BEZAKTIV HP
Top-class dye range
Extreme routes can only be successfully mastered with the best equipment. Absolute material reliability is only a basic requirement. Maximum commitment and boundless passion combined with the highest material demands regarding functionality and versatility mean that even the most ambitious aims can be reached.

> REACH YOUR CELLULOSE DYEING AIMS WITH BEZAKTIV HP!

The BEZAKTIV HP range means the highest performance on a world-class level. It features dyes with a wide variation in brilliance to enable selection of the ideal dye for all applications. All dyes are perfectly combinable and therefore ensure optimum production reliability in both exhaust and continuous dyeing processes. With the combination of elements it is possible to eliminate any potentially occurring metamerism with existing recipes, and there are therefore no obstacles for switching to high performance.

The dye range has the following outstanding features:

- Perfect combinability due to even bath exhaustion and fixation
- High shade consistency in the event of fluctuating production parameters
- Excellent suitability for all processes
- Tail-free dyeing in the continuous process
- Balanced dye migration ensures the best levelling and minimum double-sidedness, especially on emerised fabric
- No photochromism
- High light fastness and perspiration light fastness, especially in the shade-sensitive grey, brown and olive ranges
- Wide colour space coverage
- High washing fastness
BRILLIANT COLOURS FOR UNIVERSAL APPLICATIONS

When exclusively using non-contrastingly, generally dull dyes, limits are already reached with the illustrated shades, and the exact shade setting is sometimes no longer possible. With the BEZAKTIV HP dye range these shades can easily be achieved and can be dyed reliably with effective reproduction. The wide colour range coverage means that even more brilliant colour shades are not a challenge. With the new supplementary elements BEZAKTIV Brown HP-5R, BEZAKTIV Grey HP-N and BEZAKTIV Olive HP-B, reproducibility and process reliability when dyeing particularly tricky shades can be increased even further.

> LIGHT AND PERSPIRATION LIGHT FASTNESS

The BEZAKTIV HP dye range is particularly able to demonstrate its strengths regarding light and perspiration light fastness with dull and often dyed shades. The fastness level of the individual elements is coordinated so that the shade does not change.

Alkaline perspiration light fastness

<table>
<thead>
<tr>
<th>High performance ranges</th>
<th>khaki</th>
<th>grey</th>
<th>olive</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEZAKTIV HP</td>
<td>![khaki]</td>
<td>![grey]</td>
<td>![olive]</td>
</tr>
<tr>
<td>Traditional 1</td>
<td>![khaki]</td>
<td>![grey]</td>
<td>![olive]</td>
</tr>
<tr>
<td>Traditional 2</td>
<td>![khaki]</td>
<td>![grey]</td>
<td>![olive]</td>
</tr>
<tr>
<td>Traditional 3</td>
<td>![khaki]</td>
<td>![grey]</td>
<td>![olive]</td>
</tr>
</tbody>
</table>
NO PHOTOCHROMISM: ADDITIONAL CUSTOMER BENEFITS

Although photochromism is a reversible change in colour due to exposure to light, it is an unwanted factor and is normally not accepted. A number of golden-yellow dyes often have, however, a pronounced tendency to photochromism. For this reason golden-yellow elements are contained in many ternaries which match red and blue due to their dyeing behaviour, but are photochromic. BEZAKTIV Yellow HP-NP is photochromism-free. The diagram shows the change in shade during exposure of the dyed product to a number of light flashes.

SHADE-IN-SHADE COLOUR BUILD UP

The excellent reproducibility and transferability from laboratory to production result from coordinated substantivity and reactivity of all elements of the BEZAKTIV HP dye range. This can be illustrated with a shade-in-shade colour build up during dosing of salt and alkali.

Dyeing process with dosing of salt and alkali

Corresponding shade
> COLOUR CONSISTENCY

Variations in the process parameters are the main cause for problems with reproducibility. Conventional dyes in a ternary respond individually to these process parameters. The BEZAKTIV HP dyes possess highest robustness towards these variations of parameters. Thus differences in hue and strength can be avoided. The following graphics illustrate the robustness of BEZAKTIV HP.

> EXHAUST

In exhaust dyeing various process parameters can affect strength and/or shade of a dyeing, particularly filling level, liquor ratio, amount of salt and alkali as well as dyeing time and temperature.

**Total difference of shade (Delta E)**

![Graph showing total difference of shade (Delta E)](image)
> COLD PAD BATCH
Due to the optimally coordinated substantivity and reactivity, no shifts in shade occur due to tailing with the BEZAKTIV HP dye range. There is also no difference in shade between both sides of emerised fabric.

<table>
<thead>
<tr>
<th>Tailing</th>
<th>Colour at the beginning</th>
<th>Colour after consumption of 70 % of the padding liquor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shade variation</td>
<td>dH: 0.31</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>dH: 0.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

> PAD DRY PAD STEAM
Also in the pad dry pad steam process a colour consistency is guaranteed which meets the highest requirements, even in the event of fluctuation of the steaming time, salt and lye concentration.

**Total difference of shade (Delta E)**

<table>
<thead>
<tr>
<th>+1.5 ml/l NaOH</th>
<th>+50 g/l salt</th>
<th>−1.5 ml/l NaOH</th>
<th>−50 g/l salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>−15 s steaming</td>
<td>+15 s steaming</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- BEZAKTIV HP
- Traditional 1
- Traditional 3
BEZAKTIV HP dyes are universal-application reactive dyes and can be used in exhaust, semi-continuous and continuous dye processes. BEZAKTIV HP dyes can be combined with BEZAKTIV V and BEZAKTIV S dyes.

> **EXHAUST PROCESS FOR BEZAKTIV HP**

The optimal dyeing temperature is 60 °C. BEZAKTIV HP dyes can be used both on exhaust machines (jet, overflow) and also on exhaust apparatus (cross-package or warp beam dyeing apparatus, beam dyeing apparatus). The recommended auxiliaries and the correct application amounts are listed in the process descriptions. The application amounts of salt and alkali depend on the fabric, the amount of dyes and the liquor ratio.
**Isothermal process**
Universal procedure to obtain excellent reproducibility and levelness. If the dosage is monitored, sodium carbonate and caustic soda can be added simultaneously. With progressive alkali dosing a steady increasing fixing curve and therefore the best possible levelness is reached. In addition, premature hydrolysis of the dye is prevented. This means the highest possible colour yield.

**Temperature step process**
Process which is mainly used for dyeing on machines without a suitable dosing device. To prevent unlevelness the alkali should be added in portions. Furthermore this process can be used to improve the tone-in-tone dyeing of cotton/viscose blends.
Migration step process 80/60 °C
Process for articles with which level dyeing is very difficult and for critical shades such as grey, khaki or beige. Excellent dye penetration and levelness, especially on dense yarn packages or cross-bobbins. With difficult light or medium colours, salt dosing is also possible after the dye has been added. Glauber’s salt is preferable to common salt for this process.

Salt- and alkali requirement for BEZAKTIV HP dyes

For unmercerised cotton in liquor ratio 1:8 – 1:12

<table>
<thead>
<tr>
<th>% dyestuff</th>
<th>salt g/l</th>
<th>soda ash g/l</th>
<th>caustic soda solution 38 °Bé ml/l</th>
<th>only soda ash g/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.1 %</td>
<td>10</td>
<td>5</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>0.1 – 0.5 %</td>
<td>20</td>
<td>10</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>0.5 – 1.0 %</td>
<td>30</td>
<td>5</td>
<td>1.0</td>
<td>15</td>
</tr>
<tr>
<td>1.0 – 2.0 %</td>
<td>40</td>
<td>5</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>2.0 – 4.0 %</td>
<td>60</td>
<td>5</td>
<td>2.0</td>
<td>20</td>
</tr>
<tr>
<td>4.0 – 6.0 %</td>
<td>80</td>
<td>5</td>
<td>3.0</td>
<td>25</td>
</tr>
<tr>
<td>&gt; 6.0 %</td>
<td>90</td>
<td>5</td>
<td>3.5</td>
<td>25</td>
</tr>
</tbody>
</table>

For mercerised cotton and viscose in liquor ratio 1:8 – 1:12

<table>
<thead>
<tr>
<th>% dyestuff</th>
<th>salt g/l</th>
<th>soda ash g/l</th>
<th>caustic soda solution 38 °Bé ml/l</th>
<th>only soda ash g/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.1 %</td>
<td>10</td>
<td>5</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>0.1 – 0.5 %</td>
<td>15</td>
<td>7.5</td>
<td>-</td>
<td>7.5</td>
</tr>
<tr>
<td>0.5 – 1.0 %</td>
<td>20</td>
<td>5</td>
<td>0.8</td>
<td>10</td>
</tr>
<tr>
<td>1.0 – 2.0 %</td>
<td>30</td>
<td>5</td>
<td>1.1</td>
<td>15</td>
</tr>
<tr>
<td>2.0 – 4.0 %</td>
<td>40</td>
<td>5</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>4.0 – 6.0 %</td>
<td>60</td>
<td>5</td>
<td>2.0</td>
<td>20</td>
</tr>
<tr>
<td>&gt; 6.0 %</td>
<td>70</td>
<td>5</td>
<td>2.0</td>
<td>25</td>
</tr>
</tbody>
</table>

Conversion factors to determine the alkali requirements depending on the liquor ratio

<table>
<thead>
<tr>
<th>Liquor ratio</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>1.30</td>
</tr>
<tr>
<td>1:10</td>
<td>1.00</td>
</tr>
<tr>
<td>1:15</td>
<td>0.80</td>
</tr>
<tr>
<td>1:20</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Conversion factors to determine the salt requirements depending on the liquor ratio

<table>
<thead>
<tr>
<th>Liquor ratio</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>- 10 g/l Salt</td>
</tr>
<tr>
<td>1:10</td>
<td>- standard</td>
</tr>
<tr>
<td>1:15</td>
<td>+ 10 g/l salt</td>
</tr>
<tr>
<td>1:20</td>
<td>+ 20 g/l salt</td>
</tr>
</tbody>
</table>
> SEMI-CONTINUOUS PROCESS

Woven and knitted fabric made of cellulose or regenerated cellulose can be dyed very economically with the cold pad batch (CPB) process with BEZAKTIV HP dyes. When BEZAKTIV HP dyes are combined with BEZAKTIV V or S it should be ensured that dyes with the same dyeing properties such as fibre affinity, liquor stability and fixing speed should be used. This information is given in the respective tables. To prevent tailing during padding, a high liquor exchange should be ensured. With lightweight fabrics dyeing should be performed with a low trough level and a high running speed. A low liquor stability can result in tailing. To ensure a high liquor stability it is highly recommended that the temperature of the padding liquor is not higher than 25 °C. Dye and alkali solution with a 4:1 ratio are combined just before the padder with a mixing pump or doser and added to the dye trough. The application amounts of dye, auxiliaries and fixing alkalis are based on the overall volume of the padding liquor. It is important that the fabrics have been cooled properly before padding to ensure reproducibility. If the fabric temperature is too high, the liquor stability is lowered which results in a change of colour or its depth. A constant production speed should generally be ensured. Different speeds influence the liquor pick-up and result in tailing. During dyeing the fabric is rolled with a straight line fabric. In order to ensure optimum fixation of the dye, the dyed goods must be packed with an air-tight plastic film and left for a certain time at room temperature. Packing the goods with an airtight package prevents carbon dioxide from the air partially neutralizing the fixing alkali. When dyeing with several dyes the dwelling time of the dye with the longest dwelling time should be taken.

Cold pad batch process with reduced sodium silicate quantity

The reduced silicate version is the standard version and has a high pad liquor stability in the temperature range of 20 – 30 °C. The application amount of sodium silicate 38 °Bé is generally 50 ml/l. Addition of the dye with the fixing alkali is performed with a mixing pump with a ratio of 4:1. Silicate deposits can occur on the rollers if silicate is used. Furthermore the use of sodium silicate during the soaping process requires an intensive washing process before neutralization to prevent silicate precipitation.

Dye solution:
- \( x \) g/l BEZAKTIV HP dye
- 0 – 100 g/l Urea
- 1 – 3 g/l COLORCONTIN SAN

Alkali solution:
- 50 ml/l Sodium silicate 38 °Bé
- \( y \) ml/l Caustic soda solution 32.5 % (38 °Bé)

Mixing ratio:
The stated quantities g/l of dye, ml/l of sodium silicate and ml/l of caustic soda solution 32.5 % (38 °Bé) are based on the total volume of the padding liquor. Dye and alkali solution are combined with a mixing pump with a normal mixing ratio of 4:1 and form the total padding liquor volume.

Padding liquor temperature:
20 – 25 °C

Dwelling time:
12 – 24 hours, up to 40 hours no colour losses or shifts in shade occur.

Table information:
The given dye specifications were determined with use of the reduced sodium silicate method (50 ml/l) and caustic soda solution 38 °Bé with a dye application amount of 30 g/l at a padding temperature of 25 °C and a dwelling temperature of 25 °C.

Fibre affinity:
The fibre affinity was determined by adding alkali and characterises the specific exhaustion properties of a dye. To counter tailing problems, the use of dyes with the same fibre affinity is advantageous.
**Padding liquor stability:**
The padding liquor stability is given in minutes. A period of time for hydrolysis of 10 % of the employed dye is determined. This theoretical value cannot be implemented directly in practice, as the dye and alkali solution are constantly added to the trough. For this reason the actual value of the liquor replacement in the trough should not exceed three minutes. The values of the BEZAKTIV HP dyes were determined at a temperature of 25 °C and with the use of the reduced sodium silicate variant. A higher temperature and different alkali systems influence the liquor stability.

The BEZAKTIV dyes are categorised as follows:
- **Low** < 10 minutes
- **Medium** 10 – 20 minutes
- **High** > 20 minutes

**Fixation speed:**
The speed of fixation depends greatly on the dwelling temperature. A regular temperature of the dyed fabric, liquor and environment is a requirement for regular fixation. The stated values of the BEZAKTIV HP dyes are based on an ambient temperature of 25 °C during dwelling. If the ambient temperature is lower, the dye is fixed more slowly. For this reason it is necessary to adapt the dwelling time accordingly.

- **Slow** > 16 hours
- **Medium** 8 – 16 hours
- **Fast** < 8 hours

**CONTINUOUS DYEING PROCESS**

**Pad dry pad steam process**
The pad dry pad steam process is the classic continuous process for dyeing woven fabrics. It is primarily used for cellulose articles with a high yardage. This process is characterised by a high productivity, a good fabric appearance as well as a good colour yield. The use of a dosing pump is not necessary with this process.

Dye pad:
- x g/l BEZAKTIV HP dye
  - 1.0 – 3.0 g/l COLORCONTIN SAN
  - 1.0 – 5.0 g/l MEROPAN XRN PEARLS
  - 5.0 – 10.0 g/l MIGRASOL SAP

Pick up: 60 – 80 %

Padding temperature: 20 – 30 °C

Pre-drying to a residual moisture content of 30 – 35 % in the IR zone

Drying: 110 – 120 °C

Padding chemicals:
- 250 g/l Common salt
- 20 g/l Sodium carbonate
- 7.5 – 15 g/l Caustic soda solution 38 °Bé

Pick up: 80 – 100 %

Padding temperature: 20 – 30 °C

Fixation: Steaming with 102 °C saturated steam for 60 – 90 seconds.

**Alkali requirements**

<table>
<thead>
<tr>
<th>Dye</th>
<th>g/l</th>
<th>&lt; 20</th>
<th>20 – 40</th>
<th>&gt; 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic soda solution 38 °Bé</td>
<td>ml/l</td>
<td>7.5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

**Remarks:**
Regular pre-drying is necessary to ensure optimum reproducibility and a level fabric appearance.

**Pad dry thermofix process**
The pad dry thermofix process is a single-bath and salt-free continuous process. Particularly suitable for light to medium shades. A lower light fastness level is achieved than with the pad dry pad steam process. No dosing pump is required for this process. Fixation is performed with hot air. Sodium bicarbonate is recommended as a fixing alkali, because of higher liquor stability than sodium carbonate.

Dye pad:
- x g/l BEZAKTIV HP dye
  - 1.0 – 3.0 g/l COLORCONTIN SAN
  - 1.0 – 5.0 g/l MEROPAN XRN PEARLS
  - 5.0 – 10.0 g/l MIGRASOL SAP
  - 0 – 150 g/l Urea
  - x g/l Sodium bicarbonate

Pick up: 60 – 80 %

Padding temperature: 20 – 30 °C

Pre-drying to a residual moisture content of 30 – 35 % in the IR zone

Drying: 110 – 120 °C

Thermofixation: 60 – 180 seconds at 150 °C

**Alkali requirements (sodium bicarbonate)**

<table>
<thead>
<tr>
<th>Dye</th>
<th>g/l</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>&gt; 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium bicarbonate</td>
<td>g/l</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

**Remarks:**
Regular pre-drying is necessary to ensure optimum reproducibility and a level fabric appearance. The dyes should be preselected due to the specific conditions during thermofixation.
### BEZAKTIV HP Dyes

**BEZAKTIV Yellow HP-NP**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 6-7
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 3-4
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Red HP-BL**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 5
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 1
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Red HP-3B**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 5
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 3-4
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Blue HP-R**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 5
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 2-3
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Olive HP-B**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 5
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 1-2
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Brown HP-5R**

- **Solubility at 25 °C in g/l**: 80
- **Light Fastness**: 4-5
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 4
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**BEZAKTIV Grey HP-N**

- **Solubility at 25 °C in g/l**: 100
- **Light Fastness**: 6
- **Washing Fastness at 60 °C**: 4-5
- **Washing Fastness at 95 °C**: 4-5
- **Water Fastness**: 5
- **Perspiration Fastness**: 5
- **Chlorine Washing Fastness**: 4-5
- **Chlorinated Water Fastness**: 2-3
- **Dischargeability**: +
- **Suitability for CPB**: +
- **Exhaustion Temp.**: 60 °C

**GOTS 3.0 Suitability**

Data about fastness properties:
The fastness properties indicated in this shade card were determined on 1/1 standard depth dyeings on bleached mercerised cotton.

- **Fastness to light**: DIN EN ISO 105-B02
- **Fastness to washing**: DIN EN ISO 105-C06/E01
- **Fastness to perspiration**: DIN EN ISO 105-C06/D01
- **Fastness to washing with hypochlorite**: DIN EN ISO 105-C06/C2S
- **Fastness to chlorinated water (swimming pool water)**: DIN EN ISO 105-C06/D3S

**Dischargeability**
- (+) suitable for white discharge
- (–) not dischargeable