



# HVG – CO<sub>2</sub> Extract

## Product Specification

### Manufacturer

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The HVG-CO<sub>2</sub> extract contains the natural non-polar substances of the flower of the hops plant (*humulus lupulus*) in their natural chemical unchanged form.  
The HVG-CO<sub>2</sub> extract is a mixture of the aromatic substances of the hops (hop oils) and the bittering resins (humulones and lupulones).

According to the EBC (European brewery convention) Manual of good practice for Hops and Hop Products (ISBN3-418-00758-9) the process of gaining the extract out of the hops is the following:

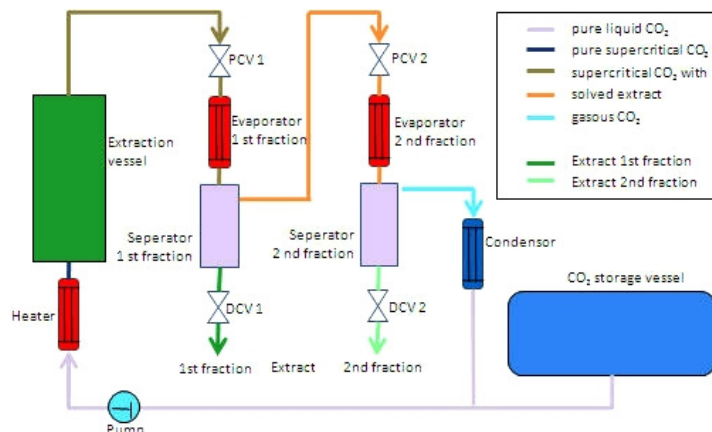
“Hops pellets (grinded and pressed flowers) are filled into an extractor which is pressurised to working pressure. Liquid carbon dioxide is raised to extraction pressure and pumped through the extractor. As the carbon dioxide is passed through the pellets, bitter and aroma substances are dissolved. In the separation tank the pressure is decreased and carbon dioxide separates from the extract, which precipitates and is collected in the separator. This is a batch process.”

### Utilisation of HVG-CO<sub>2</sub> extracts

Like the hop flowers, the HVG CO<sub>2</sub> Extract extract is used as a natural flavouring ingredient in the process of beer brewing. The extract should be dosed during the process of wort boiling in order to achieve the isomerisation of the humulones (alfa-acids) to iso-humulones (iso alfa acids).



## Production Flowsheet



- Pure liquid Carbon Dioxide is pressurized with a pump
- The heater adjusts the temperature, Carbon Dioxide now supercritical
- The extraction vessel is filled with raw material
- Carbon Dioxide dissolves substances out of the raw material
- Pressure drop caused through PCV 1 (pressure control valve)
- Temperature adjustment with evaporator 1 st separation of extract (1st fraction) and carbondioxide/still solved material
- Pressure drop through PCV 2
- Temperature adjustment with evaporator 2
- Separation of extract (2nd fraction) and clean gaseous Carbon Dioxide
- Gaseous Carbon Dioxide is liquified in condensor and recirculated
- extract is discharged periodically with DCV 1 and DCV 2 (discharge control valve).

## Typical characterisation of extracts

$\alpha$  – acids (resins):                    between 25% to 55% w/w dependent on the hop variety  
 $\beta$  – acids (resins):                    between 15% to 35% w/w dependent on the hop variety  
 essential oils:                            up to 10 ml/ 100 g                    dependent on the hop variety

Appearance:                            viscous liquid. Colour dependent on the hop variety from yellow-brownish to dark green.

Density:                                    from 900 g/l to 1.100 g/l

Viscosity:                                Flow properties changes depending on the temperature of the extract. At temperatures of about 25°C it moves like Honey and the higher the temperature becomes, the more fluid it gets. At temperatures of about 40 °C it flows a little bit similar to Olive Oil.

Meassured with Haake VT 500 according to DIN 53019  
 Eta from 1 to 3 Pas.



## Storage / Stability

Good stability characteristics. Out of quality reasons HVG CO2-Extract should be used as soon as possible after opening the packaging. Hop constituents oxidise in contact with air, no hazardous reactivity known. Recommended storing conditions:

at 10 - 15 °C: up to 2 years

at 0 - 5 °C: up to 8 years

No special precautions necessary.

## Health and Safety

Rubber gloves are advisable to avoid accidental contact. Protective goggles are advisable to avoid accidental contact. See MSDS.

## Packing and Dosage

HVG CO2-Extract is packed into cans lined with high quality food grade lining from 0,5 Kg to 4,0 Kg extract weight. Larger packing volumes, e.g. 200 litre standard or stainless steel drums, are available for use with automatic dosing units. Hops in the brew-house

Traditionally the hopping takes place in the wort copper. The time for the dosage varies from the first-wort hopping, via the additions directly before casting, up to direct aroma hopping in the whirlpool. After being dosed the hop components pass through the following stages:

- mechanical distribution
- emulgation i.e. dissolving the components
- components are transformed by heat
- evaporating volatile (partly undesired) hop oils
- partially combining with proteins and precipitation

At the same time the following processes occur during the wort boil:

- Bitter substances: alpha isomerises to iso-alpha-acid, dissolving other components of the resin fraction like the humulinic acids
- Aroma substances: dissolving, evaporation, oxidation

## Yield of bitter substances

In the brewery the yield results from the ratio between the remaining bitter substances in the finished beer and the bitter substances dosed with the hops according to the following rule:

$$\text{Yield} = \frac{\text{bitter compounds in the finished beer}}{\text{bitter hops dosed in hops}} \times 100$$



and is calculated as the isomerisation rate as follows:

$$\text{Rate of isomerisation} = \frac{\text{iso-alpha-acids in wort or beer}}{\text{alpha-acids dosed}} \times 100$$

Utilisation of the alfa acids as early addition to the kettle is in the range of 25% to 45%, typically 35%.

HVG CO2-Extract can be used as single hop addition or in combination with HVG-Hop Pellets.

### **Analytical Methods**

For hop extracts the following analysis methods can applied to measure the alfa and beta acids:

EBC 7.6 Bitter Substances in Hop Extracts: Ganzlin Modification of the Wöllmer Method

EBC 7.7 Alpha and beta acids in Hops and Hop Products by HPLC (ASBC Hops-14)

EBC 7.8 Iso-alpha, alpha and beta acids in Hops and Hop Products by HPLC

ASBC Hops-6 Spectrophotometric method

### **Other information**

The product is accompanied by the Phytosanitary certificate, which states that the product has been produced according to the national health regulations.

The above information is based on the current state of knowledge of our product at the time of publication and is furnished without warranty of any kind. The user must satisfy himself that the product is entirely suitable for his purposes.

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