With BALINIT, efficiency and productivity are in top form.

BALINIT在顶级成型中实现高效、高产

Optimal wear protection solutions for your punching and forming tools.

冲压和成型模具的最佳耐磨解决方案
Upgrade your tools to a new quality level.
With BALINIT.

通过使用BALINIT，您的模具将会提升到一个全新的质量水平

In production, stamping and forming tools are exposed to extreme forces and, consequently, subject to wear. You can minimise the wear of your tools, however, with BALINIT® hard coatings by Oerlikon Balzers. As a global technology leader in PVD coatings, we can offer you significant advantages with our BALINIT® coating solutions that will boost the efficiency, cost-effectiveness, and ecological soundness of your applications.

在生产过程中，冲压和成型模具暴露于极端的压力下，因此难免磨损。但是，通过使用欧瑞康巴尔查斯的BALINIT®硬膜涂层可以最大程度地减少模具磨损。作为PVD涂层全球科技领导者，我们可以通过BALINIT®涂层解决方案给您带来绝对性的竞争优势，它不仅可以提高您应用的效率，增加成本效益同时还可以维护生态平衡。

<table>
<thead>
<tr>
<th>Extreme coating hardness</th>
<th>Protection against abrasive wear</th>
<th>No dimensional changes of functional surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>涂层硬度极高</td>
<td>抗磨损保护</td>
<td>功能表面无任何尺寸变化</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low coefficient of friction, high thermal stability</th>
<th>High wear resistance, very good sliding properties</th>
<th>Improved surface and cut quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>低摩擦系数，高热稳定性</td>
<td>高耐磨性，优秀的滑动性能</td>
<td>提高表面和剪切质量</td>
</tr>
<tr>
<td>Prevention of adhesive wear</td>
<td>Improved forming</td>
<td>No micro-welding, scoring, and rough sheared edges</td>
</tr>
<tr>
<td>防粘着磨损</td>
<td>改善成形</td>
<td>无微焊，刮伤和粗糙的剪切边缘</td>
</tr>
<tr>
<td>No cold welding</td>
<td>Greater dimensional accuracy across longer runs</td>
<td>Better dimensional stability despite tighter manufacturing tolerances</td>
</tr>
<tr>
<td>无冷焊</td>
<td>仍能保持尺寸精度在长时间的运行中</td>
<td>更小的公差范围内确保更好的尺寸稳定性</td>
</tr>
<tr>
<td>No heat checking</td>
<td>Fewer drawing passes</td>
<td></td>
</tr>
<tr>
<td>无热裂纹</td>
<td>增加拉伸阶段</td>
<td></td>
</tr>
<tr>
<td>Reduced lubricant consumption</td>
<td>Reduced production costs due to less machine downtime and higher cycle frequencies</td>
<td>Perceptibly less after-machining due to higher workpiece quality</td>
</tr>
<tr>
<td>减少了润滑剂的消耗</td>
<td>减少停机时间，提高周期频率，从而降低生产成本</td>
<td>更好的工件表面质量，显著减少后续的加工</td>
</tr>
</tbody>
</table>

**BALINIT® for punching and forming: Greater productivity, efficiency, and process reliability with an optimised ecobalance**

经BALINIT®涂层的冲压和成型模具：提升生产力、提高效率和确保工艺稳定性
Rely on outstanding performance.

BALINIT® ALCRONA PRO: Extrusion of screw heads

Tool:
Extrusion punch (HSS Ø 10mm)

Workpiece:
Screw heads, steel 1.5526 (30MnB4)

Challenge:
BALINIT® B / Untreated:
Cold welding, heat checking, and thus shorter tool life

Solution:
BALINIT® ALCRONA PRO
- Tool life doubled
- Reduced unit costs

BALINIT® ALCRONA PRO: Fine blanking of safety parts

Tool:
Punch and die

Workpiece:
Latch part for seat belts, Steel 1.7225 (42 CrMo4)

Challenge:
Uncoated: Microwelds, scoring, rough cut surfaces; requires much more frequent regrinding of the tool

Solution:
BALINIT® ALCRONA PRO
- More than 50-fold increase in tool life
- Perceptibly better surface and cut quality
- Clearly lower need for aftermachining

BALINIT® LUMENA DUXEL: Sheet metal forming of B-pillars

Tool:
Sheet metal forming die

Workpiece:
B-pillar, automobile chassis, 980 MPa, T=2mm

Challenge:
Untreated: extreme abrasive wear and surface pressure due to high material strength, especially at the drawing radius

Solution:
BALINIT® LUMENA
- 5-fold increase in parts production
- Increased wear resistance thanks to BALINIT® LUMENA
- Greater compressive strength due to DUPLEX treatment

Solution:
BALINIT® LUMENA DUXEL
- 5-fold increase in parts production
- Increased wear resistance thanks to BALINIT® LUMENA
- Greater compressive strength due to DUPLEX treatment
Coating properties at a glance.
涂层性能一览表

<table>
<thead>
<tr>
<th>Coating material 涂层材料</th>
<th>TiCN</th>
<th>TiAIN</th>
<th>TAI N + C/C</th>
<th>CrN</th>
<th>TiAIN</th>
<th>AlCrN</th>
<th>WC/C (a-C:H:W)</th>
<th>DLC (a-C:H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microhardness (HV 0.05) Vickers硬度</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000*</td>
<td>1,750</td>
<td>3,400</td>
<td>3,200</td>
<td>1,000 / 1,500</td>
<td>&gt; 2,500</td>
</tr>
<tr>
<td>Coefficient of friction against steel (dry) 对钢的摩擦系数（干）</td>
<td>0.3</td>
<td>0.30 - 0.35</td>
<td>0.15 - 0.20</td>
<td>0.35</td>
<td>0.30 - 0.35</td>
<td>0.35</td>
<td>0.1 - 0.2</td>
<td>0.1 - 0.2</td>
</tr>
<tr>
<td>Coating thickness per l/μm 涂层厚度</td>
<td>application-dependent 取决于具体应用</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual stress (GPa) 残余应力</td>
<td>-4.0</td>
<td>-1.3 / -1.5</td>
<td>-1.7 / -2.0</td>
<td>-1.5 / -2.0</td>
<td>-1.1</td>
<td>-3.0</td>
<td>-1.0</td>
<td></td>
</tr>
<tr>
<td>Max. service temperature (°C) 最高工作温度</td>
<td>400</td>
<td>900</td>
<td>800*</td>
<td>700</td>
<td>900</td>
<td>1,100</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>Coating temperature (°C) 涂层生成温度</td>
<td>450</td>
<td>200 - 450</td>
<td>450</td>
<td>200 - 450</td>
<td>450</td>
<td>&lt; 500</td>
<td>&lt; 250</td>
<td>160 - 260</td>
</tr>
<tr>
<td>Coating colour 涂层颜色</td>
<td>blue-grey 蓝灰色</td>
<td>violet-grey 紫灰色</td>
<td>dark grey 深灰色</td>
<td>silver-grey 银灰色</td>
<td>violet-grey 紫灰色</td>
<td>bright grey 亮灰色</td>
<td>anthracite 煤灰色</td>
<td>black 黑色</td>
</tr>
<tr>
<td>Coating structure 涂层结构</td>
<td>Multilayer, graded 多层结构</td>
<td>Nano-structured 纳米结构</td>
<td>Multilayer, lamellar 多层片状结构</td>
<td>Monolayer 单层</td>
<td>Nano-structured 纳米结构</td>
<td>Monolayer 单层</td>
<td>Lamellar 片状结构</td>
<td>Monolayer 单层</td>
</tr>
</tbody>
</table>

1) relative to TiAIN 相对于TiAIN

Application recommendations:
推荐应用:

<table>
<thead>
<tr>
<th>Punching 冲压</th>
<th>Forming 成型</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanking 下料</td>
<td>Fire blanking 火冲</td>
</tr>
<tr>
<td>Sheet metal 板金</td>
<td>Bulk forming 板块成型</td>
</tr>
<tr>
<td>Warm forming 热成型</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-alloyed steel 非合金钢</th>
<th>B, AP</th>
<th>B, AP</th>
<th>B, L</th>
<th>B, F, AP</th>
<th>L, AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel &lt; 500 N/mm² 钢&lt;500 N/mm²</td>
<td>B, AP</td>
<td>B, AP</td>
<td>B, L</td>
<td>L, AP Ad</td>
<td>L, AP Ad</td>
</tr>
<tr>
<td>Steel &gt; 500 N/mm² 钢&gt;500 N/mm²</td>
<td>F, AP</td>
<td>F, AP</td>
<td>F, AP</td>
<td>L, AP Ad</td>
<td>L, AP Du</td>
</tr>
<tr>
<td>Steel &gt; 1100 N/mm² 钢&gt;1100 N/mm²</td>
<td>F, AP</td>
<td>F, AP</td>
<td>F, AP</td>
<td>L, AP Du</td>
<td>L, AP Du</td>
</tr>
<tr>
<td>Stainless steel 不锈钢</td>
<td>HL, AP+C</td>
<td>HL, AP+C</td>
<td>HL, AP+C</td>
<td>HL, AP+C</td>
<td>L, AP Du</td>
</tr>
<tr>
<td>Titanium alloys 钛合金</td>
<td>F</td>
<td>F</td>
<td>L</td>
<td>F</td>
<td>L, AP</td>
</tr>
<tr>
<td>Aluminium alloys 铝合金</td>
<td>HL, T</td>
<td>HL, T</td>
<td>HL, AP+C</td>
<td>HL, AP+C</td>
<td>L, AP</td>
</tr>
<tr>
<td>Copper, brass, bronze 铜，黄铜，青铜</td>
<td>F, AP</td>
<td>F, AP</td>
<td>D, AP</td>
<td>D, AP</td>
<td>D, AP</td>
</tr>
<tr>
<td>Zined sheets 锌合金板</td>
<td>F, AP</td>
<td>F, AP</td>
<td>HL, AP+C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B = BALINIT® B  AP = BALINIT® ALCRONA PRO
D = BALINIT® D  HL = BALINIT® HARDLUBE
C = BALINIT® C  T = BALINIT® TRITON
F = BALINIT® FUTURA NANO  Ad = ADVANCED Series
L = BALINIT® LUMENA  Du = DUPLEX treatment
Save up to 86% of costs in production.
生产中节约86%成本

When forming stainless steel, untreated tools quickly approach their limits. The series production of heat shields, for instance, will stop at about 2000 produced parts due to cracks in the tool surface. However, with BALINIT®
当不锈钢成型时，未经处理的模具很快达到它们的极限。例如，对热屏蔽的系列生产，例如，将停止在大约2000个制造的部件，由于工具表面的裂缝。但是，使用BALINIT®

ALCRONA PRO and BALINIT® C, you can extend the life of the forming tool as much as tenfold, which saves up to 86% of costs.
ALCRONA PRO和BALINIT® C涂层后，模具寿命可以延长十倍，同时节省86%的成本。

### Production of Heat shields
防热罩生产

<table>
<thead>
<tr>
<th></th>
<th>Untreated</th>
<th>BALINIT® ALCRONA PRO</th>
<th>BALINIT® C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool costs (EUR)</td>
<td>10,000</td>
<td>11,080</td>
<td></td>
</tr>
<tr>
<td>Tool life (Number of formed parts)</td>
<td>2,000</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Tool cost per produced part (EUR)</td>
<td>5.00</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Production per minute (no. of parts per min.)</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Production costs per minute (EUR/min.)</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Production costs per part (EUR)</td>
<td>0.20</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Costs of machinery downtime</td>
<td>0.02</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Subsequent machining costs (EUR)</td>
<td>0.02</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Extra cost per part (EUR)</td>
<td>0.04</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Total production costs per part (EUR)</td>
<td>5.24</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

The bars merely illustrate the correlations among the individual cost factors and do not relate directly to the bottom-line sum.
以上数据只是反映了相关的单个成本因素，不能直接代表最终总成本。

86% cost savings 成本节省86%
Benefit from optimised wear-protection solutions for punching and forming tools.
Contact us now!

冲压和成型模具的最佳磨损保护解决方案。
即刻联系我们！

Headquarters 总部
Oerlikon Balzers Coating AG
Balzers Technology & Service Centre
Iramai 18
LI-9490 Balzers
T: +423 388 7500
www.oerlikon.com/balzers

Germany 德国
Oerlikon Balzers Coating
Germany GmbH
Am Ockenheimer Graben 41
D-55411 Bingen
T: +49 67 21 7 93-0
www.oerlikon.com/balzers/de

Austria 奥地利
Oerlikon Balzers Coating Austria GmbH
Burgwallweg 27
A-8025 Kapfenberg
T: +43 38 82 34144
www.oerlikon.com/balzers/at

Liechtenstein 列支敦士登
Oerlikon Balzers Coating AG
Bescichtungszentrum
Iramai 18
LI-9490 Balzers
T: +423 38 57 01
www.oerlikon.com/balzers/ch

Oerlikon Balzers Coating
Germany GmbH
Hohe Flum Strasse 22
D-79030 Schopfheim
T: +49 76 22 39 99-0
www.oerlikon.com/balzers/de

Switzerland 瑞士
Oerlikon Balzers Coating SA, Brugg
Eferstrasse 39
CH-2255 Brugg
T: +41 22 65 74 74
www.oerlikon.com/balzers/ch

For a complete list of our locations, visit:
全球详细地址请查询：
www.oerlikon.com/balzers/cn

Oerlikon Balzers Coating (Suzhou) Co., Ltd | No.9 Chang Yang Street | Suzhou Industrial Park 215024 | Jiangsu Province | P.R.China
T: +86 512 67620389 | F: +86 512 67620359 | E: info.balzers.cn@oerlikon.com | www.oerlikon.com/balzers/cn

欧瑞康巴尔zers涂层（苏州）有限公司 | 长阳街9号苏州工业园区 | 215024 | 江苏省 | 中国
电话: +86 512 67620389 | 传真: +86 512 67620359 | 邮箱: info.balzers.cn@oerlikon.com