

## Redihop®

Redihop® is an aqueous alkaline solution of the potassium salts of rho-iso- $\alpha$ -acids, and is produced from CO<sub>2</sub> hop extract. Redihop® gives protection from light-struck flavour when used as a sole source of hop-derived bittering or in conjunction with other reduced hop products. Furthermore, when added to wort or beer, Redihop® will act as an antimicrobial agent. Redihop® is often described as having a pleasant smooth bitterness. Redihop® is classified as a modified hop extract that may be safely used in beer in accordance with US FDA regulation 21 CFR 172.560 (b) (1).

### Product Specifications:

Description:	A reddish to amber-brown, aqueous solution of reduced ( <i>rho</i> ) iso- $\alpha$ -acids in potassium salts form. A re-dissolvable precipitate may form during normal storage.
Concentration:	30.0% $\pm$ 0.5 of rho-iso- $\alpha$ -acids by HPLC
pH:	8 - 11
Density:	1.090 g/mL (approximately) at 20 °C (68 °F)
Viscosity:	20 - 40 mPas at 20 °C (68 °F)
Iso- $\alpha$ -acids:	< 0.2%

### Quality and Food Safety:

BarthHaas maintains quality management systems registered to the ISO 9001 standard, as well as food safety management programs based on internationally recognised (HACCP) principles. Please refer to our web site ([www.barthhaas.com](http://www.barthhaas.com)) for more information on our systems and programs.

### Product Use:

Redihop® is normally used as a post fermentation addition to unhopped beer, but good utilisation can be achieved by addition to the kettle and therefore, some brewers prefer to make a partial or even complete addition to the wort. Dosing Redihop® into the kettle reduces the chances of encountering bacterial growth during fermentation. For light-stable beers packaged in clear or green glass bottles, all hop bitterness must be derived from light-stable hop products such as Redihop®, usually in combination with Tetrahop Gold® or Hexahop Gold®. Redihop® should be added, without prior dilution, to the kettle or directly to beer either before or after conditioning but before the final filtration. Preferably, post-fermentation dosage should be by metered injection into a turbulent beer stream during transfer. The addition point should be well separated from that of any other additions.

The dosing rate depends on the expected utilisation for the chosen point of addition, and also allowing for the fact that rho-iso- $\alpha$ -acids are less bitter than normal iso- $\alpha$ -acids by a factor of 0.7. Actual utilisation varies depending on plant and process conditions in the brewery. To ensure optimum performance for post fermentation addition, we recommend that Redihop® be warmed to 50 °C (120 °F) and then agitated to ensure dissolution of any precipitate before use. We recommend that the clear solution be injected directly into the turbulent beer stream preferably after primary filtration and gravity adjustment, but prior to final filtration (polish/trap filter). The dosing pump should be adjusted to deliver Redihop® over approximately 70% of the total transfer time. Following dosing, we recommend cleaning lines and dosing pumps with warm slightly alkaline de-mineralised water or ethanol immediately after each use

## Usage Calculations:

The following calculations are based on the fact that, for the same concentration in beer, rho-iso- $\alpha$ -acids (rho-IAA) are reported to have only 0.7 sensory bitter units compared with normal iso- $\alpha$ -acids (IAA). Utilisation of rho-IAA is likely to be about 70 - 75% when Redihop® is used post-fermentation and about 45% when used in the kettle.

### 1. Post-fermentation use

Desired Sensory Bitterness Units = BU

$$\text{rho IAA required in beer (mg/L)} = \frac{\text{BU}}{0.7} \quad (0.7 = \text{bitterness of Redihop relative to IAA})$$

$$\text{Dosage rho IAA in mg/L (70\% utilisation assumed)} = \frac{\text{BU}}{0.7} \times \frac{100}{70}$$

$$\text{Dosage in grams rho IAA per hL of beer} = \frac{\text{BU}}{0.7} \times \frac{100}{70} \times \frac{100}{1000}$$

Dosage amount of Redihop® (30% rho IAA) in g/hL :

$$\frac{\text{BU}}{0.7} \times \frac{100}{70} \times \frac{100}{1000} \times \frac{100}{30} \text{ g/hL} = \text{BU} \times 0.68 \text{ g/hL}$$

Dosage amount of Redihop® (30% rho IAA) in mL/hL :

$$\frac{\text{BU}}{0.7} \times \frac{100}{70} \times \frac{100}{1000} \times \frac{100}{30} \times \frac{1}{1.090} \text{ mL/hL} = \text{BU} \times 0.62 \text{ mL/hL}$$

(e.g. in order to achieve a bitterness of **12** desired sensory bitter units ( $12/0.7 \times 100/70 \times 100/1000 \times 100/30$ ) **8.2** g/hL of Redihop® or **7.5** mL/hL are necessary).

### 2. Kettle use

Substituting 45% for 70% utilisation in the calculation shown above, the amount of Redihop® to use in the kettle = BU X 1.06 mL/hL

(e. g. for **12** Sensory Bitter Units; **12.7** g/hL)

### **Light Stability:**

Redihop® will only provide protection from light-struck flavour if a complete absence of normal iso- $\alpha$ -acids is achieved, therefore no other sources of non-reduced iso- $\alpha$ -acids should exist in the wort or beer streams. Thus for light-stable beers packaged in clear or green glass bottles, all the hop bitterness must be derived from reduced hop acids such as Tetrahop Gold®, Redihop® or Hexahop® products. Iso- $\alpha$ -acids (from equipment or yeast) must not be present in the beer. If beta extracts are used as kettle additives, ensure that the concentration of  $\alpha$ -acids and iso- $\alpha$ -acids are below 0.2%

### **Packaging:**

Redihop® is normally supplied in high-density polyethylene containers of 20 kg.

### **Storage and Best-by Recommendation:**

Store Redihop® in full, closed containers at 15 - 25 °C (59 - 77 °F). It is normal for a precipitate of rho-iso- $\alpha$ -acids to separate during storage, however, warming the product to 50 °C and gentle agitation will re-dissolve this precipitate. Redihop® is best if used within 24 months from production date if stored as recommended. Opened containers should be used within a few days.

### **Safety:**

The Safety Data Sheet (SDS) is available on our website [www.barthhaas.com](http://www.barthhaas.com).

### **Analytical Methods:**

The concentration of reduced (*rho*) iso- $\alpha$ -acids is measured by UV Spectrophotometry (with modified factors) or by the EBC Method 7.9 (HPLC). Details of recommended methods are available on request.

### **Technical Support:**

We will be pleased to offer help and advice on the use of Redihop® in brewing.