Always a step ahead

High-performance coating solutions for unbeatable threading results
**High-performance, reliable and efficient threading tools with Oerlikon Balzers coating solutions**

Threading is one of the last manufacturing steps, meaning that high-quality tools to ensure efficient and reliable production processes are required. In addition to substrate material, geometry and design of the cutting edge, the coating plays a key role in tool performance.

Coatings influence wear resistance, torque development during threading and chip formation and evacuation. Optimised coatings reduce wear, decrease torque and enable smooth chip flow, significantly increasing tool reliability and service life.

**New manufacturing options with high process reliability**

<table>
<thead>
<tr>
<th>Demands in threading</th>
<th>Coating solutions from Oerlikon Balzers</th>
</tr>
</thead>
<tbody>
<tr>
<td>High stability and reliability of the manufacturing process</td>
<td>Revolutionary smooth and defect-free coatings with outstanding adhesion, no post-treatment needed</td>
</tr>
<tr>
<td>Universal tool coatings for a wide range of high-performance applications</td>
<td>Well established solutions like BALINIT® B and A ensure a high level of performance. The latest Oerlikon Balzers technology enables coating design beyond TiN and TiCN, boosting tool performance in a broad range of threading applications</td>
</tr>
<tr>
<td>Significantly reduced torque during threading for exceptional tool performance</td>
<td>Coating specifically designed to prevent welding between tool surface and workpiece, defect-free coating enables smooth chip flow</td>
</tr>
<tr>
<td>Resistance to abrasive wear</td>
<td>Oerlikon Balzers coating solutions, especially the AlCrN-based layers, provide a very high level of protection against abrasive wear, boosting performance for threading tools</td>
</tr>
<tr>
<td>High cutting edge precision</td>
<td>Innovative coating technology enables homogeneous coatings on the cutting edge</td>
</tr>
</tbody>
</table>
We used all our experience and expertise to develop BALIQ® AUROS, a brand new coating solution for threading applications. Made from pioneering S3p technology, it combines an extremely wear-resistant AlCrN-based layer with a top layer to reduce welding between the tool and the workpiece, which minimises and stabilises torque during threading. Customised coating properties together with a defect-free coating surface allow high-level performance and provide process stability for tapping tools.

**BALIQ AUROS**

**Tapping of low alloyed steel**

<table>
<thead>
<tr>
<th>Tool</th>
<th>PM-HSS tap M15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>Steel 1.7225, 42CrMo4 (AISI4140, SCM440) 1000 N/mm²</td>
</tr>
<tr>
<td>Cutting parameters</td>
<td>( v_c = 20 \text{ m/min} ) Thread depth: 40 mm Blind hole Emulsion</td>
</tr>
<tr>
<td>Source</td>
<td>Tool manufacturer</td>
</tr>
</tbody>
</table>

**BALIQ AUROS**

**Tapping of carbon steel**

<table>
<thead>
<tr>
<th>Tool</th>
<th>PM-HSS tap M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>Steel 1.1141, Ck15 (AISI 1015, JIS S15C) 120 - 140 HB</td>
</tr>
<tr>
<td>Cutting parameters</td>
<td>( v_c = 30 \text{ m/min} ) Thread depth: 10 mm Blind hole Emulsion</td>
</tr>
<tr>
<td>Source</td>
<td>Tool manufacturer</td>
</tr>
</tbody>
</table>

**Coming soon:**

**BALIQ® ANTOS**

for difficult applications such as machining workpiece materials that form long chips.

This coating solution is designed to allow formation of short chips and eliminate chip winding on the tool, increasing the reliability of the machining process and the performance of the tools.
Our coating solutions for reliable threading applications

### THREADING

<table>
<thead>
<tr>
<th>Material</th>
<th>Taps</th>
<th>Thread formers</th>
<th>Thread mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unalloyed steel</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Steel &lt; 1000 N/mm²</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Steel 45 - 56 HRC</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Steel 56 - 72 HRC</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Cast iron (GG, GGG)</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>ALC / AP</td>
</tr>
<tr>
<td>Wrought Al / Cast Al (6 - 12% Si)</td>
<td>HC / B</td>
<td>HC / A</td>
<td>HC / B</td>
</tr>
<tr>
<td>AI alloys &gt; 12% Si</td>
<td>HC / DIA N</td>
<td>HC / DIA N</td>
<td>HC / DIA N</td>
</tr>
<tr>
<td>Nickel alloys</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>TIS / LM</td>
</tr>
<tr>
<td>Titanium, titanium alloys</td>
<td>AUR / ALC / B</td>
<td>AUR / ALC / A</td>
<td>TIS / LM</td>
</tr>
<tr>
<td>Brass, copper, bronze</td>
<td>HC</td>
<td>HC</td>
<td>HC / B</td>
</tr>
</tbody>
</table>

A = BALINIT® A  
B = BALINIT® B  
AP = BALINIT® ALCRONA PRO  
HC = BALINIT® HARD CARBON  
LM = BALINIT® LATUMA  
TF = BALINIT® TISAFLEX  
ALC = BALIQ® ALCRONOS  
TIS = BALIQ® TISINOS  
AUR = BALIQ® AUROS  
DIA N = BALINIT® DIAMOND NANO

### Coating properties at a glance

<table>
<thead>
<tr>
<th>BALINIT®</th>
<th>Coating material</th>
<th>Coating hardness ( H_n ) (GPa)</th>
<th>Compressive stress ( \varepsilon ) (GPa)</th>
<th>Max. service temperature ( \theta ) (°C)</th>
<th>Coating temperature ( \theta_c ) (°C)</th>
<th>Coating colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TiN</td>
<td>30 +/-3</td>
<td>-2 +/-1</td>
<td>600</td>
<td>&lt; 500</td>
<td>golden yellow</td>
</tr>
<tr>
<td></td>
<td>ALCrN-based</td>
<td>36 +/-3</td>
<td>-3 +/-1</td>
<td>1,100</td>
<td>&lt; 500</td>
<td>light grey</td>
</tr>
<tr>
<td>B</td>
<td>TiCN</td>
<td>37 +/-3</td>
<td>-3 +/-1</td>
<td>400</td>
<td>&lt; 500</td>
<td>blue grey</td>
</tr>
<tr>
<td></td>
<td>C (sp³) nano-crystalline</td>
<td>80 - 100</td>
<td>–</td>
<td>600</td>
<td>&lt; 900</td>
<td>grey</td>
</tr>
<tr>
<td></td>
<td>ta-C</td>
<td>50 - 60</td>
<td>–</td>
<td>500</td>
<td>&lt; 150</td>
<td>black rainbow</td>
</tr>
<tr>
<td>LATUMA</td>
<td>AITIN-based</td>
<td>35 +/-3</td>
<td>-3 +/-1</td>
<td>1,000</td>
<td>&lt; 500</td>
<td>grey</td>
</tr>
<tr>
<td>TISAFLEX</td>
<td>AITIN/TiSiXN</td>
<td>38 +/-5</td>
<td>-5 +/-1</td>
<td>1,100</td>
<td>&lt; 600</td>
<td>bronze</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BALIQ®</th>
<th>Coating material</th>
<th>Coating hardness ( H_n ) (GPa)</th>
<th>Compressive stress ( \varepsilon ) (GPa)</th>
<th>Max. service temperature ( \theta ) (°C)</th>
<th>Coating temperature ( \theta_c ) (°C)</th>
<th>Coating colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALCRONOS</td>
<td>ALCrN-based</td>
<td>37 +/-3</td>
<td>-3.5 +/-1</td>
<td>1,100</td>
<td>&lt; 500</td>
<td>bright grey</td>
</tr>
<tr>
<td>AUROS</td>
<td>ALCrTiN-based</td>
<td>30 +/-3</td>
<td>-2.5 +/-1</td>
<td>600</td>
<td>&lt; 500</td>
<td>rose gold</td>
</tr>
<tr>
<td>TISINOS</td>
<td>AITiSiN-based</td>
<td>38 +/-5</td>
<td>-3.1 +/-1</td>
<td>1,000</td>
<td>&lt; 500</td>
<td>bronze</td>
</tr>
</tbody>
</table>

All given data are approximate values and depend on application, environment and test conditions.
Excellent threading results

Process reliability in thread forming
Application: Stainless steel

**Tool**
PM-HSS thread former M3

**Workpiece**
Steel 1.4571, X6CrNiMoTi1712 (AISI 316Ti, SUS 316 Ti)

**Cutting parameters**
- $v_c = 12 \text{ m/min}$
- Thread depth: 7.5 mm
- Blind hole
- Emulsion 6%

**Source**
Oerlikon Balzers and University of Hamburg

Process reliability in thread forming
Application: Steel

**Tool**
PM-HSS thread former M10

**Workpiece**
Steel 1.7225 (AISI4140, SCM440) 1000 N/mm²

**Cutting parameters**
- $v_c = 17.5 \text{ m/min}$
- Thread depth: 20 mm
- Blind hole
- Emulsion

**Source**
Oerlikon Balzers Cutting Laboratory

**BALIQ ALCRONOS shows a low, uniform torque level**

Tool life [number of threads]

<table>
<thead>
<tr>
<th>Tool</th>
<th>BALIQ ALCRONOS</th>
<th>BALINIT A® (Iontron)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>200</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>300</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
<td>2,500</td>
</tr>
</tbody>
</table>

**Tool**
PM-HSS thread former M3

**Workpiece**
Steel 1.4571, X6CrNiMoTi1712 (AISI 316Ti, SUS 316 Ti)

**Cutting parameters**
- $v_c = 12 \text{ m/min}$
- Thread depth: 7.5 mm
- Blind hole
- Emulsion 6%

**Source**
Oerlikon Balzers and University of Hamburg

**BALIQ ALCRONOS** – steel tapping at moderate cutting conditions

Tool life [parts]

<table>
<thead>
<tr>
<th>Tool</th>
<th>Uncoated</th>
<th>BALINIT A® (Iontron)</th>
<th>BALIQ ALCRONOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
<td>400</td>
<td>800</td>
</tr>
<tr>
<td>400</td>
<td>600</td>
<td>1,000</td>
<td>1,200</td>
</tr>
<tr>
<td>1,000</td>
<td>1,200</td>
<td>1,200</td>
<td>1,200</td>
</tr>
</tbody>
</table>

**Tool**
HSS Taps M12 x 1.25 Spiral Flute

**Workpiece**
Steel 1.1141, Ck15 (AISI 1015, JIS S15C) 120 - 140 HB

**Cutting parameters**
- Spindle speed: 600 rpm
- Criteria for end of tool life: Thread quality

**Source**
Automotive industry end user
Coming soon: BALIQ® ANTOS® for difficult applications such as machining workpiece materials that form long chips. This coating solution is designed to allow formation of short chips and eliminate chip winding on the tool, increasing the reliability of the machining process and the performance of the tools.

Close to our customers – worldwide

**Americas**
around 25 customer centres in the

- Argentina
- Brazil
- Canada
- Mexico
- USA

**Europe**
around 50 customer centres in

- Austria
- Belgium
- Czech Republic
- Finland
- France
- Germany
- Hungary
- Italy
- Liechtenstein
- Luxembourg
- Netherlands
- Poland
- Portugal
- Romania
- Russia
- Slovakia
- Spain
- Sweden
- Switzerland
- Turkey
- United Kingdom

**Asia**
more than 35 customer centres in

- China
- India
- Indonesia
- Japan
- Malaysia
- Philippines
- Singapore
- South Korea
- Thailand
- Vietnam

Contact us now!

**Balzers Headquarters**
Oerlikon Balzers Coating AG
Balzers Technology and Service Centre
Iramali 18
LI-9496 Balzers
Liechtenstein
T +423 388 7500

www.oerlikon.com/balzers