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.

	FORMING & EXTRUDING					PIERCING & TRIMMING			
	Draw/Flange	Extruding	Forging	Hot Forming	Coin/Emboss	Pierce & Trim	Hot Stamping	Fine Blanking	Shave/Lance
Non-alloyed Steel	TAN	TAN MWU* ACD	TAN MWU* ACD	TAN MWU* ACD	TCN TAN MWE MTN	TAN ACN	ACN TAN TCN	TCN ACN ACA	TCN ACN
Steel < 250 Mpa	TIN TCN	ACN MWU* ACD MWE MTN			TCN MWN MWE MTD	TIN TCN		TIN ACN	TIN TCN ACN
Steel < 400 Mpa	TCN ACN	ACN MWU*			TCN ACN	ACN MWU* ACA		TAN ACN	TAN TCN ACN
High Strength Steels	TCN ACN	ACN TCN TAN		ACN MWU* ACD	TCN ACN MWU*	ACN MWU* ACA	ACN TCN MWU* ACA	TAN ACN	TAN ACN
Aluminum**	HCB DLC	HCB DLC	HCB MWU* ACD		HCB DLC TCN	HCB DLC		HCB DLC	HCB DLC
Stainless Steels	TCN ACN MWU* FMP ACD	TCN ACN MWU* FMP ACD	TCN ACN MWU* FMP ACD		TCN MWU* ACD	ACN TCN MWU* ACA MSP		ACN TCN	ACN TCN
Brass/Bronze/Copper	CRN ACD	CRN MWU* ACD	CRN MWU* ACD		CRN MWU* ACD	CRN ACN TAN		CRN ACN TAN	CRN ACN TAN

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

TIN - TiN
TCN - TiCN
TAN - TiAlN
ACN - Alcronoa Pro

ACD- Alcrona Pro Duplex
ACA - Alcrona Pro Advanced
FMP - Formera Plus
MST - MoST

CRN - CrN
DLC - a-C:H
HCB - Hard Carbon
MWU* - M-Wear Ultra

MSP - Moeller Special Process
MWN - M-Wear
MWE - M-Wear Extreme
LAP - M-LAP

MTN - M-Tride
ESF - Enhanced Surface Finish
EGB - Edge Break
CDF - Cryogenic Deep Freeze

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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 2-4µ
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 3 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 2-4µ
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 3-6µ
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 Pro™ – Aluminum Chromium Nitride Based

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

Oerlikon Blazers Alcrona Pro provides excellent all-around performance, thermal stability, and low coefficient of friction, for most piercing and forming applications, including high-strength steels

Technical Information:

Thickness 2-5µ
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

Oerlikon Balzers Alcrona Pro Advanced

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

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

Technical Information:

Thickness 2-5µ
Nitride Case Depth Approx. 30µ
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 Pro Duplex

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

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

Technical Information:

Thickness 2-5µ
Nitride Case Depth Approx. 200µ
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 Formera Plus

Alteration Code: FMP • *Add 3 days to Delivery*

Technical Information:

Thickness 6.5-8u
Nitride Case Depth Approx..003"-.004"
Hardness 3000HV
Coefficient of Friction 0.35
Max. Service Temp. 900°+C/1652°+F

- Works excellent on any draw application of steel or stainless part material
- Duplex nitride process is applied prior to Formera Plus
- Superior to any other coatings available on AHSS Forming Applications up to 1180DP
- Works excellent on all Stainless Steel forming applications–exception 409 stainless

MoST™ – Titanium CarboNitride with Molybdenum Disulfide

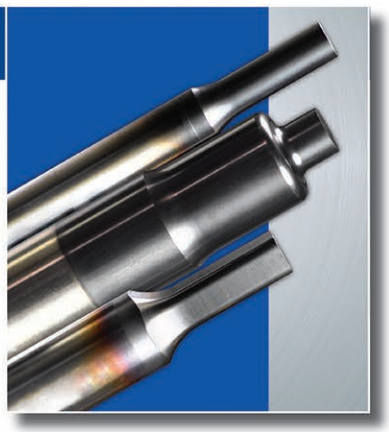
Alteration Order Code: MST • *Add 10 days to Delivery*

MoST is a two layer coating that reduces operating friction and galling through the use of a very lubricious top layer, which is idea for pre-painted and plated materials

Technical Information:

Thickness 3-5µ
Hardness TiCN layer 3000HV MoST layer 2000HV
Coefficient of Friction 0.06
Max. Service Temp. 500°C/932°F

- Extremely high lubricity
- Ideal for pre-painted and plated materials



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 2-5µ
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

COATINGS FOR ALUMINUM APPLICATIONS

DLC – Diamond Like Carbon (a-C:H)

Alteration Code: DLC • *Add 10 days to Delivery*
Diamond-Like coatings are perfectly suited for applications that incur the most extreme wear and galling, such as when piercing and forming todays most advanced aluminums

Technical Information:

Thickness 1-3µ
Hardness 2500HV
Coefficient of Friction 0.1-0.2
Max. Service Temp. 300°C/572°F

- Excellent for piercing and forming aluminum
- Superior resistance to abrasive wear and galling
- Superior coefficient of friction

Note: DLC performs best when combined with "pre and post polish"

Oerlkon Balzers Hard Carbon (ta-C)

Alteration Code: HCB • *Add 5 days to Delivery*
Oerlikon Balzers Hard Carbon is the premier coatings for piercing and forming aluminum, as well as other non-ferrous materials, such as copper and plastics.

Technical Information:

Thickness 1-2µ
Hardness 5000HV
Coefficient of Friction 0.15
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.

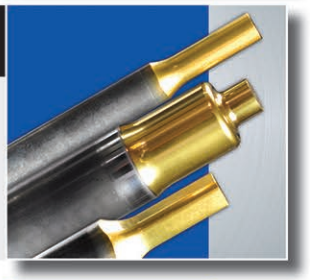
- Tailored to both piercing and forming applications
- High wear resistance for increased tool life
- Resists fatigue due to increased toughness
- Superior finish reduces the coefficient of friction
- Proven to increase tool life up to five times in high strength and stainless applications

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

M-Wear

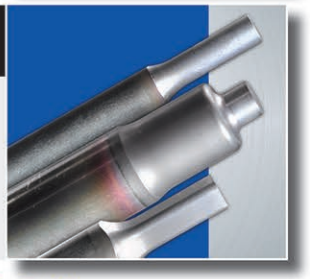


Alteration Code: MWN • *Add 7 days to Delivery*
This dual process surface treatment and coating provides a hard top coating on top of a less hard, but very tough surface treatment

- Beneficial for extruding and forming applications
- Helps distribute stress and load applied to small areas of the tool

Note: Use of stamping lubricants is recommended with M-Wear. M-Wear is not compatible with stainless steels, nickel, or copper.

M-Wear Extreme



Alteration Code: MWE • *Add 7 days to Delivery*
M-Wear Extreme is similar to M-Wear, but has a lower coefficient of friction and higher wear resistance.

- Beneficial for extruding and forming applications
- Helps distribute stress and load applied to small areas of the tool
- Improved coefficient of friction over Moeller M-Wear
- Suitable for stainless, nickel, and copper applications

SURFACE FINISH UPGRADES

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

SURFACE AND EDGE ENHANCEMENTS

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

- Prevents premature breakdown of the cutting edge on pierce punches

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

MOELLER PRECISION TOOL

M-CAD DESIGN

www.moellermcad.com

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