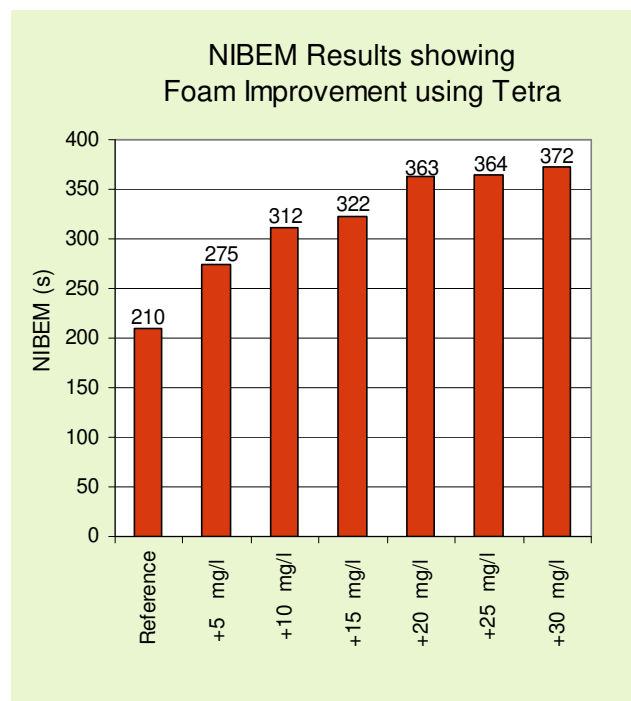


# Tetra Iso-Extract (Tetra)

## ❖ Overview

- **Tetra** is a pure, aqueous solution of the potassium salts of tetrahydro-iso-alpha acids produced entirely from CO<sub>2</sub> hop extract.
- **Tetra** will greatly enhance beer foam when used as a post fermentation replacement for a proportion of the normal bittering.
- In the absence of normal alpha and iso-alpha acids, **Tetra** will give virtually complete protection against development of light-struck flavors.



## ❖ Specification

- **Description:** A yellow to amber colored, aqueous solution of the potassium salts of tetrahydro-iso-alpha acids.
- **Concentration:** 9.0 ± 0.5 % (w/w) of tetrahydro-iso-alpha acids by HPLC (or 10.0 ± 0.5 % (w/w) by UV spectrophotometric analysis)
- **pH:** 9.5 (± 1.0)
- **Viscosity:** 2 – 6 mPas (at 20 °C / 68 °F)
- **Density:** 1.017 (± 0.005) g/ml – concentration by HPLC (1.015 g/ml – UV Spectrophotometric)
- **Solubility:** Soluble in pH adjusted, demineralized water.

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## ❖ Properties

### ❑ Appearance

A homogeneous, yellow to amber, clear aqueous solution; mobile and free flowing at all normal storage and use temperatures. Miscible with demineralized water and alcohol.

### ❑ Utilization

Utilization of **Tetra** in final beer can be between 60 – 80 % depending on the time and efficiency of dosing.

### ❑ Light stability

**Tetra** will only provide protection from light-struck flavor in the complete absence of normal iso-alpha acids. **Tetra** can be used in conjunction with Hopsteiner® Reduced Iso-Extract to achieve light stability, improved foam and balanced bitterness.

### ❑ Foam enhancement

**Tetra** enhances both foam retention and cling. Noticeable foam improvement can often be achieved with as little as 3 – 5 BU's of **Tetra** in beer.

### ❑ Bitterness

**Tetra** should provide 1.0 to 1.7 times the perceived (tasteable) bitterness as compared to the same BU level from traditional hopping. The actual figure depends on the details of its use and also on the type of beer. Therefore, the target level for beer BU must be determined in preliminary tests to achieve the correct degree of *sensory* bitterness.

### ❑ Quality

All Hopsteiner® products are produced in plants accredited to internationally accepted quality standards.

## ❖ Packaging

**Tetra** is normally packaged into 20 kg pails.

## ❖ Product Use

Typically added after fermentation and before final filtration.

### ❑ Dosage

Dosage is calculated based on the product concentration and an assumed utilization of say 70 %. Trials at the brewery will determine the correct dosage of **Tetra**. (Remember that **Tetra** will give about 1.0 to 1.7 times the perceived bitterness of iso-alpha acids derived from traditional hop sources). **Tetra** should not be left in dosing lines at low temperatures. Lines and dosing pump should be flushed with warm, slightly alkaline, demineralized water or ethanol to clean.

### ❑ Addition

We recommend dosing **Tetra** undiluted to the center of the beer stream during at least 70 % of the beer transfer, preferably before final filtration and after any gravity adjustment.

An accurate, high pressure, dosing pump is required ensuring vigorous injection into the beer stream. **Tetra** can be injected at ambient temperature. If dilution is necessary, always add **Tetra** to demineralized water to achieve a dilution; adjust pH to 10 – 11 using KOH.

### ❑ For Light Stable Beer

It is essential that no other sources of non-reduced iso-alpha acids be inadvertently introduced into the wort or beer.

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Therefore it is essential to:

- Avoid contamination from equipment surfaces that have been in contact with normal iso-alpha acids.
- Never pitch wort with yeast that has been in contact with normal alpha or iso-alpha acids.
- If beta extracts are used as kettle additives ensure that they are light stable.

□ **Storage**

**Tetra** should be stored in unopened containers at 5 – 15°C (41 – 59°F). Avoid exposure to sunlight and use up any opened containers as soon as possible.

□ **Best Before Date**

**Tetra** is stable 1 year from date of production under the recommended storage conditions.

□ **Safety**

**Tetra** is an intensely bitter material. However solutions of **Tetra** are mildly alkaline and therefore contact with sensitive skin should be avoided. If **Tetra** gets into the eyes, irrigate with excess water until clear and seek medical attention.

For full safety information please see the relevant Hopsteiner® material safety data sheet.

## ❖ Analytical methods

□ **Concentrations of Tetrahydro-Iso-Alpha Acids in Product**

The concentration of tetrahydro-iso-alpha acids can be determined by UV Spectrophotometric analysis or by HPLC using the current ICS standard according to the EBC 7.9 method. The recommended procedures can be obtained from Steiner.

□ **Concentrations of Tetrahydro-Iso-Alpha Acids in Beer**

The concentration of tetrahydro-iso-alpha acids in beer is determined by the ASBC or EBC BU analytical method or by HPLC. The BU analytical result can be adjusted by a factor of 1.0 – 1.7 to compensate for the higher perceived bitterness of the tetrahydro-iso-alpha acids.

□ **Light Stability Test**

Light stability of **Tetra** brewed beers, packaged in either clear or green glass bottles, can be tested by placing bottles in sunlight or next to a fluorescent light for 2 - 6 hours. The beers can be checked organoleptically for lightstruck flavors.

□ **Foam Stability and Cling Test**

Beers produced with **Tetra** usually show dramatically improved foam stability and cling. We recommend using a 'pour' beer test for foam stability. This test most accurately reflects how the customer observes beer foam.