COATING SELECTION GUIDE

voestalpine eifeler Coatings
www.eifeler.com/northamerica
# COATING SELECTION GUIDE

## PVD - voestalpine eifeler Coatings - Properties and Applications

<table>
<thead>
<tr>
<th>Coating Material</th>
<th>TiN</th>
<th>TiCN</th>
<th>ZrN</th>
<th>CrN</th>
<th>EXXTRAL® plus</th>
<th>EXXTRAL® blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium Nitride</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aluminum Titanium Nitride (with additives)</td>
<td>Aluminum Titanium Nitride (nanostructured)</td>
</tr>
<tr>
<td>TiN (ML)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AITiN (stacked)</td>
<td>AITiN (nanostructured)</td>
</tr>
<tr>
<td>Microhardness HV&lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>2300±300</td>
<td>3500±500</td>
<td>2800±300</td>
<td>2000±200</td>
<td>3300±300</td>
<td>3500±500</td>
</tr>
<tr>
<td>Friction Coefficient Against Steel (Dry)</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
<td>0.3 - 0.4</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Coating Thickness (&lt;sup&gt;1&lt;/sup&gt;) (µm)</td>
<td>2-4</td>
<td>2-4</td>
<td>1-4</td>
<td>1-6</td>
<td>2-5</td>
<td>2-5</td>
</tr>
<tr>
<td>Thermal Threshold</td>
<td>500°C / 900°F</td>
<td>400°C / 750°F</td>
<td>600°C / 1100°F</td>
<td>600°C / 1100°F</td>
<td>800°C / 1470°F</td>
<td>900°C / 1650°F</td>
</tr>
<tr>
<td>Color of the Coating</td>
<td>gold</td>
<td>blue gray</td>
<td>pale yellow</td>
<td>silver-gray</td>
<td>anthracite</td>
<td>blue-violet</td>
</tr>
</tbody>
</table>

### Key Characteristics
- **Coating Material**
  - TiN: standard, all-purpose coating
  - TiCN (ML): high hardness, excellent abrasive wear resistance, enhanced toughness
  - ZrN: decorative color, good wear and corrosion resistance
  - CrN: low stress / good adhesion, high toughness and corrosion resistance
  - EXXTRAL® plus: high hardness, very good oxidation resistance
  - EXXTRAL® blue: extreme wear resistance at high temperature, excellent oxidation resistance

### Key Applications
- **Coating Material**
  - TiN: Cutting, Punching/Forming, Medical
  - TiCN (ML): Cutting, Punching/Forming, Medical
  - ZrN: Cutting, Punching/Forming, Medical
  - CrN: Forming, Cutting
  - EXXTRAL® plus: Cutting
  - EXXTRAL® blue: Cutting

### Ultrafine Duplex Biocompatible
- TiN: ultrafine Available
- TiCN (ML): ultrafine Available
- ZrN: Biocompatible
- CrN: Duplex Available

### Primary Applications
- **Coating Material**
  - TiN: machining/cutting of iron based materials, metal forming, plastic molding
  - TiCN (ML): machining of difficult-to-machine alloy steels, high performance cutting where moderate temperatures are generated at the cutting edge, excellent for metal forming (stainless steel)
  - ZrN: cast aluminum and generally non-ferrous materials machining, machining of fiberglass, nylon and most polymer materials, forming and punching
  - CrN: metal forming, plastic molding
  - EXXTRAL® plus: machining of hardened steel work pieces, for use on round shank carbide tools, high speed operations, semi-dry or dry machining
  - EXXTRAL® blue: cutting abrasive or hard materials, machining of hardened steel (> 55 HRC), high performance machining, semi-dry or dry machining

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<sup>1</sup> depends on size of tools, for micro tools also smaller thicknesses necessary.

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Other application specific coatings available upon request. For further information and contact details please check our website: www.eifeler.com/northamerica

This information is based upon our present state of knowledge and is intended to provide general notes on products and their uses. It should not, therefore, be construed as a warranty of specific properties of the products described, or, as a warranty of suitability for a particular purpose. Rev.4 April 24/2019.
### ADDITIONAL COATING SERVICES

voestalpine eifeler Coatings can service all coating requirements from new tooling programs to the refurbishment and recoating of existing tools. Our capabilities include:

<table>
<thead>
<tr>
<th>CROSAL®-plus</th>
<th>SISTRAL®</th>
<th>TIGRAL®</th>
<th>VARIANTA®</th>
<th>VARIANTIC®</th>
<th>CARBON-X®</th>
<th>SUCASLIDE®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Chromium Nitride</td>
<td>AluminumTitanium Nitride (with additives)</td>
<td>AluminumChromium Titanium Nitride</td>
<td>Titanium Aluminum</td>
<td>Titanium Aluminum Carbo-Nitride</td>
<td>Chrome Base Carbon Coating /DLC</td>
<td>Chrome Base Carbon Coating /DLC</td>
</tr>
<tr>
<td>AICrN</td>
<td>AITiN (nanostructured)</td>
<td>AICrTiN</td>
<td>TiAIN (ML)</td>
<td>TiAINC (ML)</td>
<td>3200±300</td>
<td>3500±500</td>
</tr>
<tr>
<td>0.45</td>
<td>0.7</td>
<td>0.6</td>
<td>0.7</td>
<td>0.2</td>
<td>3300±300</td>
<td>3500±500</td>
</tr>
<tr>
<td>2-5</td>
<td>1-3</td>
<td>3-5</td>
<td>2-4</td>
<td>2-4</td>
<td>1100°C</td>
<td>900°C</td>
</tr>
<tr>
<td>slate-gray</td>
<td>anthracite</td>
<td>dark gray</td>
<td>anthracite</td>
<td>old rose</td>
<td>1922°F</td>
<td>1650°F</td>
</tr>
<tr>
<td>extreme hot hardness, high oxidation resistance and high adhesive strength</td>
<td>extreme wear resistance at high temperature, excellent oxidation resistance</td>
<td>high oxidation resistance, high protection against abrasive wear</td>
<td>high hardness, very good oxidation resistance</td>
<td>low friction, high oxidation resistance</td>
<td>highly wear resistance due to high hardness, very low friction, reduce sticking and top performance under tough conditions</td>
<td>good adhesive strength, very hard, sufficient coating thickness, low friction coefficient, biocompatible</td>
</tr>
<tr>
<td>Cutting</td>
<td>Cutting</td>
<td>Cutting Forming</td>
<td>Cutting Forming Medical</td>
<td>Cutting</td>
<td>Cutting</td>
<td>Tools, Components</td>
</tr>
<tr>
<td>Punching/Forming</td>
<td>Punching/Forming</td>
<td>Cutting Forming</td>
<td>Cutting Forming Medical</td>
<td>Cutting</td>
<td>Cutting</td>
<td>Plastic Injection Components</td>
</tr>
<tr>
<td>ultrafine Available</td>
<td>Duplex Available</td>
<td>Biocompatible</td>
<td>Duplex Available</td>
<td>Biocompatible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>» cutting: high performance cutting, hobbing, dry broaching</td>
<td>» forming/punching</td>
<td>» machining under dry conditions</td>
<td>» coating for a wide range of carbide, cermet and high speed steel tooling</td>
<td>» coating for a wide range of carbide, cermet and high speed steel tooling</td>
<td>» forming and fine blanking</td>
<td>» plastic molding with high abrasive plastics</td>
</tr>
<tr>
<td>» excellent choice for cutting under extreme conditions (hard, abrasive materials, high speed, dry cutting)</td>
<td>» hot forming sheet metals</td>
<td>» die casting</td>
<td>» machining of cast iron and nickel based high temperature alloys</td>
<td>» machining of all types of steel under dry as well as wet machining conditions</td>
<td>» injection molding tools and components</td>
<td>» metal forming</td>
</tr>
<tr>
<td>» high speed operations, semi-dry or dry machining</td>
<td>» die forming</td>
<td>» die casting</td>
<td>» drawing, stamping, punching, forming</td>
<td>» cutting of non-ferrous materials</td>
<td>» decorative applications</td>
<td>» orthopedic</td>
</tr>
<tr>
<td>» forming/cutting of ferrous materials</td>
<td>» piercing</td>
<td>» forming</td>
<td>» drilling</td>
<td>» food components</td>
<td>» cutting</td>
<td>» vacuum and cooling technology</td>
</tr>
</tbody>
</table>
Locations:

Canada - voestalpine eifeler Coatings
voestalpine High Performance Metals Ltd.
2645 Meadowvale Blvd.
Mississauga, ON L5N 7Y4
T. +1 (800) 665-8335
F. +1 (905) 812-9231
Email: sales.canada@voestalpine.com

USA

voestalpine eifeler Coatings - California
EDRO Engineering, Inc.
20492 Carrey Road
Walnut, CA 91789
T. +1 (909) 594-5751
Email: coatings@edro.com

voestalpine eifeler Coatings, Inc. - Illinois
3800 Commerce Drive
St. Charles, IL 60174
T. +1 (630) 587-1220
F. +1 (630) 587-1230
Email: sales.usa@eifeler.com

voestalpine eifeler Coatings, Inc. - Michigan
2222 Spikes Lane
Lansing, MI 48906
T. +1 (517) 708-7945
F. +1 (517) 913-6279

voestalpine eifeler Coatings, Inc. - Ohio
18687B Sheldon Road
Middleburg Heights, OH 44130
T. +1 (216) 658-3870
F. +1 (216) 658-3871

voestalpine eifeler Coatings, Inc. - Tennessee
3450 Old Tasso Road NE
Cleveland, TN 37312
T. +1 (423) 790-7382
F. +1 (423) 790-7386

Mexico - voestalpine eifeler Coatings
voestalpine High Performance Metals S.A. de C.V.
Cerrada de la Noria No. 200 Int. A-14
Parque Industrial Querétaro, C.P. 76220.
Querétaro, México
T. +52 (442) 349-7949
Email: ventas.mexico@voestalpine.com
Blvd. Milenium 5052
Parque Industrial Milenium Aeropuerto
Apodaca Nuevo Leon
66626 Monterey
T. +52 (818) 352-5239