Perfect cutting edge protection for ultimate performance
Tailored coatings for demanding machining with inserts
High performance Oerlikon Balzers coating solutions for continuous and discontinuous chip formation with inserts

Inserts that are used for turning and milling applications need to withstand highest temperatures and variations in thermal stress. The Oerlikon Balzers coating solutions for turning, parting, grooving, threading and milling insert tools guarantee the utmost in thermal stability.

Depending on the machining process, work piece material and tool geometry we offer tailored coating solutions from our BALINIT®, BALIQ® and BALDIA® coating families for the highest performance in machining with inserts.

New manufacturing options with high process reliability

<table>
<thead>
<tr>
<th>Demands for machining with indexable inserts</th>
<th>Coating solutions from Oerlikon Balzers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior performance and a reliable machining process for a wide range of materials</td>
<td>The BALINIT®, BALIQ® and BALDIA® coatings offer the right solution for continuous and interrupted cuts with inserts</td>
</tr>
<tr>
<td>High wear resistance for noticeable cost and time savings, even at high service temperatures</td>
<td>The tool shows very high thermal stability, giving it a long service life with noticeably fewer number of tool changes</td>
</tr>
<tr>
<td>Reliable performance for difficult-to-cut materials and expensive workpieces</td>
<td>With BALINIT®, BALIQ® and BALDIA® we offer dedicated coatings for machining stainless steel, titanium and nickel based alloys as well as non-ferrous materials</td>
</tr>
<tr>
<td>Universal coatings for an extensive range of high-performance applications using indexable inserts</td>
<td>The AlTiN based coating BALINIT® LATUMA as allrounder for turning and milling applications with worldwide availability</td>
</tr>
<tr>
<td>Very homogenous coating thickness distribution over the cutting edge enables coating of even the sharpest cutting edges</td>
<td>Innovative S3p coating technology enables homogeneous coatings for sharp cutting edges</td>
</tr>
</tbody>
</table>
# Oerlikon Balzers coating solutions for insert applications

<table>
<thead>
<tr>
<th>Material</th>
<th>Turning with inserts</th>
<th>Milling with inserts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unalloyed steel</td>
<td>LM / ALT</td>
<td>LM / AP</td>
</tr>
<tr>
<td>Steel &lt; 1,000 N/mm²</td>
<td>LM / ALT</td>
<td>LM / AP</td>
</tr>
<tr>
<td>Steel &gt; 1,000 N/mm²</td>
<td>LM / ALT</td>
<td>LM / AN</td>
</tr>
<tr>
<td>Steel 45 – 56 HRC</td>
<td>LM / ALT</td>
<td>LM / AN</td>
</tr>
<tr>
<td>Steel 56 – 72 HRC</td>
<td>ALT / LM</td>
<td>ALT / LM</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>LM / ALT</td>
<td>LM / AN / ALT</td>
</tr>
<tr>
<td>Cast iron (GG, GGG)</td>
<td>LM / ALT</td>
<td>LM</td>
</tr>
<tr>
<td>Wrought Al / Al alloys &lt; 12% Si</td>
<td>MY / HC</td>
<td>MY / HC</td>
</tr>
<tr>
<td>Al alloys &gt; 12% Si</td>
<td>DIA CS DC / DIA N / MY</td>
<td>DIA CS DC / DIA N / MY</td>
</tr>
<tr>
<td>Nickel alloys</td>
<td>LM</td>
<td>LM / AN</td>
</tr>
<tr>
<td>Titanium, titanium alloys</td>
<td>LM</td>
<td>TIS / AN / LM</td>
</tr>
<tr>
<td>Brass, copper, bronze</td>
<td>MY / HC</td>
<td>MY / HC</td>
</tr>
<tr>
<td>Graphite</td>
<td>DIA CT / DIA CT CD</td>
<td>DIA CT / DIA CT DC</td>
</tr>
<tr>
<td>CFRP / GFRP / Sandwich materials / Stacks</td>
<td>DIA CS DC / DIA N</td>
<td>DIA CS DC / DIA N</td>
</tr>
<tr>
<td>Organic fibres (e.g. wood, paper)</td>
<td>MY / HC</td>
<td>MY / HC</td>
</tr>
</tbody>
</table>

## Coating properties at a glance

### BALINIT®

#### ALCRONA PRO
- Coating material: AlCrN-based
- Coating hardness: H<sub>c</sub> = 36 +/-3 [GPa]
- Compressive stress: σ<sub>c</sub> = -3 +/-1 [GPa]
- Max. service temperature: T<sub>max</sub> = 1,100 [°C]
- Coating temperature: T<sub>coat</sub> = < 500 [°C]
- Coating colour: light grey

#### ALNOVA
- Coating material: AlCrN-based
- Coating hardness: H<sub>c</sub> = 38 +/-3 [GPa]
- Compressive stress: σ<sub>c</sub> = -3 +/-1 [GPa]
- Max. service temperature: T<sub>max</sub> = 1,100 [°C]
- Coating temperature: T<sub>coat</sub> = < 500 [°C]
- Coating colour: light grey

#### HARD CARBON
- Coating material: ta-C
- Coating hardness: H<sub>c</sub> = 50 – 60 [GPa]
- Compressive stress: σ<sub>c</sub> = – [GPa]
- Max. service temperature: T<sub>max</sub> = 500 [°C]
- Coating temperature: T<sub>coat</sub> = < 150 [°C]
- Coating colour: black rainbow

#### LATUMA
- Coating material: AlTiN-based
- Coating hardness: H<sub>c</sub> = 35 +/-3 [GPa]
- Compressive stress: σ<sub>c</sub> = -3 +/-1 [GPa]
- Max. service temperature: T<sub>max</sub> = 1,000 [°C]
- Coating temperature: T<sub>coat</sub> = < 500 [°C]
- Coating colour: grey

#### MAYURA
- Coating material: ta-C
- Coating hardness: H<sub>c</sub> = > 65 [GPa]
- Compressive stress: σ<sub>c</sub> = – [GPa]
- Max. service temperature: T<sub>max</sub> = > 500 [°C]
- Coating temperature: T<sub>coat</sub> = < 150 [°C]
- Coating colour: rainbow / rainbow black

### BALIQ®

#### ALTINOS
- Coating material: AlTiN-based
- Coating hardness: H<sub>c</sub> = 36 +/-3 [GPa]
- Compressive stress: σ<sub>c</sub> = -3.3 +/-1 [GPa]
- Max. service temperature: T<sub>max</sub> = 1,000 [°C]
- Coating temperature: T<sub>coat</sub> = < 500 [°C]
- Coating colour: anthracite

#### TISINOS
- Coating material: AlTiSiN-based
- Coating hardness: H<sub>c</sub> = 38 +/-5 [GPa]
- Compressive stress: σ<sub>c</sub> = -3.1 +/-1 [GPa]
- Max. service temperature: T<sub>max</sub> = 1,000 [°C]
- Coating temperature: T<sub>coat</sub> = < 500 [°C]
- Coating colour: bronze

### BALDIA®

#### COMPACT
- Coating material: C-based (sp3)
- Coating hardness: H<sub>c</sub> = 80 – 100 [GPa]
- Compressive stress: σ<sub>c</sub> = – [GPa]
- Max. service temperature: T<sub>max</sub> = 600 [°C]
- Coating temperature: T<sub>coat</sub> = < 900 [°C]
- Coating colour: grey

### NANO

### COMPOSITE DC

All given data are approximate values and depend on application, environment and test conditions.
Oerlikon Balzers’ S3p (Scalable Pulsed Power Plasma)-based BALIQ® coatings offer manifold advantages that make them perfectly suitable for demanding insert applications.

The BALIQ® coatings have a low propensity to stick and are very wear-resistant, even at high operating temperatures. The result: Very high tool thermal stability combined with long service lifetime and thus fewer tool changes. Outstanding surface and cutting edge quality bring significant performance advantages, especially with the very thinnest chips.

One of the unmatched qualities of the BALIQ® coatings are the precise coating thickness, protecting all shapes and cutting edges homogeneously. With these, BALIQ® offers exceptional wear resistance and oxidation resistance, even at extreme temperatures. BALIQ® enables long tool life at toughest conditions. Through the extremely smooth surface, polishing is no longer required, reaching further cost reduction possibilities.
Convincing results with Oerlikon Balzers coatings

**BALINIT LATUMA – hard machining with inserts**

- **Tool**: Ballnose insert
- **Workpiece**: Steel 1.2344, X40CrMoV5-1, 52 HRC
- **Cutting parameters**
  - $v_c = 200$ m/min
  - $f = 0.05$ mm
  - $a_e = 0.5$ mm
- **Source**: Axle manufacturer

**Tool life [parts]**

<table>
<thead>
<tr>
<th>Parts</th>
<th>TiAlN benchmark</th>
<th><strong>+ 80%</strong></th>
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</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>50</td>
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</tr>
<tr>
<td>100</td>
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<td>200</td>
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<tr>
<td>250</td>
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</table>

**BALINIT LATUMA – inserts application for crank shaft milling**

- **Tool**: Carbide insert (milling)
- **Workpiece**: GGG80 EN-GJS-800-2
- **Cutting parameters**
  - $v_c = 180$ m/min
  - $f = 0.2 – 0.3$ mm
- **Source**: Automotive end customer

**Tool life [parts]**

<table>
<thead>
<tr>
<th>Parts</th>
<th>TiAlN benchmark</th>
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<td>0</td>
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<td>200</td>
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<tr>
<td>250</td>
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</tbody>
</table>

**BALIQ ALTINOS – turning hardened steel with CBN inserts**

- **Tool**: PCBN insert (CNMA 120408)
- **Workpiece**: Steel 1.7262, 15CrMo5 (SCM 415) 60–63 HRC
- **Cutting parameters**
  - $v_c = 220$ m/min
  - $f = 0.15$ mm
  - $a_e = 0.10$ mm
  - *wet*
- **Source**: Tool manufacturer

**Tool life [minutes]**

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Cutting tool manufacturer</th>
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<tbody>
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</tr>
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<tr>
<td>14</td>
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</tr>
</tbody>
</table>

**BALIQ ALTINOS – steel grooving**

- **Tool**: Carbide insert (grooving)
- **Workpiece**: Steel 1.7225, 42CrMo4 (AISI 1040, SCM 440)
- **Cutting parameters**
  - $v_c = 220$ m/min
  - $a_e = 2$ mm
  - $a_p = 4$ mm
  - *wet*
- **Source**: Oerlikon Balzers cutting laboratory

**Tool life [number of cuts]**

<table>
<thead>
<tr>
<th>Number of cuts</th>
<th>Competitor</th>
<th><strong>+ 270%</strong></th>
<th>BALINIT LATUMA</th>
<th>BALIQ ALTINOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
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<td>500</td>
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<td>1.000</td>
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<td>3.000</td>
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