

**MOELLER**  
PRECISION TOOL

**performance**  
ENHANCEMENT COATINGS

**WEAR-RESISTANT SURFACE TREATMENTS**



INNOVATIVE PRODUCTS • PROGRESSIVE SOLUTIONS

# *performance*

## ENHANCEMENT COATINGS

Wear resistant surface treatments offer great benefits to stamping tools when applied appropriately. While there are many good surface treatments and processes to choose from, Physical Vapor Deposition (PVD) coatings are ideally suited and typically the best option for use on precision slip and press fit punch components.

Selecting the right surface treatment and substrate tool steel combination is critical for achieving optimum tool life. PVD coatings provide excellent abrasion and galling resistance while maintaining the integrity of many substrate tool steels. These coatings work best when applied to high speed tool steels such as M2, PM M4, and T15. A few select cold work tool steel grades can also be PVD coated successfully as long as they maintain at least a 60 HRC when tempered at or above 1,000 degrees Fahrenheit.

It is important to note that the PVD process is a line of sight process, which may limit the ability to coat interior contours and features. For these applications, nitriding, which case hardens all exposed surfaces is recommended.

The adjacent chart contains our standard offering of coatings, and should serve as a guide for selecting the appropriate coating for your application. Please contact our factory for a detailed consultation. Additional coatings are available upon request.



# SPECIALTY COATINGS AND TREATMENTS



## TiN – Titanium Nitride

**Alteration Order Code: TIN** • Add 3 days to Delivery

TiN is the least expensive and most commonly used PVD, wear resistant, coating.

**Technical Information:**

Thickness 2-4 $\mu$   
Hardness 2300HV  
Coefficient of Friction ~0.6  
Max. Service Temp. 600°C/1112°F

- Improved wear resistance on cutting edges and wear surfaces
- Improved lubricity for a reduction of adhesive wear
- Suitable thermal stability for most cold work metalworking applications

*Note: TiN should be reserved for light stamping operations with use of stamping lubricants, and is not compatible for use with stainless steel, nickel, or copper applications.*

## TiCN – Titanium CarboNitride

**Alteration Order Code: TCN** • Add 4 days to Delivery

TiCN has a broad range of applications, including piercing and forming of carbon and stainless steels, nickel and copper.

**Technical Information:**

Thickness 2-4 $\mu$   
Hardness 3000HV  
Coefficient of Friction ~0.4  
Max. Service Temp. 400°C/752°F

- High wear resistance on cutting edges and wear surfaces
- Excellent toughness for high pressure applications
- Provides improved lubricity over TiN
- High micro hardness of 3000HV

*Note: TiCN is suitable for forming and piercing both ferritic and austenitic stainless steel, but will perform better when forming. TiCN is also suitable for nickel and copper applications.*



## TiAlN - Titanium Aluminum Nitride

**Alteration Order Code: TAN** • Add 3 days to Delivery

TiAlN provides excellent protection against wear on cutting edges in applications where surface heat is generated.

**Technical Information:**

Thickness 3-6 $\mu$   
Hardness 3400HV  
Coefficient of Friction 0.3-0.35  
Max. Service Temp. 900°C/1652°F

- Excellent protection against abrasive wear
- Can be used with minimum lubrication
- Ideal for high heat applications, and highly stressed components
- Excellent for medium strength steels
- Allows increased press stroke speed

## Alcrona EVO™ – Aluminum Chromium Nitride Titanium Based

**Alteration Order Code: ACE** • Add 5 days to Delivery

Oerlikon Balzers Alcrona EVO is the next evolution of their Alcrona series of PVD coatings, and is improved over the vastly popular Alcrona Pro. Alcrona EVO provides excellent all-around performance, thermal stability, and low coefficient of friction, for the most piercing and forming applications, including high-strength steels.

**Technical Information:**

Thickness 2-5 $\mu$   
Hardness 3200HV  
Coefficient of Friction ~0.35  
Max. Service Temp. 1,100°C/2012°F

- Recommended for piercing and forming high-strength steels
- Excellent for hot stamping applications and applications which introduce thermal shock
- Exceptionally low coefficient of friction
- Extraordinarily high wear resistance and thermal stability
- Excellent for applications with high mechanical loads
- Allows increased press stroke speeds



Product availability may vary by region



### Oerlikon Balzers Alcrona EVO Advanced

**Alteration Code: ACA** • Add 10 days to Delivery

Oerlikon Balzers Alcrona EVO Advanced combines the benefits of Alcrona EVO with “Advanced” thin-layer nitride technology to provide increased tool life over Alcrona EVO for tough piercing applications.

*Technical Information:*

- Thickness 2-5 $\mu$
- Nitride Case Depth Approx. 30 $\mu$
- Hardness 3200HV
- Coefficient of Friction ~0.35
- Max. Service Temp. 1,100°C/2012°F

- Thin nitride layer provides excellent toughness for piercing application
- Exceptionally low coefficient of friction
- Extraordinarily high toughness, wear resistance, and thermal stability

### Oerlikon Balzers Alcrona EVO Duplex

**Alteration Code: ACD** • Add 5 days to Delivery

Oerlikon Balzers Alcrona EVO Duplex combines the benefits of Alcrona EVO with “Duplex” deep-layer nitride technology to provide increased tool life over Alcrona EVO for tough forming applications.

*Technical Information:*

- Thickness 2-5 $\mu$
- Nitride Case Depth Approx. 200 $\mu$
- Hardness 3200HV
- Coefficient of Friction ~0.35
- Max. Service Temp. 1,100°C/2012°F

- Deep nitride layer provides excellent toughness for forming application
- Exceptionally low coefficient of friction
- Extraordinarily high wear resistance and thermal stability



### Oerlikon Balzers Alcronos (Aluminum Chromium Nitride based)

**Alteration Code: ACO** • Add 5 days to Delivery

Oerlikon Balzers Alcronos is the ultimate solution for stamping high performance alloys, such as stainless steel, titanium, Inconel, CuNiSi, and more. Alcronos offers exceptional resistance to abrasion, and the ability to maintain extremely tight tolerances, which equates to high productivity gains, and consistent part quality.

*Technical Information:*

- Thickness 2-4 $\mu$
- Hardness 3800HV
- Coefficient of Friction ~0.35
- Max. Service Temp. 1,100°C/2012°F

- Superbly smooth coating with outstanding adhesion
- High precision coating thickness with excellent cutting edge stability
- High coating hardness and wear resistance

### CrN – Chromium Nitride

**Alteration Code: CRN** • Add 5 days to Delivery

Chromium Nitride is an excellent substitute for applications where hard chrome is preferred, but is significantly harder, has better coating adhesion. Chromium Nitride is foodstuff-neutral.

*Technical Information:*

- Thickness 2-5 $\mu$
- Hardness 2000HV
- Coefficient of Friction ~0.5
- Max. Service Temp. 700°C/1292°F

- Superior substitute to hard chrome
- Very high coating adhesion and hardness
- Excellent for forming low strength steels and copper
- Resistant to corrosion and aggressive chemicals



Product availability may vary by region

# COATINGS FOR ALUMINUM APPLICATIONS

## Oerlikon Balzers Mayura (ta-C based)

**Alteration Code: MAY** • Add 5 days to Delivery

Oerlikon Balzers Mayura's brilliant rainbow color reveals its true value in the demanding stamping of aluminum, and other non-ferrous materials, such as copper, plastics, etc. Mayura is harder and smoother than other DLC coatings, including Hard Carbon, which minimizes material adhesion, and it is extremely thin, which keeps cutting edges sharp.

*Technical Information:*

Thickness 0.3 $\mu$

Hardness >6600HV

Coefficient of Friction <0.10

Max. Service Temp. 500°C/932°F

- The ultimate solution for piercing and forming aluminum, and other non-ferrous materials
- Extreme protection against abrasive wear and galling
- Smooth coating surface provides a low coefficient of friction
- Retains sharp cutting edges
- High thermal stability



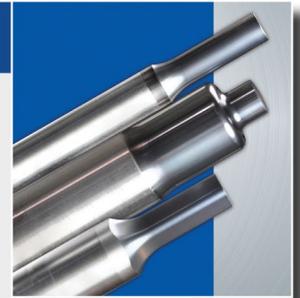
## MOELLER EXCLUSIVE MULTI-PART SURFACE TREATMENTS

### M-WEAR ULTRA

**Alteration Code: MWU** • Add 7 days to Delivery

Moeller exclusive tooling solution combines multi-part surface treatments and advanced coating technology to meet the demands of today's toughest piercing and forming applications.

- Tailored to both piercing and forming applications
- High wear resistance for increased tool life
- Resists fatigue due to increased toughness
- Superior finish reduces the coefficient of friction
- Proven to increase tool life up to five times in high strength and stainless applications



### MSP – Moeller Special Process with TiCN

**Alteration Code: MSP** • Add 5 days to Delivery

Moeller Special Process (MSP) offers the ultimate in cutting edge longevity and resistance to galling, while providing the benefits of TiCN coating

- Superior Surface finish provides increased lubricity and resistance to galling
- Treatment to cutting edge increases cutting edge longevity



Product availability may vary by region

# S U R F A C E F I N I S H U P G R A D E S

## Enhanced Surface Finish

### **Alteration Code: ESF** • *Add 2 days to Delivery*

Available as a stand alone alteration, or in combination with any of our performance enhancement coatings, Moeller's team of polishing experts will improve the working surfaces of punch points and extrusion buttons to 6 Ra or better, which reduces galling by improving the coefficient of friction.

## M-Lap

### **Alteration Code: LAP** • *Add 1 day to Delivery*

Moeller M-Lap uses a unique media that includes diamond particles to polish even the most irregular surfaces and hard to reach areas.

- Enhances durability of pierce and forming tools
- Uniform surface finishing without misshaping, or marring
- Provides improved finish and increased adhesion for PVD/CVD coatings
- Virtually no material is removed allowing tight tolerance to be held consistently

# S U B S T R A T E A N D E D G E E N H A N C E M E N T S

## MTN – M-Tride – Nitride

### **Alteration Code: MTN** • *Add 5 days to Delivery*

M-Tride is a case hardening surface treatment that is applied to all outer surfaces of the tool.

- Provides a tough outer layer
- Increases surface hardness by approximately 10 points HRC
- Ideal for die buttons with internal features that are difficult to coat using the PVD line of sight process

## Edge Break

### **Alteration Code: EDG** • *Add 1 day to Delivery*

Adds a small edge break to the cutting edge of pierce tools to prevent premature breakdown

## Cryogenic Deep Freeze

### **Alteration Code: CDF** • *Add 2 days to Delivery*

This process is an effective way to achieve optimum toughness and dimensional stability, even when exposed to up to fifty degrees Fahrenheit above the steels original tempering temperature

Product availability may vary by region

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## FORMING & EXTRUDING

## PIERCING & TRIMMING

	Draw/Flange	Extruding	Forging	Hot Forming	Coin/Emboss	Pierce & Trim	Hot Stamping	Fine Blanking	Shave/Lance
<b>Non-alloyed Steel</b>	TAN	TAN MWU* ACD	TAN MWU* ACD	TAN MWU* ACD	TCN TAN MTN	TAN ACE	ACE TAN TCN	TCN ACE ACA	TCN ACE
<b>Steel &lt; 250 Mpa</b>	TIN TCN	ACE MWU* ACD MTN			TCN MTN	TIN TCN		TCN ACE	TIN TCN ACE
<b>Steel &lt; 400 Mpa</b>	TCN ACE	ACE MWU*			TCN ACE	ACE MWU* ACA		TAN ACE	TAN TCN ACE
<b>High Strength Steels</b>	ACE TCN	ACE TCN TAN		ACE MWU* ACD	TCN ACE MWU*	ACE MWU* ACA	ACE TCN MWU* ACA	TAN ACE	TAN ACE
<b>Aluminum **</b>	MAY	MAY	MAY		MAY TCN	MAY		MAY	MAY
<b>Stainless Steels</b>	TCN ACE MWU* ACD	TCN ACE MWU* ACD	TCN ACE MWU* ACD		TCN MWU* ACD	ACE TCN MWU* ACA MSP		ACE TCN	ACE TCN
<b>Brass/Bronze/Copper</b>	CRN ACD	CRN MWU* ACD	CRN MWU* ACD		CRN MWU* ACD	CRN ACE TAN		CRN ACE TAN	CRN ACE TAN
<b>Exotic Alloys</b>	ACO	ACO	ACO		ACO	ACO		ACO	ACO

\* M-Wear Ultra includes Moeller's Enhanced Surface Finish (ESF) \*\* Moeller Enhanced Surface Finish (ESF) is recommended for all aluminum applications

**TIN** - Titanium Nitride (TiN)  
**TCN** - Titanium Carbonitride (TiCN)  
**TAN** - Titanium Aluminum Nitride (TiAlN)

**ACA** - Alcrona EVO Advanced  
**ACD** - Alcrona EVO Duplex  
**ACE** - Alcrona EVO (AlCrN-based)

**ACO** - Alcronos  
**CRN** - Chromium Nitride (CRN)  
**ESF** - Enhanced Surface Finish

**MAY** - Mayura DLC  
**MWU** - M-Wear Ultra  
**MSP** - Moeller Special Process

**MTN** - M-Tride



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Please contact our experts for specific, application based, recommendations. Product availability may vary by region.



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