Erbslöh Beer Compendium

Good beer demands the best ingredients

- KiGel® products for clear and stable beers
- BrauSol – special silica sol for beer production
- Kieselguhrs, perlites and cellulose
- Erbslöh filter sheets and Parker filter cartridges
- Activated carbons in beer production
- Erbslöh beer yeasts
- Foam stabilisation with ErboStabil
- Yeast nutrients

VUPIS DOO

ERBSLÖH

Progress is our future

KiGel® products for clear and stable beers

Smell, taste, clarity, foam and colour are the criteria by which the consumer judges a beer. The increase in the global beer production and in customer demands require safe quality parameters for at least one year.

The chemical-physical stability is indicated after bottling through appearance, smell, taste and clarity. A particularly critical factor is chill haze.

Chill haze is formed when beer is cooled and is a result of the interaction between proteins and flavanoid polyphenols which are able to form complexes. Chill haze dissolves with higher beer temperatures. In the course of time quantity and size of the complexes increase and permanent haze may form.

Besides proteins and polyphenols, also polysaccharides, alkaline-earth salts, oxygen and heavy metals play an important role in the haze formation of beer, always depending on temperature.

The following criteria must be observed to remove potential haze-forming substances and to extend the shelf life of beer.

- **Selection of suitable raw materials**
- **Appropriate technology during beer production**
- **Use of special stabilisation measures**

To assure beer stability, proteins and starch must be sufficiently degraded in the brewhouse. During wort boiling it is important to precipitate to the largest possible extent high-molecular nitrogen compounds by heat coagulation. Anthocyanogens support this process. A low wort pH (5.0 – 5.2) promotes protein precipitation.

During wort treatment hot break removal is crucial. It is also important to aerate the pitching wort sufficiently and to use fresh, actively fermenting yeast together with a rapid course of fermentation. By the end of storage, a deep cooling period of minus 2° C to 0° C should be kept.
Beer must not be warmed when transferred from the storage cellar to filtration to prevent substances responsible for chill haze to redissolve.

The following products prevent, respectively delay the formation of haze:

- **BrauSol**
- **KiGel® Clear, KiGel® Xero, KiGel® Brilliant, KiGel® Medi, KiGel® Hydro and KiGel® Sensitive**
- **Erbslöh PVPP**
- **Beerzym Chill**
- **Bentonite**

These products counteract adsorptively or biochemically the protein-tannic substance bonding. By the application of silica sol and silica gels it is possible to positively affect chemical-physical stability. Proteins are reduced.

Silica gels

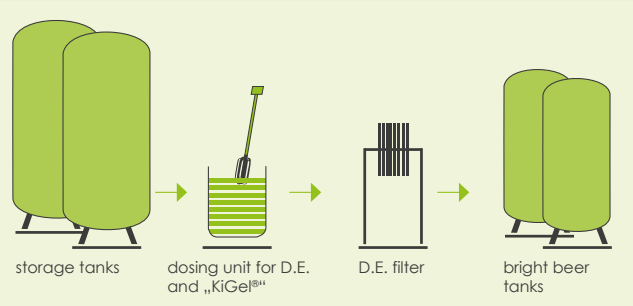
In the reaction of water glass with diluted acid (e.g. sulphuric acid), a gelatinous silicon dioxide is formed at a certain pH. This is the so-called silica sol. The silica gel jelly is washed out and is dried by separation of water without increase of particle size. By grinding the product is adjusted to a defined degree of fineness.
Dependent on precipitation, drying and grinding, hydrogels, hydrated silica gels or xero silica gels are made from silica sols. Due to the formation of the surface, high-molecular proteins with haze-forming potential are adsorbed from the beer.
Of special importance for the adsorbency and the filtering behaviour are grinding degree and average particle size. Pore radius and pore volume are crucial for the effectiveness of the KiGel® products. All KiGel® products are produced with an optimal pore radius of 3.0 – 3.5 nanometer.
The pore volume is as follows:

- **KiGel® Xero 1.2 mL / g**
- **KiGel® Medi 0.8 mL / g**
- **KiGel® Hydro 0.4 mL / g**
- **KiGel® Clear 1.0 mL / g**

This value is decisive for the efficiency of the respective stabilising agent.

Addition of KiGel®
during kieselguhr filtration

The application of KiGel® during kieselguhr filtration is the easiest way to improve shelf stability. The particle size distribution and the overall structure of the KiGel® products include excellent stabilisation capacity and very good filtration properties.
The use of highly effective KiGel® products reduces the kieselguhr dosage by up to 30 %. Recommended is an addition of 30 – 50 g/m² filter area during the second precoating to assure full beer stability from the start.

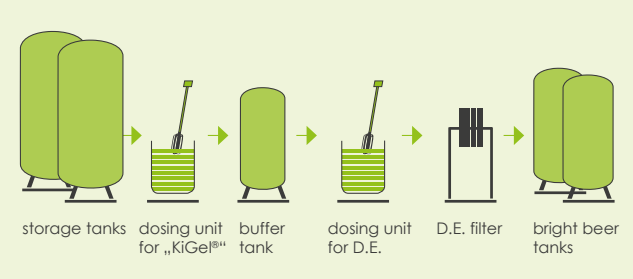


Stabilisation during the transfer

With bad malt qualities or with beers with higher fermentation temperatures approximately 1/3 of the required amount of KiGel® is added during the transfer. Beers clarify quicker and storage time is reduced. Haze-forming protein is adsorbed and filtration-inhibiting substances settle together with the KiGel® products. The remaining amount is added during subsequent kieselguhr filtration.

Stabilisation with buffer tank

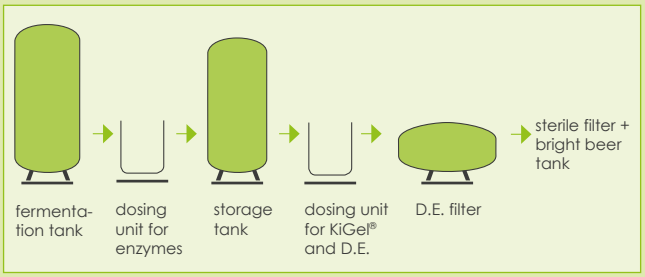
By the addition of the KiGel® products into the beer flow through a dosing unit efficiency is optimised and stabilisation is made more economic. Dosing unit and buffer tank are placed in front of kieselguhr filtration.
The size of the buffer tank should amount to 50 % of the kieselguhr filter capacity per hour to assure a minimum contact time of 15 minutes between stabiliser and beer.



Combination of KiGel® products and Beerzym Chill

The combined use of KiGel® and Beerzym Chill is a very effective stabilisation method. KiGel® amounts can be reduced by 25 –50 %. Beerzym Chill can be added either to the filtrate or to the storage tank during the transfer from the fermenter. The dosage is 2 – 4 g/100 L.
When dosing Beerzym Chill directly to the filtrate, the beer should be pasteurised or short-time heat treated, since otherwise residual enzyme activities may be present in the finished beer.

It is more effective to add Beerzym Chill into the storage tank because contact time is longer and product activities are almost fully degraded. The remaining activity is adsorbed by the addition of KiGel® products during filtration.



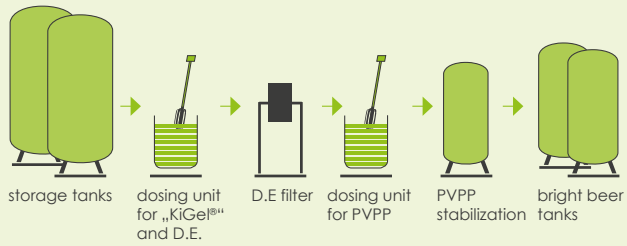
When using Beerzym Chill, observe laws and regulations of the individual country.

Stabilisation with KiGel® and PVPP

High- and medium-molecular protein compounds and polyphenols (chill haze reaction partner) are eliminated through this procedure. KiGel® and PVPP are added during kieselguhr filtration. In the course of PVPP addition, the volume may increase by an up to 8-fold amount of the weighed portion. We recommend to preswell PVPP about 20 minutes in water (20 – 30°C). By this measure PVPP develops its full adsorbency and is able to bind polyphenols directly.

Stabilisation with regenerable PVPP

After kieselguhr filtration PVPP treatment follows. PVPP is retained in the stabilisation filter and is later regenerated with NaOH. When using PVPP, oxygen rates in the beer must be carefully observed since oxygen affects taste stability in a negative way.



KiGel® – application in practice

Optimal dosages depend on the parameters of the respective brewery:

- **desired chemical-physical stability**
- **technology used in the brewery**
- **clarification and filtration process engineering**
- **base stability of the beer variety**

Shelf life	KiGel® Clear	KiGel® Sensitive	KiGel® Medi	KiGel® Xero
3 months	35 g/100 L	25 g/100 L	40 g/100 L	30 g/100 L
6 months	55 g/100 L	40 g/100 L	60 g/100 L	50 g/100 L
>12 months	90 g/100 L	75 g/100 L	100 g/100 L	80 g/100 L

The indicated dosages are without obligation and are given as general instructions. With a combined application of PVPP or Beerzym Chill dosage amounts must be accordingly reduced.

BrauSol P & BrauSol Special NEW

BrauSol is a specific colloidal solution of silicic acid in water. It provides for clarity and promotes filtration.

BrauSol capacity during the brewing process

When BrauSol is added to the wort or beer and under suitable pH conditions the SiO_2 molecules cross-link and transform into an insoluble hydrogel. Together with adsorbed haze-forming particles it flocculates and settles at the bottom of the tank.
Characteristics:

- **SiO_2-content of about 30 %**
- **alkaline**
- **surface area of about 220 m^2/g**
- **average particle size of 12 nanometers**

Application of BrauSol in the brewhouse

For optimal hot trub separation BrauSol is already added in the brewhouse. It is dosed into the hot outcast wort approximately 5 – 10 minutes before the end of the boil and the silica gel flocculation which forms in the whirlpool is separated together with the hot trub. Dosage: 30 – 50 mL/100 L wort.

- **accelerates fermentation**
- **optimizes filter throughput**
- **strong hot trub precipitation**
- **formation of very compact trub**

Application of BrauSol in the fermentation or storage cellar

During this process BrauSol is dosed into the cooled finished wort or into the fermented beer using a special dosing unit.

- **green beer clarifies quicker**
- **no impact on fermentation**
- **yeast crop is increased**
- **filter throughput during final filtration is increased**

The dosage of BrauSol during transfer from fermenter to storage cellar provides good results particularly when used in final fermented beer which is hosed with a temperature around the freezing point. Dosage: 40 – 50 mL BrauSol/100 L green beer.
The main portion of the chill haze forming particles is insoluble at low beer temperatures. Together with other filtration-inhibiting substances they are eliminated from the beer in a rapid sedimentation process. The brewmaster must take into account that settling time is around 1.1–1.3 m/day.

Special applications of BrauSol

With beers difficult to filtrate, for instance Weizen-, Kölsch- or Altbier (German top fermentation beers), an addition of 30 g/100 L BrauSol during fermentation leads to good results. Protein compounds resulting from the wheat malt are adsorbed and filterability is significantly improved. It is advisable to proceed in the same way with beers which pose filtration problems due to variations in the malt raw material.

IsingClair-Hausenpaste

Isinglass gel for the clarification of beer

When dissolved in the beer, IsingClair-Hausenpaste leads to a rapid flocculation of haze-forming particles. These settle as a compact layer at the tank bottom and are separated/filtrated. The temperature during application or ageing has a strong impact on the consistency of the Hausenpaste. Higher temperatures lead to a thinner consistency whereas lower temperatures result in thicker solutions. Yet the consistency does not affect the effectiveness. If IsingClair-Hausenpaste is thick due to low temperatures it is getting thinner when stored in a warm place. This process takes several days. Therefore it is easier to dilute IsingClair- Hausenpaste with some warm water and to shake it vigorously or to stir with a whisk. After that, the product can be used without problems.

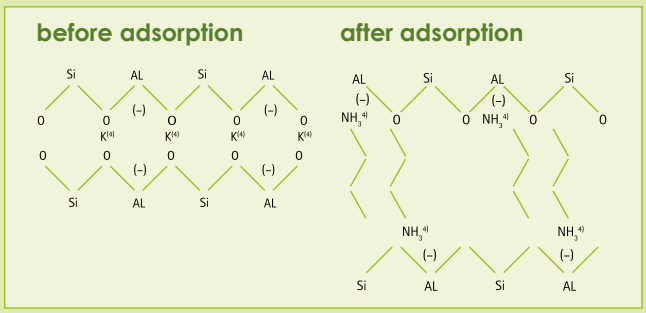
Bentonite – the alternative protein stabilisation

In the beverage industry, specially selected and refined types of bentonite are used as clarifying and protein stabilising agents. Application in beverages requires a high product standard which is assured by thorough and consistent quality assurance in Geisenheim.

In the field of beer treatment bentonites with strong swelling capacities with small alkali ion or alkaline earth ion portion are applied. Mainly alkali bentonites are used to improve beer stability since these bentonites with high swelling capacity have a high adsorbency. Bentonites contain exchangeable cations. The ion-exchange capacity amounts to up to 100 mval/100 g bentonite. Bentonites used in the brewing industry, must be low in iron, since iron negatively affects beer taste and stability. Erbslöh low-iron bentonites selectively eliminate high-molecular proteins which together with tannic substances can cause chill haze.

Although the full range of proteinaceous compounds are adsorbed to a certain extent, the high-molecular proteins are most affected by a bentonite treatment. Polyphenols and anthocyanogens which together with proteins can lead to chill haze, are reduced too.
Above all bentonite is used to optimize the stability of export beers. By pumping over the beer into a stabilisation tank, the required bentonite amount can be uniformly added. Dosage is made exclusively in the storage cellar. Bentonite activity depends on the settling rate: with temperatures of -1 °C in the stabilisation tank a storage time of at least four days is required.

With shorter storage periods, comparable results of stability are obtained but beer loss is higher. Storage times of more than a week do not result in improved stability, since the bentonite settles at the bottom of the stabilisation tank. The bentonite should be added about one week prior to subsequent filtration and depends on the initial base stability of the beer and the desired shelf life. The dosage ranges between 20 –150 g/100 L. Very high amounts may have an impact on beer foam.



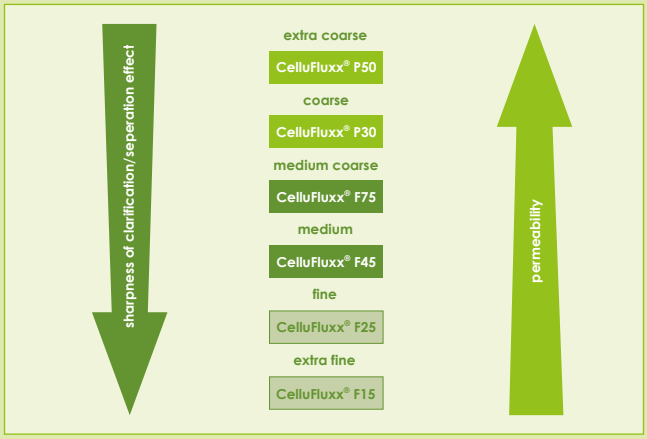
Kieselguhrs, perlites and cellulose

Since customers demand American low-in-calcium kieselguhrs, we extended the Erbslöh portfolio and offer kieselguhrs (diatomaceous earth), perlites and cellulose for beer filtration:

DICALITE – KIESELGUHR:
- **Dicalite Superaid-UF (finest kieselguhr)**
- **Dicalite Speedflow (finest medium kieselguhr)**
- **Dicalite Speedplus (medium coarse kieselguhr)**
- **Dicalite Speedex (coarse kieselguhr)**

DICALITE – PERLITES:
- **Dicalite 418 (fine)**
- **Dicalite MF2 (medium-coarse)**
- **Dicalite 4258 (coarse)**

Cellulose



Parker filter cartridges

The single product types are available with different nominal retention rates, respectively different absolute pore sizes and with any kind of adapter type.

Erbslöh filter sheets, B-series

Erbslöh filter sheets are produced according to the newest technical findings and knowledge using best raw materials. Erbslöh's experience made with special cellulose fibres contributes to improve the production process, which also applies to the special care dedicated to the selection of high-quality innovative raw materials.

Coarse particles are retained at the surface or in the first part of the filter sheet according to the principle of screen filtration. Fine particles are occluded in the cross-linked fibre structure of the filter sheets. Microorganisms are adsorbed by electrokinetic charge forces and are enclosed in the spatial structure. The filtration with Erbslöh filter sheets can be individually adjusted to specific requirements. By the choice of the appropriate type and the correct sizing of the filter surface, positive and reliable filtration results are obtained and an economic throughput is achieved. Retention rates of the B-series are designed to fulfil the specific requirements of filtration processes from clarifying filtration to sterile filtration.

Type	Field of application	Pore size [µm]	Thickness [mm] (+/- 0.3 mm)
B-5S	Sterile filtration	0.5	3.8
B-7S		0.7	3.8
B-9S		1.0	3.8
B-12	Fine filtration	1.5	3.6
B-16		2.5	3.6
B-20	Clarifying filtration	4.0	3.8
B-22		8.0	3.6
P-400	Kieselguhr support	-/-	3.3

Erbslöh-activated carbons for beer production: Granucol® und Ercarbon

The activated carbons of vegetable origin differ in their raw materials, in the production process and in their inner surface and thus a selective adsorptive capacity for the different requirements in brewing technology is achieved:

- for the removal of undesirable off-flavours, consequently elimination of sensory defects: Granucol® GE and Ercarbon GE
- for the adsorption of dark-coloured melanoidine (formed through Maillard reaction) and elimination of colour changes and browning reactions: Granucol® BI and Ercarbon BI

Longer contact times lead to optimal efficiency of action. In particularly difficult treatments dosages are divided into two portions: 40 % of the total amount of either Granucol® or Ercarbon are added to the storage tank and 60 % during final filtration.

Application of Granucol® GE and Granucol® BI:

Trials have showed that increased dosages of the two activated carbons (> 50 g/100 L) can result in a reduction of total polyphenols in beer of > 15 %.
We therefore recommend to conduct laboratory tests prior to large-scale application.

Ercarbon and Granucol® are added to the beer during kieselguhr filtration. Dosage is 10 – 50 g/100 L. To optimize efficiency Ercarbon and Granucol® are already added into the storage tank.

Enzymes in the brewing process

In brewing enzymes play a central role. In the brewing process with barley malt enzymes are formed during malting. Malt is a vegetable enzyme concentrate with several enzyme activities of which amylases, proteinases and glucanases are most important. Alpha and beta-amylases produce dextrins and fermentable sugars from starch. Proteinases and peptidases break down proteins into low-molecular peptides and amino acids and β-glucanases control glucan degradation. The effect of the mentioned enzyme activities controls the time course of the brewing process.

When combining malt and adjuncts in the mash, the enzyme activity of the raw materials is limited to the malt portion. The activity of the malt is sufficient for the processing of an adjunct portion (unmalted barley, rice, corn, millet, etc.) of up to 30 %. The addition of technical enzymes therefore significantly accelerates the brewing process and better and lastingly balances variations in raw material.

When using greater portions of adjuncts this absolutely requires the addition of technical enzymes since otherwise the process would not run. Mashing processes can be divided into infusion and decoction methods. Technical amylolytic, proteolytic and cytolytic enzymes are used solely or combined in these mashes with adjuncts. The enzymes degrade starch, proteins and skeletal substances of the applied adjuncts.

Beerzym products for starch hydrolysis

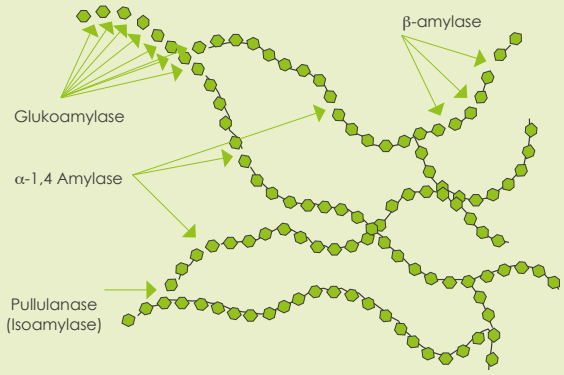
The hydrolysis of starch can be divided into three steps:

- starch gelatinisation
- starch liquefaction
- starch saccharification

Gelatinisation temperatures of different adjuncts

Barley	53 – 58 °C
Barley malt	61 – 65 °C
Wheat	55 – 65 °C
Rye	58 – 70 °C
Corn	68 – 80 °C
Rice	70 – 90 °C
Sorghum	80 – 92 °C
Corn rich in amylose	68 – 105 °C

Degradation of starch by amylases



Firstly starch is gelatinised by heat treatment (heating, cooking). Only then enzymatic process steps follow: liquefaction, subsequently saccharification to maltose respectively glucose. The liquefaction of the thermally gelatinised starch is done by α-amylases, the saccharification of the liquefied starch by β-amylases or gluco-amylases.

Dependent on the raw materials used different gelatinisation temperatures and thus different requirements of the liquefaction enzymes result.

In infusion mashing with barley, wheat and rye liquefaction of the gelatinised digested starch is conducted at temperatures of up to 75°C. Beerzym Amyl shows optimal activity at a temperature optimum of 70°C and

with natural mash pH. In decoction mashes the application of Beerzym HT or Beerzym Amyl ST is recommended. The digestion of starch in the adjunct cooker requires the use of thermo stable bacterial α-amylases.

The degradation of digested, liquefied starch and dextrins to fermentable sugars is performed either with Beerzym Alfa-Beta or with Beerzym Minical. With Erbslöh amylases complete starch digestion and iodine normality of the wort is assured.

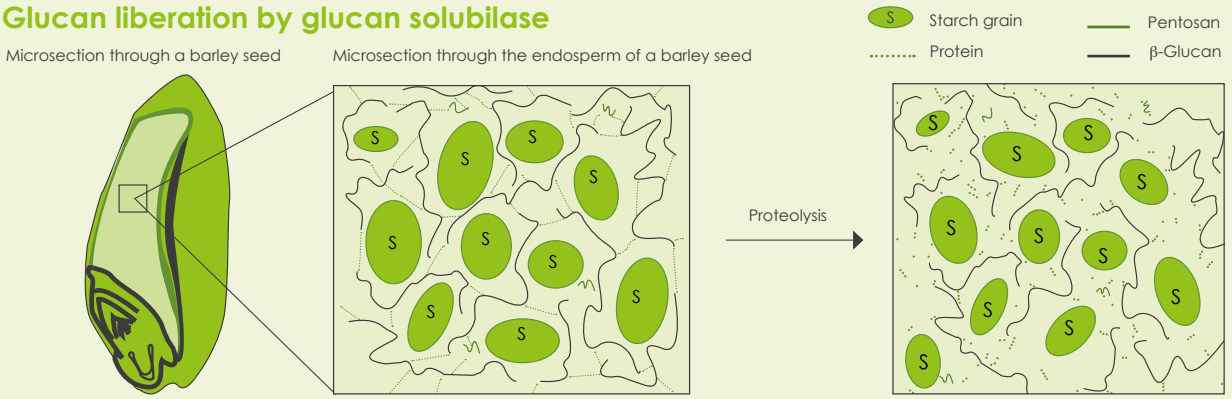
Beerzym products for glucan degradation (with malt or adjuncts)

High-molecular β-glucan causes problems during lautering followed by wort cloudiness.
During the mashing process, endo-glucanases from the malt are continuously degrading glucan until they are thermally inactivated. At the same time, the malt glucan-solubilase makes insoluble glucan soluble and additionally releases hemicelluloses.

Malt endo-glucanase is inactivated at temperatures above 50°C. The malt glucan solubilase is active up to a temperature maximum of 80°C and releases undesirable β-glucan which is not further degradable. As a result, problems during lautering occur, filter capacity is reduced and cloudiness in the final beer develops.

Besides β-glucans, above all, pentosans are released when processing wheat or rye and lead to significant filtration problems. The addition of Beerzym Penta is recommended.

Glucan liberation by glucan solubilase



Impact of Beerzym BG Super on beer foam and subsequent filtration capacity

Analytical value	Control	Beerzym BG Super to the mash	Beerzym BG Super in the fermentation tank
Glucan content in the mash (mg/L)	374	374	374
Glucan content in the wort (mg/L)	367	149	372
Glucan content in beer (mg/L)	367	145	0
Filter capacity (L/min)	2.45	3.63	3.58
Foam stability directly/after 6 weeks (s)	255/258	252/248	252/248

Beerzyme

Product	Activity	Conditions	Dosage	Effect	Characteristic
Beerzym Amyl	α-amylase from Bacillus subtilis	pH-range: 4 – 8 temperature: 30 – 90 °C	150 – 350 mL/t adjuncts	for liquefaction of gelatinized starch	• ideal conditions: pH-range: 5.8 – 6.0 and temperature: 70 – 80 °C • calcium activates and stabilises the enzyme, the calcium demand is ≥ 50 ppm
Beerzym Amyl HT	α-amylase from Bacillus licheni-formis	pH-range: 5 – 9 temperature: 30 – 100 °C	80 – 240 mL/t adjuncts	for liquefaction of gelatinized starch	• thermostable • ideal conditions: pH 6.5 and temperature: 90 – 95 °C • for a short time the enzyme tole-rates temperatures of up to 105 °C • the calcium demand for enzyme activation and stabilisation is ≥ 50 ppm
EnerZyme HT	glucoamylase from Aspergillus niger	pH-range: 2.5 – 6.5 temperature: 2 – 80 °C	2 – 5 mL/100 L green beer	for saccharification of liquefied starch and dextrins to glucose in a pH-range of 4.2 – 4.5	• ideal conditions: pH-range: 3.8 – 4.2 and temperature 65 °C • during application in the fermenting tank or in the storage tank the atte-nuation limit can be raised
Beerzym Crystal	α-amylase, from Aspergillus niger	pH-range 2.0 – 7.0 temperature range from 20 – 85 °C	guide value: 2 – 10 mL/100 hL (addition de-pends on time of dosage)	prevention and de-gradation of colloidal haze in green beer (e.g. glycogen)	optimal: pH 4.0 – 5.0 temperature optimum at 65 °C
Beerzym BG and BG-HK 4	thermostable endo-β-1.3-glucanase and endo-β-1.3(4)-glucanase from Geosmithia emersonii, resp. Talaromyces emersonii	pH-range: 2 – 6.5 temperature: 15 – 95 °C, parti-cularly suitable for application in the mashing process	200 – 400 mL/t malt (Beerzym BG); 50 mL/t malt (Beerzym BG-HK4)	degradation of β-glucan and lami-narin	• effective against cereal-β-glucans • ideal conditions: pH: 4.5 and temperature: 20 – 85 °C • little effect below 30 °C, therefore no application in the fermenting room or in tank beer • high proteinases side activity (proteinases hydrolyse proteins which are required for foam formation) • optimises the lautering period • optimises filter capacity
Beerzym BG Super	thermo-tolerant endo-β-1.3-glucanase/ endo-β-1.3(4)-glucanase/ hemicellulase complex from Penicillium funi-culosum	pH-range: 2.5 – 7 temperature: 2 – 75 °C	0.5 – 1 mL/100 L green beer or 150 – 300 mL/t malt	effective against cereal-β-glucans	• effective at temperatures around <10 °C • little side activity with proteolytic effect allows an application in the fermenting room or in tank beer • ideal conditions: pH 5.0 and temperature: 2 – 75 °C • no negative impact on beer foam • improved filter capacity • no impact on foam numbers
Beerzym Penta	hemicellulase complex from β-glucanase and pentosanase (Trichoderma spec.)	pH-range: 2.5 – 6.5 temperature: 4 – 65 °C	2 – 20 mL/100 L (dependent on time of addition)	degradation of β-glucan and pentosan and other hemicelluloses at the same time	• effective against β-glucan and other pentosans • ideal conditions: pH 4.5 and temperature: 4 – 70 °C • for the beer production from cereals rich in pentosan or malts (wheat)
Beerzym Saphir	proteinase and a thermotolerant β-glucanase	pH-range from 2.0 – 6.0, tempe-rature range from 20 – 70 °C	guide value: 80 mL/t malt or barley, 110 mL/t rye, 25 mL/hL beer in ageing	for the degradation of haze caused by proteins and β-glucans in beer with fluctuating quality of the crop	optimal: pH 1.5 – 6.5, temperature optimum at 55 – 60 °C

Beerzyme

Product	Activity	Conditions	Dosage	Effect	Characteristic
VP 1506/2 GL	Mixture of β-Glucanases, Cellulases und Proteases	pH-Range 4,5–5,5, Temperature Range from 45° to 70 °C	Recommended dosage 0,3 – 0,5 %, based on the total liquid volume	Decrease and destroying of Cross flow membrane blockage ingredients	• Ideal pH: 4,5 bis 5,5 • Ideal Temperature: 45 – 65 °C
Beerzym Combi	Mixture of α-Amylases, different ß-Glucanases	pH-Range 4,5–5,5, Temperature Range from 45° to 70 °C	Recommended dosage 0,5 %, based on the total liquid volume	Decrease and destroying of filter cartridge blockage ingredients like ß-Glucanes and α-Glucanes	• Ideal pH: 5,0 bis 5,5 • Ideal Temperature: 45 – 70 °C
Beerzym Rapid	α-acetolactate-decarboxylase	pH-range from 3.0 – 7.5, temperature range from 4 – 65 °C	guide value: 0.8 – 1.0 mL/100 L (addition at fermentation onset)	direct conversion of α-acetolactate to acetoin (thus no diacetyl formation)	optimal: pH 5.5 and temperature optimum at 45 °C
Beerzym Chill	peptidyl-peptide-hydrolase	pH-range 3.5 – 10.5, temperature range from 4 – 85 °C	guide value: 20 – 80 mL/t malt, 2 – 4 mL/100 L beer in ageing, 1 – 3 mL/100 L finished beer	hydrolysis of proteins to amino acids	optimal: pH 7.5 and temperature optimum at 60 – 70 °C
EnerZyme P7	proteinase from Bacillus subtilis	pH-range 5.0 – 10.0, temperature range from 25 – 70 °C	guide value: 150 – 250 mL/t malt, 350 – 700 mL/t malt with adjuncts	release of proteins, during mashing up to 60 °C to improve yeast nutrition	optimal: pH 7.0 and temperature optimum at 55 °C

Beer yeasts

Differences in taste and smell of the beers can be obtained by the Erbslöh beer yeasts.

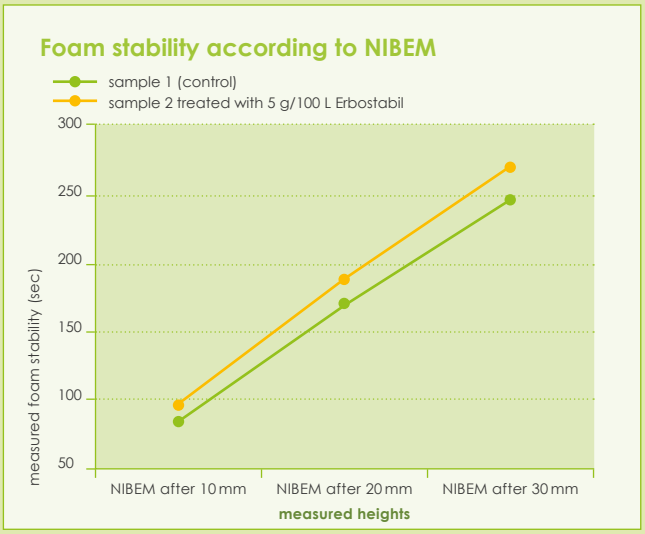
Product	Characteristic	Aroma profile	Settling behaviour	Fermentation degree	Special features
BrewMasters® German Classic W34/79 2G NEW	The Weihenstephan yeast strain is the mostly used strain for classical bottom fermented lager beers, worldwide	Neutral in smell and taste	Highly flocculating and settling down after fermentation	High	Ideal for beers such as German Pilsner, Export, Hell or Lager-style
BrewMasters® Lager Yeast	Bottom fermenting yeast strain LW-EBH 001 (lager yeast), strong and rapid fermentation, broad applicable temperature range (9 – 18 °C)	Similar to strain W34/70 2G	Highly flocculating and settling after fermentation	Medium-high	Strong diacetyl reduction, for classical bottom fermented beer (lager), alcohol tolerance up to 14 %
BrewMasters® Pilsner Style Yeast	Bottom fermenting yeast strain LW-EBH 002, strong and rapid fermentation, broad applicable temperature range (9 – 15 °C)	Neutral in smell, typical lager taste	Highly flocculating and settling after fermentation and thus „good clarification“	High	For classical Pilsner and lager beer
BrewMasters® Ale Yeast	Top fermenting yeast strain LW-EBH 004, English Ale, strong and rapid fermentation, broad applicable temperature range (17 – 32 °C, ideal 16 – 24 °C)	Maracuja/passion fruit and pineapple aroma components	Good flocculation after fermentation and thus „good clarification“	High	Alcohol tolerance up to 9.5 %, individually applicable for IPAs, Stout and Porter
BrewMasters® Wheatbeer Yeast	Top fermenting yeast strain LW-EBH 003, strong and rapid fermentation, broad applicable temperature range (15 – 30 °C)	Phenolic, estery aroma components, fruity, banana flavour	With extreme cooling, strong sedimentation	Low-medium	For classical Bavarian wheat beer and fruity, special beers

Foam stabilisation

Foam stabilisation with ErboStabil

The following factors affect the foam stability of the beer:

- raw materials (e.g. highly modified malt with a low protein content)
- the mashing method (e.g. low mashing-in temperatures, long protein rests)
- boil of the wort (increased precipitation of coagulable nitrogen)
- insufficient hot trub separation after wort boiling
- intensive fermentation methods
- sharp filtration (with excessive use of stabilising agents)
- high portions of adjuncts (corn, rice, sugar) used in raw grain beer



Product	Components	Conditions	Conditions	Conditions
ErboStabil	Saccharomyces cerevisiae (yeast cell walls and trace elements of the yeast)	addition prior to D.E. filtration, dosage: 5 –10 g/100 L	yeast constituents and trace elements act in a foam stabilising way	• powder form • improvement of foam numbers by 10 – 20 % • improvement of foam structure • improvement of chill stability
Ercobin (protection against oxidation)	pure vitamin C, pure ascorbic acid	addition prior to bottling into the filtered beer, dosage: 1–5 g/100 L, maximally 8 g/100 L	oxygen reduction by maximally 1.0 mg/L to limit oxidation of beer constituents	• improvement of taste stability • by the application of Ercobin the oxygen present can be reduced by half, since one oxygen molecule in the beer reacts with two ascorbic acid molecules
Vitamon® yeast nutrients	special yeast nutrient preparations	addition into the pitching wort prior to addition to the yeast, dosage: 5–15 g/100 L. dissolve product in water and mix thoroughly	• by the ammonium and phosphate portion an additional nutrient basis is provided for the yeast • supports yeast propagation and thus assures quick fermentation onset and complete fermentation	• application into the wort to ferment with lack of phosphate and nitrogen • increase of yeast-utilizable phosphate portion • addition of nitrogen at the same time • increases the vitamin B content for rapid yeast propagation
BeerProtect	potassium disulphite, ascorbic acid	addition at D.E. filtration, dosage: 1 g/100 L	oxygen reduction and thus increase of taste stability	improvement of chemical-physical stability

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