on dimensioning

**Image:** Diagram illustrating the production and incorporation of pectin solutions and mixtures into a product batch.
Classic, Combi, Amid and Instant-Pectins. Clearly Defined Areas of Application.

We differentiate between the following groups of pectins:

- **Classic Pectins**: high, medium and low ester apple, citrus, beet and grapefruit pectins
- **Amid Pectins**: high and low ester amidated apple and citrus pectins
- **Combi Pectins**: high ester pectin based on apple and citrus pomace
- **Instant Pectins**: high, medium and low ester instantized apple and citrus pectins

The pectins within the different groups will form quite typical gel structures, depending on the production process, raw materials and degree of esterification. These are the most important chief characteristics of the various groups:

**Classic Pectins:**
Our Classic Apple and Citrus Pectins are, due to their consistency, in the majority used in the food industry. Betapec Beet Pectins contain acetyl groups and thus will not gel. They are mostly used for dietary fibre enhancement due to their low viscosity or in pharmaceutical products.

**Amid Pectins:**
Where flexibility and tolerance towards calcium ions are required, preferably Amid Pectins are used, as well as to create specific gel textures in certain products.
**Combi Pectins:**
Combi Pectins with highly specific properties are the result of special extraction conditions. These pectins are, in their gelling properties, situated somewhat between apple and citrus pectins. The more pronounced viscous properties of apple pectins are supplemented by the greater elasticity of citrus pectins. The result are pectins which form gels of great elasticity but remain spreadable at the same time and show a relatively low tendency to syneresis.

**Instant Pectins:**
Instant Pectins can provide technological, economic but also qualitative benefits for the user, especially when there is no possibility to use the pectin as solution or pre-dispersed (see page 17).

Instant Pectins are made in a granulation process, in which powdery standardized particles of pectin conglomerate to particles of a bigger size. This effects a porous structure in the individual pectin particles. The space created in this process inside the pectin granulate permits a faster penetration of liquid and – compared to traditional pectins – the wetting of a far larger surface area. This makes lump-free dispersion in a cold product batch possible and results in a safe solution.

Three major requirements postulated by the user basically determine what pectin grade or what type of pectin will finally be used:

- requirements on texture
- formulation
- production technology

*Reliable and quick solubility as well as shorter cooking times, these are convincing arguments for the use of Instant Pectin.*
H&F Pectins and their Use in the Fruit Processing Industry.

The appealing properties of jams, marmalades and jellies postulated by the fruit processing industry are to a large degree owing to the benefits of pectin: smooth gel, low syneresis, glossy surface, good spreadability, regular fruit distribution, clear cut and natural, fruit specific flavour.

The incomparable textural properties of Classic Apple Pectins enjoy a worldwide reputation. Classic Citrus Pectins are a meaningful and economic completion of the product range.

Precise balancing of the individual formulation parameters and precise choice of the exactly right Classic, Combi or Amid Pectin will bring about the desired product features. For the fruit processing industry, it is of major importance to have pectins at their disposal which settle fruit pieces regularly already during production and filling and start forming a gel structure at defined temperatures.

Jams, jellies and marmalades are made from fruits or fruit juices, sugar, edible acids and pectin as gelling agent. With their sugar content of more than 60% and a pH value of about 3.0, high ester pectins at a dosage of approx. 0.2 to 0.4% are recommended, since these are optimal gelling conditions.

On the other hand, low ester or LM-amidated pectins with an addition of calcium salt are recommended for use in products with a low sugar content.

The structure providing properties as well as enhancing the fruit specific flavour have made the natural product pectin an indispensable substance in the production of jams, jellies and marmalades for many decades now.
## Jams, Marmalades, Jellies and Fruit Preparations

### 1. Jams, Marmalades, Jellies and Fruit Preparations, TSS > 55 °Bx

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AF 101</td>
<td>&gt;77%</td>
<td>–</td>
<td>const. breaking strength E 440 Apple Pectin, extra rapid set</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 3.0-3.3) • dietetic jams and marmalades (TSS ≥ 55 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 201</td>
<td>72-76%</td>
<td>–</td>
<td>const. breaking strength E 440 Apple Pectin, rapid set</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 202</td>
<td>70-72 %</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. breaking strength E 440 Apple Pectin, firm gel structure</td>
<td>• jams and marmalades filled in glass jars or large-size containers • fruit preparations and fruit spreads sweetened with concentrate (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 401</td>
<td>59 -64%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. breaking strength E 440 Apple Pectin, medium rapid set, smooth gel structure</td>
<td>• jams and marmalades filled in glass jars or large-size containers • fruit preparations and fruit spreads sweetened with concentrate (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 501</td>
<td>56-63 %</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. breaking strength E 440 Apple Pectin, slow set, spreadable gel texture</td>
<td>• jams, marmalades and jellies (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 504</td>
<td>51-58%</td>
<td>–</td>
<td>const. breaking strength E 440 Apple Pectin, optimal fruit distribution, even at high filling temp., smooth gel structure</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 601</td>
<td>48 -54%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. breaking strength E 440 Apple Pectin, smooth gel structure, spreadable texture</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.8-3.2)</td>
</tr>
<tr>
<td>Classic AF 605</td>
<td>48-54%</td>
<td>–</td>
<td>const. breaking strength E 440 Apple Pectin, very good solubility, even with high soluble solids</td>
<td>• gelling agent for household, system 1 + 1</td>
</tr>
<tr>
<td>Amid AF 005</td>
<td>32-40% 10-16%</td>
<td>–</td>
<td>const. breaking strength E 440 amidated Apple Pectin, low calcium reactivity</td>
<td>• jams, marmalades, low-calorie fruit preparations and fruit spreads (TSS 50-65%, pH 3.0-3.5)</td>
</tr>
<tr>
<td>Classic CF 201</td>
<td>&gt;70%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. setting time E 440 Citrus Pectin, rapid set</td>
<td>• jams, marmalades, low-calorie fruit preparations and fruit spreads (TSS ≥ 58 %, pH 2.9-3.3)</td>
</tr>
<tr>
<td>Classic CF 301</td>
<td>65-70%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. setting time E 440 Citrus Pectin, medium rapid set</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.9-3.3)</td>
</tr>
<tr>
<td>Classic CF 401</td>
<td>60-66%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. setting time E 440 Citrus Pectin, slow set</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.9-3.3)</td>
</tr>
<tr>
<td>Classic CF 501</td>
<td>55-61%</td>
<td>–</td>
<td>150° +/- 5°USA-Sag const. setting time E 440 Citrus Pectin, extra slow set</td>
<td>• jams, marmalades and fruit preparations (TSS ≥ 58 %, pH 2.9-3.3)</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation
### 1. Jams, Marmalades, Jellies and Fruit Preparations, TSS > 55 °Bx

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amid CF 005-B</td>
<td>36-42%</td>
<td>10-16%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, very low calcium reactivity</td>
<td>• jams, marmalades, low-calorie fruit preparations and fruit spreads (TSS &gt;55%, pH 3.0 - 3.7)</td>
</tr>
</tbody>
</table>

### 2. Jams, Marmalades, Jellies and Fruit Preparations, TSS < 55 °Bx

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AF 702</td>
<td>38 - 44%</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440</td>
<td>Apple Pectin, low calcium sensitivity</td>
<td>• dietetic jams, marmalades and jellies (TSS &lt; 55%, pH 3.0 - 3.4)</td>
</tr>
</tbody>
</table>
| Classic AF 703 | 38 - 44% | – | const. calcium sensitivity const. breaking strength E 440 | Apple Pectin, medium calcium sensitivity | • low-calorie jams and fruit preparations (TSS < 55%, pH 3.0 - 3.4)  
• fruit purées (TSS 15 - 25%, pH 3.3 - 3.8)  
• fruit toppings (TSS < 55%, pH 3.0 - 3.8) |
| Classic AF 710 | 29-34% | – | const. calcium-sensitivity const. breaking strength E 440 | Apple Pectin, elastic Texture high calcium sensitivity | • low-calorie fruit preparations (TSS 10-50 %, pH 3.0-3.4)  
> 40% TSS setting without adding calcium  
< 40 % TSS low calcium addition necessary |
| Classic AF 901 | 38 - 44% | – | const. calcium sensitivity const. breaking strength E 440, E 333 | Apple Pectin, gelling at reduced TSS without calcium addition | • cowberries (TSS approx. 50%, pH 2.8 - 3.3) |
| Classic CF 701 | 39-45% | – | const. calcium sensitivity const. breaking strength E 440 | Citrus Pectin, low calcium sensitivity | • low-calorie jams, fruit spreads and jellies (TSS 40-60 %, pH 3.0-3.6) |
| Classic CF 703 | 32-38% | – | const. calcium sensitivity const. breaking strength E 440 | Citrus Pectin, high calcium sensitivity | • low-calorie jams, marmalades, fruit spreads and jellies (TSS ≤ 45%, pH 3.0-3.6) |

DE° = degree of esterification / DA° = degree of amidation
## 2. Jams, Marmalades, Jellies and Fruit Preparations, TSS < 55 °Bx

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amid AF 010</td>
<td>30-36%</td>
<td>14-20%</td>
<td>const. gelling strength E 440</td>
<td>amidated Apple Pectin, medium calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 30-55 %, pH 3.0-3.5)</td>
</tr>
<tr>
<td>Amid AF 015-A</td>
<td>28-34%</td>
<td>16-22%</td>
<td>const. gelling strength E 440, E 340, E 341</td>
<td>amidated Apple Pectin, buffered, high calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 20-50 %, pH 3.0-3.5)</td>
</tr>
<tr>
<td>Amid AF 020</td>
<td>27-32%</td>
<td>18-23%</td>
<td>const. gelling strength E 440</td>
<td>amidated Apple Pectin, high calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 10-40 %, pH 3.0-4.0)</td>
</tr>
<tr>
<td>Amid CF 005</td>
<td>32-40%</td>
<td>10-16%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, low calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS &gt; 45 %, pH 3.0-3.5)</td>
</tr>
<tr>
<td>Amid CF 010</td>
<td>30-36%</td>
<td>14-20%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, medium calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 30-55 %, pH 3.0-3.5)</td>
</tr>
<tr>
<td>Amid CF 020</td>
<td>27-32%</td>
<td>18-23%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, high calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 15-45 %, pH 3.0-4.0)</td>
</tr>
<tr>
<td>Amid CF 025-D</td>
<td>23-28%</td>
<td>22-25%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, very high calcium reactivity</td>
<td>low-calorie jams, marmalades, fruit preparations and fruit spreads (TSS 15-30 %, pH 3.0-4.0)</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation
H&F Pectins and their Use in the Baking Industry.

Baked products
Classic Apple Pectins prove their indis-pensable characteristics especially in baked products. They show their true worth most of all in baking stable fruit preparations.

Whether in doughnut fillings, on pies, in gingerbread, on yeast dough or biscuits, in Danish or puff pastry – it is largely owing to pectin that perfect processing can be guaranteed.

Centre fillings, which are mostly supplied in large-size containers for large-scale production, must show a smooth pump-able, pasty consistency and problem-free metering.

Mechanical stressing, as e.g. is sometimes generated during filling, must not have a negative effect on the gel structure. Furthermore, a high melting temperature and good stability of shape during baking is of highest importance to prevent deformation and leakage of the fruit filling.

The baked product will be of delicious appearance and will keep its typical fruit flavour.

Cake glazings
Cake glazings or “nappage” prevents fruits from drying out and provides cakes and biscuits with a glossy surface. The textural requirements for these products are extremely demanding and may be specifically designed for this application by using standardized Amid Pectins.
# Baked Products

## 1. Baking Stable Fruit Preparations

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AB 401</td>
<td>59-64 %</td>
<td>–</td>
<td>150° +/- 5° USA-Sag, const. breaking strength E 440</td>
<td>Apple Pectin, baking stable, gelled texture</td>
<td>• baking stable fruit preparations (TSS ≥ 60 %, pH 2.9-3.2)</td>
</tr>
<tr>
<td>Classic AB 901</td>
<td>35-42 %</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440</td>
<td>Apple Pectin, very high baking stability pasty, smooth texture</td>
<td>• baking stable fruit preparations (TSS 40-72 %, pH 3.0-3.8)</td>
</tr>
<tr>
<td>Classic AB 902</td>
<td>36-44 %</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440, E 341</td>
<td>Apple Pectin, baking stable, pasty, pumpable texture</td>
<td>• baking stable fruit preparations (TSS 50-72 %, pH 2.8-3.8)</td>
</tr>
<tr>
<td>Classic AB 908</td>
<td>31-37%</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440</td>
<td>Apple Pectin, very high baking stability smooth, pasty texture</td>
<td>• baking stable fruit preparations (TSS 50-80%, pH 3.0-3.8)</td>
</tr>
</tbody>
</table>

## 2. Fruit Fillings

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
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<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AB 902</td>
<td>36-44 %</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440, E 341</td>
<td>Apple Pectin, pumpable, reversible</td>
<td>• fruit fillings for baked products (TSS 40-72 %, pH 3.0-3.8)</td>
</tr>
<tr>
<td>Classic AB 903</td>
<td>37-44 %</td>
<td>–</td>
<td>const. calcium sensitivity const. breaking strength E 440, E 331, E 341</td>
<td>Apple Pectin, pumpable, reversible, smooth texture</td>
<td>• fruit fillings for baked products (TSS 40-72 %, pH 3.0-3.8)</td>
</tr>
</tbody>
</table>

## 3. Cake Glazings (Nappage)

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amid CB 025</td>
<td>23-28 %</td>
<td>22-25%</td>
<td>const. calcium reactivity const. gelling strength E 440</td>
<td>amidated Citrus Pectin high calcium reactivity</td>
<td>• nappage concentrate to dilute with 20 - 70% water (TSS 62 - 67%, pH 3.2 - 3.8)</td>
</tr>
<tr>
<td>Amid CB 020-A</td>
<td>27-32%</td>
<td>18-23%</td>
<td>const. calcium reactivity const. gelling behaviour E 440, E 333, E 425</td>
<td>amidated Citrus Pectin with buffer substance</td>
<td>• classic nappage (dilutable with 0-30 % water) (TSS 62-67 %, pH 3.3-3.8)</td>
</tr>
<tr>
<td>Amid CB 005-A</td>
<td>30-36%</td>
<td>4-8%</td>
<td>const. calcium reactivity const. gelling behaviour const. flowability E 440, E 450, E 452</td>
<td>amidated Citrus Pectin with buffer substance</td>
<td>• cake glazing for cold use (TSS 60 - 65%, pH 3.1 - 3.7)</td>
</tr>
</tbody>
</table>

**DE° = degree of esterification / DA° = degree of amidation**
H&F Pectins and their Use in the Confectionery Industry.

Sweets
Producers and consumers of confectionery articles have a very clear idea as to what fruit jellies and jelly fillings should taste like. Pectins provide the appealing, elastic structure and enhance naturally the fruit inherent flavour and allow a smooth, brilliant cut.

The confectionery industry, moreover, greatly appreciates the good solubility and the accurate setting temperature as well as setting time of pectins. Classic Pectins are standardized to a constant gelling behaviour, dissolve rapidly, are heat stable and thus promote uninterrupted processing.

Pectins have a great application potential in the confectionery field: fruit jellies, fruit gums, gum products with and without gelatine, delicate fruit rolls, tasty dessert toppings, tender fillings for chocolates and high boilings, jellies in domino ginger bread, delicious coating, aerated products, jelly layers for bakery products.

Special pectins are used in combination with gelatine to increase the melting temperature.
# Confectionery Articles

## Fruit Jellies, Jelly Fillings, Domino Ginger Bread Jellies

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AS 501</td>
<td>55-61%</td>
<td>–</td>
<td>150° +/- 5° USA-Sag</td>
<td>Apple Pectin, slow set, as a rule addition of buffer salts required</td>
<td>• fruit jellies, jelly fillings, domino ginger (TSS 68-80 %, pH 2.8-3.4)</td>
</tr>
<tr>
<td>Classic AS 502</td>
<td>56-60%</td>
<td>–</td>
<td>const. gelling strength</td>
<td>Apple Pectin, slow set</td>
<td>• fruit jellies, jelly fillings, domino ginger (TSS 68-80 %, pH 2.8-3.4)</td>
</tr>
<tr>
<td>Classic AS 507</td>
<td>58-65%</td>
<td>–</td>
<td>const. gelling strength</td>
<td>Apple Pectin, medium rapid set firm, short, elastic texture smooth break</td>
<td>• fruit jellies, jelly fillings, domino ginger bread jellies (TSS 68-80 %, pH 2.8-3.4)</td>
</tr>
<tr>
<td>Classic CS 501</td>
<td>55-61%</td>
<td>–</td>
<td>150° +/- 5° USA-Sag</td>
<td>Citrus Pectin, slow set</td>
<td>• fruit jellies, jelly fillings (TSS 68-80%, pH 3.0-3.6)</td>
</tr>
<tr>
<td>Classic CS 502</td>
<td>58-65%</td>
<td>–</td>
<td>const. gelling strength</td>
<td>Citrus Pectin, medium rapid set firm, short, elastic-brittle texture smooth break</td>
<td>• fruit jellies, jelly fillings (TSS 68-80%, pH 3.0-3.6)</td>
</tr>
<tr>
<td>Classic CS 512-A</td>
<td>57-62 %</td>
<td>–</td>
<td>const. gelling strength</td>
<td>Citrus Pectin, slow set</td>
<td>• fruit jellies, jelly fillings (TSS 68-80 %, pH 3.0-3.6)</td>
</tr>
<tr>
<td>Amid CS 005</td>
<td>51-59%</td>
<td>4-9%</td>
<td>const. breaking strength</td>
<td>amidated Citrus Pectin, very slow set, no addition of buffer salts necessary, low heat viscosity suitable for high TSS ranges</td>
<td>• fruit jellies, jelly fillings, pastilles (TSS 68-85%, pH 2.8-3.6)</td>
</tr>
<tr>
<td>Amid CS 025-B</td>
<td>16-24%</td>
<td>20-25%</td>
<td>const. breaking strength</td>
<td>amidated Citrus Pectin, high calcium reactivity, suitable for high pH-values</td>
<td>• Turkish Delight (TSS 70-85%, pH 3.5-5.5)</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation
H & F Pectins and their Use in the Dairy Industry.

Fruit preparations for sour milk products
Fruit preparations in dairy products call for pectins, since they provide the required rheological properties and guarantee good dosing, a regular fruit distribution in the container due to their yield point, a homogeneous mixing with the fermented milk product and a good shelf life of the finished product.

In fruit yoghurts, pectins will provide the fruit preparations with a smooth and creamy structure and fruit specific flavour. They also help in a regular distribution of the fruit particles and in achieving a smooth surface. In layered products they have a stabilizing effect and keep the fruit preparation separated from the yoghurt.

Acidified milk drinks
High ester Classic Citrus and Apple Pectins in yoghurt drinks protect the protein at a low pH range against heat denaturation during the pasteurization process, thus preventing sedimentation and flocculation. This guarantees a stable product with optimal sensory properties and without loss of quality even over longer storage times.

Yoghurts, milk desserts
Special Classic and Amid Pectins which are able to react with calcium in yoghurt improve the texture of yoghurt. This reduces whey syneresis and enhances stability.

Milk-fruit desserts
Classic Pectins are also used in this area of application. A semi-finished product made of sugar, buffer substance, fruit and water is mixed e.g. with the equal amount of cold milk. The result is a gel which forms within minutes after mixing.
**Dairy Products**

### 1. Fruit Preparations for Sour Milk Products

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AM 601</td>
<td>52-57%</td>
<td>–</td>
<td>const. rheological properties E 440, E 333</td>
<td>Apple Pectin, medium calcium sensitivity, addition of calcium salts required at low TSS</td>
<td>fruit preparations for yoghurts (TSS 30-45%, pH 3.2-4.2)</td>
</tr>
<tr>
<td>Classic AM 901</td>
<td>41-48%</td>
<td>–</td>
<td>const. calcium sensitivity const. rheological properties E 440, E 341</td>
<td>Apple Pectin, low calcium sensitivity, addition of calcium salts required at low TSS</td>
<td>fruit preparations for yoghurts (TSS 45-65 %, pH 3.5-4.2)</td>
</tr>
<tr>
<td>Amid Y 005-C</td>
<td>34-39%</td>
<td>6-10%</td>
<td>const. gelling strength E 440, E 340, E 331</td>
<td>amidated Apple Pectin, low calcium reactivity</td>
<td>fruit preparations for yoghurts (TSS 25-50 %, pH 3.5-4.5)</td>
</tr>
<tr>
<td>Classic CY 301</td>
<td>66-72%</td>
<td>–</td>
<td>const. rheological properties E 440, E 452, E 341</td>
<td>Citrus Pectin, increasing viscosity after mixing with yoghurt</td>
<td>fruit preparations for yoghurts (TSS 30-50%, pH 3.5-4.2)</td>
</tr>
<tr>
<td>Amid CY 025</td>
<td>23-28%</td>
<td>22-25%</td>
<td>const. rheological properties E 440</td>
<td>amidated Citrus Pectin, very high calcium reactivity high yield point at high temperatures</td>
<td>fruit preparations for yoghurts (TSS 25-60%, pH 3.5-4.2)</td>
</tr>
<tr>
<td>Amid CY 025</td>
<td>30-36%</td>
<td>14-20%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, medium calcium reactivity</td>
<td>fruit preparations for yoghurts (TSS 30-60%, pH 3.5-4.5)</td>
</tr>
<tr>
<td>Amid CY 020</td>
<td>27-32%</td>
<td>18-23%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, high calcium reactivity</td>
<td>fruit preparations for yoghurts (TSS 10-40%, pH 3.5-4.5)</td>
</tr>
<tr>
<td>Classic CY 301</td>
<td>66-72%</td>
<td>–</td>
<td>const. rheological properties E 440, E 452, E 341</td>
<td>Citrus Pectin, increasing viscosity for yoghurts</td>
<td>fruit preparations for yoghurts (TSS 30-50%, pH 3.5-4.2)</td>
</tr>
<tr>
<td>Amid CY 025</td>
<td>23-28%</td>
<td>22-25%</td>
<td>const. rheological properties E 440</td>
<td>amidated Citrus Pectin, very high calcium reactivity high yield point at high temperatures</td>
<td>fruit preparations for yoghurts (TSS 25-60%, pH 3.5-4.2)</td>
</tr>
<tr>
<td>Amid CY 025</td>
<td>30-36%</td>
<td>14-20%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, medium calcium reactivity</td>
<td>fruit preparations for yoghurts (TSS 30-60%, pH 3.5-4.5)</td>
</tr>
<tr>
<td>Amid CY 020</td>
<td>27-32%</td>
<td>18-23%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin, high calcium reactivity</td>
<td>fruit preparations for yoghurts (TSS 10-40%, pH 3.5-4.5)</td>
</tr>
</tbody>
</table>

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H&F Pectins and their Use in the Beverage Industry.

Juices and Soft Drinks
Pectins are highly suitable components in soft drinks due to their low-calorie carbohydrate nature and turbidity stabilizing and viscosity increasing properties.

Low-calorie soft drinks are becoming ever more popular. They are defined as non-alcoholic beverages in which sugar has been partially or totally substituted by a sweetener or a combination of sweeteners. The resulting loss in full mouthfeel may be improved ideally by the use of Instant Pectins or Classic Pectins.

**Classic and Instant Pectins to enhance mouth-feel in low-calorie soft drinks.**

**Beverages and Sherbets**

**Soft Drinks and Sherbets**

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AJ 203</td>
<td>70-76%</td>
<td>–</td>
<td>const. viscosity E 440</td>
<td>Apple Pectin, turbidity stabilizing, viscosity increase</td>
<td>• stabilizing turbidity in soft drinks (pH 2.7 - 4.5) • water ice, sherbets (Dosage: 0.05 - 0.30 %)</td>
</tr>
<tr>
<td>Classic CJ 206</td>
<td>68-76%</td>
<td>–</td>
<td>const. viscosity E 440</td>
<td>Citrus Pectin, turbidity stabilizing, viscosity increase</td>
<td>• stabilizing turbidity in soft drinks (pH 2.7 - 4.5) • water ice, sherbets (Dosage: 0.05 - 0.30 %)</td>
</tr>
<tr>
<td>Instant CJ 204</td>
<td>68-72%</td>
<td>–</td>
<td>const. viscosity E 440</td>
<td>instantized Citrus Pectin, turbidity stabilizing, viscosity increase</td>
<td>• stabilizing turbidity in soft drinks (pH 2.7 - 4.5)</td>
</tr>
<tr>
<td>Betapec RU 301</td>
<td>&gt;50%</td>
<td>–</td>
<td>no addition of sugar</td>
<td>sugar beets, pure pectin unstandardized</td>
<td>• emulsion stabilizing • dietary fibre enrichment</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation
H&F Pectins and their Use in the Delicatessen Sector.

Sauces and Ketchup
A high-quality tomato ketchup has to meet very strict rheological specifications. The addition of a suitable H&F Classic Apple Pectin will compensate the shortcomings of the native pectin in view to defined yield point and structural viscous behaviour. Furthermore, rheological properties of dips, chutneys and barbecue sauces can be controlled by the use of pectin.

Crème fraîche, Mayonnaise and Margarine
With the addition of H&F Pectins the water binding capacity and texture of crème fraîche and mayonnaise are improved. Besides a good water binding capacity low-fat margarine shows an excellent spreadability by the addition of H&F Classic Pectin.

Delicatessen

Ketchup, Sauces, Crème fraîche, Mayonnaise and Margarine

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization with Neutral Sugars + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic CD 201</td>
<td>68-76%</td>
<td>–</td>
<td>const. viscosity E 440</td>
<td>Citrus Pectin, Erhöhung Wasserbindevermögen spreadability, mouthfeel</td>
<td>• fat-reduced margarine (40-60% fat content) • crème fraîche, salad creme</td>
</tr>
<tr>
<td>Amid CF 010</td>
<td>30-36%</td>
<td>14-20%</td>
<td>const. gelling strength E 440</td>
<td>amidated Citrus Pectin medium calcium reactivity</td>
<td>• ketchup, sauces and chutneys (TSS 20-40 %, pH 3.0-3.8)</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation
H&F Pectins and their Use in Pharmaceuticals, Cosmetics and the Non-Food Sector.

Pharmaceuticals and cosmetic products

Due to the exploration and the utilization of the natural properties of pectins, their application tend to become more and more varied and sophisticated. This is convincingly shown in the fields of pharmaceuticals and cosmetics.

The styptic and curing effects of natural pectins are fully developed in healing ointments. Furthermore, pectins will help to delay a rise in the glucose blood level and bring down serum cholesterol. Drugs are encapsulated with a pectin film to protect the gastric mucosa and to allow sustained release of the active substance into the blood circulation.

In the cosmetics industry, pectin is being used as a natural structure provider on plant basis for pastes, ointments, oils and creams. In deodorants and tooth pastes, pectin coats special flavour substances, but it is also used as a thickener and stabilizer in hair tonics, body lotions and shampoos.

Non-food products

In the tobacco industry, especially H&F Betapec Beet Pectin is used as a natural adhesive for the wrappers of cigars and cigarillos.

With pectins, ceramic filters with a homogeneous pore-structure can be produced. Even in the production of plastics pectins become more and more important.

This list of very different and varied applications of pectins could be continued at great length. These examples prove the development potential of pectin and the chances and opportunities waiting in the future.
## Pharmaceuticals, Cosmetics and Non-Food Products

### Dietetic, Pharmaceutical and Cosmetic Products and Dietary Fibre Enrichment

<table>
<thead>
<tr>
<th>Type of Pectin</th>
<th>DE°</th>
<th>DA°</th>
<th>Standardization + Composition</th>
<th>Characteristics + Properties</th>
<th>Main Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic AU 201 USP</td>
<td>72-76%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Apple Pectin,• pure pectin, unstandardized, USP standard</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • dietary fibre enrichment</td>
</tr>
<tr>
<td>Classic CU 201</td>
<td>70-74%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Citrus Pectin,• pure pectin, unstandardized</td>
<td>dietic and pharmaceutical products • cosmetic products</td>
</tr>
<tr>
<td>Classic AU 202</td>
<td>68-76%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Apple Pectin,• pure pectin, unstandardized</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • dietary fibre enrichment</td>
</tr>
<tr>
<td>Classic AU 701</td>
<td>38-44%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Apple Pectin,• pure pectin, unstandardized</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • cosmetic products</td>
</tr>
<tr>
<td>Classic CU 701</td>
<td>32-38%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Citrus Pectin,• pure pectin, unstandardized</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • cosmetic products</td>
</tr>
<tr>
<td>Classic AU 401 USP</td>
<td>60-64%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Citrus Pectin,• pure pectin, unstandardized, USP standard</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • dietary fibre enrichment</td>
</tr>
<tr>
<td>Classic GU 401 USP</td>
<td>&gt; 60%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Grapefruit Pectin,• pure pectin, unstandardized, USP standard</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • dietary fibre enrichment</td>
</tr>
<tr>
<td>Betapec RU 301</td>
<td>&gt; 50%</td>
<td>–</td>
<td>No sugars added, therefore the gelling properties are exposed to the natural variations of pectin. E 440</td>
<td>Beet Pectin,• pure pectin, unstandardized</td>
<td>dietic and pharmaceutical products, e.g. positive effect on serum cholesterol level • dietary fibre enrichment • emulsion stabilization</td>
</tr>
</tbody>
</table>

DE° = degree of esterification / DA° = degree of amidation